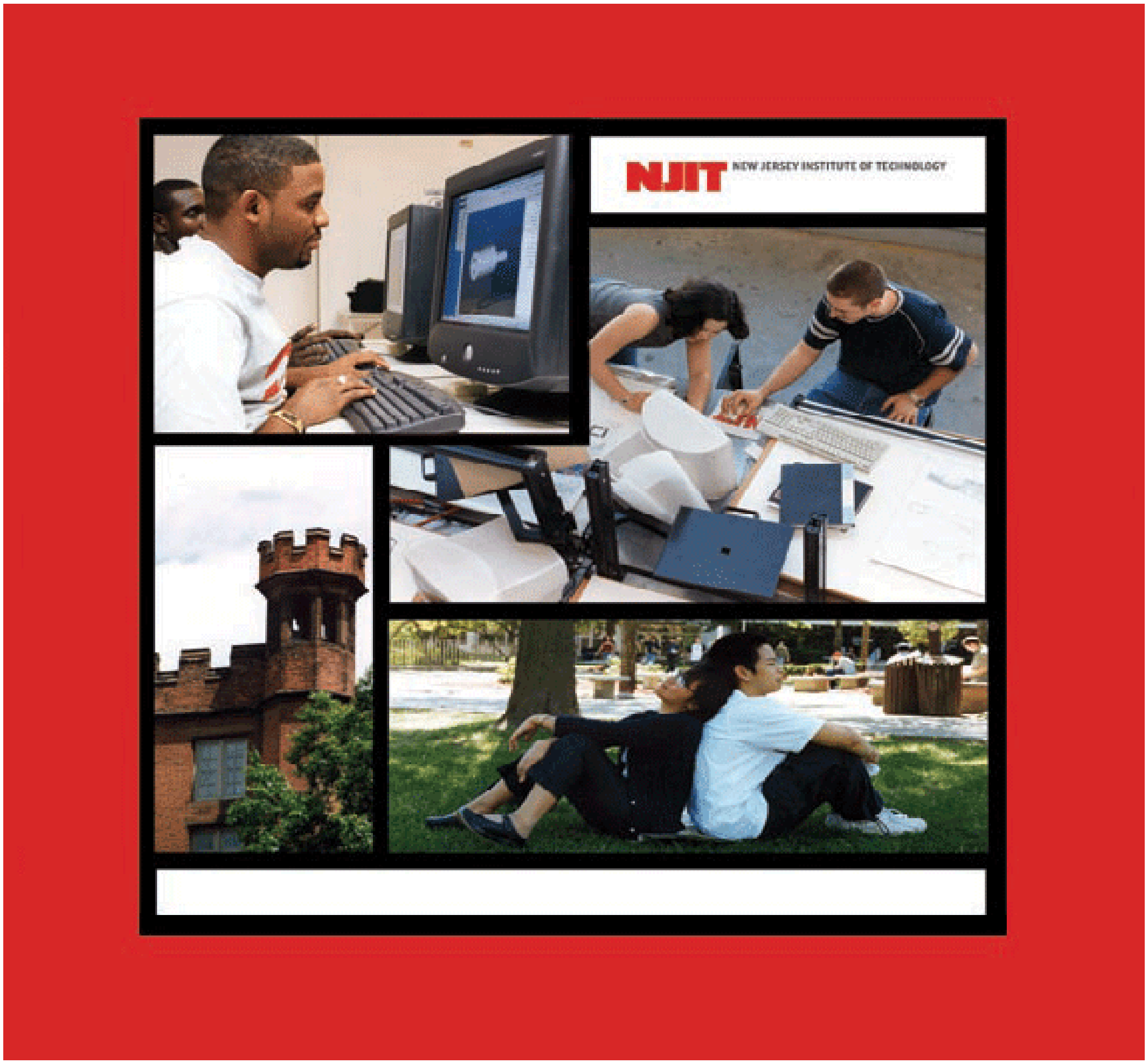
NEW JERSEY INSTITUTE OF TECHNOLOGY

2004-2005 COURSE CATALOG



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Undergraduate: About the University

New Jersey Institute of Technology

NJIT's history spans the Industrial Revolution to the Information Age. Newark was a factory town when the tuition-free evening school was founded in 1881 to support local industries. The first 90 students — including machinists, draftsmen, carpenters, printers, electricians and clerks — studied algebra, geometry, trigonometry, chemistry, physics and drawing. The range of courses offered is testimony to the fact that, from the beginning, NJIT's programs have provided a broad-based foundation to prepare students for success in the workplace. From those early days, science and technology have been the engines fueling the university's development.

Over time, the university both anticipated and responded to change by expanding its curriculum and mission. Most notably, in 1919 the university established baccalaureate programs in three engineering fields. By 1975, NJIT offered a broad range of undergraduate and graduate degrees including architecture, engineering, computer science, management and other science-oriented programs. All of these programs included significant research and public service components with the goal of providing an academic environment that fostered intellectual depth and breadth, as well as social responsibility.

Today, continuing a fourfold mission of instruction, research, economic development and public service, NJIT is among the leading comprehensive technological universities in the nation. With well over 8,000 students, NJIT is the largest technological university in the New York metropolitan region. The university has state-of-the-art facilities with more than 2 million square feet located on a 45-acre campus in Newark, and a solar observatory in Big Bear, California. With robust extension and distance education programs, NJIT's degree and non-degree programs are available throughout the state and world.

NJIT Mission Statement

NJIT is **a public, urban, research university** committed to the **pursuit of excellence** in:

- Undergraduate, graduate and continuing professional

education, preparing students for productive careers and amplifying their potential for lifelong personal and professional growth.

- The conduct of

research in such multidisciplinary areas as environmental engineering, materials science, manufacturing, productivity enhancement, infrastructure systems, communications technologies, and an array of biorelated sciences and technologies.

- Contributing to the state's

economic development through partnerships and joint ventures with the business community and through the development of intellectual property.
Service to both local communities and the broader society of the state and nation by conducting public policy studies, making educational opportunities widely available and initiating community-building projects.

NJIT **prepares its graduates** for positions of leadership as professionals and as citizens; **provides educational opportunities** for a broadly diverse student body; responds to needs of large and small businesses, state and local governmental agencies and civic organizations; and **advances the uses of technology** as a means of improving the quality of life.

NJIT offers a **comprehensive array of programs** in engineering and engineering technology, computer science, architecture, applied sciences, mathematics, management, policy studies, and related disciplines throughout New Jersey and the nation.

NJIT's Six Colleges

NJIT's roots are in engineering education. For more than eight decades, Newark College of Engineering (NCE) has been preparing engineering students to use science, mathematics, technology and problem-solving skills to design, construct, test and maintain products, services and information systems. NCE alumni lead major corporations, hold senior public positions, own their own businesses and teach at universities.

NJIT's New Jersey School of Architecture, established in 1974, is one of the largest architecture schools in the nation and is nationally recognized for the innovative integration of computer technology into the design curriculum.

The College of Science and Liberal Arts (CSLA), established in 1982, is moving into the forefront of many national research activities from solar astronomy to mathematical modeling. CSLA provides students with the skill sets for the professional marketplace, including literacy in the mathematical, physical and biological sciences, as well as traditional liberal arts disciplines.

The School of Management, established in 1988, combines the best of traditional business disciplines (e.g., finance, marketing, accounting, e-commerce) with the power of information and technology management to develop professionals who can manage and communicate effectively.

The Albert Dorman Honors College, established in 1993, offers one of the nation's leading technologically oriented honors programs for students who are prepared to undertake a rigorous and individualized course of study.

The College of Computing Sciences, established in 2001, has one of the largest educational programs in the nation, with approximately 2,000 students in 13 degree programs.

A Public Research University

As a public research university, NJIT is educating leaders for a technology-driven economy. The university is constantly updating educational programs to emphasize marketplace skills, and redesigning its methods of delivering education. Indeed, computing and information technology underpin every facet of the NJIT mission.

NJIT is designated as a "Research Intensive" University by the Carnegie Foundation and ranks among the "best national universities" by *U.S. News and World Report.* The university expends more than $75 million in a panoply of research and development partnerships with industry, government and other universities. NJIT researchers are making important advances in a wide range of areas, including the biosciences, manufacturing, microelectronics, multimedia, transportation, computer science, solar astrophysics, environmental engineering and science, and architecture and building science.

Computing-Intensive Campus

As one of America's most computing-intensive universities, NJIT is nationally recognized as a pioneer in the use of information technologies from developing algorithms to reduce simulation times on large-scale parallel computers, to advancing the frontiers of visualization technology, to patenting optics-based sensors, to developing computer-based infrastructure management systems, to developing advanced computer-mediated communication systems.

NJIT’s information services and technology resources provide members of the university community with universal access to a wealth of resources and services available over the NJIT network and the advantages of a highly computing-intensive environment. In 1998 and again in 1999, Yahoo! Internet Life magazine ranked NJIT America’s “most wired” public university in the nation for the use of technology as measured by a set of indicators that include academics, student services, communications and technology infrastructure. Students have the opportunity to experience many aspects of a “virtual university.” The latest advances in telecommunications and multimedia technology enhance the delivery of courses and overall educational experience for all students. As a member of the Internet2 research consortium, students have the opportunity to work closely with faculty and researchers as new families of advanced networking applications are developed for the new millennium. NJIT operates an on-campus PC store where all students, faculty and staff may purchase PC hardware and software, and a PC maintenance facility for service and support.

Computers and information technology play an important role in virtually every task performed on campus, from cutting-edge research to parking-space reservations. Computers assist in teaching and independent study, campus communications, library research, engineering and architectural designs. Computers allow students to register for classes and choose course schedules and ask questions of academic advisors. Students can access the tools they need to design new buildings, develop complex solutions to engineering problems or compile detailed management analyses — all by logging on to the NJIT network.

The Newark campus’ ATM network backbone connects more than 3,900 nodes in classrooms, laboratories, residence halls, faculty and staff offices, the library, student organization offices and others. The network provides access to a wealth of shared information services. Some of these include high-performance computer servers providing CPU cycles for simulation and computational research, disk arrays for storage of large data sets, communication servers for electronic mail and document exchange, databases, digital journal subscriptions and a virtual “Help Desk.” A virtual private network combined with Internet access, plus a large ISDN modem bank, extend access to campus information resources to faculty, staff and students at home, work, any of the university’s extension sites, or throughout the world.

Primary academic computing is provided via a distributed computing environment using the Andrew File System (AFS). Students receive a single log-on account that provides access to hundreds of UNIX and NT-based workstations on the campus network for programming, computation, Internet access, graphics and visualization facilities and many other applications. Powerful statistical analysis software is provided on a separate VMS computing system. The Academic Computing lab in the Student Mall has several hundred PCs for student use. Additional PC clusters are available in the Honors Center, the Robert W. Van Houten Library, the University Learning Center and many departmental facilities.

NJIT is home to the EIES/VC Virtual Classroom® conferencing system, one of the first computerized conferencing systems to be used for distance education. Each semester, more than 2,000 students use the Virtual Classroom® system as a meeting place for class group discussion.

The Van Houten Library's Information Commons provides a convenient and relaxed atmosphere to search the Web, access electronic databases, view videotapes and other electronic archives of class lectures, or retrieve scholarly publications through digital library subscriptions. Reference librarians are available to help students sort through the vast amounts of information resources available and access what they need.

The Office of Instructional Technology and Media Services provides several facilities used for live and taped broadcast of telecourses as well as satellite downlinks for a wide variety of video teleconferences and other educational and public service satellite broadcasts. Several interactive television studio classrooms provide distance learning facilities.

In addition to these extensive resources, several departments have special facilities for the support of individual academic programs, including the School of Architecture's award-winning Imaging Laboratory that provides students an opportunity to explore new media and images that alter the way buildings are visualized, interpreted and created.

All students and faculty are encouraged to make full use of computing facilities including e-mail and personal Web pages. Students may obtain accounts by following an online tutorial in one of the many computer labs. Once an account is set up, students may take advantage of an online, self-registration system to enroll in courses for subsequent semesters. NJIT alumni are eligible for lifetime e-mail.

Library Services

The university's Robert W. Van Houten Library is located in the Central Avenue Building. Erected in 1992, the Van Houten Library provides a modern facility for individual and group study, research and browsing. The library has a collection of more than 150,000 books, and subscribes to more than 1,000 printed periodicals and about 8,000 electronic journals. These electronic databases are accessible from any computer on NJIT's campus, and any member of the NJIT community (student, faculty or staff) has access to these databases from a remote location via NJIT's Virtual Private Network (VPN). The library's home page provides access to NJNEER, the library's electronic catalog, NJNEER Web, the new Web version of the catalog and links to a wide array of information services.

The library's Information Commons, located on the first floor, is designed to provide a unique variety of services to satisfy student information needs. Commons workstations have computers for searching Web sites, computers for searching the NJNEER online and Web catalogs, and access to a variety of online journal databases, many providing full-text articles. VCRs for viewing videocassettes reserved for courses are also available, as are computers with word processing and other services. A student user manual describing library services is available at the library's circulation and reference desks.

Journal and conference literature in engineering, science, management, architecture and other subject areas is accessible through a variety of indexing and abstracting publications, in both print and electronic format. Frequent review of available electronic databases has resulted in a huge increase in the number of electronic journals available to library users. Among the online databases recently added to the library's collection are Lexis-Nexis Academic Universe (access to the world's leading legal, news, medical and business resources) and JSTOR (a full-text database of more than 100 scholarly journals in economics, ecology, statistics, mathematics, history and philosophy). UnCover, a document delivery service that faxes articles within 48 hours, is available through our Interlibrary Loan/Document Delivery Service.

The librarians provide individualized reference services, literature searches and instruction in the use of information resources. There are five technical reference librarians providing such services, each holding a master's degree in library science and, among the group, degrees in chemistry, industrial engineering, information science, art, mathematics and liberal arts. They also act as liaisons to NJIT academic departments in materials selection and assistance. The Architecture Library, a branch of the Van Houten Library, is located on the fourth floor of Weston Hall, part of the Architecture and Building Sciences Complex. The collection includes more than 13,500 volumes of books and journals, nearly 80,000 slides, and more than 1,000 maps in addition to product catalogs, videotapes, CD-ROMs, models, portfolios and theses. The makeup of the collection is primarily architecture including history, theory, design and practice and secondarily art, design, structures and planning. Access to the architecture journal articles is provided by the Avery Index to Architectural Periodicals and the Art Index on the Web. All online sources are available in the Architecture Library as well as in the main Van Houten Library.

In addition to NJIT's libraries, students have access to nearby Rutgers-Newark's Dana Library, UMDNJ's Smith Library, and Newark Public Library. Students may also borrow from the libraries of Jersey City University, Kean University, Ramapo College, Rowan University, Stockton State College, William Paterson University, College of New Jersey, and Montclair State University.

More information about the library can be found at http://www.njit.edu/Library/Welcome.html or by calling (973) 596-3210 (reference desk), (973) 596-6371 (circulation desk).

Consortium with Rutgers-Newark and UMDNJ

NJIT, Rutgers-Newark, UMDNJ, and Essex County College cooperate through the Council for Higher Education in Newark (CHEN). The three research universities (NJIT, Rutgers-Newark, and UMDNJ) also work cooperatively on graduate education and graduate student services through the Newark Graduate Center. NJIT is a partner with one or both universities in 5 joint PhD programs and 8 joint master's programs. In addition, NJIT and Rutgers-New Brunswick offer a joint PhD program in one specialization.

The three institutions are partners in University Heights Science Park, designed as a mixed-use, multisponsor science and technology park. University Heights Science Park is a partnership among academia, the community, private industry, and local, state and federal governments, which provide opportunities to transfer university-based research and technology to public uses. The 50-acre University Heights Science Park is adjacent to the NJIT campus. Each year, thousands of students from NJIT and Rutgers-Newark take courses at both institutions. In addition, the two universities cosponsor common seasons of theatrical productions, as well as "World Week," and a variety of other cultural and social activities.

Graduate Studies

NJIT offers advanced studies in numerous disciplines leading to master's degrees, doctoral degrees and graduate certificates. Programs are available to full-time students and to working professionals who are interested in part-time study. Some programs are offered jointly or in cooperation with Rutgers-Newark and with UMDNJ as part of continuing collaborations within The Graduate Center at Newark. Graduateprograms at NJIT are overseen by the Office of Graduate Studies , East Building, Room 140, 973-596-3462.

Full-time students are involved in the university's extensive research activities through association with renowned faculty and research centers. Financial support is available through a variety of programs that permit students to become part of the teaching, administrative and research functions of the university. Other non-service-based support is also available.

Graduate Degrees

The doctoral and master's degree programs offered at NJIT are listed below. All doctoral programs lead to the doctor of philosophy; master's programs lead to the master of science with the exception of the Master of Architecture, the Master of Arts in History, The Master of Arts in Teaching (History), the Master of Business Administration, the Master in Infrastructure Planning, and the Master of Public Health. Dual degree offerings are available for M.Arch./M.S. in Civil Engineering, M.Arch./Master in Infrastructure Planning, the Master of City and Regional Planning and M.Arch./M.S. in Management. Other degree options include the B.S./M.S., the M.S./M.S., the Executive M.B.A. Program, and the Collaborative Doctorate.

Applied Chemistry (M.S.)	Applied Mathematics (M.S.)
Applied Physics (M.S., Ph.D.) joint with Rutgers-Newark	Applied Statistics (M.S.)
Architecture (M.Arch.)	Architectural Studies (M.S.)
Biology (M.S., Ph.D.) joint with Rutgers-Newark	Biomedical Engineering (M.S.)
Biomedical Engineering (Ph.D.) joint with UMDNJ	Business Administration (M.B.A.)
Chemical Engineering (M.S., Ph.D.)	City and Regional Planning, joint with Rutgers-New Brunswick
Civil Engineering (M.S., Ph.D.)	Computational Biology (M.S.) joint with Rutgers-Newark
Computer Engineering (M.S., Ph.D.)	Computer Science (M.S., Ph.D.)
Electrical Engineering (M.S., Ph.D.)	Engineering Management (M.S.)
Engineering Science (M.S.)	Environmental Engineering (M.S., Ph.D.)
Environmental Science (M.S., Ph.D.) joint with Rutgers-Newark	Environmental Policy Studies (M.S.)
History (M.A., M.A.T.) joint with Rutgers-Newark	Industrial Engineering (M.S., Ph.D.)
Information Systems (M.S., Ph.D.)	Infrastructure Planning (M.I.P.)
Interdisciplinary Studies (M.S.)	Internet Engineering (M.S.)
Management (M.S.)	Manufacturing Systems Engineering (M.S.)
Materials Science and Engineering (M.S., Ph.D.)	Mathematical Sciences (Ph.D.) joint with Rutgers-Newark
Mechanical Engineering (M.S., Ph.D.)	Occupational Safety and Health Engineering (M.S.)
Pharmaceutical Engineering (M.S.)	Professional and Technical Communication (M.S.)
Public Health (M.P.H.) joint with Rutgers-Newark and UMDNJ	Telecommunications (M.S.)
Transportation (M.S., Ph.D.)	Urban Systems (Ph.D.) joint with Rutgers-Newark and UMDNJ

The Collaborative Doctorate

This doctoral student option is designed to meet the workforce needs of the knowledge-dependent global economy of the 21st century recognizing the particular requirements of the practitioner. This option can meet the needs of engineers, managers, scientists, military personnel and educators who wish to pursue doctoral studies while employed full-time in the private, public and non-profit sectors.

Academic requirements are the same as for other NJIT doctoral programs but the collaborative nature of the program also allows participants to draw on the combined expertise and resources of the university and their employer. The program includes significant flexibility with opportunities for distance learning and independent study that are integrated with face-to-face classes.

To participate in this Ph.D. program, students should first confer with their employer. Employees should seek a commitment from their employer that will facilitate participation and commitment to an area of research at an appropriate time. A senior researcher or manager may wish to serve on the student's dissertation committee.

Students must meet university requirements for admission to doctoral programs. Prior work, related research activity, publications and honors will be evaluated in addition to traditional academic criteria.

Doctoral students are expected to have been employed in their field for at least five years, and to have completed a related master's degree. They are expected to continue employment until they complete all degree requirements. Annual reviews of progress will be conducted. Students may perform dissertation research at their employer's facilities. Dissertation research can be derived from interests of the student and may be related to their professional activity.

Dissertation research must satisfy university policies. The student's dissertation committee defines residency requirements. It is expected that the employer will permit a concentrated effort on dissertation research. Seminar requirements are also defined by the dissertation committee and may allow presentations or attendance at professional society meetings in place of on-campus seminars. Credit requirements must meet university standards for the doctorate. Course selection is based on previous activities and the current state of knowledge of the student. Dissertation research is expected to investigate or develop an original contribution to science, technology or management. Research may be experimental, analytical, applied or theoretical provided that it satisfies all criteria set by the dissertation committee.

Employers who have a proprietary interest in dissertation research including patent, copyright and technology transfer rights are expected to execute formal agreements with the university before research begins.

Continuing Professional Education

NJIT's Division of Continuing Professional Education provides enriching career-long learning opportunities through extension programs, ACCESS/NJIT online learning, graduate certificates, and through its non-credit technical programs, professional development training and corporate customized training.

Twelve-credit graduate certificates, which are also applicable to NJIT master's degrees, are available to those seeking a career upgrade and change. Certificates can be acquired in one calendar year by attending classes on campus, at extension sites or via online learning.

Professional development programs include short courses, certificates and license reviews, with some leading to the award of continuing education units (CEUs). The CEU is used nationally to document the type, quality and duration of study. In general, one CEU is defined as being equal to classroom hours. Taught throughout the year, individual classes typically last one to five days. Certificates and license review programs can entail a significant number of hours of instruction spanning several months.

NJIT's Division of Continuing Professional Education's non-credit training programs are available via both classroom and instructor-led eLearning virtual classrooms. Typical topics include computer and technology; and safety and environment.

All professional development courses can be adapted to meet a particular organization's needs and conducted as a custom-designed training program at a company site. For more than 50 years, NJIT has been designing and conducting non-credit courses that meet technology-based organizations' needs for high-quality, lifelong workforce education. More than 375 courses are available in 13 subject areas.

For further information contact the Division of Continuing Professional Education, at (800) 624-9850 or *cpe.njit.edu.*

Graduate Certificates

Twelve-credit graduate certificates are offered in "fast track" professional fields externally validated with expanding employment opportunities. The following list is the current selection of Graduate Certificates:

Bioinformatics
Management Essentials
Construction Management
Information Assurance & Networking Security
Information Systems Design
Information Systems Implementation
Management of Technology
Pharmaceutical Management
Pharmaceutical Technology
Practice of Technical Communications
Project Management
Telecommunications Networking

Extension Programs

Students may take courses and earn degrees throughout the state at NJIT's extension sites listed below. Admissions requirements and the quality of instruction are the same for on-campus and extension programs. Registration, advisement and support services are available at each site.

Atlantic County at the FAA Technical Center: courses leading to completion of a Master of Science in Computer Science and in Information Systems.

Camden County Community College: Master of Science degrees are available in Computer Science, in Engineering Management, and in Information Systems.

Gloucester Community College: Undergraduate SET classes.

Mercer County at the Department of Transportation: courses leading to the completion of a Master of Science in Transportation.

Mercer County at the Department of Environmental Protection: courses leading to the completion of a Master of Science in Environmental Science.

Somerset County at Raritan Valley Community College: courses leading to the completion of a Master of Science in Management.

The Office of Extension Programs also offers graduate courses on-site at technology-based organizations, including Chubb Institute, National Starch and Chemical Company, Stryker Howmedica Osteonics, Telcordia Technologies, Wyeth Pharmaceuticals and others. These courses are available only to the employees of the host corporations.

For more information about these and other off-campus programs, call the Division of Continuing Professional Education at (973) 596-3640.

ACCESS/NJIT online learning

ACCESS/NJIT provides students the opportunity to earn college credit through enrollment in online electronic-based courses. Each online course combines video media with electronic interaction primarily through Web-based and computerized conferencing under the management of an NJIT course mentor. Online courses are flexible and rigorous educational experiences suited to motivated students.

The program's reach is nationwide and international. Course material is transmitted through the Internet, cablecast, wireless cable, compressed digital teleconferencing, CD Rom and VHS tape distribution. In addition, ACCESS/NJIT originates programming for the National Technology University, a provider of graduate courses for technological professionals.

ACCESS/NJIT offers three graduate degrees (M.S. in Engineering Management, M.S. in Information Systems and M.S. in Professional and Technical Communication), four undergraduate degrees (B.S. and B.A. in Information Systems, B.S. in Computer Science and B.S. in Information Technology), select Graduate Certificates, and courses in many disciplines including the physical sciences, computer science, mathematics, engineering and management. ACCESS/NJIT offerings are listed in the Continuing Professional Education (CPE) catalog, available upon request from the Division of Continuing Professional Education and via the NJIT Web site, www.njit.edu/dl.

ACCESS/NJIT furnishes a convenient alternative to distance learners and students who have scheduling conflicts. In addition, any NJIT student needing course review can use ACCESS/NJIT course material. Several campus workstations in the Van Houten Library are set up for viewing.

For more information, contact the Division of Continuing Professional Education at (800) 624-9850.

Accreditation

NJIT is accredited by the Middle States Association of Colleges and Schools (MSACS) Commission on Higher Education.

All of NJIT’s eligible professional programs, both graduate and undergraduate, are accredited by the respective accrediting agency for their field:

AACSB American Assembly of Collegiate Schools of Business, CSAC/CSAB Computer Science Accreditation Commission of the Computing Sciences Accreditation Board, EAC of ABET Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, NLNAC National League for Nursing Accrediting Commission, TAC of ABET Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Addresses and telephone numbers for all of these accrediting agencies are listed below.

Accreditation Board for Engineering and Technology, Inc. (ABET)
Computing Accreditation Commission of the Accreditation Board for Engineering and Technology **(CAC of ABET)**
Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology **(EAC of ABET)**
Technology Accreditation Commission of the Accreditation Board for Engineering and **(TAC of ABET)**
111 Market Place, Suite 1050

Baltimore, MD 21202
Tel. (410) 347-7700

The Association to Advance Collegiate Schools of Business (AACSB)---The
International Association for Management Education
600 Emerson Road, Suite 300
St. Louis, MO 63141-6762
Tel. (314) 872-8481

Middle States Association of Colleges and Schools
3624 Market Street
Philadelphia, PA 19104
Tel. (215) 662-5606

National Architectural Accrediting Board, Inc. (NAAB)
1735 New York Avenue, NW
Washington, DC 20006
Tel. (202) 783-2007

National League for Nursing Accrediting Commission
New York, NY 10006
Tel. 1 (800) 669-1656

Graduate Student Association

The Graduate Student Association was founded in 1983 to promote the interests of graduate students, enhance program quality, foster student-faculty communication, and provide for the needs of advanced degree students. All students currently enrolled in NJIT graduate degree programs and paying the Graduate Student Association fee are members of GSA. A current graduate student and an alternate from each degree program are represented on the GSA Council. Students interested in serving on the council or learning more about GSA should contact the GSA office (973) 596-2993 or the Office of Graduate Studies (973) 596-3462. The dean of graduate studies is the GSA advisor.

Graduate Honor and Professional Societies

Alpha Epsilon Lambda Honor Society

The Sigma Chapter of Alpha Epsilon Lambda, the National Honor Society for Graduate and Professional School Students, was established in 1995 at NJIT and is the first chapter in New Jersey. Membership is based on standards of scholarship, leadership and character, and is by invitation. Contact the Dean of Graduate Studies, (973) 596-3462, for more information.

Other Honor and Professional Societies

Each program offering graduate degrees at NJIT will have information about honor and professional societies open to graduate students in particular disciplines. Contact the dean of the appropriate school or college or the dean of graduate studies for further information. NJIT also has active chapters of Omicron Delta Kappa, a service-oriented society, and Sigma Xi, which focuses on research.

NJIT Campus

Located in the University Heights section of Newark, NJIT’s 45-acre campus is adjacent to the campuses of Rutgers-Newark and Essex County College and a short distance from UMDNJ. The campus is reached easily via interstate highways and public transportation. New Jersey Transit’s City Subway stops on campus, the Pennsylvania Railroad Station is 5 minutes from campus and Newark International Airport is within 5 miles of NJIT.

The expansion and improvement of NJIT’s campus facilities have been vigorous, proceeding pursuant to a carefully drawn long-range plan, providing an environment conducive to accomplishment of the university’s mission. A new student center is under construction.

NJIT’s campus is home to some 20 R&D centers supported with industry, state, federal, foundation and university funding. NJIT’s three-story Otto H. York Center for Environmental Engineering and Science houses a number of state and federally funded research centers.

The 187,000-square-foot William S. Guttenberg Information Technologies Center houses the Center for Manufacturing Systems and the Multi-lifecycle Engineering Research Center. The building is the site of the College of Computing Sciences and industrial and manufacturing engineering instruction and research facilities.

The campus center houses the food court, dining room and a more informal eating facility, The Highlander Cafe. In addition, there is a campus theater in which student productions are staged, an athletic field, tennis courts, and indoor recreational facilities, including a swimming pool, racquetball courts, weight rooms, track, aerobics room and more. The residence halls provide dormitory and apartment-style coed living accommodations for more than 1,400 students.

Residence Life

Over 1450 students live on campus in four co-ed residence halls. Approximately 50 graduate students live on campus. Rooms are fully furnished, air-conditioned and wired for networking to the University's main computer system and to the Internet. Each hall has common areas and facilities including lounges, study areas, kitchens and laundry rooms. Rooms are wired for phone and provided approximately 50 cable TV channels. Other services include: washers and dryers, snack and soda machines, recreational equipment (pool, ping-pong, large screen televisions, etc.) and mail service Monday-Friday. Graduate students are not required to have meal plans.

Graduate students usually live in Laurel or Oak halls.

Laurel Hall is a suite-style building with approximately 582 upper class students in single, double and triple rooms. Any combination of two types of rooms can make a suite. Suites have a shared bathroom and foyer.

Oak Hall has approximately 213 upper class and graduate students housed in both suite-style rooms and apartments. Each suite-style room has a kitchenette and shared bathroom. Each apartment has a kitchen, living room and bathroom. Suites are comprised of two doubles or a double and triple bedroom. Apartment can have: a single with a double bedroom, two doubles or a double with a triple bedroom.

NJIT students use electronic cards for access to a residence hall. Desk attendants are on duty 24 hours a day and provide security for the residence halls by monitoring hall entrances and swiping resident IDs. All guests must have a valid photo ID and must be signed into the residence hall by a resident host. Guests must be accompanied by their hosts at all times.

Residence Life has staff on-duty in each hall during non-business hours. In addition, NJIT's Public Safety Office has patrols by their force of police officers and public safety officers, 24 hours a day. Patrols are conducted on foot, in cars, motor scooters and bicycles. Rooftop surveillance cameras are mounted throughout campus and monitored around the clock.

Once you have been admitted to NJIT, you can complete the Housing Application and Contract. It is located on our website as a PDF file. With the completed application, send a $50 non-refundable deposit payable to NJIT, to the Residence Life Office, 180 Bleeker Street, Newark, NJ 07103-3514.

Applications for **graduate students** are assigned housing based on the distance you live from campus, need and date of application. We anticipate a wait list for the fall for all students. You may also be assigned to a triple room. We will send a confirmation letter three-four weeks after receiving your application.

While some graduate students choose to live on campus, many live off campus. Off-campus housing is available in a number of towns in close proximity to NJIT. Monthly rents typically begin at $300 and increase depending on the specific living conditions. Most rental space will require one month's rent and one month's deposit before moving in. Have a sufficient amount of money available when you begin your apartment search. It is recommended that you arrive as early as possible to allow yourself time to search for suitable accommodations (temporary housing is available (http://oisf.njit.edu/new_students_prearrival.php). The Residence Life Office provides an "Off-Campus Housing" newsletter and a list of available rentals in the area (updated weekly). You can view the newsletter and the list of available rentals by logging onto http://www.njit.edu/old/reslife/services.php and clicking on off-Campus Housing. In addition, Residence Life staff will be available to assist you in finding housing upon your arrival. You can email the Off Campus Housing Coordinator in the Residence Life Office at offcampus.housing@njit.edu with any questions. For additional information please review our website http://www.njit.edu/reslife For additional questions, contact us via email reslife@njit.edu or call 973.596.3039.

Housing and Meal Plan Fees Per Semester

- Laurel Hall, Oak Hall Double Rooms $ 2,872.00.

- The single room rate is $3,372.00 per semester. Single rooms are available only to upperclass or graduate students based on room selection criteria and processes.

- Twelve-month housing contracts are available. The charge is an additional $1,000 per semester.

Meal Plans Per Semester
A – Plan $1,249.00 5 dinner meals per week, $500 flex dollars, 10 guest dinners*
B – Plan $1,249.00 7 dinner meals per week and $400 flex dollars
C – Plan $1,339.00 5 dinner meals per week, $600 flex dollars, 10 guest dinners*
D – Plan $1,339.00 7 dinner meals per week and $500 flex dollars
E – Plan $1,246.00 70 dinner meals per semester, 12 guest dinners**, $450 flex dollars

* Guest dinners, for A and C, are allotted monthly, 3-Sept., 3-Oct, 2-Nov., 2-Dec., 1-Jan., 2-Feb., 3 Mar., 3-Apr., 1-May (Varies by academic year.)
** Guest dinners on the block plan can be used at “anytime” during the semester.

- Dinners are all-you-can eat meals.
- Flex dollars can be used in the Dining Room (breakfast and lunch meals), the Highlander Club or Starbucks Coffee Shop.
- ONLY Flex dollars carry over from fall to spring semester. At the end of spring semester there are no refunds from flex dollars. Students may purchase extra flex dollars. The initial increment is $100 and after this they may be made in $25 increments.

*Expect room and board rates for 2005-2006 to increase 4-7 percent.

Payment and Cancellation

For new students (first time freshman, transfers, exchange students): Enclosed with the signed contract a check or money order (only) payable to NIT, in the amount of $50 serves as a non-refundable room reservation deposit. A cancellation fee will be assessed, if cancellation is made prior to checking in.

For All Students (returning residents, current commuters apply for housing): All students must complete and sign this contract. If a contract is cancelled prior to check-in, the following cancellation fee will apply: if cancelled before May 16, 2004 - $0, Between May 17 and June 27, 2004 - $250 and after June 28 - $450.

Students applying for spring 2005 housing-- You will be charge a $450 cancellation, if your contract is cancelled prior to check-in.

In all cases
No refunds of room charges will be made once a resident takes possession of a room. A resident has possession of a room once he/she signs the “Check-in-Form.”

Releases from the Contract
A Resident may be released from the contract assignment from the fall to the spring semester without forfeiture of charges or during the semester, if the Residence Life Office is notified in writing, with supporting documentation in the following cases only:

- Withdrawal from the University
- Marriage or pregnancy
- Transfer to another University
- Graduation
- Loss of University financial aid

In these circumstances only, students are billed until the end of the semester in which they cancel their contract or are pro-rated to the date of check-out (if it falls prior to the end of the semester.) If a student loses housing privileges as a result of a policy violation, if it falls prior to the end of the semester, they pay housing charges only until the end of the semester.

Meal Plan Refund Policy

If a student is released from their housing contract during a semester, they are charged until the date of check for meals and flex dollars

If a resident student places cash in their flex account, they are entitled to a refund anytime, or may carry the flex amounts over from one semester to the next.

Meal Plans for Commuter Students

Commuter students may elect to have a full meal plan or place money in their account. The initial increment is $100 and after this they may be made in $25 increments.

If a student is released from their housing contract during a semester, they are charged until the date of check for meals and flex dollars

If a resident student places cash in their flex account, they are entitled to a refund anytime, or may carry the flex amounts over from one semester to the next.

Meal plan Refund Policy for Commuter Students

If students select a regular meal plan the refund policy and procedures are the same as for resident students.

If commuter students place cash in their flex account, they are entitled to a refund anytime, or may carry the flex amounts over from one semester to the next.

PARKING

Every vehicle parked in NJIT lots must be registered with the Department of Security, Identification and Parking Systems, and must display a valid parking permit for the semester. Student parking registration must be completed on-line at www.njit.edu/parking and is available to NJIT students who have registered for classes. Upon registering for parking, a separate fee will be charged to your student bursar's account and a parking permit will be mailed to the address you choose on-line. Additional information is available on-line, or at the Department of Security, Identification and Parking Systems located on the second floor of the parking deck.

PHOTO ID

All new students at NJIT are required to report to the Photo ID office, located on the second level of the parking deck, to obtain a photo identification card. Each semester, this ID card must be validated at Public Safety, the Campus Center, or the Library. Identification cards must be carried at all times to be presented upon request as valid identification while on campus. The photo identification card will be programmed for access to and use of the residence halls, the parking facility, the library, the gymnasium and the cafeteria meal plan as needed by each individual student. Hours of operation for the Photo ID office vary each semester and will be posted. If you have any questions, please call (973) 642-7190 or visit us on line at [www.njit.edu/parking.](www.njit.edu/parking)

A Look at Student Life

NJIT offers a wide range of extracurricular programs from sports to professional societies.

NJIT has an extensive intercollegiate sports program. Men's sports are baseball, basketball, cross-country, fencing, judo, soccer, swimming, tennis and volleyball. Women's sports include basketball, cross-country, fencing, judo, swimming, tennis and volleyball. The intramural program includes all sports available at the intercollegiate team level plus track and field, racquetball, flag football, badminton, softball and archery.

The Graduate Student Association sponsors a wide range of activities and supports many clubs as Tier 1 clubs and Tier 2 clubs. The Tier 1 clubs are generally culturally based and the Tier 2 clubs are generally professional interest based. Graduate students may belong to any or all of the clubs supported by GSA. Specific activities offered annually may be social, cultural, or professional. Some annual cultural festivals include the Chinese Moon festival, Indian Festival of Lights, international food fair, and others representative of the diverse culture of our full-time and part-time United States and international graduate students. There are also regular late afternoon coffee hours each week, typically on Wednesdays.

Trips with discounted cost to the New York City theater, the New Jersey Performing Arts Center, east coast cities such as Boston, Philadelphia, and Washington, countries such as Canada and Mexico, and other locations are often scheduled. These take full advantage of the unique location of Newark as transportation hub within the New York /New Jersey metropolitan region. Professional programs each semester include a thesis/dissertation workshop sponsored by GSA on behalf of the Graduate Studies Office. The GSA website gives a full schedule of activities. The NJIT GSA is also active in the National Association of Graduate and Professional Students and develops programs with them as well.

NJIT is within walking distance of the Newark downtown area and nearby campuses, which, along with NJIT, are located in Newark's University Heights section. Students may take advantage of Newark's nationally ranked museum, library, Symphony Hall, and New Jersey Performing Arts Center (NJPAC) and may enjoy the city's burgeoning art and jazz scene. In addition, students have easy access to the vast cultural resources of the New York/New Jersey metropolitan area. NJIT is only 20 minutes from midtown and downtown Manhattan, and the city is easy to reach by bus, train or car. A joint Rutgers/NJIT shuttle bus provides regular free commuting service to principal transportation centers.

Student Services

The dean of student services administers and coordinates the activities of the Student Services Division, including the Campus Center, the Counseling Center, Health Services, Residence Life, the University Learning Center and the University Research Experience. Special services for evening and disabled students are provided. The office also is the liaison for Food Services, The Highlander Cafe and the NJIT Bookstore.

The office is located in Student Services, Campbell Hall. The phone number is (973) 596-3466/3470.

The Campus Center

The final phase of NJIT's $83 million campus construction program opened in September 2004. The centerpiece is a new four-story student center with an outdoor roof garden with seating, a two-story student lounge and an expanded woman's center. Additional features will include a bookstore, a convenience store, six-lane bowling alley and computer center.

The Campus Center is a place for cultural, educational and social activities for the NJIT community. The Campus Center staff strives to provide students, faculty and staff with a relaxing environment where they can enjoy a meal, study, watch a film, play billiards or a variety of other games, participate in the many activities offered or just socialize with friends. The Offices of Student Activities, Greek Life, Women's Center and Miniversity are located within the building. The center also houses a wide variety of student clubs and organizations including the Student Senate, Graduate Student Association (GSA), Student Activities Council (SAC), university newspaper (Vector), yearbook (Nucleus) and radio station (WJTB). More than 50 student-run cultural, professional, special interest and social clubs and organizations share office space in the Campus Center.

On the lower level of the center is a recreation area with bowling, billiards, table tennis and video games. A variety of tournaments is offered each semester. The majority of student organization offices, radio station WJTB and The Pub are also located on the lower level. The main level of the center houses the Food Court, Student Dining Room, Information Desk and offices of the director of the Campus Center, assistant director for Greek Life and the reservation manager. The second floor of the center houses the offices of the associate director for student activities, the Women's Center, Miniversity and several student organizations. This floor also contains the Ballroom, which is used for a variety of large events, several meeting rooms, an art gallery and the Faculty/Staff Dining Room.

The Campus Center Information Desk personnel provide information about the campus, community events and public transportation. The Information Desk also has a university telephone directory, campus maps, discount tickets for Broadway shows, postage stamps and mail service. Two computers are provided for students to check class schedules, grades and registration information. The Campus Center Office also provides fax service for a nominal charge. The phone number for the Information Desk is (973) 596-3605.

The Murray Center for Women in Technology

The Constance A. Murray Women's Center provides a hospitable environment for all women at NJIT. Located on the second floor of the Campus Center, the women's center offers a wide range of resources, including a multimedia library, computer workstations and access to a World Wide Web database about women in technology. The center contains space for small group meetings, study, tutoring and research. It provides a forum for women to discuss matters of mutual concern, including issues related to the academic and social environment at NJIT. It sponsors programs and events especially designed to facilitate mentoring and career networking among women. The center also supports research about women and technology and fosters efforts to explore the continued integration of gender into the curriculum. The lounge/study area is open to all members of the NJIT community daily, Monday through Friday.

International Students

The Office of International Students and Faculty offers numerous services and programs to aid students in their adjustment to NJIT. Because immigration regulations frequently change, affecting the status of students, all international students holding non-immigrant visas (especially F and J visas) must attend a mandatory orientation program prior to the beginning of their first semester. F-1 and J-1 students must maintain full-time registration (12 credits per semester), except for special cases as defined by immigration regulations. Students on dependent visas (such as F-2, J-2 and H-4) should consult with the Office of International Students and Faculty if change in status or full-time study is contemplated. The office is located in The East Building, Room 140. The phone number is (973) 596-2451.

Students with Disabilities

The coordinator of Student Disability Services assists students with disabilities in the NJIT Counseling Center. Assistance services may include: providing general information; counseling; coordinating academic accommodations such as special testing arrangements or adaptive equipment; coordinating the provision of auxiliary services such as note takers, sign language interpreters, readers; and liaison with faculty, staff and other agencies. Services are provided to students with documented disabilities and require meeting with the coordinator, submitting documentation and completing appropriate forms. For further information or to discuss accommodations, please contact the coordinator of student disability services in the Counseling Center. The Counseling Center, located in Student Services, Campbell Hall, is open from 8 a.m. to 6 p.m. Monday through Thursday and 8 a.m. to 5 p.m. Friday during fall and spring semesters; from 8 a.m. to 5 p.m. Monday through Thursday and 8 a.m. to 4 p.m. Friday during summer sessions. The phone number is (973) 596-3414. Scheduling an appointment is important to ensure availability and make arrangements for appropriate accessibility.

Immunizations

The State of New Jersey and NJIT require all students to submit proof of having two doses of measles vaccine and one dose each of mumps and rubella vaccine. A tuberculin test (PPD) and entrance physical exam also are required. If documentation is unavailable then re-immunization is required. Contact the Office of Health Services for further information.

Health Insurance

The State of New Jersey and NJIT require all students enrolled full-time and all international students to maintain health insurance coverage that provides basic hospital and medical benefits. Coverage must be maintained throughout the student's enrollment. Insurance may be provided by the student or may be purchased through the university. Students may waive participation in the NJIT plan for the full academic year. To waive insurance, the student must complete a waiver form and submit it to Health Services within the 30-day enrollment period at the beginning of the semester. Waiver forms and insurance brochures are available in the Office of Health Services. International students with J-1 visa status must be covered by an insurance package at all times as specified by the U.S. Department of State, which generally exceeds NJIT's plan coverage. Further information about required coverage and/or enrollment can be obtained from the Office of International Students and Faculty. Part-time students also may purchase health insurance through NJIT within the 30-day enrollment period at the beginning of the semester. Insurance also may be purchased for dependents.

U.S. citizens and permanent residents who are full-time by virtue of there carrying 9 or more credits and all international students, carrying 3 or more credits are automatically billed for insurance in the NJIT plan. U.S. citizens and permanent residents carrying less than 9 credits and international students carrying less than 3 credits are not automatically billed for the NJIT plan. U.S. citizens and permanent residents who have been certified as full-time with less than 9 credits, even if on financial support, are not automatically billed and should take immediate steps to assure that they have continuous health insurance coverage either through the NJIT plan or through separate insurance. International students with less then 3 credits, whether certified full-time or not, should also take immediate steps to assure continuous health insurance coverage. Students on support should verify whether or not the support includes the cost of Health Insurance. Some support packages include this coverage and some do not particularly support packages that cannot support student fees

Health Services

To function well in a college setting, a student must be physically healthy. To ensure the good health of our students, the Office of Health Services provides primary health care to all enrolled students who have submitted a complete medical examination form. Services offered to eligible students include the assessment and treatment of health problems and injuries, laboratory tests, health counseling and education. Referrals are made to area hospitals, physicians and other resources when necessary. The office also coordinates mandatory immunization requirements, which apply to all students. Information on immunization requirements is available at the Office of Health Services. The office is open 8:30 a.m. to 4:30 p.m., Monday, Wednesday and Thursday, and 8:30 a.m. to 6 p.m. Tuesday and Friday during fall and spring semesters. Physicians are available for consultation in the Office of Health Services by appointment during the academic year. Summer hours are 9 a.m. to 4 p.m., Monday through Friday. Health services staff may be reached at (973) 596-3621.

Child Care Center

The NJIT child care center, currently operated by Childtime Children's Centers Inc., is located on the first floor of NJIT's Enterprise Development Center II building, 105 Lock Street. The center is available to children of NJIT employees and students, employees of tenants in the university's incubator program and residents in the neighboring community. The center is licensed by the State of New Jersey.

The center is for children age 6 weeks to 5 years. Programs and activities are divided into levels for infant, young toddler, toddler, young preschooler and preschooler. Developmentally appropriate activities for each age group include hands-on pre- math, science, language and reading activities. An after-school program is also offered to children ages 5 through 13.

The center operates year-round, 6:30 a.m. to 6:30 p.m. Monday through Friday, excluding university holidays. For further information, call Childtime Children's Centers Inc. at (973) 645-0442.

Counseling Center

The Counseling Center, staffed by experienced psychologists and professional counselors, provides services for students seeking psychological, academic and substance abuse counseling. In addition to the professional counseling staff, a psychiatrist is available for consultation as needed. The Counseling Center also offers workshops on different topics, maintains a library of career and graduate school information, coordinates services for students with disabilities and administers supportive testing. Students are welcome to come in and browse through the informational materials or call for an appointment with a counselor. Office hours are scheduled so that services are also accessible to adult evening students.The Counseling Center is open from 8 a. m. to 6 p.m. Monday through Thursday and 8 a.m. to 5 p.m. Friday during fall and spring semesters; from 8 a.m. to 5 p.m. Monday through Thursday and 8 a.m. to 4 p.m. Friday during summer sessions. The Counseling Center offers professional counseling to adult students facing stress from academic, personal, family or employment responsibilities. Counseling services are confidential, with limited exceptions. Call us at (973) 596-3414 for an appointment. The center is located in Student Services, Campbell Hall.

Stop-In Center

The Stop-In Center, staffed by trained student peers, provides on-the-spot information and assistance about all aspects of college life. Peer counselors are prepared to talk with fellow students about a wide range of questions or concerns — academic or personal — as well as provide relevant information. If they are unable to resolve a problem directly, they refer students to the person or office that can. No appointment is necessary and students are invited to stop by and become familiar with the staff and services available. The phone number is (973) 596-3422 and the Stop-In Center is open weekdays during the fall and spring semesters.

Evening Students

Office of the Dean of Student Services staff members are available until 5:45 p.m., Tuesday through Thursday, to provide advisement and needed information to evening students. The Counseling Center is open to evening students until 6 p.m., Monday through Thursday and until 5 p.m. Friday during fall and spring semesters, offering confidential professional counseling to adult students who face stress from academic, personal or employment responsibilities. Many other offices, including the Registrar's Office, remain open after regular hours to assist students taking evening courses. Students should contact individual offices to determine availability.The Campus Center features weekly films and activities in the evening. All forums are held in the evening to allow evening students' participation.

Food Services

Three student-dining facilities are located in the Campus Center. NJIT's private food services vendor, Gourmet Dining Services, operates the Student Dining Room and the Food Court. Students who choose to purchase a meal plan can sign up for one of five options at the Gourmet Dining Services office. The Student Dining Room offers breakfast 7:30 a.m. to 9:30 a.m., lunch 11:30 a.m. to 1:30 p.m., and dinner 4:30 p.m. to 6:30 p.m., Monday through Friday, and brunch 11 a.m. to 1 p.m. and dinner 4:30 p.m. to 6 p. m. on Saturday, Sunday and holidays. Students dining here are permitted to eat as much as they want for one price. Payment is either by cash or through the meal plan. Food cannot be taken out. The Food Court is open 7:30 a.m. to 10 p.m., Monday through Friday, 8:30 a.m. to 8:30 p.m. on Saturday and is closed on Sunday. The Food Court is open to the entire community. Cash or the student meal plan can be used for payment. Students choose from a variety of dining options: Taco Bell, Nathan's Finest, gourmet pizza bar, and a made-to-order pasta station and deli section. A full salad bar also is available. Food may be eaten at the Food Court or carried out. The Pub, located in the lower level of the Campus Center, is operated by a non-profit corporation. The Pub offers sandwiches and snacks, and, to those 21 years of age or older, beer and wine. Student meal cards are not accepted at The Pub.

Physical Education and Athletics

The Division of Physical Education and Athletics encourages students to develop individual physical skills that can be used throughout life, and provides a variety of programs that will meet the diverse needs and interests of the NJIT community. These include programs of skills instruction, intramural and intercollegiate competition, sports clubs and open recreation. The Estelle and Zoom Fleisher Athletic Center houses a swimming pool; locker rooms; Fleisher fitness center with a 1/16-mile indoor track; an athletic training room; dance, exercise and fencing areas; conference and audio/visual rooms; four racquet sport courts; and three gymnasia. Lubetkin Field is a multipurpose, lighted recreational area with a regulation soccer field, softball and baseball fields and a jogging area. There are four lighted tennis courts behind the athletic center. Recreational areas are open from 7 a.m. to 11 p.m. Monday through Friday, from 9 a.m. to 7 p.m. on Saturday, and from noon to 9 p.m. on Sunday. For information, contact the division office in the Physical Education Building. The phone number is (973) 596-3636.

Division of Career Development Services

The Division of Career Development Services (CDS) is responsible for Career Planning and Placement, Cooperative Education and Internships, Student Employment, Community and Public Service, and Alumni Career Services. Students may utilize these services by calling CDS at (973) 596-3100 to schedule an appointment, or stop by to find out if a career counselor is available. Several services are available online at *www.njit.edu/CDS.* After registering for this free service, students can connect to several career-related hyperlinks to browse job openings in several majors and concentrations. Online help is available for those who need assistance.

Community and Public Service

See the Academic Programs section in this catalog for more information.

Cooperative Education and Internships

See the Academic Programs section in this catalog for more information.

Career Planning and Placement

The Division of Career Development Services offers students a broad range of career investigation and preparation services. Included are career advising, career development workshops led by staff and industry representatives, job fairs, access to the Career Resource Center, career counseling, and on-campus recruitment by a wide range of prospective employers. Access to information is provided on site and remotely through the CDS Online Internet service. In addition, the office maintains full-time job listings. SIGI+, a computerized career assessment instrument, and company information are located in the Career Resource Center. The center is open Monday through Thursday, 8:30 a.m. to 6 p.m., and Fridays, 8:30 a.m. to 4:30 p.m.

For more information, contact the Division of Career Development Services, (973) 596-3100 or *www.njit.edu/CDS.*

Student Employment

The Office of Student Employment offers services and programs to help NJIT students earn money to finance college expenses and acquire practical work experiences through part-time and summer employment. Opportunities are provided for on-campus and off-campus employment for eligible students in all academic disciplines. Through the student employee training and development service, students are helped to succeed on the job. Students may participate in the following programs.

Federal Work Study (FWS)

Students who are U.S. citizens or permanent residents and have received a FWS allocation as a part of their Financial Aid award are eligible to participate. Students may earn up to the amount specified on the award letter from the Financial Aid Office. FWS jobs are available both on- and off-campus.

University Work Study (UWS)

UWS provides on-campus employment opportunities for NJIT students not eligible for the FWS program. Students must be enrolled full- or half-time, accepted into a degree-granting academic program and attending classes to apply for UWS jobs. Eligible international students must also have on-campus employment clearance from the Office of International Students and Faculty.

Grant/Contract Hourly Employment

NJIT's faculty and staff are often awarded grants or contracts from governmental agencies, foundations or private corporations to conduct research projects or special programs. Eligible NJIT students may be hired for on-campus jobs funded by these grants or contracts. Students should contact their academic departments and/or professors about available positions.

Job Location and Development Services (JLDS)

JLDS provides assistance for any NJIT student seeking part-time or summer employment off-campus. Private and public employers in the New Jersey/New York area send numerous job announcements daily to NJIT. Students may view job postings in the Career Resource Center or access the part-time job listings on the Internet via CDS Online. Also, a six-week Summer Job Search Club is offered each spring semester to help students find off-campus summer jobs related to their academic major.

For additional information, contact the Division of Career Development Services, (973) 596-6590.

Alumni Career Services

Alumni of NJIT graduate or undergraduate programs have access to a variety of career assistance services and programs provided by the Division of Career Development Services. Whether interested in changing careers or currently out of work, NJIT connections are valuable and offer a good place to begin a personal career search. Alumni can take advantage of these services: individual career counseling, the Career Resource Center, full- and part-time employment listings, support groups, a computerized bulletin board listing experienced-level job openings, direct access to job postings on the Internet, alumni mentors offering career advice and employment leads, and career-related workshops such as resume writing, interviewing skills, networking and job search strategies.

Alumni Association

The Alumni Association of NJIT is a not-for-profit organization that works in partnership with the university family to promote and support NJIT. The association maintains a relationship with alumni to provide them with a voice and a means of fellowship and growth.

The association offers numerous programs and services: free and lifetime use of the university's computer network and e-mail service, including the association's home page on the NJIT Web site; seminars and business forums; a variety of annual award programs to recognize the accomplishments of NJIT's constituency, students and faculty members; the annual Financial Aid Scholarship Program that provides needed aid for aspiring NJIT students; grants that provide financial support and recognition to NJIT organizations and departments; development and support of U.S. and international association chapters; free subscription to the association newsletter; free miniature copy of the student's diploma upon graduation; access to the Robert W. Van Houten Library, and the gymnasium facilities, pool and tennis courts.

The Alumni Association works closely with the Division of Career Development Services to assist alumni faced with unemployment, early retirement, and second careers.

The Foundation at NJIT

The foundation is a privately incorporated resource development organization that supports excellence in teaching, research and public service programs at NJIT. The NJIT Board of Overseers has leadership and fiduciary responsibility for the foundation. The foundation's mission includes fund-raising and, through the Board of Overseers, soliciting private philanthropy on behalf of the university.

Major Research and Public Service Centers

Engineering and Applied Science

Center for Applied Mathematics and Statistics (CAMS)

Fosters and supports the application of advanced mathematical and statistical methods to scientific, engineering and management problems. The statistical consulting facility assists internal and external clients with problems in data analysis, time series, design of experiments and estimation and reliability theory. (973) 596-8465

Center for Membrane Technologies[1]

The center focuses on research in new membrane structures, materials and devices, novel membrane-based processes and techniques and applications, development of membrane technologies for separations and other applications. NJIT leads an academic consortium whose other members include Rowan, Rutgers-New Brunswick and Stevens. Training of professionals, graduate and undergraduate students, developing new membrane technologies and their applications and transferring them to corporate partners are prime objectives of the center. (973) 596-8479

Center for Solar-Terrestrial Research

The center focuses on observational and theoretical astrophysics and operates the Big Bear Solar Observatory, at Big Bear Lake, California, and a dedicated array of solar radio telescopes at Owens Valley Radio Observatory, in Owens Valley, California. The facilities at both locations have the unique capacity to study the sun and its extended magnetic atmosphere simultaneously. (973) 596-3565

New Jersey Center for Engineered Particulates[1]

The center focuses on fundamental and applied research in particle technology for industry and promotes technology development and transfer to industrial partners. The research thrust areas include particle storage and transport, particle and surface property modification (engineered particulate materials), particle segregation, mixing and separations, simulations and modeling. Undergraduate and graduate education and professional training complement the research. (973) 596-3352

New Jersey Center for Wireless Networking and Internet Security

New approaches and new software tools for integrated wireless and wired network management, including data and network security, are the goals of the newly established New Jersey Center for Wireless Networking and Internet Security. A partnership between NJIT's Department of Electrical and Computer Engineering and Princeton University, the center is supported by a $2.6 million R&D Excellence Grant from New Jersey Commission on Science and Technology. Its main objective is to provide optimized efficiency and security in the multimedia environment. Led by Atam Dhawan, professor and chair of electrical and computer engineering, the new center builds on NJIT's established strengths in wireless communication, signal processing, multimedia and networking. Other NJIT members of the center team include Associate Professors Constantine Manikopoulos and Yun-Qing Shi and Assistant Professors Symeon Papavassiliou and Sirin Tekinay, all of electrical and computer engineering. Center researchers are collaborating with leading organizations, including Panasonic, Prediction Systems, AT&T, the U.S. Army and Mitre Corp. (973)596-3524.

New Jersey Center for Microflow Control

Research at the New Jersey Center for Micro-Flow Control (MFC), an increasingly important technology, involves the manipulation of fluid --- gas or liquid --- flow fields by creating small disturbances in the flow.

The New Jersey Commission on Science and Technology R&D excellence program partially builds upon the work of the W.M. Keck Foundation Laboratory for Electro-Hydrodynamics of Suspensions, headed at NJIT by Nadine Aubry, F. Leslie and Mildred Jacobus Professor of mechanical engineering, professor of mathematics and chair of the Mechanical Engineering Department, and Boris Khusid, associate professor of mechanical engineering. The laboratory is funded by a $500,000 grant from the W.M. Keck Foundation. The New Jersey MFC Center is led by professor Aubry.

MFC technology has a wide range of applications, including devices for medical diagnosis and treatment, telecommunications, environmental remediation, chemical and materials processing. In collaboration with researchers from Princeton University and industrial partners, the NJIT center will focus on the development of new technologies such as miniaturized systems on a microchip for the characterization and manipulation of cells, bacteria, spores or other microscopic particles, and high-precision microprocessing tools using microjets.

With their collaborators from the City University of New York, the research team has also received funding from the U.S. Office of Naval Research to develop an electro-hydrodynamic technology for monitoring and cleaning contaminants from oils, lubricants and coolants and other fluids used in shipboard equipment. Many machine failures are caused by contamination of hydraulic fluids, coolants and other liquids with micron- or sub-micron-sized particles due to corrosion or aging of fluids, but mechanical filtering is ineffective for such fine debris. In contrast, a strong high-gradient AC electric field can be used to control and manipulate the motion and aggregation of particles in flowing liquids. The team is developing a field prototype of online filtering hardware and will test it aboard a naval ship. (973) 642-7268.

Environmental Engineering and Science

Otto H. York Center for Environmental Engineering and Science (CEES)

CEES is the home for many of NJIT’s environmental centers, programs and initiatives. The $11 million center, containing $2.4 million in state-of-the-art laboratory equipment, is the first building in the nation especially constructed for cooperative public and private research in hazardous waste management. (973) 596-3233

Manufacturing

Center for Manufacturing Systems (CMS)[1]

CMS is NJIT’s focal point for industrial interaction in research, technology extension, education and training pertinent to manufacturing. Project work spans aspects of materials production, component part fabrication and automated assembly. (973) 596-2874

Polymer Engineering Center (PEC)

PEC seeks to advance the foundations of design and control of polymer production and part-fabrication technologies with facilities that include a production scale, multilayer co-extrusion line with thermoforming unit and extruders, injection molding machines, and test and characterization equipment. (973) 642-4582

Polymer Processing Institute (PPI)

PPI is a not-for-profit institute with special areas of expertise in the development of high-performance products and processes for advanced compounding, property characterization and computer modeling. PPI includes the professionally managed Characterization Lab, Computer Center and Process Lab, which contains a number of single- and twin-screw extruders and several injection machines along with downstream equipment. (973) 642-4582

Transportation

International Intermodal Transportation Center

The institute conducts interdisciplinary research on the transportation needs of the public and private sectors. Affiliated centers include the National Center for Transportation and Industrial Productivity, which investigates methods for increasing productivity through transportation improvements and provides technical, administrative and fiscal management necessary to conduct research projects in the field of transportation (973) 596-3355; and the New Jersey Center for Transportation Information and Decision Engineering (TIDE) Center, a partnership of NJIT, Princeton and Rutgers that develops and markets technologies that will help individuals and commercial enterprises make better transportation-related decisions. (973) 642-7214.

New Jersey Transportation Planning Authority

The North Jersey Transportation Planning Authority is the federally authorized Metropolitan Planning Organization for 6 million people in the 13-county northern New Jersey region. Each year, the NJTPA oversees more than $2 billion in transportation improvement projects and provides a forum for interagency cooperation and public input into funding decisions. It also sponsors and conducts studies, assists county planning agencies and monitors compliance with national air quality goald. (973) 639-8400.

Electronics and Communications

Center for Communications and Signal Processing Research

The center promotes research on the theoretical and practical aspects of communications and signal processing in collaboration with government organizations and local industry with emphasis on wireless and personal communications. (973) 596-8474

Electronic Imaging Center

The center's research emphasizes novel diffractive methods in spectral filtering, which are combined with visible and infrared imaging systems. Of particular interest are applications of infrared imaging and radiometry with industrial and commercial partners. (973) 596-3538

Microelectronics Fabrication Center

Research focuses on advanced semiconductor and micromachined device design, simulation and fabrication. The center features a complete Class 10 cleanroom with 6-inch silicon wafer processing capability, one of only a few such university cleanrooms in the nation. Recent state-of-the-art equipment additions include wafer bonding and deep reactive etching tools. The center provides industry and university clients with technical support and prototype development in MEMS and/or CMOS technologies. (973) 596-5736

Architecture

Center for Architecture and Building Science Research

This applied research group investigates the building environment within a social and economic context. Major areas of study include housing, learning environments, healthcare and aging, disabilities, preservation technologies and the utilization of waste materials for construction and infrastructure. (973) 596-3097

Public Policy

Small Business Assistance

Center for Information Age Technology (CIAT)

CIAT provides impartial, professional computer-related assistance to government, education, non-profit and business organizations. The center assists with a wide range of projects such as assessment of current hardware and software, identification of systems requirements, vendor and package evaluation, implementation, training and Web site development. (973) 596-3035

Defense Procurement Technical Assistance Center

The center provides individualized marketing, contractual and technical assistance to businesses currently selling or seeking to sell goods/services to the federal, state or local government and prime contractors. (973) 596-5807

Enterprise Development Centers (EDC I, II & III)

EDC I,II and III operate technology-oriented small business incubators committed to the long-term economic vitality and growth of entrepreneurial ventures in New Jersey. EDC addresses problems inherent to these businesses and helps to commercialize companies' new products, processes and services. (973) 596-5740

New Jersey Manufacturing Extension Program, Inc. (MEP)

MEP is a not-for-profit organization headquartered at NJIT that serves as a gateway for small to medium-sized manufacturers to access statewide services in the public and private sectors that address business, financial and technical issues essential to forming high-performance firms. (973) 642-7099

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1 Supported by the N.J. Commission on Science and Technology

2 A National Science Foundation Industry/University Cooperative Research Center

3 Supported by the U.S. Environmental Protection Agency

4 Supported by the U.S. Department of Transportation

5 Supported by the N.J. Department of Environmental Protection

NJIT Faculty Research

NJIT faculty conduct extensive research in the university's research centers and laboratories, and in partnership with other universities, industry and government laboratories. Highlights of major research areas are presented here. www.njit.edu/research.

ARCHITECTURE

In addition to independent research, architecture faculty are involved in a wide array of interdisciplinary research, mainly through the Center for Architecture and Building Materials Research and the Multi-lifecycle Engineering Research Center.

Areas of Research

Building Technologies and Sciences — Moisture in buildings, building materials, energy transfer through building envelopes, conservation and passive solar heating, building systems integration and building economics.

Computer-Aided Architecture — Use of computers in architectural practice, modeling and simulation, computer application in architectural design, and data structures and graphic representation.

History and Theory of Architecture — Architectural theory and criticism, history of architecture since 1750, urban history and cultural geography, literary themes in architecture, and contemporary art and architectural criticism.

Housing Studies and Urban Design — Housing for new household types, public policies in design arts, technology and architectural design, social meaning of building form, housing environments, community revitalization and economic development.

Urban Infrastructure Planning — Interdisciplinary project planning and design, infrastructure technology and design principles, public space infrastructure, history and theory of urban infrastructure, and financing and implementation of infrastructure projects.

BIOMEDICAL ENGINEERING

NJIT's interdisciplinary biomedical engineering faculty are involved in research and development in collaboration with the following institutions:

Columbia College of Physicians and Surgeons
Hershey Medical Center
Kessler Institute for Rehabilitation
Saint Barnabas Medical Center
UMDNJ-New Jersey Medical School
UMDNJ-New Jersey Dental School
Veterans Administration Medical Center in East Orange

Areas of Research

Mechanical Engineering — In the area of biomechanics, research is ongoing in knee joints, heart valves, spinal disks, spinal fixation devices and a quantification device for lower back pain. Biomaterials research focuses on artificial ligaments and resorbable fracture fixation materials.

Electrical Engineering — Researchers in biomedical signal processing are developing electrocardiogram analysis as a tool for diagnosing and treating stroke disorders and neuromuscular disorders. Other signal processing research involves electroencephalogram analysis in treating epilepsy and electromyogram analysis in fatigue studies.

Chemical Engineering/Chemistry — Studies involve use of membranes for controlled-release of pharmaceuticals, protein separation using affinity chromatography, molecular modeling of drug-receptor interactions and mixing and mass transfer phenomena in bioreactors.

CHEMICAL ENGINEERING

The chemical engineering, research programs are closely associated with these centers;
Center for Membrane Technologies
Center for Engineered Particulates
Otto York Center for Environmental Engineering and Science
Polymer Engineering Center
Polymer Processing Institute

Areas of Research

Hazardous Waste Treatment and Waste Minimization — Dynamic modeling of biological reactors, anaerobic/aerobic biotreatment processes, in-situ bioremediation, biofiltration of VOCs, supercritical extraction, ultrasonic enhancement of in-situ remediation and process design for waste minimization.

Biochemical Processing — Reactor analysis, mixing phenomena, chromatographic separations, molecular modeling of enzyme mimics and drug-receptor interactions.

Materials Processing — Polymer characterization and process engineering, plastics recycling and particle flow systems.

Membrane Separations — Excellent facilities exist for conducting research on membrane separation processes, particularly hollow-fiber membranes. Applications include gas-gas, gas-liquid, and solute-liquid separations, as well as combined reaction/separation processes. Support for these activities comes from industrial and federal research grants, the environmental research centers at NJIT and NJIT's Sponsored Chair in Membrane Separations and Biotechnology.

CHEMISTRY AND ENVIRONMENTAL SCIENCE

The Chemistry and Environmental Sceince research programs are closely associated with these centers;
Otto York center for Environmental Engineering and Science

Areas of Research

Environmental Studies — Research is ongoing in policy studies, health, coastal geomorphology, economics, ethics, history, communications and education. The department hosts the nationally acclaimed environmental publication, Terra Nova.
Hazardous Waste Treatment and Waste Minimization —Thermodynamic analysis of combustion and pyrolysis processes, catalytic combustion, acid gas treatment, sampling & analysis of organic and inorganic pollutants, treatment of gaseous pollutants by corona discharge, novel routes for solvent-less chemical synthesis.
Biochemical Processing — Reactor analysis, mixing phenomena, chromatographic separations, molecular modeling of enzyme mimics and drug-receptor interactions.

CIVIL AND ENVIRONMENTAL ENGINEERING

Research in civil and environmental engineering is conducted within the department and in these NJIT centers:
Center for Manufacturing Systems
Otto York center for Environmental Engineering and Science
International Intermodal Transposrtation Center

Areas of Research

Geoenvironmental Engineering Laboratory — This state-of-the-art facility was established with support from a $1 million National Science Foundation (NSF) grant, which was matched with more than $2 million from NJIT. The laboratory provides research support for geoenvironmental projects such as soil decontamination using biological, chemical and/or physical means; modeling of contaminant transformation and transport; and the testing of waste treatment, solidification, and stabilization and containment systems. The equipment includes an environmental scanning electron microscope (ESEM), X-ray fluorescence and X-ray diffraction spectrometers (XRF/XRD), GC/MS and SFE, capillary electrophoresis (CE), UV-VIS, FT/IR, respirometers, particle size analyzer (PSA) and hydraulic conductivity apparatus.

High Performance Concrete Laboratory — Equipped with funds from NSF, this laboratory is capable of testing very high strength concretes under uniaxial as well as triaxial states of stress. The primary testing system is capable of applying up to 1 million pounds of axial load on a specimen in a computer-controlled closed-loop environment. The materials processing component includes two computer-controlled micro-sizers, and fractionators for particle size analysis and categorization of industrial by-product additives to concrete, such as fly-ash, microsilica and blast furnace slags.

Smart Sensors and Nondestructive Testing Laboratory — This laboratory provides means for studying self-sensing systems built into structures to monitor excessive strains, deflections, load distributions, temperature variations and corrosion.

Recycled Plastics Laboratory — This research facility concentrates on developing innovative uses for recycled plastics. In addition to material tests, the lab develops constitutive models and analysis techniques required by the nonlinear characteristics of the material and its variation through the cross section. Computer simulations are used to analyze the barriers during a crash by modifying current programs to include recycled plastic models. Experimental studies include wind and acoustic tests of noise barriers and in-situ implementation of the proposed designs.

COMPUTER SCIENCE AND INFORMATION SYSTEMS

Computer and information science research is conducted in the following laboratories:

- advanced computer architecture and parallel processing, artificial intelligence, computer communications and networking, data and knowledge engineering, knowledge representation and artificial intelligence, dependable real-time systems, collaborative systems, computer vision, computing education, cognition and learning, hypermedia information systems, neurological computation and robotics, simulation and modeling and software engineering.

Areas of Research

The departments provide research laboratories with infrastructure and coordination for conducting multidisciplinary research and development. Some key areas that the department focuses on are the technology, health care and financial industries, which require research in software engineering, telecommunications, computing systems, artificial intelligence, database, algorithms, and biomedical and information systems. In addition, the department sustains an interdisciplinary research support environment for biomedical and neuroscience applications, computer engineering, computer-mediated communication, enterprise engineering, health care information systems, manufacturing systems, medical imaging and information systems, microelectronics, as well as other disciplines.

ELECTRICAL AND COMPUTER ENGINEERING

In addition to independent research, Department of Electrical and Computer Engineering faculty participate in research at the:
Center for Communications and Signal Processing Research
Electronic Imaging Center
Microelectronics Research Center
Multi-lifecycle Engineering Research Center
New Jersey Center for Wireless Telecommunications

Areas of Research

Ion Beam and Thin Film Laboratory — Studies focus on processing and properties of materials and structures in the form of thin films. The laboratory has a number of thin film deposition systems, including a state-of-the-art ultrahigh vacuum chamber that permits deposition on atomically clean surfaces. Thin film structures, basic elements of modern microelectronic and optoelectronic devices, are increasingly important in almost all areas of technology. Current research includes metal epitaxy on silicon, modification of surfaces with atomic and cluster ions, and development of novel dielectrics with properties controlled by light beams.

Microwave and Lightwave Engineering Laboratory — Research is ongoing in the areas of microwave device modeling and measurement, computer-aided design (CAD) of microwave components and systems, characterization of RF/microwave/optical systems, monolithic microwave integrated circuit design and testing, numerical electomagnetic codes, analysis design and wire antenna multiscattering in vegetation, experimental and theoretical study of linear and semiconductor surfaces, integrated optics, fabrication and characterization.

Multimedia — Research projects are in the areas of multimedia signal processing and compression, multimedia communications, digital content security and data hiding, Internet delivery of multimedia and many others. The multimedia production and Internet delivery studio, with its state-of-the-art webcasting and DVD authoring platforms, facilitates the use of emerging Internet multimedia technologies for education and learning purposes. More than 30 faculty members and about 40 doctoral students are involved in multimedia research.

Communications and Signal Processing — Recent emphasis on wireless and personal communication systems includes multiuser detection and interference cancellation algorithms, smart antennas and space-time processing. Other areas include adaptive systems and arrays, blind signal separation and equalization, synthetic aperture, radar processing and calibration, source encoding and synchronization, detection and estimation and ATM networking. Signal processing research covers wide areas of nonlinear and adaptive signal processing and algorithms, one- and multidimensional signal processing, image-video coding, subband and wavelet transforms, QMF-wavelet filters, and advanced DCT algorithms.

Computer Engineering — Computer engineering faculty members are conducting research in these areas: test generation; fault simulation; design for testability; built-in self-test; data compression; CAD; computer architecture; design verification; computer reliability; fault tolerance; interconnection in high speed digital circuits; microprocessing; Internet-based computer-aided instruction; interconnection networks; multiprocessor systems; nonlinear optimization techniques; genetic algorithms; neural networks; infrared imaging; computer networks; routing in ATM networks; LANs; CEBus; BACnet; parallel computing systems;

parallel algorithms; computer vision; Petri nets; discrete event systems; embedded control; computer integrated manufacturing and networking intelligent automation; information display; robotics; ATM switches; and VLSI.

Electronic Imaging — Special filters are widely used in the characterization of chemical or biological systems. Much information on these systems can be deduced from spectral analysis of transmission and reflection of the samples, especially in the infrared (IR) spectral region. Researchers examine tunable filter systems, such as wavefront division interferometers (WDI), together with a two-dimensional IR imager. Such systems are based on multiplexing procedure, which minimizes optical loss. The resolution and the extent of the filtering process is determined by novel electronic processing methods. The goal is to develop a hand-held instrument to monitor harmful molecules in a remote or a nearby environment.

Nonlinear Nanostructures Laboratory — Nanotechnology is a fast-growing interdisciplinary area. While many thin film and granular technologies are within the nano scale, nanotechnology is related to the "added value," i.e., the functionality, of nanostructures. The basic "building block," the nanocluster, is an ultrafine-grained solid with a high percentage of atoms at the grain boundaries. The nonlinear optical properties of nanoclusters are of intense interest for use in optical switching and IR sensing. The confinement of the electronic wave function to small dimensions results in an enormous refractive index change. Experiments are under way on Si nanoclusters grown by either laser ablation or ion implantation.

Wireless Telecommunications — Research activities are distributed among four focus areas: wave propagation models for delivery of advanced broadband services and R.F. engineering of novel devices and systems for wireless digital communications technologies; wideband multiple access systems, and multiuser technologies including adaptive equalization and space-time adaptive processing; wireless networking including architectures, wireless ATM, geolocation, teletraffic modeling, resources allocation; and services, applications and wireless technology transfer.

HISTORY

The Federated History Department of NJIT and Rutgers-Newark conducts research in a wide variety of historical fields, regions and periods. Faculty in the department have obtained many grants from government and private foundations such as the National Endowment for the Humanities; the National Science Foundation; the John Simon Guggenheim Memorial Foundation; Fulbright Fellowships; and the Spencer Foundation. The department produces two periodicals:
Eighteenth-Century Scotland
Horn of Africa

Areas of Research

History of Technology, Environment and Medicine — American environmental history; urban environmental history; the social and cultural history of medicine and technology (including gender issues); military medicine; history of mental health; history of print culture; film, television and history; and technology and warfare.

American History — Social, cultural and diplomatic history; the history of women and the family; African-American history; legal history; public history.

World History — Comparative history; economic history; intellectual, cultural, and political history; modern Africa; modern China; Latin America and the Caribbean; Russia and eastern Europe; medieval Europe and Eurasia; modern France, Spain and Britain.

HUMANITIES

The department integrates the humanities and social sciences for the purpose of understanding the cultural, social and scientific contexts informing contemporary culture. Special emphasis is given to research in the study of science, technology and society; the study of communication; the study of environmental and health policy; professional ethics; the study of environmental and health economics; and the study of multicultural and international literature. The department is committed to using the humanities and the social sciences as a coherent model for examining human society. Research is conducted in these centers:
Center for Architecture and Building Science Research
International Intermodal Transportation Center

Areas of Research

Professional and Technical Writing — Multimedia design, distance learning, writing assessment and environmental communications are areas that faculty currently pursue. The department hosts a new journal, Newark Review.

Contemporary Literature — This research area includes modern poetry, multicultural and international studies, and the relationship between literature and the natural world.

INDUSTRIAL AND MANUFACTURING ENGINEERING

The Department of Industrial and Manufacturing Engineering has a significant and diverse research program that includes areas such as industrial and operations research, design for manufacturing, quality, assembly and concurrent engineering, robotics, global networking, logistics and simulation issues of small and medium-sized companies, multimedia, environmental and health/safety and medical engineering. Research also is affiliated with these major NJIT research centers:

Center for Manufacturing Systems
International Intermodal Transportation Center

Areas of Research

Industrial Engineering, Systems and Operations — Research includes the development of control and scheduling algorithms for the optimization of container terminal operations, global networking and logistics operations for small, medium and large corporations, the impact of telecommuting strategies on traffic flow, engineering system modeling and design tools, distributed virtual laboratory networks between research groups, the R&D of quality systems, quality control and management systems.

Manufacturing Systems and Mechatronics Engineering — Focus is on robotics, robot cell design, flexible computer-integrated manufacturing, system integration of automation systems, flexible assembly system modeling, integration, implementation, non-contact sensing and inspection, CAD/CAM integration, servo pneumatic positioning and sensor technology.

Concurrent/Simultaneous and Total Lifecycle Engineering — This new research field includes the development of new methods and toolsets for small batch luxury automobile manufacturers (such as Rolls-Royce Motor Cars), and general methods, tools and technologies for design for manufacturing, design for quality manufacturing, and assembly and maintenance systems.

Medical, Environmental, Health and Safety Engineering — Activity in this area is increasing. Main areas include the assessment of the realistic impact of environmental factors on productivity, devices and methods for the prevention of repetitive motion injuries, microrobotic manipulators for human artery cleaning, and new medical devices coupled with simulators and expert systems that can be used for interacting with the human body and other medical applications.

Multimedia, Simulation and Virtual Reality Modeling — Research activities are spread between discrete event and continuous system modeling and simulation and areas such as graphical modeling of workcells, object-oriented simulation coupled with AI, engineering multimedia developments for the study of servopneumatic positioning, multimedia for total quality management and the ISO9001 standard, flexible automation, concurrent engineering and the virtual reality simulation (and rapid prototyping) of complex electromechanical products and their manufacturing/assembly processes.

MANAGEMENT

In addition to independent research, School of Management faculty are pursuing research conducted in affiliation with these centers:
Center for Manufacturing Systems
International Intermodal Transportation Center

Areas of Research

Entrepreneurship and Small Business — Assessment of emerging technologies, economics, employment growth, theories and practice in relation to entrepreneurship and private enterprise.

Building Production and Management — Building efficiencies, organization of international construction, environmental technology management, and industrial ecology systems.

Behavioral Science and Organizational Theory — Organizational design and development, organizational behavior, occupational and organizational socialization, legal and ethical issues, public administration, social perception, leadership, attachment and commitment processes in organizations, and transportation behavior.

Economics and Finance — Mathematical programming and multicriteria decision making in financial management, portfolio analysis, emerging international capital markets, applied corporate finance, financial economics, public finance, international competitiveness of U.S. economy, and international economic/financial relationships.

Human Resources Management — Managing new technology, labor management relations, public policy and technological change, and tasks and unit level technologies.

Information Systems Management — Policy analysis, computer auditing, control and security, interface design, systems evaluation, technological forecasting and assessment, management information systems, management and social impacts of computer and information systems, group decision support systems and database analysis.

Information Systems Auditing — Operational auditing, internal auditing.

Marketing Management — Marketing research, new product management, consumer behavior, international marketing, marketing technological innovation, mathematical programming and multicriteria decision making, strategic management, sales management, enhancing global competitiveness and technology transfer.

Operations Management — Project management, industrial quality control, production planning, management of manufacturing systems, and mathematical programming and multicriteria decision making.

Corporate Law and Ethics — Employment law, legal and ethical issues in business, international legal environment of business, job security and unlawful discharge/unjust dismissal.

MATHEMATICAL SCIENCES

The research interests of the faculty focus on the development and use of mathematical and computational tools for solving scientific, technological and industrial problems. The Center for Applied Mathematics and Statistics promotes and represents the research interests of all NJIT mathematical sciences faculty.

Areas of Research

Acoustics and Signal Processing — Faculty involved in acoustics study both the forward and inverse problem of sound propagation in the ocean. Work on the forward problem aims for accurate and computationally efficient solutions of the wave equation for complex oceanic environments. Research on the inverse problem addresses the development of algorithms for source localization and geoacoustic inversion, combining array and statistical signal processing concepts and waveguide physics.

Electromagnetics — The electromagnetics group is concerned with the scattering of electromagnetic waves by complex structures and materials. Methods used include modeling, asymptotics and numerical analysis. Applications to material processing are an important aspect of this work. Current and recent projects include the analysis of microwave sintering of ceramics, including thermal runaway and hot-spot dynamics, electron beam welding of ceramics, nonlinear pulses in optical fibers and the development of numerical methods for Maxwell's equations in free-space and in complex, dispersive media.

Fluid Dynamics and Materials Science — Several faculty are involved in the development of analytical and computational methods and their application to problems arising in fluid dynamics and materials science. A particular area of emphasis is the study of the dynamics of interfaces between two fluids or a fluid and a solid. Research in this area includes liquid jet breakup, bubble dynamics, crystal growth, and flame front propagation as well as related problems in combustion and detonation. Other research areas include stability theory, particulate flows, viscoplastic flows, thin films and physiological fluid mechanics (e.g., blood flow in arteries).

Mathematical Biology — This group is involved in two major research projects. First, the development of strategies to promote improved medical and therapeutic techniques, including use of coupled-oscillator theory for optimal walking strategies, use of elasticity theory for wound suturing and use of virtual reality in studies of epilepsy. Second, the development of testable mathematical models of neuronal networks including modeling the bistability of vertebrate motoneurons, modeling motor patterns in crustacea and modeling of hippocampal place cell dynamics in connection to memory recollection.

Statistics — Faculty research areas and interests include applied probability modeling, statistical inference, statistical reliability theory and applications, survival analysis and applications in biostatistics, time series analysis and forecasting, signal processing, design and analysis of industrial experiments.

MECHANICAL ENGINEERING

The scope of research in the Department of Mechanical Engineering is broad. Projects are carried out within the department's laboratories as well as in collaboration with the following centers:
Center for Manufacturing Systems
New Jersey Center for Microflow Control
Center for Engineered Particulates
Polymer Engineering Center

Areas of Research

Bearings and Bearing Lubrication — Research areas include design of hydrodynamic, hydrostatic, rolling element bearings and novel designs of unique bearings, such as composite bearings. Also, the role of bearings in rotor dynamics is investigated. Students are engaged in the design and development of testing machines, which include computer data acquisition, for friction and wear, and for testing bearing materials and lubricant additives. Research is conducted in modeling and compensation of friction in control systems for precise motion control, stick-slip friction, friction-induced vibrations and antilock brakes. Work is conducted in modeling and measurement of dynamic friction in bearings, clutches, vehicle breaks and tires. Other research interests are rheology of lubricants, including viscoelastic and synthetic lubricants.

Computational Fluid Dynamics —- The laboratory for computational fluid dynamics is equipped with state-of-the-art computer equipment consisting of an SGI compute server (Origin 2000), four SGI 02 workstations and PCs. The purpose of the laboratory is the understanding, prediction and control of many fluid flows in the laminar, transitional and turbulent regimes. High performance computing, advanced data analysis, hydrodynamic stability theory and control theory are used for this purpose. Research includes boundary layer and channel flows, wake flows, film flows, ocean water waves and propagating flames. Another thrust area is the numerical simulation of multiphase flows such as particulate and bubbly flows.

Electro-Hydrodynamics Research — The research aims at developing a fundamental theory of the synergism of electric- and shear-induced phenomena in suspensions and to examine the accuracy of predictions regarding the effects of high-gradient strong fields on the particle motions and aggregation. Understanding of these phenomena is used toward the control and manipulation of suspension flows. Applications include the development of a novel filtering technology for online cleaning of in-service fluids in shipboard equipment.

Granular Flow — The goal of this research is to develop predictive models of flowing granular materials critical to the design of efficient and reliable solids handling systems prevalent in the industrial sector (chemicals, food, agriculture, pharmaceuticals, minerals, energy, materials, munitions, and electronics), as particulates are universally found in most products either as raw materials or as the final product. Investigations aimed at understanding observable bulk behavior are carried out as part of the Particle Technology Center and made through realistic dynamic computer simulations, analytical modeling and physical experiments. Paramount is the connection between microstructure evolution and transport properties. Phenomena of interest include hopper flows, vibrated beds, shearing, percolation in packed beds, and segregation.

Multiphase Flow Research — Research objectives are to develop a fundamental knowledge of hydrodynamic and interfacial interactions of phases in multiphase flows as well as develop advanced technologies related to particulate multiphase flows. Projects include drag forces and collisions of interacting particles in viscous flows, fibrous filtration of particulate-laden flows, membrane separation, wet scrubbing, liquid jet evaporation in gas-solid suspension flows, and filtration applications using rotating fluidized beds.

Non-Newtonian Fluid Dynamics — A knowledge of non-Newtonian fluid dynamics is essential in many industries, including those involving plastics, paints, suspensions, oils, lubricants, rubber and detergents. Projects include theoretical and computational analyses of the popular constitutive equations for a range of flow problems, e.g., injection molding, porous media flows, viscoelastic particulate flows, free-surface flows as well as the modeling of non-Newtonian fluids. Both finite element and finite difference methods are used to solve the governing equations in two and three dimensions.

Particle Technology Research — Research includes fundamental and applied projects including modeling and development of novel techniques for dry particle coating and manufacturing of engineered particles; ultrafine particle mixing using dry methods, discrete element modeling (DEM) and numerical simulations of particle flows and processes; granulation with minimal use of liquids; particle transport; and handling/flow and delivery from hoppers. Some past projects were development of non-intrusive particle tracing technique for granular flow experiments; development of motion analysis algorithms for high-speed optical imaging of three-dimensional particle collisions; and pattern recognition and cluster analysis techniques to detect micro-structure in granular flows.

Pattern Recognition/Cluster Analysis/Image Processing Research — This research focuses on the use of “soft computing” methods for various applications: fuzzy clustering algorithms, robust clustering, clustering of relational data, application of robust statistical techniques in cluster analysis, shape detection in noisy data, generalization of fuzzy clustering algorithms for multicharacteristic shape detection, such as hyper-spherical/ellipsoidal shells as cluster prototypes, or adaptive clustering and cluster validity issues. Clustering methods and evidence collection techniques are used for lines, curves and arc detection in digital images. These algorithms are also used in reverse engineering through development of CAD models from image sensor data. Machine vision applications are also studied.

Plastics Engineering — The New Jersey Bell Plastics Laboratory is well equipped with a wide range of state-of-the-art plastics processing and forming equipment, supported by analytical testing capabilities. The laboratory is used for a wide range of research and development activities. Activities include re-engineering of commingled waste plastics, studies on self-reinforced composites, and combined parametric and experimental studies to develop models to explain the interrelationships between product properties and process parameters for injection molding processes. As part of the research activities, students use CAD and computer-aided engineering (CAE) tools in the design, analysis and manufacture of plastics products.

Rapid Intelligent Manufacturing and Prototyping — The research aims to generate fundamental knowledge and develop advanced technologies to enable the design and manufacture of products to be done more quickly and cost-effectively. Research projects include next-generation CAD/CAM system with virtual reality, rapid tooling and manufacturing, rapid freezing prototyping, and environmental performance analysis of solid freeform fabrication processes.

System Integration and Robotic — The research applies theoretical analyses, simulations and experiments to the design and control of mechanical and electromechanical systems (mechatronics). Kinematic and dynamic modeling, system calibration and optimization techniques are used to enhance system performance. Projects include development of design, planning, and control methodologies for effective use of parallel kinematics machines and development of ultrafine motion technologies to enable fast, flexible automated assembly of optoelectronics systems.

Waterjet Technology Research — The Waterjet Research facility develops technologies for the use of high- and super high-speed fluid jets for manufacturing complex components from hard-to-machine materials, cleaning and grinding of sensitive surfaces, and bio-medical applications. Projects include numerical modeling of fluid jets, developing expert systems for jet-based processing, precision cleaning of complex surfaces, using ice for machining applications, and using impact and explosion to form jets.

PHYSICS

Interdisciplinary applied physics research is conducted in collaboration with faculties of NJIT, Rutgers-Newark, Rutgers-New Brunswick, and UMDNJ in areas such as electrical engineering, chemistry and chemical engineering, materials science, industrial and manufacturing engineering, biological sciences and geological sciences. Cooperative research efforts are under way with the National Solar Observatory, Bell Labs-Lucent Technologies, U.S. Army Research Lab, and other industrial and federal research laboratories. Research also is conducted at these major NJIT centers and NJIT-maintained facilities:
Microelectronics Research Center
Center for Solar Research
Big Bear Solar Observatory
Owens Valley Radio Observatory

Areas of Research

Device Physics — Research at NJIT is under way in silicon microfabrication, micromachining and fusion bonding for conventional and novel microelectromechanical (MEMS) device applications, metal-insulator-semiconductor device structures and rapid thermal processes in silicon integrated circuits. Studies at Rutgers-Newark involve sensors for biophysics applications. Facilities for this work include state-of-the-art metrology electrical characterization equipment, cryostats for very low temperature measurements and access to NJIT's Class 10 cleanroom with full process capabilities for 6-inch silicon wafers.

Materials Research — Molecular beam epitaxy (MBE) of III-V semiconductors is used to fabricate various photonic devices, digital integrated circuits and optoelectronic integrated circuits. Research on the synthesis and characterization of chemical vapor deposited (CVD) and physical vapor deposited (PVD) silicon-based dielectric films is ongoing. Optical characterization of materials includes visible and far-infrared spectroscopy, photoconductivity, photoluminescence, spectral emissometry and thermal modulation spectroscopy. Materials studies include photoinduced superconductivity in High-Tc materials (i.e., YBCO) and optical properties of SiC, GaN and porous silicon.

Ultrafast Optical and Optoelectronic Phenomena — Terahertz spectroscopy is used to study ultrafast carrier dynamics in semiconductors. Other areas include ultrafast photodetectors, ultrashort nonlinear pulse propagation in optical fibers and planar waveguides, ultrafast photophysics of semiconductor and quantum well devices, and ultrafast optical switching in novel nonlinear materials. The Ultrafast Optics and Optoelectronics Laboratory is capable of producing ultrashort laser pulses of 100 femtosecond duration over a tuning range of 230-nm (ultraviolet) to 2300-nm (infrared).

Optical Science and Engineering Education — The National Science Foundation (NSF) is supporting the development of an optical science and engineering curriculum with optics research collaboration among NJIT's physics, electrical and computer engineering, and chemical engineering, chemistry and environmental science departments.

Solar Physics — The Center for Solar Research operates two world-class observation facilities: Big Bear Solar Observatory (BBSO) and a dedicated array of solar radio telescopes at Owens Valley Radio Observatory (OVRO), both in California and both formerly managed by Caltech. Research focuses on the development of state-of-the-art instruments for solar observations; the study of solar magnetic fields and extended atmosphere; and the study of solar activities and their terrestrial effects. Solar physics interacts closely with other research areas at NJIT, including device physics, image processing and atmospheric chemistry. With the acquisition of BBSO and OVRO, the NJIT physics department has one of the best-known university-based research efforts in solar physics in the world.

Imaging Technology — A developing initiative builds upon NJIT's nationally recognized work in infrared imaging technology, applying it to the promising area of infrared solar physics. State-of-the-art infrared imaging devices are being developed and tested as part of an IR telescope system to be installed at Big Bear Solar Observatory.

Surface Physics — This area focuses on research on laser-induced physical processes on surfaces. One area of current interest is laser-stimulated hydrogen ion desorption from a hydrogenated Si (100) surface. Another area is the interaction of spin polarized atoms with surfaces.

Discharge Physics — Research on glow discharges for plasma processing of semiconductors and other materials is being carried out under an NSF-sponsored program. Related studies on VUV (vacuum ultraviolet) light sources and unique laser pumping schemes are also under way.

Applied Laser Physics — With industry funding, research is being carried out at Rutgers-Newark on laser processing of materials with low thermal conductivity. The physics involves heat transport, laser properties and material properties. New instrumentation to resolve variations in temperature in time and space is being developed. This work is in collaboration with the Department of Ceramics and Engineering in the Rutgers College of Engineering in New Brunswick.

Biophysics — An NSF-funded research training group program in collaboration with the Rutgers-Newark's chemistry department, the federated biological sciences department and Rutgers-Newark's Center for Molecular and Behavioral Neuroscience provides training and research opportunities in frontier interdisciplinary biophysics areas including spectroscopy, signal processing and biomedical instrumentation. One area of great current interest involves the use of stable isotope tracers for medical diagnostics. Another is the development of microsensors to probe nonlinear auditory response in mammals.

TRANSPORTATION

The interdisciplinary program in transportation through the Institute for Transportation involves about 30 NJIT faculty and 25 NJIT graduate students in its research program activities. Congressional legislation requires that TELUS (Transportation Economic and Land Use System) be customized and deployed for use throughout the United States. TELUS is a computerized system for tracking the progress of transportation projects and assessing their economic and land use impacts and interrelationships.
Institute research activities are associated with the following centers at NJIT:
International Intermodal Transportation Center
North Jersey Transportation Planning Authority

Areas of Research

Mitigation of Increased Highway Congestion — resulting in reduced productivity, increased gridlock, pollution and fuel consumption.

Advanced Traffic Control and Engineering — are requiring new systems for traffic management and new engineering and management techniques to expand the capacity of the transportation infrastructure.

Intelligent Transportation Systems — resulting in more efficient use and increased safety for the existing transportation infrastructure.

Increased Competition — for railroad, truck and air carriers because of deregulation. Carriers must further reduce costs while providing high-quality service and consider that a smaller number of large companies may dominate the market.

Globalization — of markets requiring the ability to efficiently move goods over long distances often using multiple carriers. Several large transportation consortia are likely to establish themselves in world markets in the next decade.

Reduction in Public Assistance to Transportation — and the high social and political costs of building new transportation systems placing a tremendous emphasis on improved management of existing facilities, thereby requiring the introduction of innovative financing practices and larger participation from the private sector.

Increase in Social Awareness — demonstrated by society’s concern with the energy consumption of scarce fossil fuels and the negative by-products of transportation such as noise, air and water pollution.

Streamlining the Logistics Process — to reduce transportation and inventory costs through the expedition of raw materials from origins to production plants, semi-finished products between plants and finished products to consumers.

Intermodalism — to combine the best of two or more modes of transportation for the coordinated movement of people or freight. The economy of line haul with the flexibility of another mode for local collection and distribution is an example.

Aircraft Routing — to reduce aircraft noise and to improve air traffic operation.

Undergraduate : Admissions

Applying for Admission

Students considering applying for admission to any of the undergraduate programs at NJIT should read the detailed requirements and procedures set out on the following pages.

Many NJIT students enroll as freshmen after graduating from high school, but applications are also welcome from transfer students who have completed some college work. The university works closely with community colleges and other institutions to facilitate transfer of students.

Admissions counselors are available to help students define their college plans. They will provide further information about any of the undergraduate programs, and explain the admission requirements for each program. If students are uncertain about which program to take, a counselor can help them make a decision.

The university strongly encourages applicants to visit the campus. The Office of University Admissions will be happy to arrange an interview and a student-guided tour.

An interview may be required as the University Admissions Office attempts to evaluate each student's ability to complete a program at NJIT.

For further information contact:

Office of University Admissions

New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982
(973) 596-3300 or (800) 925-NJIT
E-mail: admissions@njit.edu

For an online application for admission, see NJIT on the Internet at www.njit.edu

General Admission Requirements

All Math/Science/Engineering Majors

HIGH SCHOOL UNITS Applicants for admission must have completed a minimum of 16 secondary school units. Prospective students who have not taken all these units may be required to complete preparatory courses in the summer and/or pursue a modified program in the freshman year.

Required units

English	4 units
College preparatory mathematics, including algebra, geometry and trigonometry	4 units
Lab sciences, chemistry and physics preferred	2 units
Other units	6 units

STANDARDIZED EXAMINATION REQUIREMENTS All applicants must take the Scholastic Assessment Test. The American College Test is also accepted.

Architecture Majors

Same general requirements with the following exception:

Requirement	Units

Lab sciences, physics preferred	2 units

History, Management, and Professional and Technical Communication Majors

Same general requirements with the following exceptions:

Requirement	Units
College preparatory mathematics	3 units
Science, including one lab science	2 units

Science, Technology and Society Majors

Same general requirements with the following exception:

Requirement	Units
College preparatory mathematics	3 units

Engineering Technology Majors

Applicants should hold an associate's degree or its equivalent in an appropriate field of technology from a community college or similar institution. Applicants for Surveying Engineering Technology may apply as first-time freshmen.

Freshman Admission

High school graduates who have not previously attended college may apply for admission as freshmen. In lieu of a certificate of graduation from an approved secondary school, a high school equivalency certificate, as issued by the New Jersey State Board of Education or similar state agency, may be submitted. To apply for admission, you must complete an Application for Undergraduate Admission form and pay a non-refundable application fee. Please review the admissions application for further details. Your application will be considered on the basis of your high school record, your performance on standardized examinations, and other pertinent information.

Early Admission

Exceptional students who meet the course requirements and standardized examination requirements for a freshman program may begin as freshmen without completing the senior year of high school or receiving a high school diploma. Inquiries should be directed to the Office of University Admissions.

Advanced Placement

Accepted students may be awarded credit for freshman course work in a number of areas by taking the proper courses in secondary school and/or attaining satisfactory scores on appropriate Advanced Placement (AP) Examinations. Policies for awarding AP credit may be found at: admissions/pdf/Ap3.pdf

Course Placement

Students enter at many levels of achievement. The credentials of all accepted students are reviewed before specific courses are assigned; for details refer to section on Freshman and transfer testing in Academic Policies and Procedures .

The course work available ranges from the review (refresher)-level to honors-level courses, which provide more challenge for the well-prepared student.

Students for whom review is suggested or required may do such work during summer school or in a modified program during the freshman year.

Transfer Admission

To be considered for admission as a transfer student applicants must submit an Application for Undergraduate Admission and a non-refundable application fee.

Further details on transcript and standardized examination requirements may be found online or on the paper Application for Undergraduate Admission.

NOTE: Transfer candidates who have completed the equivalent of one or more years of full-time study at an accredited U.S. college or university in the same discipline as the one they plan to enter at NJIT are not required to submit standardized examination results or secondary school records except in cases in which it is deemed necessary by the Office of University Admissions.

Engineering Technology Majors

Candidates for admission to the program leading to the Bachelor of Science in Engineering Technology (except for Surveying) must submit a transcript indicating that they hold an associate's degree in technology (A.A.S.) or in related areas. The university will consider applicants who have an educational background equivalent to an appropriate associate's degree but who do not have the degree. Transfer students from engineering programs may be required to complete a minimum number of technology courses in addition to the junior and senior year Bachelor of Science in Engineering Technology program.

The computer technology option is designed as a continuation of an associate's degree program in computer-related areas offered by community colleges or technical institutes.

Students who apply to the construction option must demonstrate successful completion of a two-year program (or an approved equivalent) in one of the following fields of technology: civil engineering, construction, drafting and design, mechanical engineering, or architecture.

Students who apply to the construction management option typically have an associate's degree in engineering technology or other related technical areas.

Students who apply to the electrical option must demonstrate successful completion of a two-year program (or an approved equivalent) in electrical or electronics engineering technologies.

Students who apply to the manufacturing option must have completed a two-year program (or an approved equivalent) in a field of engineering technology.

Students who apply to the mechanical option must have completed a two-year program (or an approved equivalent) in mechanical technology.

Students who apply to the surveying option may have successfully completed a two-year program (or an approved equivalent) in a field of engineering technology, or may begin their studies as first-time freshmen.

Joint Admissions Agreements with New Jersey Community Colleges

To assure the smooth transition from associate's degree programs offered at New Jersey community colleges to NJIT's bachelor's degree programs, NJIT has a number of Joint Admissions Agreements in place. These agreements specify the courses that community college students should take in order to maximize the number of transferable credits to NJIT. Generally, students electing this option can complete a specific B.A. or B.S. degree in four semesters of full-time study.

An important feature of all joint admissions agreements is that high school graduates are simultaneously admitted to both the cooperating community college and NJIT. The NJIT Office of University Admissions monitors the academic progress of students as they pursue the associate's degree. For the most recent list of joint admission/articulation agreements, visit: admissions/undergrad/prospective/articulation.php

International Student Admission

Students whose native language is not English are required to submit their results from the Test of English as a Foreign Language (TOEFL) examination and may also be required to take courses in English as a Second Language. The minimum TOEFL score is 550 on the paper-based exam, or 213 on the computer-based exam.

Students who wish to receive transfer credit for course work completed in a country other than the United States are required to have their credentials evaluated by an accredited independent service. NJIT recommends the use of: World Education Services, Inc , Old Chelsea Station, New York, New York 10011. The transcript evaluation will be used to determine the transferability of courses. The cost for the evaluation of foreign records is borne by the student.

Only matriculated students will be considered for transfer credit. Credit will be given only for completed courses that are equivalent to those in the NJIT curriculum. A minimum grade of C is required in order to receive transfer credit. For transfer course equivalencies for New Jersey colleges, visit: njtransfer.org

Students whose native language is not English, who transfer to NJIT from other U.S. colleges or from foreign universities are required to take the English Placement Test. Further details are included with the Application for Undergraduate Admission and in the Academic Policy Section.

All students who will maintain F-1 or J-1 student status while attending NJIT must submit an International Student Financial Statement as part of their application. This form is available at the admissions home pages.

Special Programs

Accelerated Seven-year Programs Combining an NJIT Bachelor's Degree with a Medical, Dental, or Optometry Degree

Seven-year programs are available leading to the M.D. degree from either the University of Medicine and Dentistry of New Jersey

(UMDNJ) or St. George's University School of Medicine (SGUSOM). Students spend three years at NJIT in an established accelerated curriculum, followed by either four years at UMDNJ or two years at SGUSOM followed by two years at St. Michael's Medical Center, Newark. Seven-year programs are available leading to a Dental degree from UMDNJ or New York University College of Dentistry, following a similar plan. A seven-year program is available leading to the Doctor of Optometry (O.D.) degree from New York University School of Optometry.

Approved accelerated curricula have been established in Biology, Biomedical Engineering, Chemistry, Engineering Science, Mathematics, and Physics. A Bachelor's degree is awarded by NJIT following successful completion of the first year at the professional school.

Accelerated Six-Year B.S./J.D. or B.A./J.D.

NJIT and the Seton Hall University School of Law offer a program leading to the Bachelor of Science (B.S.) or Bachelor of Arts (B. A.) and the Doctor of Law (J.D.) following completion of a prescribed six-year course of study, including three years in an accelerated curriculum at NJIT as described above.

Combined Seven-Year B.S./J.D. or B.A./J.D.

NJIT and the Rutgers-Newark School of Law offer a program providing combined admission to both institutions and leading to the Bachelor of Science (B.S.) or Bachelor of Arts (B.A.) and the Doctor of Law (J.D.) following completion of a prescribed seven-year course of study.

Admission to all combined/accelerated programs is highly competitive, and there is an early application deadline. Students must apply through the Albert Dorman Honors College. For a detailed description of these accelerated programs, see the Albert Dorman Honors College web site or contact the College.

Non-Matriculated Students

Academically qualified students who do not desire to enter a degree program may enroll for credit in certain undergraduate courses. Such students must present transcripts of previous academic work or other appropriate evidence each semester they register in order to indicate adequate preparation for the course work involved. A non-matriculated student fee is required for each semester in which a student registers. Students are limited to 15 credit hours of non-matriculated enrollment.

Official transcripts for non-matriculated students must list subjects completed, grades earned, and credits taken. No grades or academic credits will be awarded for audited courses. Auditors, however, may receive a statement of their attendance in the course.
Non-Matriculated Students Non-matriculated students should contact the Office of University Admissions for details of admission and registration procedures at least one month before the date of intended enrollment. Extension and distance learning students should contact the Division of Continuing Professional Education.

Credit by Examination and Transfer Credit

For further information see [Academic Policies and Procedures]

College Level Examination Program (CLEP)

Applicants may be granted course credit for non-traditional college education such as independent studies or job-related experiences by successfully passing appropriate CLEP Subject Examinations. Interested candidates should contact the Counseling Center for additional information: (973) 596-3414.

Examinations to earn credit are available in certain courses. Students who believe they have the background covered in a given course should consult with their advisor in the department offering the course to see whether an examination is offered. To receive credit by examination, a student must earn a test score at or above the level designated by that department. Students who have failed or attempted a course at NJIT may not take an examination for credit in that course. A fee is charged for the examination.

Readmission

Students who have discontinued their studies must apply for readmission to the Office of University Admissions by the application deadline. A non-refundable application fee must accompany applications. Applicants are subject to all probationary and unmet conditions in force at the time they discontinued their studies. Program requirements at the time of readmission will apply in addition to satisfaction of any prior unmet conditions. Application deadlines are:

For the fall semester	July 1
For the spring semester	Nov. 1

The Office of University Admissions will inform applicants of their readmission status.

Undergraduate : Tuition and Fees

New Jersey Institute of Technology reserves the right to revise its charges for tuition and fees and to establish fees as may be required by increased educational costs. Tuition includes charges for services other than instruction, such as library, publications, counseling, placement, but does not cover the cost of damage to or loss of university property.

Fees provide funds for the operation of health services, student services and activities, inter-collegiate athletics, and various facilities and services.

Liability for Charges

New Jersey Institute of Technology reserves the right to increase tuition and fees as required.

Students incur a legal obligation to pay tuition and fees when they register for classes. Unless the registrar receives written notice by the fifth day of the semester that a student will not be attending classes, the student will be billed and held responsible for payment.

Tuition and Fees 2004-2005 (in U.S. dollars)

Effective July 24, 2004 the charges for tuition and fees for undergraduate programs are as follows:

TUITION

	New Jersey Resident	Non-Resident
Full-time	$3,959/semester	$6,858/semester
Part-time	$300/credit	$587/credit

NOTES: Part-time = 1--11 credits per semester. Full-time = 12 or more credits per semester. However, for any additional credits taken over 19, there is a per credit charge at the part -time rate in addtion to the full-time charge.

FEES

Full-Time (fees per semester)

Registration	$ 70
Academic Facilities	315
Student Services	56
Activities	48
Athletics	30
Health Services	12
Technology Infrastructure Fee	100
Total	$ 631

Part-Time (fees per semester)

Registration	$ 70
Health Services Fee	12
Total	$ 82

In addition to the above, Part-time students are also charged the following fees per credit:

Academic Facilities	$ 33
Student Services	7
Activities	5

Athletics	3
Technology Infrastructure Fee	13
Total	$61(Per credit)

International Student Fee $60 per semester
International students are charged the Non-Resident tution rate.

Health Insurance is $244 per academic year for all full-time students.

International students are charged $282 per academic year for taking 3 credits or more.

HEALTH INSURANCE

New Jersey statutes require all full-time students and all international students (whether full or part-time) to show evidence of existing health insurance, or they will be required to purchase coverage from the university at the rate of $244/$282 per academic year. Students with comparable coverage may waive the fee for this insurance by completing a waiver card and submitting it to the Office of Health Services during the 30-day enrollment period at the beginning of the semester. Students must be registered for at least 3 credits to be able to purchase insurance from the university. International students with less than 3 credits must contact the Office of Health Services for further information. Students with J-1 visas, see "Health Insurance" under "Student Services" in this catalog for further information.

Full and Part-time students interested in purchasing supplemental coverage for spouses and families should contact the Office of Health Services for more information.

APPLICATION AND SPECIAL FEES

Admissions Application Fee Applications for admission must be accompanied by a non-refundable fee of $35.

Late Payment Fee Students are charged $50 if they do not pay tuition and fees within the period stipulated in payment instructions.

Late Registration Fee Registration is required each semester. A late registration fee is required after the deadline specified in registration instructions. See www.njit.edu/Registrar for current fee.

Maintaining Registration Fee Students admitted to degree programs and who find it necessary to temporarily discontinue their studies, may maintain their enrollment by paying a maintaining registration fee of $20 for each semester they do not register for courses. Other limitations on maintaining registration exist for those in academic difficulty. If international students must interrupt their studies temporarily, they are required to first consult with the Office of International Students and Faculty to obtain permission for a leave of absence.

Readmission Application Fee A non-refundable fee of $35 must accompany applications for readmission.

Schedule Change Fee A fee of $15 is charged for each schedule change requested after the deadline specified by the registrar.
Graduation Fee A $70 fee is charged each time a student applies. If the degree requirements are not completed and a student is not certified for graduation, the student must reapply for graduation and pay the $70 graduation fee again.

Parking Fee NJIT students who have registered for classes may purchase a parking permit. Parking fees (per semester) are $125 for full-time students (12 credits or more) and $65 for part-time students (less than 12 credits). Adjustments to parking fees to reflect changes in full-time or part-time status will automatically be made on the fifth day of the semester only. Written requests for refunds will be granted by the Department of Public Safety only until the fifth day of each semester.

Special Examination Fee For examinations, taken at times other than those regularly scheduled, a fee of $5 is charged.

Additional Fees From time to time, additional fees may be necessary, or current fees may need to be increased. Currently these include:

Distance Learning $65 per semester

Continuing Professional Education (CPE) Tuition and Fees
In some cases, there is a differentiation in fees for CPE programs. See www.njit.edu/cpe/ for a current listing of fee labels and fee amounts or call CPE at 1 (800) 624-9850.

Tuition Refunds for Withdrawal

Total Withdrawals During Fall or Spring Semesters
When students withdraw from all courses voluntarily(a complete withdrawl) they may receive a refund of some part of the tuition provided they have property completed a withdrawl on the Highlander Website.

INSTITUTIONAL REFUND SCHEDULE

Students receive refunds of tuition for complete withdrawal according to the following schedule:

Through the end of	% Refunded
Week 1	100% (plus all fees)
Week 2	90%
Weeks 3 and 4	50%
Weeks 5, 6 and 7	25%
After Week 7	0%

Partial Withdrawals During Fall or Spring Semesters

The percentage of tuition refunded for credit reductions short of complete withdrawal (a partial withdrawal) in a semester is:

Through the end of	% Refunded
Week 1	100% (plus all fees)
Week 2	90%
Weeks 3--15	0%

For more information on policies and procedures for the treatment of financial aid due to withdrawl, go to [www.njit.edu/FINAID/WITHDE.PHP.](www.njit.edu/FINAID/WITHDE.PHP)

After the last day of the second week of classes each semester, students who reduce credits, but remain enrolled will not receive any refund of tuition or other charges. For federal and state financial aid purposes, enrollment status is determined on the 15th day of classes, no adjustment from full-time to part-time status is made after the end of the second week of classes. Refund policy and procedures for summer sessions are published in summer session registration materials at [www.njit.edu/Registrar.](www.njit.edu/Registrar)

Emergency Withdrawal

The Office of the Dean of Student Services approves emergency, complete withdrawals contingent upon receipt of appropriate documentation. Students receive a tuition refund on a prorated basis according to the number of weeks attended in the term. Students unable to complete the term may request emergency withdrawal for either of the following reasons: medical circumstances or a call to military service.

Housing and Meal Plan Fees Per Semester

Cypress Hall, Laurel Hall, Oak Hall Double Rooms $ 2,872.00

Redwood Hall Double Room $ 2,695.00

- The single room rate is $3,372.00 per semester. Single rooms are available only to upperclass students based on room selection criteria and processes.
- Designated tripled rooms will receive a $500 credit after the fifth week of the fall semester only.
- Twelve-month housing contracts are available. The charge is an additional $1,000 per semester.

Meal Plans Per Semester
A – Plan $1,249.00 5 dinner meals per week, $500 flex dollars, 10 guest dinners*
B – Plan $1,249.00 7 dinner meals per week and $400 flex dollars
C – Plan $1,339.00 5 dinner meals per week, $600 flex dollars, 10 guest dinners*
D – Plan $1,339.00 7 dinner meals per week and $500 flex dollars
E – Plan $1,246.00 70 dinner meals per semester, 12 guest dinners**, $450 flex dollars

* Guest dinners, for A and C, are allotted monthly, 3-Sept., 3-Oct, 2-Nov., 2-Dec., 1-Jan., 2-Feb., 3 Mar., 3-Apr., 1-May (Varies by academic year.)
** Guest dinners on the block plan can be used at "anytime" during the semester.

- Dinners are all-you-can eat meals.
- Flex dollars can be used in the Dining Room (breakfast and lunch meals), the Highlander Club or Starbucks Coffee Shop.
- ONLY Flex dollars carry over from fall to spring semester. At the end of spring semester there are no refunds from flex dollars. Students may purchase extra flex dollars. The initial increment is $100 and after this they may be made in $25 increments.

*Expect room and board rates for 2005-2006 to increase 4-7 percent.

Payment and Cancellation

For new students (first time freshman, transfers, exchange students): Enclosed with the signed contract a check or money order (only) payable to NIT, in the amount of $50 serves as a non-refundable room reservation deposit. A cancellation fee will be assessed, if cancellation is made prior to checking in.

For All Students (returning residents, current commuters apply for housing): All students must complete and sign this contract. If a contract is cancelled prior to check-in, the following cancellation fee will apply: if cancelled before May 16, 2004 - $0, Between May 17 and June 27, 2004 - $250 and after June 28 - $450.

Students applying for spring 2005 housing-- You will be charge a $450 cancellation, if your contract is cancelled prior to check-in.

In all cases
No refunds of room charges will be made once a resident takes possession of a room. A resident has possession of a room once he/she signs the "Check-in-Form."

Releases from the Contract
A Resident may be released from the contract assignment from the fall to the spring semester without forfeiture of charges or during the semester, if the Residence Life Office is notified in writing, with supporting documentation in the following cases only:

- Withdrawal from the University
- Marriage or pregnancy
- Transfer to another University
- Graduation
- Loss of University financial aid

In these circumstances only, students are billed until the end of the semester in which they cancel their contract or are pro-rated to the date of check-out (if it falls prior to the end of the semester.) If a student loses housing privileges as a result of a policy violation, if it falls prior to the end of the semester, they pay housing charges only until the end of the semester.

Meal Plan Refund Policy

If a student is released from their housing contract during a semester, they are charged until the date of checkout for meals and flex dollars

If a resident student places cash in their flex account, they are entitled to a refund anytime, or may carry the flex amounts over from one semester to the next.

Meal Plans for Commuter Students

Commuter students may elect to have a full meal plan or place money in their account. The initial increment is $100 and after this they may be made in $25 increments.

If a student is released from their housing contract during a semester, they are charged until the date of checkout for meals and flex dollars

If a resident student places cash in their flex account, they are entitled to a refund anytime, or may carry the flex amounts over from one semester to the next.

Meal plan Refund Policy for Commuter Students

If students select a regular meal plan the refund policy and procedures are the same as for resident students.

If commuter students place cash in their flex account, they are entitled to a refund anytime, or may carry the flex amounts over from one semester to the next.

Cancellation of Housing Contract Prior to Check-In

NEW STUDENTS ---- All new students are required to provide a $50 non-refundable room reservation deposit. If a contract is cancelled prior to check-in, a $450 (less the $50 non-refundable room reservation deposit) cancellation fee will be assessed.

CONTINUING STUDENTS ---- All students must complete and sign a housing contract. If a contract is cancelled prior to check-in, a $450 cancellation fee will be assessed.

Cancellation of Housing Contract After Check-In

No refunds of room charges will be made once a resident takes possession of a room. A resident has possession of a room once he/she signs the Check-in Form.

A resident may be released from the contract assignment without forfeiture of room charges or assessment of a cancellation fee, if the Residence Life Office is notified in writing, with supporting documentation, under the following circumstances only:
1. Withdrawal from NJIT
2. Marriage
3. Pregnancy
4. Transfer to another university
5. Graduation from NJIT
6. Loss of financial aid

In these circumstances only, students are billed until the end of the semester in which they cancel their contract or pro-rated to the date of check-out (if it falls prior to the end of the semester).

Payment Methods

Payment for tuition and fees may be made using any of the following methods:

Checks and Money Orders

Checks or money orders must be made payable to NJIT. Write the NJIT ID number on the face of the check or money order. The university reserves the right to add missing ID numbers to checks for payment.

Cash

Cash payments can be made only at the Bursar's Office.

Credit Cards

At this time, the university only accepts Visa, MasterCard and Discover. For your convenience we allow the use of credit card payment over the web. Go directly to http://my.njit.edu and sign on to Highlander Pipeline, then select view and pay your bill. You may also use the back portion of your invoice to authorize use of the above credit cards or you can opt to pay in person.

Deferred Payment

Students may use the NJIT deferred payment plan. In order to take advantage of this plan, the student must pay one-half of the bill plus a $25 deferral fee. All prior debts must be paid in full in order to take advantage of a deferral.

Student Residency for Tuition Purposes

Residency status for the purpose of tuition assessment will be made by the university based upon N.J.S.A. 18:62-1 et seq. and New Jersey Administrative Code Title 9. These set forth the standards that individuals legally reside in the state for 12 months prior to enrollment to be eligible for in-state tuition rates.

The procedures outlined below will govern the determination of residency status for the purpose of calculating tuition. All students who are not legal residents of New Jersey within the meaning of the statutes will be assessed out-of-state tuition rates.

Initial Determination of Residency

When an application is submitted for admission to any graduate or undergraduate program the admissions office will determine the applicant's resident status for tuition assessment. This determination will be based upon information supplied by the applicant on the application for admission. Applicants who are not citizens of the United States must complete the non-resident portion of the application and supply documentation of their non-immigrant status.

The university reserves the right to correct any errors in resident status based upon incorrect or insufficient information supplied by the student, which directly or by inference leads to an inaccurate tuition assessment. When an error has been identified and corrected, tuition will be recalculated for the terms affected, and the student will be held liable for any additional tuition.

Legal Determination of Residence

The following statement from the New Jersey Statutes Annotated defines residence for higher-education purposes: "Persons who have been domiciled within this State for a period of 12 months prior to initial enrollment in a public institution of higher education are presumed to be domiciled in this State for tuition purposes. Persons who have been domiciled within this State for less than 12 months prior to initial enrollment are presumed to be non-domiciliaries for tuition purposes."

The university reserves the right to request the student to have the Internal Revenue Service or the New Jersey Division of

Taxation forward tax records to the appropriate university office for review or to request same directly from the student.

An individual who claims to have established a new domicile in New Jersey must show (1) a physical abandonment of the previous domicile, together with an intent not to return to it, and (2) actual presence in New Jersey with the intention of remaining permanently in the state for reasons other than attending school.

An individual from another state or country who has enrolled in any type of educational institution in New Jersey prior to applying to NJIT will be presumed to be in New Jersey primarily for educational purposes and will be presumed not to have established domicile in New Jersey. Although the student may present proof to overcome these presumptions, it must be noted that continued residence in New Jersey during vacation periods or occasional periods of interruption to the course of study does not of itself overcome the presumptions.

THE EFFECTS OF MARRIAGE ON RESIDENCY ---- A U.S. citizen or permanent resident who marries a bonafide New Jersey legal resident assumes the domicile of that spouse for tuition purposes in the term following marriage. The same test for residency will be applied to spouses when marriage is claimed as the basis for domicile.

No change in status will occur when a legal resident student marries a non-legal resident.

FOREIGN NATIONALS ---- International students studying under a non-immigrant status (such as F, J, and all others) may be eligible to pay resident tuition upon receipt of their permanent resident card. In addition to receipt of permanent resident status in the United States, students must comply with the definition of "Domicile" as described in that section of the catalog. Any other non-immigrant alien (H-1, E-1, etc., status) will be classified as a non-resident for the assessment of tuition.

Residency will be determined as of the first term following the admission date on the permanent resident card. Applications for residency will not be processed unless a photocopy of both sides of the permanent resident card is included with the application. A tuition refund will be issued if the admission date on the permanent resident card precedes the start date of the current term.

Residence established solely for the purpose of attending a particular college or university cannot be considered as fulfilling the definition of domicile.

Refugees Students who have been granted political asylum in the United States may be eligible to pay resident tuition rates effective the semester after which asylum has been granted.

Political Asylum Students who have been granted political asylum are not permanent residents of the United States and are not eligible to pay resident tuition rates. Employment Authorization Visas issued by INS do not qualify students for NJ resident tuition status.

Request for a Change of Residency Status

Requests for a change in residency status must be submitted to the registrar no later than four weeks before the end of the term for which a change in status is sought. A Residency Analysis Form with all supporting affidavits, deemed appropriate by the registrar pursuant to N.J.A.C. 9A:5-1.1 et seq., must be filed at the time of application. Students who qualify for resident tuition assessment based on the information supplied with their request will have their status changed only for the current and subsequent terms. No adjustments in tuition assessments will be made for prior terms.

Residency Appeals

Appeals on the determination of residency status will be made to the registrar and will be accepted no later than one month after the date of notification of any such determination. Unresolved appeals will be forwarded to the assistant vice president for academic affairs: enrollment planning. The assistant vice president will respond to the appeal within 30 working days of receipt of the appeal.

The decision of the assistant vice president for academic affairs: enrollment planning will be final.

Student Responsibilities

Students are responsible for providing relevant and accurate information upon which a residency determination can be made. The burden of proving residency status lies solely upon the student. Moreover, it is considered the obligation of the student to seek advice when in doubt regarding eligibility for in-state tuition assessment. If the student delays or neglects to question eligibility status beyond the period specified above, the student forfeits the right to a residency assessment to which he or she might have been deemed eligible had an appeal been filed at the appropriate time.

Students who are classified as resident students but who become non-residents at any time by virtue of a change of legal residence are required to notify the registrar immediately.

An independent student loses residency status for in-state tuition payment immediately upon abandonment of the New Jersey domicile. Assessment of non-resident tuition charges will take effect the term following the date of abandonment.

Penalties

If a student has obtained or seeks to obtain resident classification by deliberate concealment of facts or misrepresentation of facts or fails to come forward with notification upon becoming a non-resident, he or she is subject to disciplinary action before the university's professional conduct committee.

Factors Considered in Determining Residence for Tuition Assessment

CLASSIFICATION ---- Students residing in New Jersey for a period of 12 months before first enrolling at a public institution of higher education in the State of New Jersey are presumed to be state residents for tuition purposes.

Students who have been domiciled within this state for less than 12 months prior to the date of enrollment are presumed to be non-residents for the purpose of calculating tuition. Students who assert residency but whose resident status is challenged by the university, must prove their domicile according to the following regulations.

DOMICILE ---- "Domicile" means the place where a person has his or her true, fixed, permanent home and principal living establishment, and to which, whenever he or she is absent, he or she has the intention of returning.

Although actual presence is not necessary to preserve domicile once it has been acquired, a person, if absent from the state, must have the intention of returning to New Jersey in order to remain a legal resident.

In determining whether legal resident status has been shown, mere physical presence and the assertion of a declaration of intent to remain in the state may not be sufficient. To assist in determining whether a person is a New Jersey legal resident, the primary evidence of residency, although not dispositive, is a notarized affidavit setting forth domicile and a copy of New Jersey income tax return substantiating employment in New Jersey as the applicant's primary reason for residing in the state. In the case of dependent students, a copy of the parent's or legal guardian's New Jersey tax return will be required in addition to the affidavit. The following additional items may be considered: voter registration of the individual in New Jersey; a New Jersey driver's license and/or a registration or such other information as the university deems acceptable. In unusual circumstances, if primary evidence is not available, the institution may make a determination of New Jersey domicile based exclusively on supplementary evidence; however, supplementary evidence may not be deemed sufficient to justify a determination of legal resident status.

If a student resides with his or her parents or legal guardians for more than six consecutive weeks last or this year, or is dependent upon them for food, clothing, or shelter during the present or prior year, or is claimed, or will be claimed, as a dependent for income tax purposes for the last or current year, the student is deemed to be financially dependent. In such case, the domicile of the individual's parent or legal guardian for the year prior to the term of admission will determine the domicile of the dependent student.

Conversely, if a student has not lived, and will not live, with parents or legal guardians for more than six consecutive weeks during the present or prior year; and has not received and will not receive financial assistance from parents or legal guardians of more than $750 in support of any kind including food, clothing and shelter last year and this year; and has not been claimed as an exemption on parents' or legal guardians' tax return last and this year; and has resources, which should be at least equal to the level of public assistance in the preceding calendar year, the individual is deemed to be financially independent and student's own domicile, for the year prior to the term for which New Jersey domiciliary status is sought, will determine his or her legal resident status.

PRESENCE IN NEW JERSEY DUE TO MILITARY SERVICE ---- As a general rule, in the absence of any intention to effect a change of domicile, the domicile of a person is not affected or changed by reason of his or her entry into the military service.

United States military personnel and their dependents who are living in New Jersey are regarded as residents of the state for tuition purposes.

Undergradute : Academic Policies and Procedures

Academic Advising

Academic advising is the planning of a student's educational program. The academic advisor ensures that the student is taking the correct courses and in the proper sequence in order to meet all degree requirements. The academic advisor also monitors satisfactory academic progress, which has an impact on academic standing, student financial aid eligibility, and a timely graduation.

As a freshman, the initial plan is developed between the student and the dean of freshman studies. The plan is reviewed and revised, if necessary, by the student working with the departmental academic advisor at least once a year. Students must meet with their academic advisor prior to registering for courses each semester (including summer). An electronic hold is placed on students' access to registration to ensure that students have met with their advisors.

Registration

Registration is required each semester. The office of the registrar is located in the Student Mall, on the ground floor of the parking facility. The office is open when classes are in session, Monday through Thursday, from 8:30 a.m. to 6 p.m. and Friday, 8:30 a.m. to 4:30 p.m. Registration procedures for each category of student are listed below.

NJIT has an advance self-registration system that obligates all students currently enrolled in undergraduate degree programs to register in advance for their courses. An approved registration guarantees class seats until the first class meeting. Students who do not attend the first class meeting may lose their place in class.

All admitted students register online via Campus Pipeline

Continuity of Registration

A student must register in each fall semester and spring semester continuously from the semester in which first registered until the semester in which graduated. Students who are voluntarily not taking classes or who have been granted a leave of absence will comply with this requirement by registering for "maintaining registration". Students who allow their registration to lapse will have to apply for readmission on the same basis as new students, can be readmitted only with the consent of their department, and the university is under no obligation to readmit them. Students who are in academic suspension are an exception to this rule, and are governed by the policy on reinstatement after academic suspension.

Responsibility for Registration

NJIT mails notices in advance, but cannot guarantee postal delivery. Regardless, students are expected to obtain all necessary information and comply with all registration procedures on time. New international students are only permitted to register after attending the required international student orientation program and must register in-person. Students who receive financial support must be in attendance at NJIT and will not be permitted to have other persons register for them.

Currently Enrolled Students Currently enrolled students are informed of registration procedures for the fall and spring semesters by the Office of the Registrar during March and October respectively, and must then register during the advance registration period. Students who fail to comply with these instructions are charged a late fee. Instructions for the summer session are provided with the fall registration materials.

New and Readmitted Students The Office of University Admissions informs prospective and readmitted students of registration procedures.

Non-Matriculated Students Non-matriculated students should contact the Office of University Admissions for details of admission and registration procedures at least one month before the date of intended enrollment. Extension and distance learning students should contact the Division of Continuing and Professional Education.

Maintenance of Registration

Students enrolled in a degree program who find it necessary to temporarily discontinue their studies are permitted to maintain registration for a fee of $20 for each semester they do not register. International students on F-1 and J-1 visa status may not maintain registration unless they have obtained prior written permission from the Office of International Students and the Office of

Graduate Studies.

Students who maintain registration are mailed registration notices for the following semester and are not required to reapply for admission. To maintain registration, students must register for "Maintaining Registration" on the registration Web site.

Each semester, in which registration is maintained, is counted in the total time period allotted to complete degree requirements except for students with an approved leave of absence.

Registration at Another College *

Students in good standing at NJIT wishing to take courses at a college or university other than those included in the cross-registration program must:

1. Obtain an Approval for Courses at other Colleges Form from the registrar's office.
2. Obtain approval from the NJIT department giving the comparable course prior to enrolling in the course. Be prepared to show the department advisor a catalog description of the course(s) you intend to take. First semester, full-time transfer students who wish to take FALL OR SPRING SEMESTER courses at a college or university other than those included in the cross-registration program must also obtain approval from the dean of freshman studies.
3. Have the form countersigned by the registrar and retain one copy. Registrar will retain original and send a copy to the NJIT department involved.
4. Take the copy to host college and follow their registration procedure.
5. Upon completion of the course(s), arrange to have an official transcript sent to the NJIT registrar. Upon receipt, transfer credit will be posted to your NJIT transcript provided the grade earned is a "C" or higher.
6. Courses completed at another college other than "cross-registered courses" will not be factored in the calculation of the NJIT semester or cumulative GPA.
7. Summer classes may be taken at Rutgers-Newark or Essex County College only if the course(s) is (are) not offered at NJIT during the summer.
8. Calculus I and II (equivalents of Math 111, 112, 113 and 114) may be taken at other colleges/universities where the duration of the summer course is eight (8) weeks or more.
9. Physics I and II (equivalents of Phys 111 and 121) may be taken at other colleges/universities where the duration of the summer courses is six (6) weeks or more.
10. Throughout a student's academic career at NJIT, a maximum of two (2) humanities or social science GUR-equivalent courses may be taken at other colleges/universities during the summer. However, the capstone seminar in humanities and social science must be taken at NJIT.

Approval Form For Undergraduate Courses At Another School

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* Exclusive of cross-registration at Rutgers-Newark College of Arts and Sciences, Essex County College, UMDNJ.

Enrollment Status

Full-Time Students Students registered for 12 credits or more throughout an entire semester are considered full-time. International students must maintain full-time status each semester.

Part-Time Students Students registered for fewer than 12 credits during a semester.

Credits that Must Be Taken at NJIT

To be eligible for graduation, students transferring to NJIT must complete in residence at NJIT, at least 33 credits in upper division courses approved by the department of their major study.

Credit for Non-Traditional Learning

Students may be granted course credit for certain college-level knowledge acquired through non-traditional education such as independent study or job-related experiences. This credit may be granted for successfully passing selected DANTES or CLEP (College Level Examination Program) Subject Examinations, or, if credit is sought for advanced courses, by successfully passing a special departmental examination. Interested students should contact the Counseling Center for additional information about CLEP or DANTES examinations: (973) 596-3414. Students should contact the appropriate academic department for information about special departmental examinations. A fee is charged for these examinations.

Cross-Registration Rutgers Students

Rutgers students cross-registering for courses at NJIT must be matriculated in a degree-granting program on the Newark campus.

Summer Students The above procedure applies only to fall and spring undergraduate courses. For summer courses, a form entitled "Permission to Take Courses at Other Colleges" must be processed through the registrar's office and the student must pay the applicable tuition and fees to the host school.

Transfer Credit

Transfer credit may be awarded at the time of admission for courses that are equivalent to those offered by NJIT. A minimum grade of C must be earned in the course in order to receive transfer credit. All transfer credit must be documented by an official transcript issued by the school where the course was completed. Students who have attended foreign institutions of higher education must also submit an evaluation of their work made by World Educational Services Inc. or another approved service. Further information regarding evaluations may be obtained from the registrar's office.

Students may request additional transfer credit by completing a request for transfer credit form and submitting it to the registrar's office along with the appropriate documentation.

Transfer credit is not factored in the calculation of the NJIT semester or cumulative GPA.

Courses Additions and Schedule Changes

Students who add a course to their program will be charged the full tuition and fee for the course added. If, within the first five class days of the semester, students change their schedule, they must complete the change via the registrar web site and pay a schedule change fee.

Courses cannot be added after the fifth day of the semester. Students attending courses for which they are not properly registered will not receive credit for such courses.

Undergraduate Registration in Graduate Courses

Undergraduate students who wish to take 500- or 600-level courses must obtain the written approval of the graduate advisor for the program that offers the course and their undergraduate advisor. If undergraduates wish to take 600-level courses, they must also obtain written approval from the chairperson of the department offering the course. Undergraduates are not permitted to take 700-level courses.

Undergraduate students who enroll in graduate courses for undergraduate credit pay tuition at the undergraduate rate. Grades will follow the graduate grading system.

The undergraduate academic advisor will review the student's academic record prior to approval. Approval can be granted only to students who have completed the appropriate prerequisites for the course and are in satisfactory academic standing. The approval will be noted on a form that requires appropriate signatures and reports the student's cumulative undergraduate GPA. Students shall have a cumulative undergraduate GPA of 2.5 to be approved for registration in 500-level courses (500G for Architecture) and 2.8 for registration in 600-level courses.

Students whose undergraduate GPA is below the 2.5 or 2.8 minima, are considering courses out of the student's current major, are lacking appropriate prerequisites, have completed any prior graduate courses with a grade below a B, or have already completed 9 or more credits at the 500 level and above (15 credits for those in the B.S./M.S. program), or have an excessive number of credits for the undergraduate degree will also require review by the dean of graduate studies and the program advisors.

Undergraduate students should be aware that need-based financial aid may not be sustainable for registration in graduate courses.

Graduate Registration in Undergraduate Courses

Graduate students may be asked to register in undergraduate courses as conditions of admission, as bridge courses or by direction of the graduate advisor for their current program. Enrollment in other undergraduate courses requires the approval of the dean of graduate studies or the graduate advisor, and the undergraduate department offering the course. Tuition for these courses is assessed at the graduate rate.

Withdrawal from Course(s)

Students who wish to withdraw from one or more courses should first determine if the withdrawal would have an impact on full-time status, financial support, or academic standing and progress. They should consult their advisor in advance.

Students wishing to withdraw from individual courses may do so without penalty by the end of the ninth week of the semester via the Registrar Web site. Failure to do so will result in grades other than W.

Discontinued attendance or verbal approval to withdraw alone will not result in a W and most likely will instead result in an undesirable final grade.

Withdrawal from NJIT

Students wishing to withdraw entirely from the university may do so without penalty by the end of the ninth week of the semester via the Registrar Web site. Failure to do so will result in grades other than W.

Auditing a Course

Students who wish to audit a course must state their intention to do so at the time of registration. Change in auditing status is not permitted once a semester has begun. Students who audit are required to pay full tuition and fees for the course. Audited courses are not counted in determining full-time status. Students on probation are not permitted to audit.

Satisfactory and Unsatisfactory

The grades S or U report progress in project, thesis, dissertation, and pre-doctoral research courses. These also can be final grades in seminar, co-op, teaching methods, ESL and physical education courses. The grade of S is given for satisfactory progress and U is given for unsatisfactory progress. Students who fail to meet with their advisors or do not satisfy relevant attendance requirements will receive a U grade. Credits for courses in which U is received cannot count toward a degree.

Course Cancellations

The university does not guarantee offering all or any of the courses listed in this catalog. When there is inadequate registration for a course, it may be cancelled without notice. The registrar will attempt to notify all students of course cancellations before the first meeting of the semester.

Room Changes

Room and laboratory changes are noted in the online schedule maintained by the registrar at www.njit.edu/registrar. Changes are also posted adjacent to doors of originally scheduled rooms.

Basic Skills Testing

NJIT places prime importance on its students' ability to communicate. The ability to communicate effectively what has been learned in courses is essential, and so the university requires students to master the verbal skills necessary for writing and speaking clear, correct English. Appropriate developmental work may be assigned to students who do not demonstrate the mastery of these skills. To the extent appropriate to the course, instructors in all disciplines stress the importance of writing and speaking ability.

English as a Second Language (ESL)

Students whose first language is not English and/or whose English proficiency is limited will be required to take a special examination in English and enroll for the appropriate course in their first semester. Placement in the appropriate course (**Eng 095** or the sequence HSS 099S-100S) is based on performance in the examination. Tutoring is a required part of these courses. Students will not be permitted to enroll in cultural history courses until they have achieved satisfactory grades in HSS 099S-100S (and **Eng 095**, if required).

The ESL Program offers ESL sections of a number of courses in the humanities and social sciences department. These sections carry full academic credit and are designed to help students strengthen their English language proficiency while also mastering course content. Enrollment in the ESL section of a course is optional. ESL sections include **HSS 211S**, **HSS 212S**, **HSS 213S**, **Eng 352S**, **Lit 320S**, and **Lit 350S**.

Freshman and Transfer Testing

After being accepted to NJIT, but prior to registration, all entering freshmen are required to take placement tests. These consist of reading, writing, mathematics and, for some majors, chemistry. Transfer students who do not receive transfer credit for required first year courses in English, mathematics and chemistry also are required to take these placement tests. All testing is held at NJIT; no fee is charged.

The results of the placement tests do not affect a student's admission to the university. The information is used only to make decisions about the level of courses that a student is prepared to take at NJIT.

Professional Skills Examinations

NJIT actively participates in programs that assure the quality of education in all undergraduate majors. In some cases, this participation requires students to prepare and sit for professional examinations. In other cases, NJIT students are required to sit for examinations, especially during the sophomore and senior years. Since these examinations carry no credit, they are not specifically listed in the major curricula listed elsewhere in this catalog. Nonetheless, these proficiency examinations are part of degree requirements, and students selected to participate in such examinations are required to take them.

All students enrolled in an Accreditation Board for Engineering and Technology, Inc. (ABET) accredited engineering program at NJIT are required to take an assessment examination, the Basic Engineering Skills Test (BEST), in the junior or senior year. The examination is offered at the beginning of the fall and the spring semester. Taking the examination is a graduation requirement commencing with students entering Newark College of Engineering in fall 2000.

Additive Credit Courses

Additive credit cannot be used to satisfy degree graduation requirements in any curriculum. Courses with additive credit are listed on the transcript and factored into the calculation of cumulative credits and the cumulative grade point average (GPA). Courses carrying additive credit include physical education courses beyond the credits required as part of the general university requirements and selected courses in humanities and social sciences and mathematics (e.g., HSS 099). Some cooperative education credits and some of the credits in the developmental sequences in first year physics and chemistry also are additive.

ACADEMIC STANDING

Grades

The following grades will be used:

GRADES	SIGNIFICANCE
A	Superior
B+	Excellent
B	Very Good
C+	Good
C	Acceptable
D	Minimum
F	Inadequate
AUD	Audit
INC	Grade deferred--given in rare instances to students who would normally have completed the course work but who could not do so because of special circumstances. If this grade is not removed during the next regular semester, a grade of F will result.
W	Withdrawn
S	Satisfactory
U	Unsatisfactory

Grade Reports

Students can view term grades along with their entire academic record via the registrar Web site at www.njit.edu/registrar. The web term grade report is valid for employee tuition reimbursement if this benefit is available through the student's employer.

Grade Changes

Grade change requests will not be accepted after the end of the subsequent semester.

Grade Disputes

Students are expected to resolve disputes about grades with their instructors. If they cannot reach a satisfactory settlement with their instructor, students are permitted to request the intervention of the chairperson of the department and the dean of the school or college.

Undergraduate Course Repetition Policy

Courses numbered between 100 and 299 (Lower Division Courses)

A student may repeat any course numbered between 100 and 299 an unlimited number of times. Only the highest of the grades obtained in the original and first repeat will be counted in a student's overall GPA. In second and subsequent repeats of a course, all grades received will be averaged with the highest of the first two grades in a student's overall GPA.

Courses numbered 300 and above (Upper Division Courses)

Students may repeat any course numbered 300 or above an unlimited number of times; however, all grades received shall be included in the computation of the overall GPA.

Credit by Examination

Examinations to earn credit are available in certain courses. Students who believe they have the background covered in a given course should consult with their advisor and the department offering the course to see whether an examination is offered. To receive credit by examination, a student must perform at a level equivalent to a grade of "C" in the course. Students who have failed or attempted a course at NJIT may not take an examination for credit in that course. A fee of $35 will be charged for the examination.

Dean's List

Students matriculated in a regular program can qualify for academic honors at the end of the fall and spring semesters if they have completed 12 or more credits in the semester, achieved a GPA of 3.00 or better in the semester, and have no incomplete grades or any grade lower than a "C" in the semester.

Transcript of Grades

Students who wish to obtain a transcript issued on their behalf must submit a request in writing to the registrar. Please allow 10 days to process the request. Transcripts will not be issued to or on behalf of a student with outstanding financial obligation to the university. Official transcripts bearing the university's raised seal will be issued only to other educational institutions, government agencies, or employers. Under no circumstances will official transcripts be issued to students.

Class Standing

A student's class standing is determined by the number of course credits earned: first year standing, 0--28 credits; sophomore standing, 29--56 credits; junior standing, 57--90 credits; and senior standing, 91+ credits.

Graduation

New Jersey Institute of Technology is authorized to grant degrees by the Commission on Higher Education.

Each degree is certified by a diploma bearing the university seal and the signatures of officers of the university.

Candidates for graduation who satisfactorily complete a regular undergraduate program receive the bachelor's degree in the program pursued.

Each prospective candidate for any degree must file an application for candidacy on or before the deadline date set by the university.

In order to graduate, students must attain a cumulative grade point average of 2.0 in all the courses listed in the catalog as being required in the appropriate curriculum. They must also earn a cumulative GPA of 2.0 in the upper division course requirements of their major as determined by the academic department offering the major.

Additive credit courses will be excluded from the calculation of the cumulative GPA requirements for graduation.

NJIT holds its annual commencement exercises in May of each year. Graduates who obtain their degree at any of the 3 degree dates (January, May or August) are encouraged to participate.

Graduation with Academic Honors

The academic honors of cum laude (GPA of 3.40--3.64), magna cum laude (GPA of 3.65-3.84), and summa cum laude (GPA of 3.85--4.00) are awarded to qualified students at graduation. Cumulative GPAs are rounded to the nearest two decimal places.

Extenuating Circumstances

Students should bring to the attention of the dean of student services or their department chairperson either directly or through the advisor any extenuating circumstances which may adversely affect their academic standing. This action must be taken as soon as such circumstances develop. Documentation of the extenuating circumstances must be provided.

Academic Standing/Probation

Students are required to maintain a GPA of 2.0. Students who earn a GPA of less than 2.0 in their most recent semester will be placed in the academic status termed "probation." Probationary status will be removed when the cumulative GPA is raised to 2.0 or above.

Academic Suspension

The committee on academic standing reviews the academic record of students, and students are subject to suspension from the university whenever they have been placed on probation for two successive semesters or earn a GPA of less than 1.5 in their most recent semester.

When the record of a student has been reviewed, the committee on academic standing may: assign the academic status of "probation"; suspend the student from the university; stipulate specific requirements, which the student will be obliged to fulfill in order to retain the privilege of initiating or maintaining registration in any following semester.

Appeals

Decisions relating to a student's status are made in accordance with regulations approved by faculty. Students may appeal decisions made by the committee on academic standing by consulting with the Office of the Dean of Student Services within five days of receiving notice of the original decision.

The decision of the committee on student appeals is final. The committee will communicate in writing to the student within 15 days of the hearing.

Students wishing to appeal should prepare a letter stating accurately and completely the decision being appealed, noting when it was taken, by whom, etc., and clearly but succinctly stating the reason they believe that justice has not been fully served. Transcripts, test scores and other information which form part of the student's record will also be distributed to the committee members for their consideration.

Reinstatement After Academic Suspension

Students who are suspended from the university may apply for reinstatement after a lapse of at least one regular semester. Students may apply for reinstatement on an application form obtainable from the Office of University Admissions.

Such applications must be submitted to the Office of University Admissions according to the schedule governing readmission.

Courses taken at another college while a student is under academic suspension at NJIT may be counted as a transfer credit only. Students are strongly urged to consult with an NJIT department advisor before registering for courses at other institutions.

Expiration of Credit

For all degrees, course credits normally expire ten years after completion of the semester in which they were earned. Expired course credits cannot be used to fulfill degree requirements and must be replaced by current course credits. Students may apply to the department which offered the course or which approved the transfer of course credit for an extension of these course credits.

Degree Options

Double Major

Qualified students whose career plans make such study appropriate may be granted permission to major in two disciplines. Written approval of the proposed curriculum by the department chairperson(s) offering the majors, subject to the review and authorization of the appropriate dean(s), must be obtained by the student. The candidate for the double major must fulfill all requirements for both majors. In some instances, there is an articulated double major.

Dual Major with Rutgers-Newark

NJIT and Rutgers-Newark offer their students the option of pursuing a dual major at the two institutions. NJIT students may elect to pursue a dual (or second) major at Rutgers-Newark. Acceptance into the Rutgers-Newark major program is consistent and uniform with practices in place at NJIT and is determined solely by Rutgers-Newark. Upon successful completion of the major, Rutgers-Newark conveys certification for graduation to the appropriate certifying office at NJIT. In addition, NJIT certifies for graduation the completion of the NJIT major and any and all college requirements. NJIT then annotates the student's transcript to read: "Completion of Major Program in (name of major), (date) at Rutgers-Newark."

This option may not apply to chemistry/applied chemistry, mathematics/applied mathematics, physics/applied physics, information systems/computer science, management/School of Management programs.

Two Baccalaureate Degrees

Qualified students whose special interests and career plans make such study appropriate may be granted permission to earn two undergraduate baccalaureate degrees.

Written approval to undertake this curriculum must be obtained from each of the departments involved and the dean(s) of the appropriate college(s). In addition to meeting all general university requirements, the candidate for two degrees must earn at least 30 credits more than is required for either degree and must fulfill all requirements of the two degree programs. Normally this requires five years of study.

Minors

Students wishing to earn minors are responsible for registering their intent with the registrar's office by the semester preceding graduation. They must complete the Declare a Minor form which is available from, and should be returned to, the registrar's office.

Rights and Responsibilities

Code of Professional Conduct

NJIT requires students to conduct themselves with decorum and to adhere to standards of ethical and professional behavior. NJIT has adopted, and requires all students to comply with, a Code of Professional Conduct. The policies and procedures governing this code are contained in a separate publication, the Student Handbook, and are deemed incorporated into this catalog. A copy of the handbook may be obtained from the Office of the Dean of Student Services or online at www.njit.edu/Student/handbook.

PHOTO ID Card

All students must carry an NJIT identification card while on campus. An ID card must be presented at the request of a university administrator, faculty member or public safety officer. Facilities, parking, building access, and services of the university require presentation of a valid university ID.

Students should obtain an ID card as soon as possible after registration is completed. Photographs for ID cards are taken throughout the semester in the Department of Public Safety, located in the parking facility. Dates and times to obtain an ID are posted at the Campus Center information desk. Proof of registration in the form of a tuition receipt or registrar's receipt is required to obtain an ID card. These receipts also will be accepted as NJIT identification until the ID card is issued. ID validation stickers are issued each semester and are available at the Department of Public Safety or the Campus Center information desk.

Lost or stolen IDs should be reported as soon as possible to the Department of Public Safety. A replacement for a lost card is obtained by paying a $25 charge at the bursar's office cashier's window in the Student Mall and presenting the receipt at the Department of Public Safety where the card will be reissued.

NJIT cards are not transferable. Cards are not to be loaned to anyone for any reason. ID cards are the property of NJIT and must be returned upon request.

Family Educational Rights and Privacy Act

The Federal Family Educational Rights and Privacy Act of 1974 gives students the right to inspect any educational records about them maintained by NJIT. Students have the right to a hearing to challenge the contents of these records, and also have the right to add to their records an explanation of information they challenge. Unless specifically exempted by the public law, NJIT is mandated to keep student records strictly confidential. The university registrar is responsible for student records. Educational records are defined as transcripts, admission files and registration forms. To review their files, students must contact the registrar, in writing, to specify the items they want to see. Student health records are maintained by the director of health services and may only be examined by a health professional chosen by the student.

Educational records defined by the public law must be made available within 45 days after a student requests to see them. A catalog of educational records kept by NJIT is available from the registrar. Exceptions to the right of inspection include financial aid records and records of institutional, supervisory, and administrative personnel, and ancillary educational personnel. For a nominal service fee, copies of these records may be made for students. The law further permits release of certain information involving disciplinary violations, including violations concerning alcohol or controlled substances of students under the age of 21.

Only those at NJIT acting in the student's interest are allowed access to student files, including personnel in the registrar's, admissions, student services, and finance offices; and academic personnel within the limitations of their need to know.

With the exceptions stated in the law, no one outside NJIT shall have access to a particular student's educational record without the written consent of the student, except in exceptional circumstances such as emergencies. Accrediting agencies carrying out their accrediting function and certain state and federal officials are permitted access. A record of, and reasons for, granting access will be kept by the university and will be available to the student.

The university, at its discretion, may provide directory information, in accordance with the provisions of the law including a student's name, address, telephone listing, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student. Students who desire directory information to be withheld should notify the registrar in writing within the first two weeks of initial registration.

Request for non-disclosure will be honored by the university for ONLY ONE ACADEMIC YEAR AT A TIME. Authorization to withhold directory information must be filed annually in the Office of the Registrar.

Students who disagree with an entry may challenge its accuracy with the Office of the Registrar. If this remedy fails, either NJIT or the student may request a formal appeal hearing. The law mandates that such hearings be held within 30 days of requests, and be conducted by a university official or other person with no direct interest in the outcome. Students will be given a full and fair opportunity to present relevant evidence and be represented by their own counsel.

Students may include a written statement in their file explaining a disputed entry following an unfavorable determination of an appeal. A written decision will be rendered within 15 working days after the hearing of an appeal.

Students who believe that they are treated unfairly or improperly and contrary to the provisions of the law may request, in writing, assistance from the provost of the university or the provost's designee. Students who believe that their rights have been abridged may file complaints with the appropriate federal agency.

Anti-Discrimination Policy

New Jersey Institute of Technology reaffirms its commitment to a policy of non-discrimination on the basis of race, sex, sexual orientation, age, religion, ethnic origin, handicap or veterans' status in its employment policies, educational programs and activities under university control.

Assuring a climate of equal opportunity is the direct responsibility of all levels of management. Administrative and supervisory personnel are required to comply with applicable government regulations and the affirmative action goals of the university. Among these are Executive Orders 11246 and 11375 (Affirmative action); the Civil Rights Act of 1964, as amended; Title IX of the Education Amendments of 1972 (Sex Discrimination); Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act (Non-discrimination on the Basis of Handicap); The New Jersey Law Against Discrimination, Title 10, Chapter 5, 10:5-1 to 10:5-28, NJ Revised Statutes, as amended; and the New Jersey Governor's Code of Fair Practices, Executive Order No. 21 (1965), as amended and Executive Order No. 39 (1991), "Prohibition in State Government of Discrimination Based on Sexual Orientation."

Any reported act of discriminatory behavior will be investigated through the Office of the Dean of Student Services, the Office of Compliance and Community Relations, or Office of General Counsel and Employment Policy Relations.

Sexual Harassment Policy

It is the continuing objective of the university to offer a work and study environment to its employees and students that rewards career and educational goals based upon relevant factors such as ability and work performance. Sexual harassment of employees and students is unacceptable. It is a barrier to educational and professional development and contrary to law and university policy.

In accordance with the NJIT sexual harassment policy and procedures, persons found to have violated university policy will face investigation, managerial review and possible disciplinary action up to and including employment termination and or dismissal from the university (for students). For a full copy of the university's policy prohibiting sexual harassment, please contact the Office of General Counsel and/or the Office of Compliance and Community Relations.

Copyright Ownership

NJIT believes its role as an educational institution is best served by disclosing to the public all academic research, projects, theses and dissertations developed by students during the course of their studies or employment at the university.

Projects, theses and dissertations created by students shall be governed by the following provisions as outlined in NJIT's copyright policy under “Ownership and Disposition of Copyrightable Materials”:

A. Copyright ownership of projects, theses and dissertations generated by research that is performed in whole or in part by the student with financial support in the form of wages, salaries, stipend, or grant from funds administered by the University shall be determined in accordance with the terms of the support agreement, or in the absence of such terms, shall become the property of the University.

B. Copyright ownership of projects, theses and dissertations generated by research performed in whole or in part utilizing equipment or facilities provided to the University under conditions that impose copyright restriction shall be determined in accordance with such restrictions.

C. Copyright in projects, theses and dissertations not within the provisions of Categories A and B of this policy shall be the property of the author. However, the student must, as a condition of a degree award, grant royalty-free permission to the University to reproduce and publicly distribute copies of the project, thesis or dissertation.

Requests for permission to publish Category A and B should be addressed to the Office of Intellectual Property.

For further information, call the Office of Intellectual Property, (973) 596-5825.

Ownership of Intellectual Property

In accordance with university policy, NJIT retains all right, title and interest to any and all intellectual property (i.e., inventions, discoveries, creative works, trade secrets and know-how) developed by NJIT students during the course of their studies or employment at the university or while using university facilities.

To protect against premature disclosure of an invention and/or publication of anything that may be of a proprietary nature, students must immediately report their intent to do so to the Office of Technology Development (see http://www.njit.edu/research/officetech/). Students must neither publish nor discuss proprietary information with anyone other than the Office of Technology Development or members of the University's Intellectual Property Committee. When a project, thesis or dissertation covers material that is potentially proprietary, both the student and the advisor must report the existence of such material to the Office of Graduate Studies and the Office of Technology Development; so that the University may expedite its review of such material and determine whether or not it is proprietary and should be protected under the University's guidelines for protecting its Intellectual Property. If necessary, the Office of Graduate Studies and the Office of Technology Development will take steps to sequester patentable material in archival documents such as theses and dissertations. If the University applies for a patent, the student will sign an appropriate assignment agreement. All income derived from such intellectual property will be shared between NJIT and the student in accordance with the University's published policy (see http://www.njit.edu/research/officetech/inventors/inventors.

php).

For further information, call the Office of Intellectual Property, (973) 596-5825.

Property Loss and Damage

NJIT is not responsible for loss of property by fire or theft in its buildings or grounds. NJIT is not responsible for property damaged as the result of vandalism in its buildings or grounds.

Drug Abuse Prevention Program

New Jersey Institute of Technology prohibits the use of illegal drugs on its premises. University policy concerning possession and consumption of alcoholic beverages on campus subscribes to strict enforcement of the laws of the State of New Jersey, the County of Essex, the City of Newark, the City of Mount Laurel, and the County of Burlington. In addition, the policy stipulates that any consumption must occur within a responsible social framework wherein beverages are not the focus of the event.

Students with concerns about their own or someone else's use of drugs and/or alcohol can receive information and referral assistance from the Office of the Dean of Student Services, the Counseling Center, the office of Health Services, or the Stop-In Center. The Counseling Center professional staff provides assessment and counseling for some substance abuse problems, relapse prevention support for students in recovery, and referral to off-campus resources as needed. With limited exceptions, services of the Counseling Center are confidential. A full description of confidentiality exceptions is included in the Student Handbook. Questions about confidentiality may be discussed with professional staff prior to receiving services.

In addition, the university, through the Division of Student Services, offers a series of educational programs focused on the areas of drug and alcohol information and substance abuse prevention.

Drug-Free Workplace Policy

Student employees are subject to university policies regarding employment. New Jersey Institute of Technology is committed to maintaining a drug-free workplace in compliance with applicable laws. The university is further committed both to rigorous enforcement of applicable laws and policies and to support for those trying to cope with drug-related problems. The unlawful possession, use, distribution, dispensation, sale, or manufacture of controlled substances is prohibited on university premises. Any NJIT employee determined to have violated this policy or engaged in drug-related problems that have an impact upon the workplace may be subject to disciplinary action up to and including termination. At the discretion of the university, any employee convicted of a drug offense involving the workplace shall be subject to employee discipline (up to and including termination) and/or required to satisfactorily complete a drug rehabilitation program as a condition of continued employment.

The illegal use of controlled substances can seriously injure the health of employees, adversely affect the performance of their responsibilities, and endanger the safety and well-being of fellow employees, students, and members of the general public. Therefore, the university urges employees engaged in the illegal use of controlled substances to seek professional advice and treatment. Anyone who is employed at NJIT who has a drug problem is encouraged to contact the director of the Employee Assistance Program (EAP), who will assist in obtaining available treatment. Employees engaged in contracts with the U.S. Department of Defense are additionally subject to Department of Defense requirements and may be required to submit to tests for the illegal use of controlled substances.

As a condition of employment, an employee of NJIT will notify his/her supervisor if he or she is convicted of a criminal drug offense involving the workplace within five days of the conviction. In the event any such conviction involves an employee working on a federal contract or grant, the university will notify the granting or contracting federal agency within 10 days of receiving notice of a conviction. A copy of this statement shall be given to all employees.

This statement and its requirements are promulgated in accordance with the requirements of the Drug-Free Workplace Act of 1988 enacted by the United States Congress. The university will continue its efforts to maintain a drug-free environment by adhering to the above policy and by providing through the EAP and the offices of Human Resources, and Compliance and Training, ongoing drug awareness programs.

Undergraduate : Academic Programs

Educational Opportunity Program (EOP)

EOP provides access and comprehensive support services for populations traditionally underrepresented in the disciplines offered at NJIT. Services provided include academic and financial support, career and personal counseling to first-time, full-time freshmen, upper-class students and eligible transfer students who received EOP funding at their previous institutions. The program features support services such as scholarships, grants and loans; an intensive pre-freshman summer academic enrichment program that helps prepare students for success in their first year of college; participation in a winter intersession; and access to job and internship opportunities. Further information may be obtained from the EOP office in Campbell Hall, third floor, by calling (973) 596-3690, or by visiting the EOP home page at www.njit.edu/eop.

Dean of Freshman Studies

The Office of the Dean of Freshman Studies supports new students --- freshmen and transfers --- in the completion of their first year of studies at NJIT. The dean works closely with faculty and students to resolve academic concerns or issues that may arise, and coordinates the freshman seminar. For further information, contact the dean of freshman studies, (973) 596-2981.

Aerospace Studies

A commission as a Second Lieutenant in the United States Air Force may be available to the student who completes the aerospace studies program on campus. Students in any bachelor's or master's degree program may pursue this option in conjunction with their normal academic studies. Additionally, students who are undecided about pursuing a career as an Air Force officer may take these courses to fill electives under special student status.

Students who seek a commission may participate in programs ranging from two to four years in length, with special one-year programs available for certain degree programs. The most comprehensive program consists of four academic years of AFROTC classes. The courses taken include **AS 111** and **AS 112**, introductory courses that explore the mission and organizational structure of the U.S. Air Force; **AS 221** and **AS 222**, the study of the evolution of air power from its earliest beginnings through the present, emphasizing historical events and their impact on the development and deployment of air power; **AS 333** and **AS 334**, the study of the concepts and skills required by the successful manager and leader, focusing on organizational and personal ethics, communicative skills, and managerial strategy viewed in the context of the military; and **AS 443** and **AS 444**, a survey of a broad range of topics concerning American civil and military relations and the environment in which U.S. defense policy is formulated, including the role of the professional officer in a democratic society, the requisites for maintaining adequate national security forces, a special study of military justice and its effect on citizenship and preparation for active duty.

The four-year program requires students to participate in leadership laboratory held on Wednesday from 2:30 p.m. to 4 p.m.; departmental approval is required. This program also has a field training requirement of four weeks.

Programs of fewer than four years in length require a six-week field training session. During field training, which occurs the summer between the sophomore and junior years, students are placed in a variety of leadership positions and are given the opportunity to demonstrate their leadership, managerial, organizational, and physical skills. Upon returning to school for a fall semester, the students resume their aerospace studies with **AS 333**, followed by **AS 334**, **AS 443**, and **AS 444** as described above. Further information may be obtained by contacting the Department of Aerospace Studies, (973) 596-3626.

Pre-Professional Programs

Pre-Law

While students desiring a professional legal career may apply to law school with any NJIT undergraduate course of study, the minor in legal studies is particularly appropriate for this purpose. This interdisciplinary minor introduces students to a wide range of approaches to the study of law. It combines a core course emphasizing skills needed to pursue further study in law with elective courses designed to enhance students' familiarity with the functioning of law, to sharpen their understanding of the historical and cultural dimensions of law, and to improve their grasp of legal issues in technological fields. For more information, contact the faculty coordinator of the legal studies minor.

Premedical, Pre-Dental or Preoptometric

Students interested in eventually obtaining degrees in medicine, dentistry or optometry may pursue any major at NJIT. Typically, schools of medicine,dentistry and optometry require that students have completed certain courses. For example, most medical schools require 1 year of English, 1 year of general physics with laboratory, 1 year of general biology with laboratory, 1 year of general chemistry with laboratory and 1 year of organic chemistry with laboratory. Some schools may require additional courses. Thus, certain majors at NJIT are especially suitable as they already incorporate most of these courses; these include biology, chemistry, biomedical engineering and chemical engineering. It is also possible to follow a focused four-year pre-medical, pre-dental or pre-optometric option with engineering science. Interested students may obtain further information from the Engineering Science program director.

Accelerated Programs in Law, Medicine, Dentistry or Optometry

Students may apply for a special accelerated joint degree program and pursue the B.S./J.D. (law), B.A. / J.D. (law), B.S./M.D. (medicine), B.A./M.D. (medicine), B.S./D.M.D. (dentistry), B.S./D.D.S.(dentistry) or B.S. / O.D.(optometry).

Students applying for these programs must first apply to, and be accepted by, the Albert Dorman Honors College. Further information may be obtained in the section of the catalog about the Honors College.

B.S./M.S. and Dual Degree Programs

This accelerated dual degree program permits undergraduates to earn credits toward a master's degree. Students take 6 credits of graduate course work in their senior year. These may be counted toward both a bachelor's degree and a following master's degree if enrollment as a graduate student in the master's degree program occurs within two years of completion of the bachelor's degree. After enrollment as a graduate student, those who wish to apply the 6 credits to the graduate degree program should contact the Office of Graduate Studies.

Full-time undergraduate students become eligible to apply after they complete at least five courses in their major, and have maintained a GPA of 3.0 or better. Students must submit the application for admission to the B.S./M.S. program to the Office of Graduate Studies no later than one year prior to graduation. Applicants must fulfill all university requirements for admission to graduate programs and must submit GRE or GMAT scores.

Graduate study may be completed full or part-time.

Information and applications can be obtained from the Office of Graduate Studies, (973) 596-3462. Several other combinations of bachelor's and master's degrees exist or are under development. The number of dual-use credits for these combinations may exceed 6 credits in accordance with specific program requirements. An example is the B.Arch./M.S. in Management program, which allows 12 dual-use credits.

Cooperative Education and Internships

Cooperative Education (Co-op) and Internship programs offer students the opportunity, prior to graduation, to gain work experience that is related to their major. The Co-op Program provides students with an experiential and applications approach to education. Co-op is available to matriculated students in all approved majors. The program enhances the education of the student with the introduction of up to two full-time work experiences during which up to 6 additive or degree credits can be earned. In some majors, co-op may be taken on a part-time work schedule.

Co-op enables students to examine a professional field through employment in a major-related job. All co-op students earn a salary that can help defray college and other expenses. Co-op work experiences are scheduled after the completion of the sophomore year; for architecture students, after the completion of the junior year.

Requirements for admission into the Co-op Program include good academic standing and a GPA of at least 2.2. The summer Co-op Program GPA minimum is 2.8.

Descriptions for undergraduate co-op work experience courses (Co-op Work Experience I and Co-op Work Experience II) are found in the course listings of the departments offering them. See the list below. **Arch 310**, **410**; **CE 311**, **413**; **CET 497**; **ChE 310**, **311**; **Chem 310**, **311**; **CIS 310**, **410**, **485**; **CPT 395**; **EE 310**, **411**; **EET 395**, **495**; **Eng 490**, **491**; **IE 310**, **411**; **Math 310**, **410**; **Mgmt 310**, **410**; **ME 310**, **410**; **MET 395**, **495**; **MNET 395**, **495**; **Phys 311**, **411**; **STS 311**, **411**.

Graduate cooperative education courses may be found in the appropriate listing in the Graduate Catalog.

CAP Program

CAP, the career advancement plan, is designed for women and African American and Latino men who are U.S. citizens and permanent residents. An eligible student may enter the program prior to the first year and begin to take advantage of the CAP program's career development activities. These include $1,000 scholarships for select students, a four-day residential program called SummerTech for entering first-year students, a semester-long career development course, major-related work experiences for academic credit, group tutoring, corporate visits, and career-oriented workshops and seminars. CAP students interact with faculty, staff, and business professionals as they explore their career options.

For additional information about these programs call the Education Opportunity Program, (973) 596-3690.

Community and Public Service

Students may receive financial support through participation in the NJIT Service Corps. Through a wide variety of experiential learning activities, students link classroom theory and concepts with practical application, contribute their expertise and develop leadership, decision-making and interpersonal skills through involvement with non-profit and governmental agencies and community-based organizations. For more information about the programs described below, contact the Division of Career Development Services, Community and Public Service, (973) 596-3100.

Service Learning Program

The Service Learning Program provides students the opportunity to complete a community service activity or project that is incorporated into their studies. Work experience is available for students who register for courses that include a community service-related component or a faculty-monitored senior project/independent study.

Community Service Work-Study Program

This program offers eligible students the option of working in a non-profit agency to earn their work-study award. Many of the placements are directly related to academic disciplines. The federal government pays a percentage of the student wages and the agency covers the remaining cost.

Housing Scholars Program

Students spend the summer working full time and continue in the fall with part-time assignments at community-based, non-profit housing organizations. Students have the opportunity to develop plans, design, and initiate affordable housing and other projects.

Community Connections: A Volunteer Clearinghouse

NJIT's clearinghouse lists opportunities for students interested in providing volunteer service to community and public agencies. Students can also participate in organized, preplanned events sponsored by the NJIT Service Corps.

NJIT Literacy Corps

The America Reads Challenge of 1996 calls on all Americans to support teachers and help ensure that every American child can read well and independently by the end of the third grade. The NJIT Literacy Corps provides eligible students the opportunity of serving as tutors for children who need extra help to read well. NJIT students work with the Newark Literacy Campaign, elementary schools, and as part of the Greater Newark America Reads Program.

Ronald E. McNair Post Baccalaureate Achievement Program

The Ronald E. McNair Post Baccalaureate Achievement Program at NJIT prepares for doctoral study all science, math and engineering majors who are enrolled full-time in Newark College of Engineering, the College of Science and Liberal Arts or the Albert Dorman Honors College, and who meet first-generation and low-income guidelines or are from underrepresented groups in these fields. McNair Fellows are engaged in high-quality research and other scholarly activities with faculty mentors from their academic departments. Results of their research projects are presented at professional meetings and conferences and prepared for publication in peer review and other professional journals. Additionally, McNair Fellows participate in a wide array of workshops and activities to prepare them for doctoral study. The primary goal of the McNair Program is to increase the number of United States scientists, engineers and mathematicians who come from economically disadvantaged backgrounds. For more information about the McNair Achievement Program visit the Web site at www.mcnair.njit.edu or call (973) 596-6470 or 5590. Students may also stop by Kupfrian Hall, Room 200E.

Student Exchange/Study Abroad

NJIT offers a number of international exchange opportunities for undergraduate and graduate students in Europe and the Far East. Through established exchange agreements, participants are provided with opportunities to enhance their technological skills, expand their cultural horizons, and gain educational experience from an international perspective. Students gain firsthand knowledge of political, social, and economic systems of a rapidly changing world.

Students may elect to study for one semester or for a full academic year. NJIT students pay tuition and fees at NJIT and room and board at the host institution. Financial aid may be applied to these expenses.

With the prior written approval of the student's academic advisor, academic credit may be awarded for courses taken while participating in an international exchange program. Some programs may require proficiency in the language of the host country, especially if the language of instruction for course work is not English.

For further information, contact the Office of International Students and Faculty, (973) 596-2451.

University Research Experience (URE)

The Undergraduate Research Experience (URE) Program of EOP encourages students to include graduate and professional studies in their career planning and assists them in preparing for careers in academia by involving them in faculty guided and mentored research activities early in their undergraduate years. Assistance is also provided in the graduate admission process and identification of graduate financial aid. URE, established in September 1990, works in close collaboration with the Graduate Studies Office and the Center for Pre-College Programs at NJIT. This close collaboration affords a number of graduate students the opportunity to finance their education through stipends received as teaching assistants on campus and in public schools. This partnership also assists in the encouragement of students to pursue teaching careers, particularly at the university level.

Albert Dorman Honors College

Overview

Students with demonstrated high standards of personal and academic achievement can be candidates for the highly competitive Albert Dorman Honors College. Admission depends upon academic record, school activities, and service to the community. Significant financial support is available.

The Honors College offers challenging course work, research possibilities, and the opportunity to meet leaders from the worlds of engineering, science, the arts, architecture, industry, and government. Faculty who teach honors classes are selected for their scholarship, enthusiastic teaching, and ability to engage students in the process of learning. Independent study and research are strongly encouraged. Honors students have exclusive use of the James A. Kennedy Honors Resource Center, which provides space for study and social interaction and includes a special networked computer center. Honors students have their own governing body, publish their own newsletter, and are offered the opportunity freshman year to live on a special honors floor in one of the residence halls.

The more than 500 highly qualified students enrolled in the Honors College have been active in high school research projects, extracurricular clubs, academic competitions, and community service. More than one-fourth are women. Average SAT score on entry is 1315.

The average GPA upon graduation is 3.6. More than half have continued their studies at graduate or professional schools, including NJIT, Columbia, Cornell, Georgia Tech, Johns Hopkins, MIT, Penn State, Rutgers, Stanford, UMDNJ-RWJ Medical School, Seton Hall Law School, Yale Law School, and Rutgers Law School. Other graduates have accepted positions at AlliedSignal, AT&T, BASF, Exxon, Hoffmann-LaRoche, IBM, Nabisco, Prudential, Proctor & Gamble, PSE&G, Union Carbide, and others.

The Honors Curriculum

Honors scholars are enrolled in both the Honors College and in the college or school offering their major.

Students are guided throughout their university experience by both an Honors advisor and an advisor in their major. Advisement begins in the summer before the first year at NJIT. In their first meeting, student and advisor review high school performance, and both Advanced Placement (AP) and NJIT placement test scores to determine the best course of study. At this time, students also have the opportunity to discuss choice of major as well as special research and learning opportunities. Advisement is supplemented by a 10-week freshman seminar, in which students learn more about their curriculum, research and project opportunities, and co-curricular, extra-curricular and community service opportunities. At the end of the seminar, they are expected to draft an individual education plan for their educational experience at NJIT.

Honors students choose from dozens of specially designed courses, both for their General University Requirements and within their major. These honors courses have limited enrollment, allow in-depth study, and encourage students to take more responsibility for their learning. Admission to some of these courses is by invitation, based on a review of each student's prior work. The range of honors courses offered allows students to work in those areas in which they are strongest.

Accelerated Medical and Law Programs

The following is a general description of NJIT's accelerated medical programs available only to honors scholars. For a full description of admissions and degree requirements, please see http://honors.njit.edu/academics/accel_programs/start.php

Accelerated Seven-Year Programs in Medicine, Dentistry and Optometry

Students who have done exceptionally well in high school may apply for an accelerated seven-year program. Three years of study will be at NJIT, where students must follow an approved accelerated curriculum and meet all Honors College and NJIT requirements. The remaining four years of the seven-year program are spent at UMDNJ New Jersey Medical School, or UMDNJ New Jersey Dental School, the State University of New York (SUNY) New York School of Optometry, or the New York University College of Dentistry (NYUCD), or St. George's University School of Medicine, Grenada (two years at St. George's, and the remaining two years at St. Michael's Hospital, Newark). Admissions requirements include standing in the top 10% of the class, and SAT scores ranging from 1250 to 1400, depending on the program. Many majors may be pursued, including Biology, Biomedical Engineering, Chemistry, Math, and Physics.

Prior to acceptance, the student must be interviewed and accepted by the Albert Dorman Honors College and by the medical, dental or optometry school in which the student wishes to enroll. Final admission decisions are made by the professional school itself, not NJIT.

When students finish their first year at their professional school, they will be awarded a bachelor’s degree in their major from NJIT. After successfully completing all of the degree work at the professional school, they will be awarded the appropriate doctoral degree

Students who do not begin their studies as accelerated students but who do exceptionally well in their first year at NJIT may apply to join an accelerated program.

Accelerated Program in Law with Seton Hall University

Students interested in law may apply for an accelerated six-year program. Applicants for the program must have a combined SAT score of 1300 and rank in the top 10% of their class.

Three years of study are spent at NJIT, where students must follow an approved accelerated curriculum and meet all Honors College and NJIT requirements. To remain eligible for early entry into law school, students also must earn by the end of their junior year in college, a score on the LSAT that ranks them in the 80th percentile or above of all persons taking the LSAT in that year.

Final admission is dependent on continued satisfactory academic performance and upon completion of the baccalaureate degree. Students who do not begin their studies as accelerated law students but who do exceptionally well in their first year at NJIT may apply to join the accelerated law program.

Early Admission Program in Law with Rutgers University

Candidates for early admission to Rutgers-Newark School of Law are normally identified prior to freshman year in the Honors College, but final offers of early admission to the School of Law are not made until Aug. 1 following the completion of the student's junior year in the Honors College.

When students successfully complete their first year at the School of Law, they are awarded the B.S. or B.A. from NJIT. After completing all of the degree work at Rutgers-Newark School of Law, students are awarded the J.D.

Honors Courses

Honors students admitted as freshmen take 11 honors courses, encompassing both GUR and major-related courses. Students in the New Jersey School of Architecture, however, take a total of just eight such courses.

Examples of First and Second Year Honors Courses

Chemistry

More comprehensive and rigorous than the regular freshman and sophomore chemistry offerings, these four honors courses and an honors lab include field trips, molecular model building, readings in professional journals, oral and/or written reports, and the completion of an individual research project **Chem 124H**, **Chem 125H**, **Chem 126H** and **Chem 243H** and **Chem 244H**.

Computer Science

The Departments of Computer science Information and systems offers honors versions of **CIS 101**, **CIS 104**, **CIS 113**, and **CIS 114**. All four courses cover the material in greater depth. **CIS 101H**, **CIS 104H**, **CIS 113H**, and **CIS 114H**.

Humanities and Social Science

Honors versions are available in the following subjects: freshman composition, economics, basic social science, and great-books-oriented courses studying the literature, history and philosophy of ancient, medieval, and early modern and modern civilization. All require greater emphasis on student reading and oral and written presentation than their non-honors counterparts. **HSS 101H** (English composition), **HSS 202H** (basic social science), **SS 201H** (economics), and **HSS 211H**, **212H**, **213H** (cultural history).

Mathematics

The integrated four-course program in honors calculus and differential equations usually allows students to stay with the same professor and cadre of fellow students for two years **Math 111H**, **Math 112H**, **Math 213H**, and **Math 222H**.

Physics

This sequence of three honors physics courses offers greater use of mathematics and vector analysis, as well as in-depth study of selected topics such as electromagnetic field and the wave-particle duality in nature. **Phys 111H**, **Phys 121H** and **Phys 231H**, and associated labs.

Third and Fourth Year Honors Courses

The course of study during the third and fourth years is primarily in the student's major. As juniors and seniors, honors scholars select two seminars, one in humanities and the other in science, technology, and society (STS), history, or management. Many Honors courses are also available within the majors.

Honors scholars complete their professional preparation by taking a senior-level capstone seminar in the major. This course can involve independent research or the writing of a senior thesis.

Honors Humanities Seminars

Limited to 20 students, these interdisciplinary seminars (**HSS491H-499H**) follow the research interest of the professor leading the seminar, such as classic great books (e.g., Shakespeare), modern media (e.g., film), or contemporary issues (e.g., professional ethics). Any one of these courses is used to fulfill the Capstone Seminar in Humanities and Social Science GUR.

Honors STS Courses and Seminars

These honors courses and seminars allow students to explore new trends in science and technology as they affect economic life, government policies, environmental issues, ethical decisions, professional careers, and the individual and society.

Honors History Courses

Junior-level History course include in-depth examinations of the history of medicine or technology, and the making of modern thought

Honors Management Courses and Seminars

Both Honors Principles of Management (**Mgmt 390H**) and Engineering Management (**IE 492H**) allow honors students to study the dynamics of management in greater depth and with increased classroom interaction.

Required Honors Architecture Seminars

Honors architecture students take a special architecture honors seminar in both the fourth and fifth years

The Honors Capstone for the Major

Nearly every department at NJIT requires its seniors to enroll in a seminar, participate in a research project, write a thesis, or be a part of a special activity that allows them to bring together the skills, insights, and information they have developed in college. Honors students are expected to enroll in special honors versions of their departments' offerings, to conduct independent study or to participate in research in an industrial, business, or medical setting. Students in these Honors courses are expected to do work at alevel wuitable for publication or conference presentation.

The Honors Faculty

Honors scholars are encouraged and challenged by enthusiastic faculty members who have national and international reputations for scholarship in their fields. They represent all the research fields and academic disciplines at NJIT. Since classes are small, they provide close contact with honors faculty in a seminar-like setting. Independent academic interests are encouraged. Honors faculty often select honors scholars to work on faculty research projects.

Research and Projects

Honors scholars have the opportunity to work with faculty and in the university's more than 20 research centers, and/or to work in an industry or government setting on projects related to their major field. This work can be independent study or a capstone project offered by the students' major.

James A. Kennedy Honors Resource Center

A specially equipped suite of rooms is set aside for honors students near the Honors College offices in the East Building. A comfortable social lounge for relaxation and friendly exchanges of ideas includes stereo and video equipment, collections of magazines and journals, games and recreational equipment. There is also a room for quiet study. A separate computer facility for course work and academic research includes PCs with Internet access, laser printers, scanners, and peripherals directly connected to the university's centralized computer system. The entire center is equipped with wireless internet transmission.

Colloquium Series

While at NJIT, honors students attend a minimum of 16 colloquia. These special lectures, seminars, panel discussions, trips, concerts, and site visits are designed to enrich the students' academic experience. Students meet leaders in government, research, business, industry, academe, and the arts. Recent colloquia have introduced students to space photography, baroque music, forensic science, architectural preservation, and developments in areas of medicine. In the colloquia, experts help students to go beyond their normal course of study and to gain insights into the nature of conducting research, running businesses, or developing special talents.

Service

Honors students participate in a minimum of four semesters of service to the college, university or the community. Scholars are expected to take an active role and report on their contributions, experiential learning and personal growth.

Admissions Information

Applicants should contact the Albert Dorman Honors College as early as possible in their senior year. Please ask for the Honors College brochure.

Phone: (973) 642-4448
Fax: (973) 642-4452
E-mail: honors@njit.edu
The Honors application is part of the NJIT application form, which can be completed on paper or on-line at:
http://www.njit.edu/admissions/undergrad/undergrad_apply.php

For more information about Honors, please see http://honors.njit.edu

The Albert Dorman Honors College considers students who have SAT scores of 1250 or higher, are in the top 15 percent of their high school class, and have a wide range of interests, leadership activities, and community service. An exceptional student who's SAT scores or class rank are close to these standards and students from specialized academic high schools in which rank is not a true measure of excellence are encouraged to apply.

For the accelerated law, medical, dental, and optometry programs, candidates must rank within the top 10 percent of their high school class and have minimum SAT scores as follows: law, 1300, medical (UMDNJ), 1400 at one sitting, (St. George's) 1250; dental, 1250; and optometry, 1250. Some experience in a medical setting is helpful.

An essay and one recommendation from a high school teacher are also required, two for accelerated program applicants.

Deadlines for completed applications:

Accelerated programs November 1.

Other Honors College programs: candidates are considered year round but application by Jan. 15 is highly recommended for students who wish to be considered for additional scholarships. All other students should consider April 1 as the deadline for applications. Students may be interviewed as early as September of their senior year.

New Jersey School of Architecture: March 1

Honors College other programs: candidates are considered year round but application by Jan. 15 is highly recommended for students who wish to be considered for additional scholarships. All other students should consider April 1 as the deadline for applications. Students may be interviewed as early as September of their senior year.

Candidates who qualify for admission to the Honors College will be contacted for a personal interview. Successful candidates normally receive acceptance and scholarship notification from NJIT and the Honors College at separate times.

Financial Support

Honors scholars who are U.S. citizens or permanent residents receive a scholarship package that ranges from one-half to full in-state tuition. Out-of-state U.S. citizens or permanent residents may also be eligible for a presidential scholarship, which will reduce their tuition to the in-state rates. International students may receive a scholarship roughly equal to one-half of the in-state tuition rate.

Housing

More than half of the current honors scholars live in residence halls. They are guaranteed space in the residence halls as long as they apply by the deadline indicated on the application. Each first-year and second-year honors scholar is usually assigned a room with another honors student on the Honors floor.

Undergraduate : General University Requirements

Philosophy

As New Jersey's technological university, NJIT has a mission that includes both broad academic goals and specific professional education. General University Requirements (GUR) provide a common core for students in all the curricula. They ensure that NJIT graduates have a thorough understanding of themselves and of the ways specialized knowledge relates to a broader context. GUR requires that students develop an understanding of science and technology as intellectual disciplines in themselves and recognize their pervasive influence on contemporary life. Each college may set additional requirements that exceed those listed as GUR.

In addition to the requirements outlined below, all full-time freshmen are required to attend freshman seminar. This course not only introduces students to university life, but offers instructions for the use of the computer software provided to all students.

COMPUTER SCIENCE (2 credits) ---- The computer has become a vital tool for learning in all academic areas; all students are expected to be computer literate, to be familiar with at least one computer language, and to be able to apply computer skills, including graphics, to their major areas of study.

ENGINEERING TECHNOLOGY (6 credits) ---- Regardless of their majors, all graduates of a technological university should be familiar, through first-hand experience, with how engineers and technologists think and work.

MANAGEMENT (3 credits) ---- All students are expected to develop the management skills needed to function effectively in an organizational setting.

MATHEMATICS (6 credits) ---- The ability to reason both qualitatively and quantitatively is fundamental to success in all NJIT programs; students must master mathematics at least through the level of differential and integral calculus and understand the basic principles of probability and statistics.

NATURAL SCIENCES (7 credits) ---- The natural sciences provide the basis for our knowledge of the physical universe and for technological progress; all students are expected to develop a thorough understanding of at least one laboratory science.

PHYSICAL EDUCATION (2 credits) ---- Courses in physical education convey to students the importance of good health and fitness through planned exercise and recreational activities.

ENGLISH (3 credits) ---- The ability to communicate ideas is an essential characteristic of educated individuals; all students are expected to achieve proficiency in both oral and written English and to demonstrate it in courses throughout the curriculum.

BASIC SOCIAL SCIENCES (6 credits) ---- An understanding of the social sciences is essential in order to understand the economic, social, and political forces at work in our world.

CULTURAL HISTORY (6 credits) ---- All educated individuals are expected to understand and appreciate their history and the achievements of their culture.

HUMANITIES AND SOCIAL SCIENCE ELECTIVES (9 credits) ---- The ideals of a liberal education transcend particular major fields and career goals; all students are expected to develop an interest in specific areas within the humanities and social sciences. The required lower-level courses provide the background for upper division electives. All humanities and social science courses require an extensive amount of sophisticated reading and writing.

Courses that Satisfy the General University Requirements

Each academic department requires students to take particular General University Requirement courses. Therefore, it is essential that students find out which courses are required by their departments. To do this, students are strongly urged to refer to the academic programs described in this catalog and to consult their advisors. Students should be aware that the credit requirements specified below are minimums and that credit may be given for equivalent courses taken at other institutions and for special sections of appropriate NJIT courses (e.g., **Math 111H** is equivalent to **Math 111**). Furthermore, approved courses offered by Rutgers-Newark can be used to fulfill NJIT General University Requirements. Students should refer to the NJIT course registration bulletin found at www.njit.edu/Registrar and consult with their advisors for guidance in selecting Rutgers-Newark courses.

Computer Science (2 credits)

A 2-credit or 3-credit introductory (i.e., 100-level) course in programming and problem solving. Course selection is based upon the student's major. Specific academic programs may require specific courses. Options include **CIS 101**, **CIS 102**, **CIS 103**, **CIS 104** and **CIS 113**.

Engineering Technology (6 credits)

Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, or Management of Information Systems (**MIS 345**).

Management (3 credits)

Students take Engineering Management (**IE 492**) or Principles of Management (**Mgmt 390**) or Leadership and Management I (**AS 333**), which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take Organizational Behavior (**HRM 601**) to fulfill this requirement.

Mathematics (6 credits)

One calculus course and at least one (1) credit of course work in probability and statistics, or equivalent.

Courses that fulfill the calculus requirement are:

Calculus I (**Math 111**), Calculus II (**Math 112**), Finite Mathematics and Calculus I (**Math 113**), Calculus I for Management (**Math 121**), Calculus II for Management (**Math 122**), General Calculus I (**Math 138**), General Calculus II (**Math 238**).

Courses that fulfill the probability and statistics requirement are:

Elementary Probability and Statistics (**Math 105**), Finite Mathematics and Calculus I (**Math 113**), Honors Mathematics III (**Math 213H**), Survey of Probability and Statistics (**Math 225**), Introduction to Probability (**Math 244**), Statistics for Technology (**Math 305**), Probability and Statistics (**Math 333**), Introduction to Statistics (**Math 341**), Applied Statistical Methods (**IE 331**), Random Signals and Noise (**EE 321**), Industrial Statistics (**MNET 315**).

Natural Sciences (7 credits)

Coursework totaling 7 credits in any of the following disciplines: biology, chemistry, and physics. Students may take a sequence of courses in one of these disciplines or courses in different disciplines. Laboratory credit must be included in the 7 credits. Laboratory courses from other universities may also be acceptable.

Physical Education (2 credits)

Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

English(3 credits)

Writing, Speaking, Thinking (**HSS 101**).
or
Reading,Writing, Speaking II (**HSS 100**).

Basic Social Sciences (6 credits)

Three credits of the basic social science requirement must be taken in economics; acceptable NJIT courses are Economics (**SS 201**), Microeconomics (**Econ 265**), or Macroeconomics (**Econ 266**). The remaining 3 credits may be satisfied by Society, Technology and Environment (**HSS 202**), Technology, Society and Culture: An American View (**STS 257**), or Technology, Society and Culture: A Global View (**STS 258**). Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History (6 credits)

Take two of the following courses, in any order: The Pre-Modern World (**HSS 211**), The World and the West (**HSS 212**), The Twentieth-Century World (**HIST 213**), or from approved 200-level history courses at Rutgers-Newark. All students enrolled in the Bachelor of Architecture major satisfy 3 credits of this GUR with History of Architecture I (**Arch 251**) and one course from **HSS 211**, **HSS 212**, **HIST 213**, or an approved 200-level history course at Rutgers-Newark.

Humanities and Social Science Electives (9 credits)

Lit/Hist/Phil/STS (3 credits)

Students must take one 300-level course from any of the following disciplines: literature; history; philosophy; or science, technology, and society (STS). Students also may satisfy this requirement by taking an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science (3 credits)

Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (**Arch 382**) or by taking an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science(3 credits)

All students, except those enrolled in the honors college, take one of the following: **HSS 403**, **HSS 404**, **HSS 405**, **HSS 406**, **HSS 407**, **HSS 408**, **HSS 409**. Students enrolled in the honors college take one from **HSS 491H-499H**.

The Humanities and Social Science Portfolio

Across the humanities and social sciences curriculum, all NJIT students are required to maintain a portfolio of their best work. The portfolio will be reviewed on a regular basis to ensure that knowledge and skills are being developed and maintained in humanities and social science courses offered in the freshman, sophomore, junior, and senior years.

Bachelor's Degree Programs: Academic Minors

Students at NJIT may choose to earn a minor in a field other than their major field. Minors broaden a student's exposure and increase competence in an additional subject area. Minors often add to the marketability of a student. Consult with appropriate faculty coordinators for further information about specific minors.

Minors at NJIT require extra credits in addition to the lower level general university requirements (GUR). Upper level GUR courses may be used to satisfy the requirements of certain minors.

A minor is generally declared after a student has completed the first 28 credits in his/her academic career. This gives students at least two semesters to meet with departmental faculty coordinators to discuss minors more fully.

General rules on administration of minors.

APPLIED MATHEMATICS (16 - 18 credits)

Math 222, **Math 244** or **Math 333**, **Math 337** and two additional courses chosen with approval of the Minor Faculty Advisor.

Faculty Coordinator: Dorothy Levy
Cullimore Hall, Room 214E
Phone: (973)596-5779
E-mail: dlevy@m.njit.edu

APPLIED PHYSICS (16 - 18 credits)

Phys 234, **Phys 231A** and four additional courses chosen with approval of faculty coordinator.

Faculty Coordinator: Gordon Thomas
Tiernan Hall, Room 482
Phone: (973)596-3558
E-mail: thomas@njit.edu

APPLIED STATISTICS (16 - 17 credits)

Math 222 or **Math 226**, and **Math 333**, **Math 337**, **Math 344**, and one additional statistics course(upper division) chosen with approval of Minor Faculty Advisor.

Faculty Coordinator: Dorothy Levy
Cullimore Hall, Room 214E
Phone: (973)596-5779
E-mail: dlevy@m.njit.edu

BIOLOGY (18 credits)

Not open to biology majors. **R120:101**, **R120:102**, **R120:301** and two additional biology courses with approval of faculty coordinator.

Faculty Coordinator: Jorge Golowasch
Cullimore Hall, Room 626
Phone: (973)596-5404
E-mail: jorge.p.golowasch@adm.njit.edu

CHEMISTRY (16 - 18 credits)

FNE Chemistry Courses (not inculding freshman chemistry) chosen with appoval of faculty coordinator.

Click here for detailed information

Faculty Coordinator: James Grow

Tiernan Hall, Room 351
Phone: (973)596-3446
E-mail: james.m.grow@njit.edu

COMPUTER ENGINEERING (16 credits)

Open to computer science majors only.

EE 231 or **CoE 225**, **EE 291**, **CoE 252**, **CoE 353**, **CoE 394**, **CoE 395**, **CoE 485**

Faculty Coordinator: Edwin Hou
Electrical and Computer Engineering Center, Room 20
Phone: (973)596-3521
E-mail: hou@njit.edu

COMPUTER ENGINEERING (18 credits)

Open to all other majors except computer science.

EE 251 **CIS 114** or **CIS 335**, **CIS 252**, **CoE 353**, **CoE 394**, **CoE 395**, **CIS 332** or **CoE 485**

Faculty Coordinator: Edwin Hou
Electrical and Computer Engineering Center, Room 20
Phone: (973)596-3521
E-mail: hou@njit.edu

COMPUTER SCIENCE (18 credits)

Open to all other majors except computer engineering.

CIS 114, **CIS 251**, **CIS 332** and three additional upper division CIS courses chosen with approval of faculty coordinator.

Faculty Coordinator: Andrew Hrechak
Guttenberg Information Technologies Center, Room 4400
Phone: (973)596-3385
E-mail: ahrechak@cis.njit.edu

COMPUTER SCIENCE (18 credits)

Open to computer engineering majors only.

CIS 280, **CIS 332**, **CIS 335** / **CIS114**, **CIS 490**, **MATH340** / **CIS 421**, **CIS 451** or **CIS 461** and two additional upper division CIS courses chosen with approval of faculty coordinator.

Faculty Coordinator: Andrew Hrechak
Guttenberg Information Technologies Center, Room 4400
Phone: (973)596-3385
E-mail: ahrechak@cis.njit.edu

DRAMA/THEATER (15 credits)

Five upper division courses in dramatic literature chosen with approval of faculty coordinator.

Faculty Coordinator: Michele Rittenhouse
Kupfrian Hall, Room 133
Phone: (973)596-3457
E-mail: michele.r.rittenhouse@njit.edu

ECONOMICS (15 credits)

Five courses in economics chosen in one of the following tracks:

- Political Economy and Public Policy Analysis
- Environmental Economics
- International Economics
- Quantitative Economics (with approval of faculty coordinator).

Faculty Coordinator: Zeyuan Qiu
Cullimore Hall, Room 317
Phone: (973)596-5357
E-mail: quiz@njit.edu

ENVIRONMENTAL ENGINEERING (15 credits)

15 credits chosen from the following courses:

CE 320, **CE 321**, **CE 322**, **EnE 262**, **EnE 360**, **EnE 361** or other courses chosen with the approval of the faculty coordinator.

Faculty Coordinator: Hsin-Neng Hsieh
Otto H. York Center for Environmental Engineering and Science, Room 228
Phone: (973)596-5859
E-mail: hsieh@adm.njit.edu

GLOBAL STUDIES (15 credits)

Five courses with global content, of which four must be in the upper division, chosen with approval of the faculty coordinator.

Faculty Coordinator: Nancy Steffen-Fluhr
Cullimore Hall, Room 415
Phone: (973)596-3295
E-mail: nancy.l.steffen@njit.edu

HISTORY (15 credits)

Five upper division history courses or four upper division history courses and one non-history upper division course with approval of the faculty coordinator. Upper division GUR courses may fulfill some of the requirements for the history minor

Faculty Coordinator: Doris Sher
Cullimore Hall, Room 327
Phone: (973)596-3379
E-mail: sherd@njit.edu

INFORMATION SYSTEMS (18 credits)

CIS 114, **CIS 390**, **CIS 431**, **CIS 465** and two additional courses chosen with approval of faculty coordinator.

Faculty Coordinator: George Olsen
Guttenberg Information Technologies Center, Room 5606
Phone: (973)596-3389
E-mail: george.olsen@cis.njit.edu

LEGAL STUDIES (15 credits)

Click here for Detailed Information.

Faculty Coordinator: Doris Sher
Cullimore Hall, Room 327
Phone: (973)596-3379
E-mail: sherd@njit.edu

LITERATURE (15 credits)

Five upper division literature courses chosen with approval of faculty coordinator.

Faculty Coordinator: Nikki Stiller
Cullimore Hall, Room 413
Phone: (973)596-8549
E-mail: nikki.stiller@njit.edu

MANAGEMENT (15-18 credits)

Acct 115, **Acct 116**, or **Acct 515** and **Fin 315**, **MIS 246** or **MIS 345**, **Mrkt 330** and either **Mgmt 190** or **OM 375**.

Faculty Coordinator: Mary Kate Romano
314 Central Avenue Building
Phone: (973)596-8235
E-mail: mary.romano@njit.edu

MATERIALS ENGINEERING (15 credits)

ME 215, **ME 438**, **ME 470**, **ME 471***, **ME 490***.

Faculty Coordinator: Ed Dreizin
Mechanical Engineering Center, Room 314
Phone: (973)596-5751
E-mail: dreizin@njit.edu

PHILOSOPHY/APPLIED ETHICS (15-18 credits)

Five or six upper division courses in philosophy and STS chosen with approval of faculty coordinator.

Faculty Coordinator: Elizabeth Hodge
Cullimore Hall, Room 410
Phone: (973)596-5724
E-mail: elizabeth.j.hodge@njit.edu

PROFESSIONAL COMMUNICATIONS (15 credits)

Five courses in language and communication chosen with approval of faculty coordinator.

Faculty Coordinator: Chris Funkhouser
Cullimore Hall, Room 409
Phone: (973)596-3376
E-mail: christopher.p.funkhouser@njit.edu

SCIENCE, TECHNOLOGY AND SOCIETY (15 credits)

Five upper division courses in science, technology and society chosen with approval of faculty coordinator.

Faculty Coordinator: Eric Katz
Cullimore Hall, Room 316
Phone: (973)596-3270
E-mail: eric.m.katz@njit.edu

TECHNOLOGY, GENDER AND DIVERSITY (15 credits)

Five upper division courses in relevant fields chosen with approval of faculty coordinator.

Faculty Coordinator: Nancy Steffen-Fluhr
Cullimore Hall, Room 415
Phone: (973)596-3295
E-mail: nancy.l.steffen@njit.edu

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* (Non-mechanical engineering majors can choose courses in their discipline with the approval of the faculty coordinator).

Undergraduate : Courses of Instruction

NJIT Courses

NUMERICAL CODE

Lower Division Courses

Courses numbered between 100 and 199 are normally taken by first-year students.

Courses numbered 200--299 are normally taken by sophomores.

Upper Division Courses

Courses numbered 300--399 are normally taken by juniors.

Courses numbered 400--499 are normally taken by seniors.

The numbers after each course title (e.g., 3-3-4) represent the lecture/ recitation hours, laboratory/ studio hours, and credit hours respectively.

ALPHABETICAL CODE

Code	Department
Acct	Accounting
Arch	Architecture
AS	Aerospace Studies
Biol	Biology
BME	Biomedical Engineering
CE	Civil Engineering
CET	Construction Engineering Technology
ChE	Chemical Engineering
Chem	Chemistry
CIS	Computer and Information Science
CMT	Construction Management Technology
CoE	Computer Engineering
CPT	Computer Technology
Econ	Economics
EE	Electrical Engineering
ECET	Electrical and Computer Engineering Technology
EG	Engineering Graphics
EnE	Environmental Engineering
Entr	Entrepreneurship
Eng	English
ESC	Engineering Science
ET	Engineering Technology
FED	Fundamentals of Engineering Design
Fin	Finance

Frsh Sem	Freshman Seminar
Hist	History
HRM	Human Resources Management
HSS	Humanities and Social Sciences
HUM	Humanities
IE	Industrial Engineering
IT	Information Technology
Lit	Literature
Math	Mathematics
ME	Mechanical Engineering
Mech	Mechanics
MET	Mechanical Engineering Technology
Mgmt	Management
MIS	Management Information Systems
MNET	Manufacturing Engineering Technology
MR	Maintaining Registration
Mrkt	Marketing
MtSE	Materials Science and Engineering
OM	Operations Management
OPSE	Optical Science and Engineering
PE	Physical Education
Phil	Philosophy
Phys	Physics
SET	Surveying Engineering Technology
SS	Social Science and Policy Studies
STS	Science, Technology and Society
Thtr	Theater
TMT	Telecommunications Management Technology
Tutr	Freshman Tutorial

Rutgers-Newark Courses

The number preceding each course title is divided into three parts. The first two digits are the administrative code (standing for a faculty or a school), the next three digits are the subject code, and the final three digits are the course code.

ADMINISTRATIVE CODES

The following administrative codes are used in this catalog.

Codes	Administrative Department
21	Newark College of Arts and Sciences (NCAS) (Course normally offered only in the day.)
62	University College-Newark (UC-N) (Course normally offered only in the evening and on weekends.)
21&62	Course offered at both NCAS and UC-N
29	School of Management

SUBJECT CODES

The following subject codes are used in this catalog.

014	Afro-American and African Studies
070	Anthropology
080	Art
120	Biology
160	Chemistry

190	Classics
202	Criminal Justice
220	Economics
350	English
352	American Literature
390	Finance
420	French
460	Geology
510	History
512	American History
560	Italian
570	Journalism, Writing and Media
640	Mathematics
730	Philosophy
755	Physics, Applied
830	Psychology
790	Political Science
920	Sociology
940	Spanish
950	Speech
965	Theatre Arts
960	Statistics

COURSE CODES

Course codes from 100 to 299 indicate introductory and intermediate undergraduate courses. Codes from 300 to 499 indicate advanced undergraduate courses.

Two course codes separated by a comma indicate that each term course may be taken independently of the other, e.g., 21&62:350:319,320. Two course codes separated by a hyphen indicate that a satisfactory completion of the first term course is a prerequisite to the second term, e.g., 21&62:920:301-302. The first term may be taken for credit without the second, unless a statement is added to indicate that both term courses must be completed in order to receive credit. The notation BA indicates that the number of credits is determined by arrangement with the department offering the course.

Undergraduate : Campus Directory

University Mailing Address

New Jersey Institute of Technology
University Heights
Newark, New Jersey 07102-1982

University Switchboard

(973) 596-3000
In New Jersey: 1 (800) 925-NJIT or
1 (800) 222-NJIT (Mount Laurel)

NJIT on the Internet: http://www.njit.edu

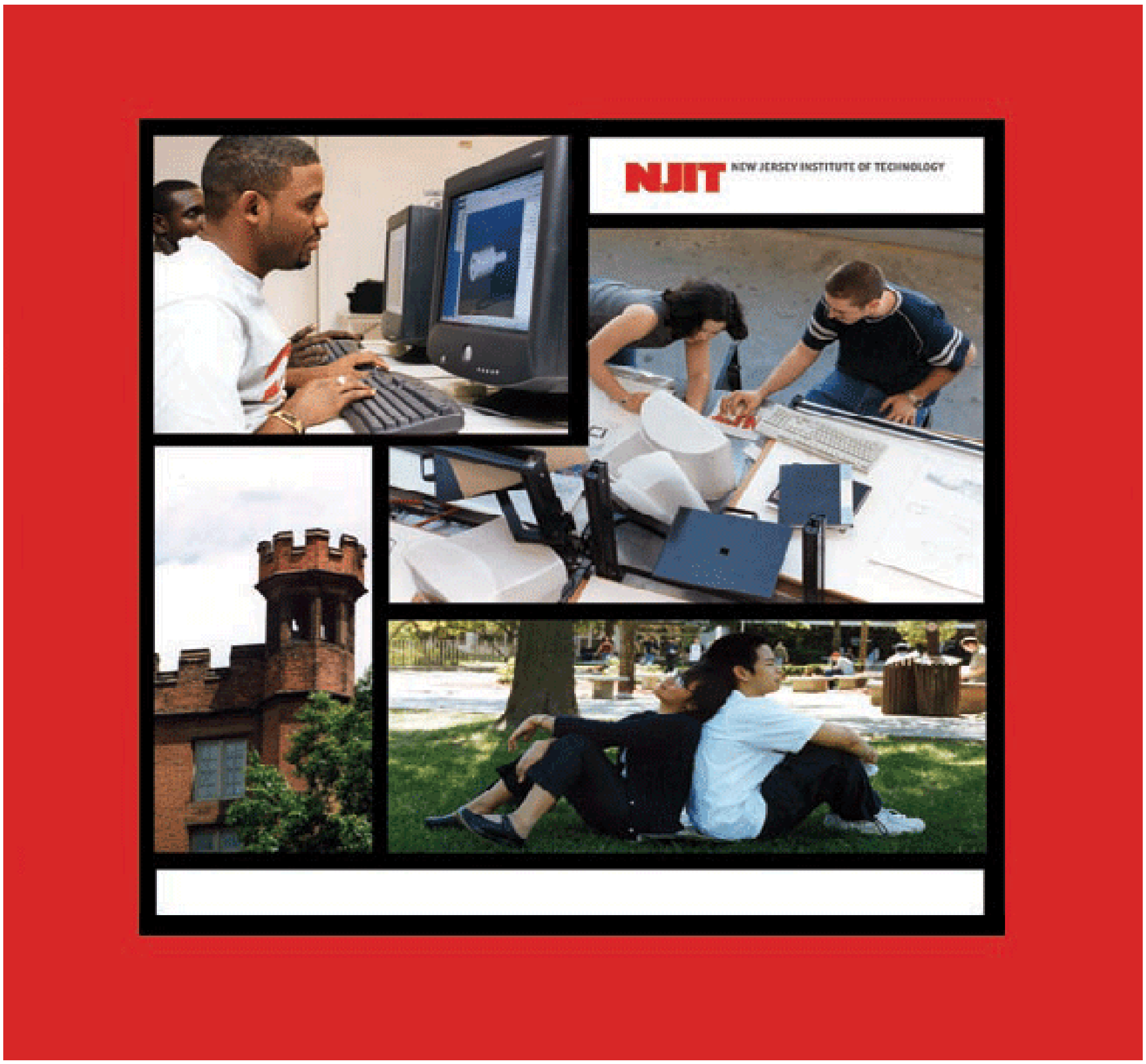
Many academic and administrative departments have home pages on NJIT's Web site and are accessible from the address above.

Main Offices	Extension
Admissions: Graduate and Undergraduate	3300
Alumni Affairs, Office of	3441
Biological Sciences, Federated Department of NJIT and Rutgers-Newark	6597
Biomedical Engineering, Department of	3584
Bookstore	3200
Bursar, Office of the	3148
Career Development Services, Division of	3100
Chemical Engineering, Department of	3568
Civil and Environmental Engineering, Department of	2444
College of Computing Sciences, Dean	5488
College of Science and Liberal Arts, Dean	3677
Computer and Information Science, Department of	3366
Computing Help Desk	2900
Continuing Professional Education, Division of	3060
Cooperative Education and Internships, Office of	3100
Electrical and Computer Engineering, Department of	3512
Employment, Student	3474
Engineering Science Program	3584
Engineering Technology, Department of	3228
Chemistry and Environmental Science Program	3595
Financial Aid, Office of	3479
Graduate Studies, Office of	3462
Information Technology Program	3366
History, Federated Department of NJIT	5344

History Federated Department of Rutgers-Newark	353-5410
Honors College, Albert Dorman	4448
Human Resources, Office of	3140
Humanities and Social Sciences, Department of	3266
Industrial and Manufacturing Engineering, Department of	3655, 3660
Intellectual Property, Office of	5825
International Students and Faculty, Office of	2451
Library, Architecture	3083
Library, Robert W. Van Houten	3206
Mathematical Sciences, Department of	5782
Mechanical Engineering, Department of	3331
Microelectronics Research Center	5714
Newark College of Engineering, Dean	3222
New Jersey School of Architecture, Dean	3080
Physical Education and Athletics	3636
Physics, Department of	3562
Public Safety	3111
Registrar, Office of the	3236
Research Office	3429
Residence Life	3039
School of Management, Dean	3248
Student Center, Hazell	3605
University Advancement	3400
University Communications	3433

NEW JERSEY INSTITUTE OF TECHNOLOGY

2004-2005 COURSE CATALOG



Neither the provision of the catalog nor the publication thereof constitute an offer for the contract which maybe accepted by students through registration and enrollment in the university. The university reserves any right to change the provision, offering or requirement at any time during the semester period of study at NJIT.

Undergraduate - Applied Physics

Administered By: Physics Departments of NJIT and Rutgers-Newark

Administration

Chairperson (NJIT)	Leon Buteau
Chairperson (Rutgers-Newark)	Zhen Wu
Associate Chairpersons (NJIT)	Dale Gary, Haimin Wang
Joint Graduate Programs Director and Graduate Advisor	N. M. Ravindra, Phone: (973) 596-3278 (Room 464 TIE)
Joint Director of Undergraduate Physics Programs	Roumiana Petrova
Assistant to the Chair	Renee Crawley

NJIT Faculty

Distinguished Professors	Goode, R. Levy
Professors	Buteau, Carr, Chin, Federici, Ravindra, Gary
Associate Professors	Towfik, Russo, G.Thomas, Tyson, H. Wang
Assistant Professors	Sirenko, Jermakian, Denker, Savrassov
Distinguished Research Professors	Hensel, Zirin, Lanzerotti
Research Professors/Special Lecturers	H. Opyrchal, Piatek, Fiory, Petrova

Rutgers-Newark Faculty

Professor Rank II	Murnick, Fayngold, Gokce, Maljian
Professor	Shaw
Associate Professor	Wu, T. Opyrchal, Redling
Assistant Professor	Shneidman

Applied physics is the study of the basic laws of nature and their application to modern technologies.

The B.S. in Applied Physics program is designed to give students a broad background in physics while at the same time relating this background to applications used in technology-based industries including optical science (with a laser physics emphasis), microelectronics (using NJIT 's clean room facility), computer-based laboratory instrumentation and astronomy/astrophysics. In addition, the program offers students a general physics option with a broad exposure to several major areas of physics. A double major in applied physics and computer science (B.S. program) is also available.

The B.S. in Applied Physics is a joint degree program offered by NJIT and Rutgers-Newark.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Applied Physics** (129 Credit minimum)

FIRST YEAR

1st Semester

Chem 125	General Chemistry (3-0-3)
CIS 113	Introduction to Computer Science I (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Math 111	Calculus I (4-1-4)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman SeminalI (1-0-0)

2nd Semester

Chem 124	General Chemistry Laboratory (0-2-1)
Chem 126	General Chemistry II (0-2-1)
CIS 114	Introduction to Computer Science II (3-1-3)
Math 112	Calculus II (4-1-4)
Phys 121	Physics II (3-0-3)

	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

†	HSS 202	Society, Technology and Environment (3-0-3)
	Math 211	Calculus III A (3-0-3)
##	Math 225	Survey of Probability and Statistics (1-0-1)
	Phys 234	Physics III (3-0-3)
	Phys 231A	Physics III Laboratory (0-2-1)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

##	CIS 231	Machine Language (3-1-3))
	Math 222	Differential Equations (4-0-4)
	Math 335	Vector Analysis (3-0-3)
	Phys 335	Introductory Thermodynamics (3-0-3)
†	SS 201	Economics (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)

THIRD YEAR: APPLIED PHYSICS/COMPUTER SCIENCE DOUBLE MAJOR ONLY

1st Semester

	CIS 251	Computer Organization (3-0-3)
	CIS 280	Programming Language Concepts (3-0-3)
	Phys 430	Classical Mechanics I (3-0-3)
	Phys 432	Electromagnetism I (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Open: GUR) (3-0-3)

2nd Semester

	CIS 332	Operating Systems I (3-0-3)
	CIS 435	Advanced Data Structures (3-0-3)
	MtSE 301	Principles of Materials Science and Engineering I (3-0-3)
	Phys 442	Introduction to Quantum Mechanics (3-0-3)
	Phys 446	Solid State Physics (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)

THIRD YEAR: OPTICAL SCIENCE OPTION

1st Semester

	OPSE 301	Optical Science and Engineering (3-0-3)
	Phys 430	Classical Mechanics I (3-0-3)
	Phys 432	Electromagnetism I (3-0-3)
	Phys 443	Modern Optics (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Open: GUR) (3-0-3)

2nd Semester

	MtSE 301	Principles of Materials Science and Engineering (3-0-3)
	OPSE 402	High Power Laser and Photonics Applications (3-0-3)
	Phys 433	Electromagnetism II (3-0-3)
	Phys 442	Introduction to Quantum Mechanics (3-0-3)
	Phys 446	Solid State Physics (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)

THIRD YEAR: ALL OTHER OPTIONS

1st Semester

	EE 231	Systems and Circuits I (3-0-3)
***	OPSE 310	Virtual Instrumentation (3-0-3)
**	Phys 320	Astronomy and Astrophysics I (3-0-3)
	Phys 430	Classical Mechanics (3-0-3)

	Phys 432	Electromagnetism I (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Open: GUR) (3-0-3)

2nd Semester

	EE 232	Circuits and Systems II (3-0-3)
	MtSE 301	Principles of Materials Science and Engineering (3-0-3)
	Phys 433	Electromagnetism II (3-0-3)
	Phys 442	Introduction to Quantum Mechanics (3-0-3)
*	Phys 446	Solid State Physics (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)

FOURTH YEAR: MICROELECTRONICS OPTION

	EE 251	Digital Design (3-0-3)
	Phys 450	Advanced Physics Laboratory (0-4-2)
	Phys 461	Computational Methods in Applied Physics (3-0-3)
	Phys 481	Microelectronics I (3-0-3)
	Phys 482	Microelectronics II (3-0-3)
	Elective	(Management: GUR) (3-0-3)
	Elective	3 from (Phys/EE) (3-0-3)
	Elective	(Technical) (3-0-3)

FOURTH YEAR: DOUBLE MAJOR IN APPLIED PHYSICS AND COMPUTER SCIENCE

	CIS 341	Introduction to Logic and Automata (3-0-3)
	CIS 421	Numerical Algorithms (3-0-3)
	CIS 431	Database Systems (3-0-3)
	CIS 432	Operating Systems II (3-0-3)
{	CIS 438	Interactive Computer Graphics (3-0-3))
		or
	CIS 461	Systems Simulation (3-0-3)
	CIS 490	Guided Design (3-0-3)
{	CIS 491	Computer Science Project (3-0-3)
		or
	Phys 490	Independent Study (3-0-3)
	Math 226	Discrete Analysis (3-0-3)
	Phys 485	Computer Modelling (3-0-3)
	Electives	(Phys) (3-0-3)
	Electives	(Management: GUR) (3-0-3)

FOURTH YEAR: GENERAL APPLIED PHYSICS OPTION

	Phys 450	Advanced Physics Laboratory (0-4-2)
	Elective	(Management: GUR) (3-0-3)
	Elective	4 from (Phys) determined by advisor (3-0-3)
	Elective	3 from (Phys/EE) (3-0-3)
	Elective	(Technical) (3-0-3)

FOURTH YEAR: OPTICAL SCIENCE OPTION

	OPSE 310	Virtual Instrumentation (3-0-3)
	Phys 450	Advanced Physics Laboratory (0-4-2)
	Elective	(Management: GUR) (3-0-3)
	Elective	2 from (Phys/EE) (3-0-3)r)
‡	Elective	2 from (Math/Phys/EE/CIS) (3-0-3)
	Electives	3 from (Technical) (3-0-3))

FOURTH YEAR: ASTRONOMY/ASTROPHYSICS OPTION

	Phys 322	Observational Astronomy (3-0-3)
	Phys 450	Advanced Physics Laboratory (0-4-2)
	Elective	(Management: GUR) (3-0-3)
****	Elective	4 from (Math/Phys/CIS) (3-0-3)
	Electives	3 from (Technical) (3-0-3)

FOURTH YEAR: INSTRUMENTATION AND COMPUTATIONAL PHYSICS OPTION

CIS 421	Numerical Algorithms (3-0-3)
CIS438	Interactive Computer Graphics (3-0-3)
	or
CIS 461	Systems Simulation (3-0-3)
Phys 450	Advanced Physics Laboratory (0-4-2)
Phys 485	Computer Modelling (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	3 from (Phys/EE) (3-0-3)
Elective	3 from (Technical) (3-0-3)

Computer science/applied physics double majors take Math 333 instead.
Required for computer science/applied physics double majors only.
* Students in the general applied physics option may substitute any Phys course for this course.
** For students in the astronomy/astrophysics option only. These students take Phys 320 and Phys 321 instead of EE 231 and EE 232.
*** Only students in the instrumentation and computational physics option take OPSE 310. OPSE310 is taken in place of the math elective.
**** Only course must be chosen from: OPSE 301, Phys 443, Phys 444, R750:403, R750:461.
‡ Recommended electives: Math 331, Math 332, R750:461.

Electives

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

† *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, or Econ 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement. The departments recommend that applied physics/computer science double majors take CIS 350.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following:HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409 Students enrolled in the honors college take one from HSS 491H - HSS 499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Management GUR: Students TakeIE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601 to fulfill this requirement.

Phys/CIS/EE: Consult the physics department for information about qualifying courses.

Math/Phys/CIS: Consult the physics department for information about qualifying courses.

Math/Phys/EE/CIS: Consult the physics department for information about qualifying courses.

Technical: Consult the physics department for information about qualifying courses.

Refer to the General University Requirement section of this catalog for further information on electives.

Co-op

Co-op courses bearing degree credit replace a technical elective or another course approved by the faculty advisor in the students major department. In applied physics, both Phys 311 and Phys 411 are taken for degree Credit with permission of faculty advisor.

Undergraduate - Architecture

Administered By: New Jersey School of Architecture

Administration

Dean	Urs P. Gauchat
Associate Dean	James E. Dyer
Graduate Program Director	Peter C. Papademetriou
Graduate Program Associate Director	Timothy Wood
M.I.P Planning Program Director	Antonio de Souza Santos
Graduate Program and Admissions Coordinator	Fred Little

Faculty

Distinguished Professor	Mostoller
Professors	Celik, Franck, Gauchat, Goldman, Greenfield, Hawk†, Papademetriou, Santos, Weisman
Associate Professors	Elwell, B. Jackson, Moore, Schuman, Wall, West, Zdepski
Graduate Advisor	Peter C. Papademetriou, Phone: (973) 596-3078 (Room 345 WES) Email: march@admin.njit.edu
MSAS Graduate Advisor	David Hawk, Phone: (973) 596-3019 (Room 3024 CAB) Email: hawk@admin.njit.edu
Co-op Advisor	Timothy Wood, Phone: (973) 596-3078

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†Joint appointee with the School of Management.

Accredited by the National Architectural Accrediting Board.

The New Jersey School of Architecture educates students to assume positions of responsibility and leadership in the architectural profession and in developing areas of opportunity in technology and community design related to the discipline of architecture. An emphasis on studio design in the curriculum is reinforced by courses in history, building science and social concerns. A diverse faculty brings its expertise to bear on issues of architecture, technology and culture and challenges students to prepare for their productive years as practitioners, scholars and researchers. The architecture program builds on the strengths of a technological university with its extensive capacity in computer graphics while emphasizing design directed toward the traditional human-centered values of architecture.

The total time needed to earn a Bachelor of Architecture (the first professional degree) at NJIT is five years.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the school to learn which curriculum applies.

Credit distribution for the Bachelor of Architecture (B.Arch.)

Required architecture credits	96
Architecture electives	15
Free electives	9
Rutgers-Newark drawing course	3
General University Requirements	41
	* 164

The New Jersey School of Architecture also offers a nonprofessional, four-year undergraduate program leading to the Bachelor of Science (B.S.) in Architecture. The B.S. does not lead to licensure as an architect; instead it presents students with a wide array of other options leading to career opportunities within the building industry. Students can be admitted to the B.S. in Architecture program as a freshman or transfer from the B.Arch. program after two years. The B.S. in Architecture program requires 135 credits and is structured as follows:

The first two years of the B.S. in Architecture program are identical to the course of study for the five-year professional program.

In the third year, all B.S. students take Arch 363 followed by a computer elective. Thus every student has at least one full year of computer-based learning. The B.S. in Architecture is designed to lead into a series of accelerated graduate degree programs in fields such as construction management (B.S. in Architecture/M.S. in Civil Engineering), infrastructure planning (B.S. in Architecture/Master in Infrastructure Planning), management (B.S. in Architecture/M.S. in Management; B.S. in Architecture/M.B.A. in Management of Technology), or a professional graduate degree in Architecture (B.S. in Architecture/Master of Architecture) leading to licensure. Graduate-level course descriptions for those listed in the dual degree programs description are located in the ***NJIT Graduate Catalog.***

Course choices are worked out on an individual basis after consultation with the academic advisor to reflect a student's individual interests and career objectives. The B.S. in Architecture provides a wide array of curriculum paths; it is designed to provide a superb general education for all building professionals.

■ **Bachelor of Architecture** (164 Credit minimum)

FIRST YEAR

1st Semester

	Arch 155	Architectural Graphics (2-3-3)
	Arch 163	Introduction to Design I (1-12-5)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 113	Finite Mathematics and Calculus I (4-0-4)
	Frsh Sem	Freshman SeminalI (1-0-0)

2nd Semester

	R080:121	Introduction to Drawing (0-6-3)
	Arch 164	Introduction to Design II (1-12-5)
	CIS 104	Computer Programming and Graphics Problems (2-1-2)
†	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 114	Finite Mathematics and Calculus II (4-0-4)

SECOND YEAR

1st Semester

	Arch 241	Architectural Construction I (3-0-3)
‡	Arch 251	History of Architecture I (3-0-3)
	Arch 263	Architecture Studio I (1-12-5)
	Phys 102	General Physics (3-0-3)
	Phys 102A	General Physics Laboratory (0-2-1)
	Elective	(Cultural History: GUR) (3-0-3)

2nd Semester

	Arch 242	Architectural Construction II (3-0-3)
	Arch 252	History of Architecture II (3-0-3)
	Arch 264	Architecture Studio II (1-12-5)
	Arch 282	Structures (3-0-3)
	Phys 103	General Physics (3-0-3)
	Phys 103A	General Physics Laboratory (0-2-1)

THIRD YEAR

1st Semester

	Arch 331	Landscape Architecture (3-0-3)
	Arch 363	Architecture Studio III (1-12-5)
	Arch 381	Architectural History III (3-0-3)
	Arch 383	Structures II (3-0-3)
	Arch 386	Building Performance (3-0-3)

2nd Semester

	Arch 364	Architecture Studio IV (1-12-5)
‡	Arch 382	Architectural History IV (3-0-3)
	Arch 384	Structures III (3-0-3)
	Arch 387	Environmental Control Systems (3-0-3)

FOURTH YEAR
1st Semester

	Arch 463	Architecture Studio V (1-12-5)
†	SS 201	Economics (3-0-3)
	Elective	(Management: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Architecture) (3-0-3)
	Elective	(Free) (3-0-3)

2nd Semester

	Arch 464	Architecture Studio VI (1-12-5)
	Arch 472	Programming and Project Development (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Architecture) (3-0-3)
	Elective	(Free) (3-0-3)

FIFTH YEAR
1st Semester

***	Arch 563	Architecture Studio VII (1-12-5)
***	Arch 565	Comprehensive Studio Lab (0-3-1)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	Elective	(Architecture) (3-0-3)
	Elective	(Architecture) (3-0-3)

2nd Semester

	Arch 558	Professional Architecture Practice (3-0-3)
***	Arch 564	Architecture Studio VIII (1-12-5)
		or
**	Arch 566	Senior Thesis (0-15-5)
	Elective	(Architecture) (3-0-3)
	Elective	(Free) (3-0-3)

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‡ Arch 251 satisfies 3 credits of the Cultural History GUR for B.Arch. majors; Arch 382 satisfies the Open Elective in Humanities and Social Science GUR for B.Arch. majors.
* The minimum Credit requirement for graduation is the successful completion of 164 credits of prescribed courses within the curriculum; and the maintenance of a 2.0 (C) average. Students are also required to maintain a minimum 2.0 studio cumulative average to advance to each succeeding year of studio. Students must take one upper level studio designated as "comprehensive".
** This option is subject to prior approval
*** To be taken concurrently with comprehensive studio.

Electives

† *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, or Econ 266. The remaining 3 credits may be satisfied byHSS 202, STS257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Management GUR: Choose IE 492 or Mgmt 390 or HRM 601 for the dual degree with management. AS 333may be substituted only by those students taking the aerospace option.

Architecture: Any architecture course.

Free: Select in consultation with curriculum advisor.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403HSS 404HSS 405HSS 406HSS 407HSS 408HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

See the General University Requirements section of this catalog for more information on electives.

Co-op
Co-op courses replace architecture or free electives. In architecture, Arch 310 and Arch 410 may be taken for degree credit.

■ **Degree Requirements for Dual B.Arch. and M.S. in Management** The New Jersey School of Architecture and the School of Management have established a dual degree program, which permits students to obtain a B.Arch. with a Master of Science (M.S.) in Management.

There is no reduction in the degree requirements for the professional degree in Architecture. The dual degree program permits students to obtain an M.S. in Management in substantially less time, in some cases with only one more semester of study. Up to 12 credits of graduate-level coursework may be applied to both the B.Arch. and M.S. in Management degrees.

Students may take additional courses at the graduate level during their undergraduate career, but these courses do not count toward the undergraduate degree requirements and students are charged at the graduate course rate. Eligible students should contact the Office of Graduate Studies in their junior or third year regarding the process for admission to the dual degree program. The Office of Graduate Studies will coordinate the process with the undergraduate program director in the School of Architecture and later with the graduate advisor and the Office of Graduate Admissions as the student nears completion of the undergraduate degree. In order to be eligible for initial and continued participation in the dual degree program, the student must maintain a 3.0 cumulative GPA and take the GMAT during the senior or final undergraduate year. A GMAT score of 550 is required for admission to graduate study in the School of Management.

In addition to existing architecture courses, the M.S. in Management comprises 36 credits as follows. Note: This program was under revision at press time. Students should contact Elly Matzko, student advisor, for the current curriculum.

12 credits **to fulfill both B.Arch. and M.S. in Management requirements:**

Arch 650	Economy of Building (architecture elective)
Arch 651	Real Estate Analysis for Architects (architecture elective)
Arch 652	Architectural Project Management (free elective)
HRM 601	Organizational Behavior (Management: GUR)

15 credits **as follows:**

Fin 516	Principles of Financial Management
Fin 600	Financial and Economic Environment
Fin 618	Public and Private Financing of Urban Areas
MIS 620	Computing Concepts for Management
Mgmt 680	Entrepreneurial Strategy
	or
Mgmt 692	Business Strategy

9 credits **of electives from:**

Acct 615	Concepts of Strategic Cost Analysis
Fin 624	Financial Management
Mgmt 640	New Venture Management
Mgmt 645	New Venture Finance
MIS 645	Operations Management, Planning and Control
Mrkt 630	Models of Consumer Behavior
Mrkt 638	Sales Management for Technical Professionals

■ **Degree Requirements for Dual B.Arch. and Master of Business Administration in Management of Technology**The New Jersey School of Architecture and the School of Management have established a dual degree program that permits students to obtain a Bachelor of Architecture degree with a Master of Business Administration (M.B.A.) in Management of Technology.

There is no reduction in the degree requirements for the professional degree in architecture. The dual degree program permits students to obtain an M.B.A. in Management of Technology in substantially less time, in some cases with only one additional year of study. Up to 12 credits of graduate-level coursework may be applied to both the B.Arch. and M.B.A.

Students may take additional courses at the graduate level during their undergraduate career, but these courses do not count toward the undergraduate degree requirements and students are charged at the graduate course rate.

Eligible students should contact the Office of Graduate Studies in their junior or third year regarding the process for admission to the dual degree program. The Office of Graduate Studies will coordinate the process with the undergraduate program director in the New Jersey School of Architecture and later with the graduate advisor and the Office of Graduate Admissions as the student nears completion of the undergraduate degree. In order to be eligible for initial and continued participation in the dual degree program, the student must maintain a 3.0 cumulative GPA and take the GMAT during the senior or final undergraduate year. A GMAT score of 550 is required for admission to graduate study in the School of Management.

The M.B.A. in Management of Technology is a 60-credit program. However, 12 credits in management background courses are waived for architecture graduates. Therefore, in addition to completion of the architecture program requirements, the M.B.A. comprises 48 credits as follows. Note: This program was under revision at press time. Students should contact Elly Matzko, student advisor, for the current curriculum.

9 required credits taken in the New Jersey School of Architecture constitute an area of concentration in architectural management and count toward both the B.Arch. and M.B.A

Arch 650	Economy of Building (3) (architecture elective)
Arch 651	Real Estate Analysis for Architects (3) (architecture elective)
Arch 652	Architectural Project Management (3) (free elective)

21 credits **in core courses - technology module:**

Fin 516	Principles of Financial Management (3)
Mgmt 620	Management of Technology (3)
Mgmt 625	Distribution Logistics (3)
Mgmt 630	Decision Analysis (3)
Mgmt 635	Management Research Methods (3)
	or
Math 661	Applied Statistics (3)
MIS 620	Computing Concepts for Management (3)
MIS 645	Operations Management, Planning and Control (3)

18 credits **in core courses - essential business processes:**

Acct 615	Concepts of Strategic Cost Analysis (3)
Fin 600	Financial and Economic Environment (3)
Fin 618	Public and Private Financing of Urban Areas (3)
HRM 601	Organizational Behavior (3) (also counts toward B.Arch.)
Mrkt 620	Competing in Global Markets (3)
Mgmt 680	Entrepreneurial Strategy (3)
	or
Mgmt 692	Business Strategy (3)

■ **Degree Requirements for Dual B.Arch. and Master in Infrastructure Planning**The New Jersey School of Architecture has established a dual degree program within the school that permits students to obtain a B.Arch. with a Master in Infrastructure Planning (M.I.P.). There is no reduction in the degree requirements for the professional degree in architecture. The dual degree program permits students to obtain an M.I.P. in substantially less time.

Up to 12 credits of graduate-level coursework may be applied to both the B.Arch. and M.I.P. Students may take additional courses at the graduate level during their undergraduate career, but these courses do not count toward the undergraduate degree requirements and students are charged at the graduate course rate.

Eligible students should contact the Office of Graduate Studies in their junior or third year regarding the process for admission to the dual degree program. The Office of Graduate Studies will coordinate the process with the undergraduate program director in the School of Architecture and later with the graduate advisor and the Office of Graduate Admissions as the student nears completion of the undergraduate degree. In order to be eligible for initial and continued participation in the dual degree program, the student must maintain a 3.0 cumulative GPA and take the GRE during the senior or final undergraduate year.

In addition to the completion of the architecture program requirements, the
M.I.P. comprises 36 credits as follows:

MIP 601	Interdisciplinary Infrastructure Studio I (6)
MIP 602	Interdisciplinary Infrastructure Studio II (6)
MIP 612	Introduction to Environmental Policy Studies (3)
MIP 615	Introduction to Transportation Science (3)
MIP 618	Public and Private Financing of Urban Areas (3)
MIP 631	History and Theory of Infrastructure (3)
MIP 652	Geographic Information Systems (3)
MIP 655	Land Use Planning (3)
MIP 674	Infrastructure and Architecture (3)
MIP 675	Elements of Infrastructure Planning (3)

Students in the B.Arch. program may take any four of the required 3-credit courses to count toward both their B.Arch. and M.I.P. Students who have completed a comprehensive options studio and have a superior academic record may take MIP 601 in place of the last options studio in the B.Arch. program. This counts for 6 of the 12 credits counted toward both degrees.

■ **Degree Requirements for Dual B.Arch. and Master of Science in Civil Engineering**The New Jersey School of Architecture and the Department of Civil and Environmental Engineering have established a dual degree program that permits students to obtain a B.Arch. and a Master of Science (M.S.) in Civil Engineering with a concentration in construction engineering and management. There is no reduction in the degree requirements for the professional degree in architecture. The dual degree program permits students to obtain an M.S. in Civil Engineering in substantially less time, in some cases with only one additional year of study.

Up to 12 credits of graduate-level coursework may be applied to both the B.Arch. and M.S. Students may take additional courses at the graduate level during their undergraduate career, but these courses do not count toward the undergraduate degree requirements and students are charged at the graduate course rate.

Eligible students should contact the Office of Graduate Studies in their junior or third year regarding the process for admission to the dual degree program. The Office of Graduate Studies will coordinate the process with the undergraduate program director in the School of Architecture and later with the graduate advisor and the Office of Graduate Admissions as the student nears completion of the undergraduate degree. In order to be eligible for initial and continued participation in the dual degree program, the student must maintain a 3.0 cumulative GPA and take the GRE during the senior or final undergraduate year.

In addition to completion of the architecture program requirements,
the M.S. in Civil Engineering comprises 30 credits as follows:

10 credits **in bridge courses.** Bridge courses are required as prerequisites for admission to the M.S. program. These courses may count as free electives in the B.Arch., but do not count toward the M.S.

CE 200	Surveying (3)
CE 200	A Surveying Lab (1)
CE 501	Introduction to Soil Behavior (3)
Math 105	Elementary Probability and Statistics (3)

12 required **credits that count toward both degrees:**

Arch 650	Economy of Building (3) (architecture elective)

Arch 651	Real Estate Analysis (3) (architecture elective)
Arch 647	Special Topics in Computer Applications (3) (architecture elective)
	or
Arch 675	Elements of Infrastructure Planning (3) (architecture elective)
MIS 645	Operations Management, Planning and Control (3) (free elective)

6 credits **in civil and environmental engineering electives from:**

CE 615	Infrastructure and Facilities Remediation (3)
CE 631	Advanced Reinforced Concrete Design (3)
CE 642	Foundation Engineering (3)
CE 702	Special Topics in Civil Engineering (3)
CE 710	Systems in Building Construction (3)
CE 711	Methods Improvement in Construction (3)
EnE 662	Site Remediation (3)

■ **Bachelor of Science in Architecture** (135 Credit minimum)

FIRST YEAR

1st Semester

Arch 155	Architectural Graphics (2-3-3)
Arch 163	Introduction to Design I (1-12-5)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Math 113	Finite Mathematics and Calculus I (4-0-4)
Frsh Sem	Freshman SeminalI (1-0-0)

2nd Semester

	R080:121	Introduction to Drawing (0-6-3)
	Arch 164	Introduction to Design II (1-12-5)
	CIS 104	Computer Programming and Graphics Problems (2-1-2)
†	HSS 202	Society, Technology and Environment (3-0-3)
	Math 114	Finite Mathematics and Calculus II (4-0-4)

SECOND YEAR

1st Semester

Arch 241	Architectural Construction I (3-0-3)
Arch 251	History of Architecture I (3-0-3)
Arch 263	Architecture Studio I (1-12-5)
Phys 102	General Physics (3-0-3)
Phys 102A	General Physics Laboratory (0-2-1)
Elective	(Cultural History: GUR) (3-0-3)

2nd Semester

Arch 242	Architectural Construction II (3-0-3)
Arch 252	History of Architecture II (3-0-3)
Arch 264	Architecture Studio II (1-12-5)
Arch 282	Structures (3-0-3)
Phys 103	General Physics (3-0-3)
Phys 103A	General Physics Laboratory (0-2-1)

THIRD YEAR

1st. Semester

Arch 363	Architecture Studio III (1-12-5)
Arch 381	Architectural History III (3-0-3)
Mgmt 390	Principles of Management (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)
Elective	(Architecture) (3-0-3)

2nd Semester

Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

†	SS 201	Economics (3-0-3)
	Elective	(Architecture) (3-0-3)
	Elective	(Architecture) (3-0-3)
	Elective	(Computing) (3-0-3)

FOURTH YEAR
1st Semester

HSS 409SS	Capstone Seminar (3-0-3)
Elective	(Open: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)
Elective	(Architecture) (3-0-3)
Elective	(Architecture) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester

Elective	(Architecture) (3-0-3)
Elective	(Architecture) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

Electives
Architecture: Any architecture course.

Computing: Select in consultation with curriculum advisor.

Free: Select in consultation with curriculum advisor.

† *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, or Econ 266. The remaining 3 credits may be satisfied byHSS 202, STS257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

See the General University Requirements section of this catalog for more information on electives.

■ **Degree Requirements for Dual B.S. in Architecture and M.S. in Management, B.S. in Architecture and M.B.A. in Management of Technology, and B.S. in Architecture and M.S. in Civil Engineering** The requirements for these programs are the same as for the B.Arch. dual degree programs. The exception is that only 6 credits of graduate-level coursework may be counted toward both degrees.

■ **Degree Requirements for Dual B.S. in Architecture and M.I.P.**The M.I.P requirements for this program are the same as for the dual B.Arch./M.I.P. The difference is that only 6 credits of coursework may be counted toward both degrees. B.Arch. students take two of the following four courses to count toward both degrees:

6 credits from

MIP 631	History and Theory of Infrastructure (3)

MIP 652	Geographic Information Systems (3)
MIP 674	Infrastructure and Architecture (3)
MIP 675	Elements of Infrastructure Planning (3)

Undergraduate - Biology

Administered By: Department of Mathematical Sciences

Administration

Division Director	Robert M. Miura, Phone: (973) 596-5464 (Room 621 Cullimore Hall) Email: miura@njit.edu
Academic Coordinator	Karen Roach, Phone: (973) 596-5612 (Room 627 Cullimore Hall) Email: kroach@njit.edu

NJIT Faculty

Distinguished Professor	Mill Jonakait
Professor	Robert Miura
Associate Professors	George Golowasch, Farzan Nadim

Rutgers-Newark Faculty

Chairperson	Edward M. Bonder
Professors	Cali, Feder (Associate Provost), Frenkel, Ganea, Kafkewitz, Kirby (Dean, FASN), Weis
Associate Professors	Bonder, Crow, Gardner, Kasper, Knox, Maiello, Morrison
Assistant Professors	Hamerlynk, Holzapfel, Friedman, Kim

The **Biology Program offers Bachelor of Science (B.S.) and Bachelor of Arts (B.A.) degrees. The coursework in the first year for the B.S. and B.A. degrees are identical, allowing students to make a choice between majors as late as the second year. The B.S. curriculum involves more rigorous training in mathematics, physics, and numerical computation. Students in the B.S. program are required, in their senior year, to complete a research project under the guidance of a faculty member affiliated with the program.

Accelerated 7-year Biology B.S./M.D. and Biology B.A./M.D. programs are also available. Contact the Albert Dorman Honors College for a sample program and information.

The curricula described below are for students entering or who entered NJIT as freshmen in the fall of 2000 or later. Students entering before that date may have a different program and should consult the program director to determine which curriculum applies.

For requirements of the two majors, click on the following links:

B.S. in Biology

B.A. in Biology

Undergraduate - Biomedical Engineering

Administered By: Department of Biomedical Engineering

Administration

Chairperson	William Hunter
Associate Chairperson and Undergraduate Program Director	David Kristol
Graduate Advisor	Stanley Reisman, Phone: (973) 596-3527 Email: reisman@njit.edu

Faculty

Foundation Professor	Van Buskirk (Biomechanics)
Distinguished Professor	Van Buskirk
Professors	Hunter, Kristol, Lacker, Reisman
Research Professors	Greene, Jaffe
Associate Professor	Foulds
Assistant Professors	Alvarez, Arinzeh
Special Lecturer	Mantilla

The biomedical engineering program is intended for those students who wish to devote themselves to the application of the principles and practices of engineering, computer science and mathematics to develop new methods that ultimately solve both clinical and more basic problems in medicine and surgery.

bioinstrumentation track utilizes electrical engineering methods extensively. The **biomechanics** track brings mechanics and mechanical engineering methods into play. The **biomaterials and tissue engineering** track employs tools from chemical engineering and materials science. The **modeling and simulation** track (pending) makes use of tools from applied mathematics and computer science. In addition, cooperative internship opportunities exist with a number of local biomedical and pharmaceutical companies.

Examples of research activity within the biomedical engineering field include signal processing of electrocardiograms, electroencephalograms, electromyograms; design of clinical instrumentation (e.g., for ophthalmology); design and analysis of prosthetic devices such as knees, hips and heart valves; design of robotic techniques for rehabilitation; experimental testing of the control of eye movements and other skeletal motor control systems; gait and limb motion analysis; development of new biomaterials (including many containing living cells) for both hard tissues (bone and teeth) and soft tissues (muscle, skin, cartilage, blood vessels), biomechanical testing of myocardial and vascular tissue; modeling and simulation of cardiac and vascular dynamics; modeling and simulation of the function of other organs such as lungs and kidneys; clinical image processing; biomedical applications of MEMS (micro electro-mechanical systems). Research is conducted cooperatively between NJIT and neighboring medical institutions.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2001 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Biomedical Engineering** (132 Credit minimum)
Computer Technology Option (66 credits) The core of the biomedical engineering curriculum is a combination of four areas of expertise that all students in biomedical engineering need to have mastered: (1) core engineering concepts as applied to biomedical and physiological systems, (2) basic sciences, (3) mathematics, (4) breadth of education from humanities, social sciences, and physical education.

Core Biomedical Engineering (24 credits)

FED 101C	Fundamentals of Engineering Design, CAD/Graphics Component (0-2.25-1)
FED 101D	Fundamentals of Engineering Design, Design Component (0-2.25-1)
BME 101	Introduction to Biomedical Engineering (1-0-0)
BME 301	Electrical Foundations of Biomed Engr (1-3-3)
BME 302	Mechanical Foundations of Biomed Engr (1-3-3)
BME 303	Biol. & Chem. Foundations for Biomed Engr (3-0-3)

BME 310	Biomedical Computing (3-0-3)
BME 381	Engineering Physiology I (3-0-3)
BME 382	Engineering Physiology II (3-0-3)
BME 491	Capstone Design I (1-0-1)
BME 492	Capstone Design II (1-2-3)

Basic Sciences (22 credits)

BME 102	Survey of Human Physiology (2-0-2)
Chem 124	General Chemistry Lab (0-2-1)
Chem 125	General Chemistry I (3-0-3)
Chem 126	General Chemistry II (3-0-3)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)
CIS 101	Computer Programming & Problem Solving (2-1-2)
Chem 337	Organic & Physical Chemistry for Life Sciences (3-0-3)

Mathematics (21 credits)

Math 111	Calculus I (4-1-4)
Math 121	Calculus II (4-1-4)
Math 211A	Calculus III (3-0-3)
Math 222	Differential Equations (4-0-4)
Math 337	Linear Algebra (3-0-3)
Math 333	Probability and Statistics (3-0-3)

Humanities and Social Sciences (29 credits)

HSS 101	Writing, Speaking, Thinking (3-0-3)
HSS 202	Society, Technology, and Environment (3-0-3)
HSS 211	Cultural History: GUR (3-0-3)
	or
HSS 212	Cultural History: GUR (3-0-3)
	or
HSS 213	Cultural History: GUR (3-0-3)
SS 201	Economics (3-0-3)
Mgmt 390	Management (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (6 credits)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Physical Education: GUR) (2 credits)

FOCUSED CURRICULUM (36 or 37 credits) Biomedical engineering is a tremendously broad field; it encompasses the entire interface between engineering and medicine/biology. To develop depth in their education, students must focus in one area of biomedical engineering specialization. The curriculum for each specialized track requires 36 or 37 credits, 30 of which must be in engineering coursework.

Specialized BME curricula are offered in four areas: (1) bioinstrumentation (2) biomechanics (3) biomaterials and tissue engineering, and (4) modeling and simulation (pending). There is also a specially adapted curriculum for those students pursuing an accelerated B.S./M.D. or B.S./D.M.D. degree.

The tables below give the courses that are required in each track. In addition, each track is completed by a number of upper-level technical electives that are chosen in consultation with track advisors.

See the biomedical engineering departmental Website for examples of the course time sequence illustrating which years and semesters specific courses might be taken in each track.

Bioinstrumentation

BME 372	Biomedical Electronics I (3-0-3)
BME 314	Biomedical Signals and Systems (3-0-3)
BME 373	Biomedical Electronics II (3-0-3)
BME 489	Medical Instrumentation (3-0-3)
EE 251	Digital Design

EE 352	Microprocessor (3-0-3)
EE 482	Control & Instrumentation Systems (3-0-3)
Advanced Electives	(chosen by consultation with advisor) (15 credits required)

Biomaterials and Tissue Engineering

BME 420	Biomaterials & Compatibility (3-0-3)
BME 427	Biotransport (3-0-3)
BME 430	Tissue Engineering (3-0-3)
BME 422	Biomaterial Characterization (3-0-3)
Mech 320	Statics & Strength of Materials (3-0-3)
ChE 221	Material Balances (4-0-4)
ChE 232	Chemical Engineering Thermodynamics I (2-2-3)
MtSE 301	Principles of Material Science & Engineering (3-0-3)
Advanced Electives	(chosen by consultation with advisor) (12 credits required)

Biomechanics

BME 472	Introduction to Biomechanical Engineering (3-0-3)
BME 474	Biomechanics of Living Tissues: Solids (3-0-3)
BME 476	Physiological Mechanics of Fluids (3-0-3)
BME 420	Biomaterials and Compatibility (3-0-3)
Mech 234	Statics (2-0-2)
Mech 236	Dynamics (2-0-2)
Mech 237	Strength of Materials (3-0-3)
CE 320	Fluid Mechanics (3-1-3)
Advanced Electives	(chosen by consultation with advisor) (15 credits required)

Modeling and Simulation
Note: This track will not begin until the 2004-2005 academic year. The electives in this program must form a coherent focus.

Accelerated Premedical Option
An individualized curriculum will be planned for each student in consultation with their advisor. All such programs must satisfy the core BME curriculum and contain at least 51 credits of engineering courses (24 from core BME curriculum; 27 from the individualized curriculum).

Electives in the General University Requirements
Management GUR: Students take IE 492 or Mgmt 390.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Basic Social Sciences GUR: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, orSTS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one fromHSS 491H-499H.

Premedical Requirements
Students who wish to apply to medical, dental, or optometry school must also take the organic chemistry sequence: Chem 243 and Chem 244 and the lab Chem 244A. Although these three courses will replace Chem 337 in the core BME curriculum, they will add a net 5 extra credits in the undergraduate program. Other requirements for medical professional schools will generally be met by the core curriculum in biomedical engineering, but students should verify this with individual professional schools.

Co-op
In biomedical engineering, co-op courses are taken for additive credit. See advisor for appropriate co-op courses.

Undergraduate - Chemical Engineering

Administered By: Otto H. York Department of Chemical Engineering

Administration

Chairperson	Basil Baltzis
Associate Chairperson for Undergraduate Studies	Reginald Tomkins
Associate Chairperson for Graduate Studies and Industrial Relations	Reginald Tomkins
Director of Pharmaceutical Engineering Program	Piero Armenante

Faculty

Distinguished Professors	Armenante, Lewandowski, Pfeffer, Sirkar
Foundation Professor	Sirkar (Membrane Separations)
Professors	Baltzis, Barat, Greenstein, Hanesian, Kimmel, Knox, Perna, Tomkins, Xanthos
Associate Professors	Loney
Assistant Professors	Bart, Howley, Huang, Simon, Wu
Honorary Professor	York
Distinguished Research Professor	Gogos
Research Professors	Hyun, Todd
Joint Appointments	Bozzelli (Chemistry), Grow (Chemistry), Dave (Mechanical Engineering)
Special Lecturer	Kisutcza
Undergraduate Advisor	Reginald Tomkins, Phone: (973) 596-5656 Email: tomkinsr@njit.edu
Graduate Advisor	Reginald Tomkins, Phone: (973) 596-5656 Email: tomkinsr@adm.njit.edu

Chemical engineering requires a mastery of the principles of chemistry, as well as physics and mathematics. Because it stands on a strong foundation in three sciences, it is particularly adaptable to solving the technological problems of modern society. Chemical engineers are employed by government, academia, and industry. They make an invaluable contribution to improving the quality of life in the production of pharmaceuticals to ward off disease, fertilizers and pesticides to grow an abundance of food, fabrics to clothe people, and petroleum products to warm homes and move cars. Their expertise is being applied to such diverse areas as the production of beverages and semiconductors, the design of heart/lung machines, and the design of treatment facilities for pollution control. Modern society could not exist without chemical engineers.

The mission of the department is to (1) educate undergraduate students primarily for employment in industry, with options to pursue graduate studies at the nation's best universities; (2) educate graduate students for employment in industry, government, or academe; (3) educate students, both undergraduate and graduate, for leadership roles; (4) engage in research to support the advanced education of graduate students, maintain the intellectual vitality of the faculty, and expand the frontiers of knowledge in areas of importance to the state and nation; (5) publish and present the results of our intellectual activities, resulting from both teaching advances as well as from research; (6) serve our profession through membership and leadership on local and national committees, and editorial boards, and (7) serve our wider constituencies by offering our expertise to industrial clients, state and local communities, and pre-college students and teachers.

The chemical engineering curriculum at NJIT provides students with the skills necessary to find employment immediately upon graduation, or to continue studies in graduate school. Alumni have continued to medical school, law school, and even careers as university professors, as well as more traditional avenues of employment.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2001 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Chemical Engineering** (135 credit minimum)

FIRST YEAR

1st Semester

ChE 101	Introduction to Chemical Engineering (1-0-0)

	Chem 125	General Chemistry I (3-0-3)
† *	FED 101C	Fundamentals of Engineering Design, CAD/Graphics Component (0-2.25-1)
† *	FED 101D	Fundamentals of Engineering Design, Design Component (0-2.25-1)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Frsh Sem	Freshman Seminar (1-0-0)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

	Chem124	General Chemistry Laboratory (0-2-1)
	Chem 126	General Chemistry II (3-0-3)
*	CIS 101	Computer Programming and Problem Solving (2-1-2)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	ChE 221	Material Balances (4-0-4)
	Chem 221	Analytical Chemical Methods (0-4-2)
	Chem 231	Physical Chemistry I (3-0-3)
	Chem 243	Organic Chemistry I (3-0-3)
	Math 211	Calculus III A (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)

2nd Semester

	ChE 232	Chemical Engineering Thermodynamics I (2-2-3)
	Chem 235	Physical Chemistry II (3-0-3)
	Chem 244	Organic Chemistry II (3-0-3)
	Chem 244A	Organic Chemistry II Laboratory (0-4-2)
	Math 222	Differential Equations (4-0-4)
	Elective	(Basic Social Sciences: GUR) (3-0-3)

THIRD YEAR

1st Semester

	ChE 342	Chemical Engineering Thermodynamics II (3-0-3)
	ChE 363	Transport Operations I (3-0-3)
	Chem 235A	Physical Chemistry Laboratory (0-4-2)
**	Math 225	Survey of Probability and Statistics (1-0-1)
‡	SS 201	Economics (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

2nd Semester

	ChE 349	Kinetics and Reactor Design (3-0-3)
	ChE 364	Transport Operations II (3-0-3)
	ChE 367	Diffusional Systems (3-0-3)
	Chem 340	Chemistry and Engineering of Materials (3-0-3)
	Mech 320	Statics and Mechanics of Materials (3-0-3)
	Exam	BEST Test (junior or senior year)

FOURTH YEAR

1st Semester

	ChE 471	Equilibrium Stage Processes (3-0-3)
	ChE 477	Process Dynamics and Control (4-0-4)
	ChE 485	Chemical Engineering Laboratory I (1-6-4)
	Elective	(Management: GUR) (3-0-3)
	Elective	(Open: GUR) (3-0-3)

2nd Semester

ChE 472	Process and Plant Design (4-0-4)
ChE 486	Chemical Engineering Laboratory II (0-8-4)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(ChE/Technical) (3-0-3)
Elective	(ChE/Technical) (3-0-3)

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† FED 101D is taken concurrently with either HSS 100 or HSS 101.

* Half of the students will take these courses in reverse order. Transfer students should substitute EG 101 for FED 101C and FED 101D.

** Half of the students will take these courses in reverse order. Transfer students should substitute Math 225 for chemical engineering or chemistry majors, in conjunction with Chem 235A.

Electives

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

‡ *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, orSTS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement. The department strongly recommends students take SS 220, which was specifically designed for chemical engineering majors.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option.

ChE/Technical: In general, one elective must be a ChE course while the other is open. For a list of qualifying courses and special options, consult the departmental associate chairperson for undergraduate studies.

BEST Test: All engineering students must take the BEST test during their junior or senior year. The results are used by the student for self-assessment and by the college for assessment of the effectiveness of its academic offerings.

Refer to the General University Requirement section of this catalog for further information on electives.

Department Regulations

For departmental regulations on prerequisites, grades and withdrawals, consult the departmental associate chairperson for undergraduate studies. Students cannot receive a B.S. in Chemical Engineering unless they achieve a minimum GPA of 2.0 in chemical engineering courses.

Co-op

In chemical engineering, ChE 310 and ChE 311 are taken for additive credit.

Undergraduate - Chemistry

Administered By: Department Chemistry and Environmental Science

Administration

Acting Chairperson	Joseph W. Bozzelli
Undergraduate Advisor	James Grow
Director of Freshman Chemistry	Robert Conley
Ada C. Fritz Professor of Environmental Engineering and Science	Joseph W. Bozzelli

Faculty

Distinguished Professors	Bozzelli, Venanzi
Professors	Grow, Gund, Krasnoperov, Mitra
Associate Professors	Dauerman
Assistant Professor	Malhotra, Gorun, Farinas
Research Professor	Iqbal
Special Lecturer	Skawinski
Director of Freshman Chemistry	Robert Conley
Professor Emeritus	Kebbekus, Getzin

The Bachelor of Science (BS) in Chemistry prepares students for careers in industry and for entry to graduate school or professional schools in areas of chemistry, medicine, dentistry or law. The program includes solid emphasis on laboratory skills, scientific principles and mathematics in practical, industrially-oriented areas of chemistry. Students can specialize or explore a particular area of chemistry or prepare for an advanced degree by selecting from a wide range of technical electives. It is recommended that each student carry out an undergraduate research project with a faculty mentor. The faculty have expertise in areas such as energy, fuels, pharmaceuticals, petrochemicals, materials, environmental chemistry and pollution control. Research areas include analytical and environmental chemistry at industrial and microchip scales, synthesis of organic and inorganic materials in green solvents, computer-aided drug design, laser diagnostics of elementary processes, kinetics, thermochemistry and thermodynamics.

Credit requirement for graduation is 125 credits.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

Web Address:http://www.njit.edu/chem

■ **B.S. in Chemistry** (125 credit minimum)

FIRST YEAR

1st Semester

Chem 125	General Chemistry I (3-0-3)
CIS 113	Introduction to Computer Science (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Math 111	Calculus I (4-1-4)
Phys 111	Physics I (4-1-4)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

Chem 124	General Chemistry Laboratory (3-0-3)
Chem 126	General Chemistry II (3-0-3)
Math 112	Calculus II (4-1-4)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	Chem 221	Analytical Chemical Methods (0-4-2)
	Chem 222	Analytical Chemistry (3-0-3)
	Chem 243	Organic Chemistry I (3-0-3)
	Math 211	Calculus III A (3-0-3)
	R160:207	Structure and Bonding (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

	Chem 231	Physical Chemistry I (3-0-3)
	Chem 244	Organic Chemistry II (3-0-3)
	Chem 244A	Organic Chemistry II Laboratory (0-4-2)
†	HSS 202	Society, Technology, and Environment (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Technical) (3-0-3)

THIRD YEAR

1st Semester

	Chem 235	Physical Chemistry II (3-0-3)
†	SS 201	Economics (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Technical) (3-0-3)
	Elective	(Technical) (3-0-3)

2nd Semester

	Chem 340	Chemistry and Engineering of Materials (3-0-3)
	Chem 336	Physical Chemistry III (3-0-3)
	Chem 235A	Physical Chemistry Laboratory (0-4-2)
*	Math 225	Survey of Probability and Statistics (1-0-1)
	Elective	(Open: GUR) (3-0-3)
	Elective	(Technical) (3-0-3)

FOURTH YEAR

1st Semester

	Chem 473	Biochemistry (3-0-3)
{	Chem 412	Inorganic Chemistry (3-0-3)
		or
	R160:413	Inorganic Chemistry (3-0-3)
	Elective	(Technical) (3-0-3)
	Elective	(Technical) (3-0-3)
	Elective	(Technical) (3-0-3)

2nd Semester

	Chem 480	Instrumental Analysis (0-4-2)
	Elective	(Management: GUR) (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	Elective	(Technical) (3-0-3)
	Elective	(Technical) (3-0-3)

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* Students must take a special section of Math 225 for chemical engineering or chemistry majors, in conjunction with Chem 235A.

Electives

† *Basic Social Sciences GUR:* Three Credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 Credits may be satisfied by HSS 202, STS 257, orSTS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601 to fulfill this requirement.

Technical: Consult the departmental associate chairperson for undergraduate studies.

Free: Consult the advisor.

Refer to the General University Requirement section of this catalog for further information on electives.

Co-op
In chemistry, Chem 310 and Chem 311can be taken as technical electives.

Department Regulations
For departmental regulations on prerequisites, grades and withdrawals, consult with the departmental undergraduate advisor. Students cannot receive a B.S. in Chemistry unless they achieve a minimum GPA of 2.0 in chemistry courses.

■ **B.S. MD program yielding a BS in Chemistry** (First 3 years 109 credits)

FIRST YEAR

1st Semester

Chem 125	General Chemistry I (3-0-3)
CIS 113	Introduction to Computer Science (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Math 111	Calculus I (4-1-4)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

Chem 124	General Chemistry Laboratory (0-2-1)
Chem 126	General Chemistry II (3-0-3)
Math 112	Calculus II (4-1-4)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

Chem 221	Analytical Chemical Methods (0-4-2)
Chem 222	Analytical Chemistry (3-0-3)
Chem 243	Organic Chemistry I (3-0-3)
Math 211	Calculus III A (3-0-3)

	Elective	Technical Elective (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

	Chem 231	Physical Chemistry I (3-0-3)
	Chem 244	Organic Chemistry II (3-0-3)
	Chem 244A	Organic Chemistry II Laboratory (0-4-2)
	R120 101	(Biology I) (3-0-3)
	Elective	Elective (Open GUR) (3-0-3)
†	HSS 202	Society, Technology, and Environment (3-0-3)

Summer

	Chem 491H	Research and Independent Study I (3-0-3)
	Chem 492H	Research and Independent Study II (3-0-3)

THIRD YEAR

1st Semester

	Chem 235	Physical Chemistry II (3-0-3)
†	SS 201	Economics (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Chem 480	Instrumental Analysis (0-4-2)
	Chem 473	Biochemistry (3-0-3)
	Elective	(Management: GUR) (3-0-3)

2nd Semester

	Chem 340	Chemistry and Engineering of Materials (3-0-3)
	Chem 336	Physical Chemistry III (3-0-3)
	Chem 235A	Physical Chemistry Laboratory (0-4-2)
*	Math 225	Survey of Probability and Statistics (1-0-1)
	Elective	(Technical) (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	R120 102	Biology II (3-0-3)

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* Students must take a special section of Math 225 for chemical engineering or chemistry majors, in conjunction with Chem 235A.

Electives

† *Basic Social Sciences GUR:* Three Credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 Credits may be satisfied by HSS 202, STS 257, orSTS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601 to fulfill this requirement.

Department Regulations

For departmental regulations on prerequisites, grades and withdrawals, consult with the departmental undergraduate advisor. Students cannot receive a B.S. in Chemistry unless they achieve a minimum GPA of 2.0 in chemistry courses.

Undergraduate - Civil Engineering

Administration

Chairperson	John Schuring
Associate Chairpersons	Hsin-Neng Hsieh, Walter Konon

Faculty

Distinguished Professor	Spillers
Professors	Bagheri, Chan, Deutschman, Dresnack, Golub, Greenfeld, Hsieh, Hsu, Khera, Konon, Meegoda, Raghu, Schuring, Spasovic, Wecharatana
Associate Professors	Olenik, Axe, Chien, Daniel, Ding, Marhaba
Assistant Professor	Liu
Undergraduate Advisor	Walter Konon, Phone: (973) 596-2476 (Room 223 COL) Email: konon@njit.edu
Graduate Advisor	Hsin-Neng Hsieh, Phone: (973) 596-5859 (Room 219 COL) Email: hsieh@njit.edu

Civil engineering is about the planning, design, construction and operation of facilities essential to modern life, ranging from bridges to transit systems. Civil engineers are problem solvers, meeting the challenges of community planning, water supply, structures, traffic congestion, energy needs, pollution, and infrastructure improvements. Societal needs, economic conditions and public safety are paramount in the work accomplished by civil engineers. High-tech tools such as computer aided design (CAD), geographical information systems (GIS) and 3-D computer modeling are a necessity in all areas of civil engineering.

Civil engineers are sought by both private companies and public agencies for a variety of professional positions. Many work for engineering consulting firms or construction companies as design engineers, field engineers and project managers. They also join government agencies to oversee transportation, water supply, environmental protection, and resource management. Graduates are equally prepared to pursue MS and Ph.D. degrees in allied fields, as well as business, management and law degrees.

The curriculum is structured to provide a broad undergraduate education with students taking courses in each of the recognized areas of civil engineering. The first two years focus on mathematics and basic science courses to provide a solid foundation for the engineering science and design courses that are taken in the junior and senior years. The program culminates in a two-semester capstone design course sequence in the senior year. The curriculum is computer intensive and includes a number of laboratory courses that reinforce concepts and principles taught in the classroom.

■ **B.S. in Civil Engineering** (131 credit minimum)

FIRST YEAR

1st Semester

	Chem 125	General Chemistry I (3-0-3)
† *	FED 101	Fundamentals of Engineering Design (2-1-2)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (1-0-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	Chem 126	General Chemistry II (3-0-3)
	Chem 124	General Chemistry Laboratory (0-2-1)
	CIS 101	Computer Programming and Problem Solving (2-1-2)
*	HSS	Basic SS Requirement (3-0-3)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	CE 200	Surveying (3-0-3)
	CE 200A	Surveying Laboratory (0-3-1)
	Math 211	Calculus III A (3-0-3)
	Math 225	Survey of Probability and Statistics (1-0-1)
	Mech 235	Statics (3-0-3)
	EnE 262	Introduction to Environmental Engineering (3-0-3)
	SS 201	Economics (3-0-3)

2nd Semester

	CE 210	Construction Materials and Procedures (3-0-3)
	CE 260	Civil Engineering Methods (3-0-3)
**	HSS	Cultural History (3-0-3)
	Math 222	Differential Equations (4-0-4)
	Mech 237	Strength of Materials (3-1-3)

THIRD YEAR

1st Semester

	CE 320	Fluid Mechanics (4-0-4)
	CE 320A	Hydraulics Laboratory (0-3-1)
	CE 321	Water Resources Engineering (3-0-3)
	CE 332	Structural Analysis (3-0-3)
	Mech 236	Dynamics (2-0-2)
**	HSS	Cultural History (3-0-3)

2nd Semester

	CE 333	Reinforced Concrete Design (3-0-3)
	CE 341	Soil Mechanics (3-0-3)
	CE 341A	Soil Mechanics Laboratory (0-3-1)
	CE 350	Transportation Engineering (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) 300 Level (3-0-3)
	Elective	(Technical) (3-0-3)

FOURTH YEAR

1st Semester

	CE 431	Construction Materials Lab (0-3-1)
	CE 432	Steel Design (3-0-3)
	CE 443	Foundation Design (3-0-3)
	CE 494	Civil Engineering Design I (3-0-3)
	ECE 405	Electrical Engineering Principles (3-0-3)
	Elective	(Open: GUR) 300 Level (3-0-3)

2nd Semester

	CE 495	Civil Engineering Design II (3-0-3)
	ME 435	Thermodynamics (3-0-3)
	Elective	(Management: GUR) (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
***	Elective	(CE Technical Elective) (3-0-3)

EVENING STUDENTS

A full-service evening program is offered by the department. Consult the associate chairperson for information on the evening curriculum for civil engineering.

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* HSS 202 or Rutgers course.

** HSS 211, HSS 212 or HSS 213. Students must select any two courses.

*** Students must choose one of the following: CE 307, CE 351, CE 410, CE 414, EnE 360, EnE 361.

† FED 101 is taken concurrently with eitherHSS 100 or HSS 101.

Note

Eligible students may substitute Math 213H for the combination of Math 211 and Math 225.

Electives
Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Basic Social Sciences GUR: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, or Econ 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, orSTS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: students, except those enrolled in the honors college, take one of the following: HSS403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS491-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Technical: Must be chosen from a list of courses available from the civil and environmental engineering department.

Refer to the General University Requirement section of this catalog for further information on electives.

Co-op
In Civil Engineering, CE 311 and CE 413 are taken for additive credit.

Undergraduate - Computer Engineering

Administered By: Department of Electrical and Computer Engineering

Administration

Chairperson	Atam Dhawan
Associate Chairpersons	Edwin Hou(undergraduate), Sotirios Ziavras(graduate)

Faculty

Distinguished Professors	Bar-Ness, Friedland, Savir
Professors	Akansu, Ansari, Carr, Cornely, Dhawan, Grebel, Haddad, Haimovich, Klapper, Misra, Rosenstark, Shi, Sohn, Sosnowski, Whitman, Zhou, Ziavras
Associate Professors	Carpinelli, Chang, Ge, Hou, Hubbi, Manikopoulos, Niver, Papavassiliou, Tekinay, Tsybeskov
Assistant Professors	Abdi, Hu, De, Rojas-Cessa, You, Zakrevski, Zhu
Special Lecturer	Bakhoum, Glaser
Undergraduate Advisor	Geny Moreno, Phone: (973) 596-5457 Email: moreno@njit.edu
Undergraduate Advisor	Edwin Hou, Phone: (973) 596-3521 Email: hou@njit.edu
Graduate Advisor	Nirwan Ansari, Phone: (973) 596-3670 (Room 223 ECE) Email: nirwan.ansari@njit.edu

The new interdisciplinary profession of computer engineering has evolved over the last two decades. Computer engineering professionals develop, design, and test computer systems. They understand both computer hardware and software and possess enough engineering breadth to design computer systems for a variety of applications. Economics and inherent flexibility have led to the widespread use of computer engineering technology. The career potential for graduates with this knowledge has been strong for many years.

Computer engineering consists of basic electrical engineering and computer science curricula combined with a set of special courses in computer systems. The curriculum generally follows a model program promulgated by the Institute of Electrical and Electronic Engineers Computer Society, and the program is fully accredited by ABET. Computer engineering students will have a broad engineering background combined with in-depth knowledge of computer hardware, software, and application tradeoffs, and the basic modeling techniques representing the computing process. The core subject areas of computer engineering are discrete mathematics, fundamentals of computing, data structures, system software and software engineering, computing languages, operating systems, logic design, digital systems design, computer architecture, interfacing and communications, and laboratory work to support the above including a project.

Students graduating from NJIT with a bachelor of science in computer engineering and a good academic record will be able to pursue further study leading to advanced degrees in computer engineering, electrical engineering, or computer science.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2000 or thereafter. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Computer Engineering** (131 credit minimum)

FIRST YEAR

1st Semester

	Chem 125	General Chemistry I (3-0-3)
† *	FED 101	Fundamentals of Engineering Design (0-2.25-1)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	CIS 113	Introduction to Computer Science I (3-1-3)
	Math 112	Calculus II (4-1-4)

	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	ECE 101	Introduction to Electrical and Computer Engineering (1-0-0)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	CIS 114	Introduction to Computer Science II (3-1-3)
	ECE 231	Circuits and Systems I (3-1-3)
	ECE 251	Digital Design (3-1-3)
	Math 213	Calculus III B (4-0-4)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

	ECE 271	Electronics Circuits I (3-1-3)
	ECE 252	Microprocessors (3-0-3)
	ECE 232	Circuits and Systems II (3-1-3)
	ECE 291	Electrical Engineering Laboratory I (0-3-1)
‡	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 222	Differential Equations (4-0-4)

THIRD YEAR

1st Semester

	CIS 280	Programming Language Concepts (3-0-3)
	ECE 368	Signal Transmission (2-0-2)
	ECE 395	Microprocessor Lab (0-4-2)
	Math 326	Discrete Analysis for Computer Engineers (3-0-3)
	Math 333	Probability and Statistics (3-0-3)
‡	SS 201	Economics (3-0-3)

2nd Semester

	CIS 332	Principles of Operating Systems (3-0-3)
	CIS 421	Numerical Algorithms (3-0-3)
		or
	Math 340	Applied Numerical Method & Optimization (3-0-3)
		or
	Math 337	Linear Algebra (3-0-3)
	ECE 353	Computer Organization and Architecture (3-0-3)
	ECE 394	Digital Systems Lab (0-3-1)
	Elective	(Open: GUR) (3-0-3)
	Elective	(Management: GUR) (3-0-3)

FOURTH YEAR

1st Semester

**	CIS 390	Requirements Analysis and Systems Design (3-0-3)
	ECE 414	Introduction to Computer Engineering Project (1-0-1)
	ECE 354	Digital Test (2-0-2)
	ECE 495	Computer Systems Design Lab (1-4-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Technical Track I) (3-0-3)
	Elective	(Technical Track II) (3-0-3)

2nd Semester

	ECE 416	Computer Engineering Project (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	Elective	(Technical Track Lab) (3-0-1)
	Elective	(Technical Track III) (3-0-3)
	Elective	(Technical) (3-0-3)
	Elective	(Technical) (3-0-3)

* Half of the students will take these courses in reverse order. Transfer students should substitute EG 101 for FED 101C and FED 101D.
† FED 101D is taken concurrently with either HSS 100 or HSS 101.
** Computer engineering majors enrolled in the computer science minor can take CIS 490.

Electives

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends computer engineering majors take STS 350 to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

‡ *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Technical: Chosen from a list of courses available from the faculty of the program.

Refer to the General University Requirement section of this catalog for further information on electives.

Technical Tracks

The computer engineering technical tracks are designed to provide in-depth study in a specialty area. Students at the fourth year of the curriculum must choose one of the available tracks. Three technical tracks have been defined.

A. Computer Communications

The computer communications track provides students with a working knowledge of digital data communications and computer network design. The subject matter includes the OSI reference model with particular emphasis on its physical and data link layers, the devices which make computer networks a reality, and methods for predicting network performance.

I.	ECE 421	Digital Data Communications
II.	ECE 422	Computer Communications Networks
III.	ECE 423	Data Communications Networking Devices
Lab.	ECE 429	Computer Communications Lab

B. Advanced Computer Systems

The emphasis in this track is on the architectural characteristics of advanced computer systems and the techniques for their design and analysis. The topics include computer system design, design advances in computer architecture, and simulation of computer systems.

I.	ECE 451	Advanced Computer Architecture I
II.	ECE 452	Advanced Computer Architecture II

III.	CIS 461	Systems Simulation
		or
	ECE 453	Introduction to Discrete Event Systems
Lab.	ECE 459	Advanced Computer System Design Lab

C. Telecommunication

This track offers in-depth knowledge in the area of telecommunication. It consists of the computer communications track and two additional courses. The two additional courses can be counted as the two technical elective courses required for the major.

I.	ECE 421	Digital Data Communications
II.	ECE 422	Computer Communications Networks
III.	ECE 423	Data Communications Networking Devices
IV.	ECE 424	Optical Communication Networks
V.	ECE 425	Wireless Communication Systems
Lab.	ECE 429	Computer Communications Lab

Co-op

Co-op courses bearing degree credit replace a technical elective or another course approved by the faculty advisor in the student's major department. In computer engineering, ECE 310 is taken for additive credit, and ECE 410 is taken for degree credit, upon acceptance by the faculty co-op advisor of an approved proposal.

Undergraduate - Computer Science

Administered By: Department of Computer Science, Guttenberg Information Technologies Center, Room 4400.

Administration

Chairperson	Dr. Narain Gehani
Associate Chairperson (Graduate)	Dr. Frank Shih
Associate Chairperson (Undergraduate)	Dr. James Geller
Departmental Coordinator	Dr. Andrew Hrechak
Graduate Advisor	Thomas Moore
Undergraduate Advisor	Sarah Vandermark

Faculty

Distinguished Professor	Joseph Leung
Professors	Alexander Thomasian, Ali Mili, Boris Verkhovsky, Frank Shih, James McHugh, James Geller, Jason Wang, Teunis Ott, Yehoshua Perl, Wojciech Rytter, Narain Gehani
Associate Professors	Andrew Sohn, Artur Czumaj, Daochuan Hung, David Nassimi, Dimitrios Theodoratos, Edward Sarian, Alexander Gerbessiotis, James Calvin, John Ryon, Marvin Nakayama, Michael Baltrush
Assistant Professors	Barry Cohen, Chengjun Liu, Vincent Oria, Cristian Borcea, Qun Ma, Usman Roshan
Special Lecturers	Dale Bromberg, George Blank, Osama Eljabiri, Jonathan Kapleau, Dennis Karvelas, Joan Kettering, Morty Kwestel, Kurban Niroomand, Theodore Nicholson, Junilda Spirollari, Wallace Rutkowski

Computer science (CS) is a discipline that involves the design and development of computing systems. It ranges from theoretical studies of algorithms to practical problems of system implementation involving both software and hardware. The breadth of computer science is all encompassing. It is an interdisciplinary field with roots in mathematics and engineering and applications in many diverse areas. Programming is but one aspect of computer science. Computer scientists work to solve multifaceted problems. Some may be solving problems with engineers or managers in design and implementation projects, while others may be involved in research and development of systems for science and medicine.

Bachelor of Science in Computer Science provides the student with the most comprehensive treatment of computers, with considerable breadth and depth in computer science topics, the sciences, mathematics, and supporting interdisciplinary studies. This degree program is fully accredited by CAC/ABET. Most students interested in computer science take this major. For the student who wishes to have a strong foundation in computer science, but with more opportunity for elective choices and with slightly fewer technical requirements, the department offers the Bachelor of Arts (B.A.) in Computer Science, a joint degree program with Rutgers-Newark. The B.A. in Computer Science also is fully accredited by CAC/ABET.

Curricula have been developed according to the recommendations of Association for Computing Machinery/Institute of Electrical and Electronics Engineers-Computer Science Joint Committee Task Force and in close cooperation with the department's industrial advisory board. Courses are constantly being monitored and modified for relevance. New courses are introduced as warranted by new developments.

Each of the majors offered by the CS department has been carefully structured to meet a specific goal each year: first year, foundations; second year, understanding the computing system; third year, theoretical foundations and applications; fourth year, integration and focus.

The Computer Science Department requires all students enrolled in its majors to prepare a Program of Study Form, an approved copy of which must be on file with the department. The form should be prepared as early as possible in the student's career, and changes should be made only in consultation with the department advisor. Computer science majors should enroll in CIS 113 and CIS 114 in the freshman year. Some students may be required to enroll in CIS 098, depending upon the results of their Basic Skills Examination.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2002 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Computer Science** (131 credit minimum)

FIRST YEAR

1st Semester

	CIS 113	Introduction to Computer Science I (3-1-3)
	CIS 113A	Computer Science Lab I (0-2-1)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Frsh Sem	Freshman Seminar (1-0-0)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

	CIS 114	Introduction to Computer Science II (3-1-3)
	CIS 114A	Computer Science Lab II (0-2-1)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
†	HSS 202	Society, Technology and Environment (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	CIS 252	Computer Organization and Architecture (3-0-3)
	CIS 280	Programming Language Concepts (3-0-3)
	Math 211	Calculus III A (3-0-3)
	Phys 234	Physics III (3-0-3)
	Phys 231A	Physics III Laboratory (0-2-1)
†	SS 201	Economics (3-0-3)

2nd Semester

	CIS 288	Intensive Programming Practicum (3-0-3)
	CIS 332	Principles of Operating Systems (3-0-3)
	CIS 241	Foundations of Computer Science (3-0-0)
	ENG 352	Technical Report Writing (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(General) (3-0-3)

THIRD YEAR

1st Semester

	CIS 341	Introduction to Logic and Automata (3-0-3)
	CIS 350	Computers and Society (3-0-3)
	Math 333	Probability and Statistics (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Interdisciplinary) (3-0-3)

2nd Semester

	CIS 435	Advanced Data Structures and Algorithm Design (3-0-3)
	Elective	(CIS) (3-0-3)
	Elective	(CIS) (3-0-3)
	Elective	(Interdisciplinary) (3-0-3)
	Elective	(General) (3-0-3)

FOURTH YEAR

1st Semester

	CIS 431	Database System Design and Management (3-0-3)
	CIS 490	Guided Design in Software Engineering (3-0-3)
	Elective	(Management: GUR) (3-0-3)
	Elective	(CIS) (3-0-3)

Elective	(Interdisciplinary) (3-0-3)
Elective	(General) (3-0-3)

2nd Semester

CIS 491	Computer Science Project (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Math) (3-0-3)
Elective	(CIS) (3-0-3)
Elective	(General) (3-0-3)

Electives

† *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends computer engineering majors take STS 350 to fulfill this requirement. The department recommends that computer science majors take Eng 352.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Mathematics: One approved 300- or 400-level course in mathematics or Math 222.

CIS: Four 300/400-level CIS electives as offered by the College of computing Sciences.

Interdisciplinary Studies: A sequence of three 300/400-level courses from mathematics, science or engineering. A list of approved course sequences is available from the advisor. Courses that are not acceptable for a major in a given department are not to be used for interdisciplinary studies.

General: A minimum of four courses (12 credits minimum). Courses should be chosen to meet prerequisite requirements of other courses. Two of the four elective courses must be in mathematics, science, computer science, or engineering. Two of these electives must be upper division courses. All students must have at least one science/scientific methods course in either their interdisciplinary studies courses or general electives. See below.

Science/Scientific Methods Requirement: One course must be in science or a course that enhances the student's abilities in application of scientific methods. This course must be chosen from a list of approved scientific/scientific methods courses available from the department. Note that the science/scientific methods course is in addition to the required three semesters of laboratory science consisting of Physics I and II (each with associated labs), and either Physics III or Biology I or Chemistry I (each with associated labs). See below.

Science with Lab: Students take Physics III, Biology I or Chemistry I, each with its associated lab. This course and associated lab fulfills one semester of the three-semester laboratory science requirement for the major.

Refer to the General University Requirements section of this catalog for further information on electives.

■ **B.A. in Computer Science** (127 credit minimum) Joint with Rutgers-Newark

FIRST YEAR

1st Semester

	CIS 113	Introduction to Computer Science I (3-1-3)
	CIS 113A	Computer Science Lab I
	Math 111	Calculus I (4-1-4)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Elective	(Science) (3-1-4)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	CIS 114	Introduction to Computer Science II (3-1-3)
	CIS 114A	Computer Science Lab II
	Math 112	Calculus II (4-1-4)
†	HSS 202	Society, Technology and Environment (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Science) (3-1-4)

SECOND YEAR

1st Semester

	CIS 252	Computer Organization and Architecture (3-0-3)
	CIS 280	Programming Language Concepts (3-0-3)
	Math 211	Calculus III A (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(General) (3-0-3)

2nd Semester

	CIS 288	Intensive Programming Practicum (3-0-3)
	CIS 332	Principles of Operating Systems (3-0-3)
	Eng 352	Technical Report Writing (3-0-3)
	Math 226	Discrete Analysis (4-0-4)
†	SS 201	Economics (3-0-3)
	Elective	(General) (3-0-3)
	CIS 288	Intensive Programming Practicum (3-0-3)

THIRD YEAR

1st Semester

	CIS 350	Computers and Society (3-0-3)
	Math 333	Probability and Statistics (3-0-3)
	Elective	(CIS) (3-0-3)
	Elective	(Interdisciplinary) (3-0-3)
	Elective	(General) (3-0-3)

2nd Semester

	CIS 435	Advanced Data Structures and Algorithm Design (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(CIS) (3-0-3)
	Elective	(Interdisciplinary) (3-0-3)
	Elective	(General) (3-0-3)

FOURTH YEAR

1st Semester

	Math 340	Applied Numerical Methods and Optimization (3-0-3)
	CIS 431	Database System Design and Management (3-0-3)
	CIS 490	Guided Design in Software Engineering (3-0-3)

Elective	(Interdisciplinary) (3-0-3)
Elective	(General) (3-0-3)
Elective	(CIS) (3-0-3)

2nd Semester

CIS 491	Computer Science Project (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(CIS) (3-0-3)
Elective	(General) (3-0-3)

Electives

† *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take HSS 211 or HSS 212 or HSS 213; or an approved 200-level history course at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends computer engineering majors take STS 350 to fulfill this requirement. The department recommends that computer science majors take Eng 352.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Sciences: A two-semester related sequence (8 credits minimum) of laboratory science elective courses e.g., physics, chemistry, biology, geology. These courses satisfy the Natural Sciences GUR.

CIS: Three 300/400-level electives as offered by the CIS department.

Interdisciplinary Studies: A sequence of three 300/400-level courses from mathematics, science or engineering. A list of approved course sequences is available from the advisor. Courses that are not acceptable for a major in a given department are not to be used for interdisciplinary studies.

General: A minimum of six courses (18 credits minimum).Courses should be chosen to meet prerequisite requirements of other courses. Four of the six electives must be upper division courses. All students must have at least two science/scientific methods courses in either their interdisciplinary studies courses or general electives. See below.

Science/Scientific Methods Requirement: Two courses must be in science or courses that enhance the student’s abilities in application of scientific methods. These two courses must be chosen from a list of approved science courses available from the department. Note that these two science courses are in addition to the laboratory science requirement.

Co-op

In computer science, CIS 310 and CIS 410 are taken for additive credit.

Undergraduate - Electrical Engineering

Administered By: Department of Electrical and Computer Engineering

Administration

Chairperson	Atam Dhawan
Associate Chairpersons	Edwin Hou(undergraduate), Sotirios Ziavras(graduate)

Faculty

Distinguished Professors	Bar-Ness, Friedland, Savir
Professors	Akansu, Ansari, Carr, Cornely, Dhawan, Grebel, Haddad, Haimovich, Klapper, Misra, Rosenstark, Shi, Sohn, Sosnowski, Whitman, Zhou, Ziavras
Associate Professors	Carpinelli, Chang, Ge, Hou, Hubbi, Manikopoulos, Niver, Papavassiliou, Tekinay, Tsybeskov
Assistant Professors	Abdi, Hu, De, Rojas-Cessa, You, Zakrevski, Zhu
Special Lecturer	Bakhoum, Glaser
Undergraduate Advisor	Geny Moreno, Phone: (973) 596-5457 Email: moreno@njit.edu
Undergraduate Advisor	Edwin Hou, Phone: (973) 596-3521 Email: hou@njit.edu
Graduate Advisor	Nirwan Ansari, Phone: (973) 596-3670 (Room 223 ECE) Email: nirwan.ansari@njit.edu

Electrical engineering is a diversified and challenging profession concerned with the design, development, fabrication, and control of the electrical devices upon which our technological society so largely depends. Electrical engineers utilize their knowledge of devices and systems design in a multitude of areas. These include electronic circuits and devices (micron size machines, high density computer circuits), computers (global networking, multimedia), biomedical instrumentation (telemedicine, imaging of vital organs), energy conversion and distribution (novel energy sources, solar, tidal, wind), control systems (robotics), electro-optics (lasers), and communication systems (satellite TV, cellular telephones). The curriculum provides a broad education in mathematics, the physical sciences, humanities, and social sciences. Upon this foundation is built a depth of understanding in electrical engineering and related fields. In the senior year, students may emphasize an area of interest by selecting from a broad range of electives, including a systems pair in communications, control, computers, power, medical instrumentation, or microwave/optics. The program seeks to produce an electrical engineer who can think analytically and creatively, work effectively, and communicate clearly with others. Electrical engineering graduates may enter industry in professional engineering work or pursue advanced studies in electrical engineering or a related field, such as biomedical engineering. They may also use their electrical engineering background as the basis for further study in a different field such as law or medicine.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Electrical Engineering** (129 credit minimum)

FIRST YEAR

1st Semester

	Chem 125	General Chemistry I (3-0-3)
† *	FED 101	Fundamentals of Engineering Design (0-2.25-1)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	CIS 113	Introduction to Computer Science I (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	ECE 101	Introduction to Electrical and Computer Engineering (1-0-0)

	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	ECE 231	Circuits and Systems I (3-1-3)
	ECE 251	Digital Design (3-1-3)
	Math 213	Calculus III B (4-0-4)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Phys 234	Physics III (3-0-3)

2nd Semester

	ECE 232	Circuits and Systems II (3-1-3)
	ECE 271	Electronic Circuits I (3-1-3)
	ECE 291	Electrical Engineering Laboratory I (0-3-1)
	ECE 252	Microprocessor (3-0-3)
‡	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 222	Differential Equations (4-0-4)

THIRD YEAR

1st Semester

	ECE 333	Signals and Systems (3-0-3)
	ECE 361	Electromagnetic Fields I (2-0-2)
	ECE 372	Electronic Circuits II (3-0-3)
	ECE 392	Electrical Engineering Laboratory II (1-2-2)
	Mech 320	Statics and Mechanics of Materials (3-0-3)
‡	SS 201	Economics (3-0-3)

2nd Semester

	ECE 321	Random Signals and Noise (3-0-3)
	ECE 362	Electromagnetic Fields II (3-0-3)
	ECE 373	Electronic Circuits III (3-0-3)
	ECE 395	Microprocessor Laboratory (0-4-2)
	Elective	(Open: GUR) (3-0-3)
	Elective	(EE Track) (3-0-3)

FOURTH YEAR

1st Semester

	ECE 341	Energy Conversion (3-0-3)
	ECE 413	Introduction to Electrical Engineering Practice (1-0-1)
	ECE 494	Electrical Engineering Laboratory III (1-2-2)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(EE Core I) (3-0-3)
	Elective	(EE Track) (3-0-3)

2nd Semester

	EE 415	Electrical Engineering Project (1-2-2)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	Elective	(Mangement: GUR) (3-0-3)
	Elective	(EE Core II) (3-0-3)
	Elective	(EE Core Laboratory) (3-0-3)
	Elective	(EE Track) (3-0-3)

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* Half of the students will take these courses in reverse order. Transfer students should substitute EG 101 for FED 101C and FED 101D.

† FED 101D is taken concurrently with either HSS 100 or HSS 101.

Electives

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends that electrical Engineering majors take Phil 334 to fulfill this requirement.

‡ *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

EE Track: Students choose one of the following tracks: telecommunications, networking, computers, control, power, RF/microwave/fiber optics, solid state, or general. See advisor for appropriate courses.

EE Core and EE Core Laboratory: See advisor for appropriate courses.

Co-op

Co-op courses bearing degree credit replace an elective or another course approved by the faculty advisor in the student's major department. In electrical engineering, ECE 310 is taken for additive credit, and ECE 410 is taken for degree credit.

Undergraduate - Engineering Science

Administered By: Office of the Dean, Newark College of Engineering

Administration

Program Director and Graduate Advisor	David Kristol, Phone: (973) 596-3584 (Room 330 COL) Email: kristol@njit.edu

Faculty

Professors from Newark College of Engineering and College of Science and Liberal Arts, as appropriate

The complexity of modern engineering, physical and life sciences problems often requires a team effort that can involve professionals from several other disciplines. For students interested in interdisciplinary problem solving, the engineering science programs offer challenging educational opportunities. The engineering science program is designed to prepare the student upon graduation to pursue advanced education in either graduate or professional school or to enter directly into the professional workforce. Students must consult with the program advisor before undertaking a course of study in any engineering science option.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2003 or Later. Students entering before that date may have a different program and should consult the program director to learn which curriculum applies.

■ **B.S. in Engineering Science Basic Program** (136 credit minimum) A minimum of 136 credits is required for the B.S. in Engineering Science. Of those 136 credits, at least 30 credits are in an option. Approval from the director is required prior to admission to the program.

Options consist of advanced undergraduate courses that show a progression in depth of knowledge in a given area of study, culminating with a senior project or undergraduate thesis. Option courses may be from different departments, but they must comprise a coherent program of study. Specific courses required by the engineering science curriculum may be counted among the 30 credits if appropriate. An option need not be one in which NJIT offers a B.S. degree.

Courses in biological sciences are available at the adjacent Newark Campus of Rutgers University. Students who demonstrate exceptional ability may choose from offerings at the graduate level at NJIT, Rutgers-Newark, or UMDNJ.

A minimum of 30 engineering credits is required for the degree.

OPTIONS

Engineering in combinations with courses in other Programs.

The following options are examples available to engineering science students. Other options may be formulated by individual students in consultation with the program advisor.

Materials Sciences and Engineering Provides a strong background in the principles underlying the development of novel engineering materials that will be needed for the advanced technologies of the future.

Premedicine/Pre-Dentistry/Pre-Optometry These options provide students with excellent preparation for medical, dental or optometric schools.

The general engineering science curriculum follows. The specific courses of study for any particular option will be developed with the approval of the program director.

FIRST YEAR
1st Semester

	Chem 125	General Chemistry I (3-0-3)
† *	FED 101C	Fundamentals of Engineering Design, CAD/Graphics Component (0-2.25-1)
† *	FED 101D	Fundamentals of Engineering Design, Design Component (0-2.25-1)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	Chem 124	General Chemistry Laboratory (0-2-1)
	Chem 126	General Chemistry II (3-0-3)
*	CIS 101	Computer Programming and Problem Solving (2-1-2)
**	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	Math 211	Calculus III A (3-0-3)
	Phys 231A	Physics III Laboratory (0-2-1)
	Phys 234	Physics III (3-0-3)
**	SS 201	Economics (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Science/Engineering) (3-0-3)

2nd Semester

	Math 222	Differential Equations (4-0-4)
	Mech 234	Engineering Mechanics (2-0-2)
		or
	Mech 236	Dynamics (2-0-2)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Science/Engineering) (3-0-3)
	Elective	(CIS) (3-0-3)

THIRD YEAR

1st Semester

	Math 333	Probability and Statistics (3-0-3)
	ME 435	Thermodynamics (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Science/Engineering) (3-0-3)
	Elective	(3-0-3)
	Elective	(3-0-3)

2nd Semester

	Elective	Lit/Phil/Hist/STS (3-0-3)
	Elective	(Mathematics) (3-0-3)
	Elective	(Science/Engineering) (3-0-3)
	Elective	Lit/Phil/Hist/STS (3-0-3)
	Elective	(3-0-3)
	Elective	(3-0-3)

FORTH YEAR

1st Semester

	ESC 491	Research and Independent Study I (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	Elective	(Engineering) (3-0-3)
	Elective	(Science/Engineering) (3-0-3)

Elective	(Science/Engineering) (3-0-3)
Elective	(3-0-3)

2nd Semester

Elective	(Management: GUR) (3-0-3)
Elective	(Science/Engineering) (3-0-3)
Elective	(3-0-3)
Elective	(3-0-3)
Elective	(3-0-3)

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* Half of the students will take these courses in reverse order. Transfer students should substitute EG 101 for FED 101C and FED 101D.

† FED 101D is taken concurrently with either HSS 100 or HSS 101.

Electives

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

** *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Refer to the General University Requirement section of this catalog for further information on electives.

Undergraduate - Engineering Technology

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

■ **B.S. in Engineering Technology**Engineering technology is that part of the technological field which requires the application of scientific and engineering knowledge and methods, combined with technical skills, for the implementation and extension of existing technologies. Engineering technology education focuses on preparing engineering technologists for positions that involve product development and improvement, system development, management, manufacturing and engineering operational functions. Graduates also enter the technical sales and customer services field, or continue in graduate work in engineering or management. Placement of graduates has been excellent.

The engineering technology program offers an opportunity for further education to persons who have completed an appropriate associate's degree program at a community college, technical institute, or similar institution or who have an equivalent education. The program can be completed in two years of full-time day study or four years of part-time evening study (normally three evenings per week), and hence is available to those employed full-time in industry. Students can enter the program at the beginning of the fall, spring, or summer terms. The university reserves the right to make changes in various curricula that will address accreditation requirements or strengthen the program.

The program provides advanced education in technical and management skills, together with selected humanities and social science electives. Students are able to specialize in construction, electrical and computer, manufacturing, mechanical, or surveying engineering technology, computer technology, construction management technology, and telecommunications management technology. The options in construction engineering technology, electrical and computer engineering technology, manufacturing engineering technology, mechanical engineering technology and surveying engineering technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC of ABET). The computer technology, the construction management technology, and the telecommunications management technology options are not yet accredited by TAC of ABET.

TRANSFERRING INTO ENGINEERING TECHNOLOGY For all options except Surveying Engineering Technology, the B.S. in Engineering Technology (B.S.E.T.) offers only the junior and senior years of study; all students transfer into the program as juniors. Usually students complete their freshman and sophomore years at a community college or technical institute, and obtain an associate's degree in applied science from these institutions. It is strongly recommended that students talk to an academic advisor at NJIT while they are still pursuing their associate's degree. The academic advisor will explain the transfer process in detail as well as suggest elective courses that may be beneficial. Contact an advisor by calling the Department of Engineering Technology at 973-596-3228, or by email at EngineeringTechnology@njitl.edu.

To be admitted, students normally need to have completed 64 credits of semester hours of appropriate lower division (i.e freshman and sophomore years) course work. All required courses must have been completed with a grade of C or better to be transferable, and up to 64 credits will be transferred to the lower division. After being admitted to NJIT, students must meet with an academic advisor to discuss the curriculum and any special interests the student might have. Students who lack necessary courses will be assigned bridge courses to make up the required prerequisites. Generally, courses taken at the freshman and sophomore level at the community colleges cannot substitute for junior or senior NJIT engineering technology courses.

Engineering technology students are expected to meet with their faculty advisor each semester to schedule courses and review their progress in the program. The advisor must approve all courses, including electives, prior to registration.

CURRICULA: *The curricula described here are for students transferring into NJIT in the Fall 2003 semester. Students entering at a different date may have a different program and should consult the department to learn which curriculum* *applies.*

Computer Technology (CT)

Construction Engineering Technology (CET)

Construction Management Technology (CMT)

Electrical and Computer Technology (ECET)

Manufacturing Engineering Technology (MNET)

Mechanical Engineering Technology (MET)

Surveying Engineering Technology (SET)

Telecommunications Management Technology (TMT)

APPENDIX

All Engineering Technology options require the same English and Humanities electives in the upper division (i.e. junior and senior year):

Open Elective in Humanities and Social Science GUR (General University Requirement): Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends telecommunications management technology option majors take Eng 352 to fulfill this requirement.

Lit/Hist/Phil/STS GUR:: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or a 300-level course at Rutgers-Newark, approved by the Humanities department.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403,HSS 404,HSS 405,HSS 406,HSS 407,HSS 408,HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Free Elective:: Consult the program coordinator. Students entering with fewer than 9 credits in humanities/social science must take an appropriate humanities/social science course to fulfill the NJIT GUR. Consult the program coordinator.

Co-op: Engineering Technology students are encouraged to take an NJIT co-op course and receive degree credit as a technical elective under the following conditions: (1) the co-op employment is obtained through the NJIT co-op office and (2) this employment has no relation to any current or previous employment of the student. The student may not take more than one course concurrently with the co-op experience and, in all cases, the co-op experience must be approved by the co-op advisor for the student's program. An additional co-op experience may be taken for additive credit but not degree credit.

Undergraduate - Computer Technology (CPT/CMPT)

Administered By: Department of Engineering Technology

Administration

Chairperson	Robert English
Coordinator	Marie-Thérèse A. Daulard
Contact	e-mail: daulard@adm.njit.edu

■ B.S. in Engineering Technology, Computer Technology Option

Computer Technology is one of the eight major options offered by the department of Engineering Technology. It is an interdisciplinary program which combines courses mainly in Engineering Technology, Computer Science and Management. The program also provides a background in mathematics and science which is sufficient to allow students to go on to graduate school. It is designed as a continuation of an associate's degree program in computer science, computer programming, computer networking, or computer software. This program prepares the student for careers as computer application programmer, database administrator, computer system manager, computer network manager, software specialist, Management Information Systems (MIS) manager, customer support engineer, computer sales representative or educator and trainer in the field of computer applications.

Prerequisites:

Students who transfer to the junior year of the Bachelor of Science in Engineering Technology program, specializing in Computer Technology, are expected to have completed their freshman and sophomore years at a community college or similar institution and received their associate's degree in a program of computer studies (i.e. computer science, computer technology, computer software, computer programming, computer networking, etc). Students who have an equivalent associate's degree in science, or in various fields of engineering, are also eligible.

In order to be admitted, they should have successfully completed most of the following courses or their equivalent in their first two years of study, with about 64 semester credit hours:

General Requirements:

Calculus I/Unified Calculus/Calculus for Business	3/4 credits
Science such as biology, botany, chemistry, geology, physics	4 credits
Humanities/Social Science/Psychology/Political Science	3 credits
Communications/English Composition	6 credits
Accounting/Economics/Business	3 credits
Physical Education	2 credits

Computer Requirements: 24 credits including:

Introduction to Programming (C++)	3 credits
Data Structures/Advanced High Level Language Programming	3 credits
Computer Architecture/Assembler/Computer System Development	3 credits
Operating Systems (DOS, Windows, UNIX)	3 credits
Database Concepts (Access, dBase, Oracle)	3 credits

Curriculum:

Computer Technology Option (66 credits):

JUNIOR YEAR

1st Semester

CPT 310	Computer Design Fundamentals for Computer Technology (2-2-3)
CPT 330	Software Web Applications for Engineering Technology I (2-2-3)
CPT 341	Visual Basic .NET for Engineering Technology (2-2-3)
Math 112	Calculus II (4-1-4)
	or
Math 346	Mathematics of Finance (3-0-3)
ENG 352	Technical Writing (3-0-3)
MIS 345	Management of Information Systems (3-0-3)

2nd Semester

CPT 335	Networks Applications for Computer Technology I (2-2-3)
CPT 315	Computer Architecture for Engineering Technology (2-2-3)
MATH 305	Statistics for Technology (3-0-3)
MNET 416	Production Scheduling (3-0-3)
	or
MRKT 330	Principle of Marketing (3-0-3)
MNET 414	Industrial Cost Analysis (3-0-3)
	or
FIN 315	Principles of Financial Management (3-0-3)
Elective	(Humanities (Lit/Hist/Phil/STS)) (3-0-3)

SENIOR YEAR

1st Semester

CPT 401	Senior Project/Co-op (0-4-2)
CPT 430	Software Web Applications for Engineering Technology II (2-2-3)
CPT 440	Visual Basic Applications for Engineering Technology (2-2-3)
MGMT 480	Managing in a Technological Environment (3-0-3)
	or
MRKT 360	Internet Marketing(E-Marketing) (3-0-3)
OM 375	Management Science (3-0-3)
Elective	(Capstone Seminar in Humanities and Social Science) (3-0-3)

2nd Semester

CPT 435	Networks Applications for Computer Technology II (2-2-3)
CPT 450	Computer Graphics (2-2-3)
Elective	(Technical: Science course in Physics or Chemistry) (3-0-3)
Elective	(Free) (3-0-3)

NOTE

To obtain a minor in management you must take the following courses

ACCT 115	Principles of Accounting I (3-0-3)
ACCT 116	Principles of Accounting II (3-0-3)
	or
ACCT 515	Accounting for Managerial Control (3-0-3)
FIN 315	Principles of Financial Management (3-0-3)
MIS 246	Microcomputer Applications for Managers (3-0-3)
	or
MIS 345	Management of Information Systems (3-0-3)
MRKT 330	Principles of Marketing (3-0-3)
MGMT 190	Industrial Organization and Management (3-0-3)
	or
OM 375	Management Science (3-0-3)

All these courses, except accounting, are built into the Computer Technology Program.

Undergraduate - Construction Engineering Technology (CET)

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

The construction engineering technology option is a program specializing in general contracting, heavy/highway and building construction, mechanical and electrical contracting and consulting. It prepares the student for a career in construction as a general contractor, project manager, safety specialist, estimator, scheduler, structural designer, temporary structures and concrete formwork designer, and many other positions whose duties and responsibilities ensure that construction projects are completed on-time, on-budget and of the desired quality. This option is accredited by TAC of ABET.

Typical Civil/Construction Engineering Technology AAS Program students who expect to transfer to the junior year of the B.S.E.T. program should have successfully completed most of the following courses or their equivalent in their first two years of study.

A minimum of 64 semester hour credits is required in:

- Communications
- College Algebra and Trigonometry
- Unified Calculus
- Physics I and II
- Computer Programming or Applications
- Engineering Graphics/CAD
- Mechanics or Statics
- Social Science/Humanities
- Surveying I and II
- Strength of Materials
- Fluid Mechanics/Hydraulics
- Steel/Concrete Design
- Soil Mechanics
- Physical Education

Construction Engineering Technology Option: (69 credits)

JUNIOR YEAR

1st Semester

CET 313	Construction Procedures I (3-0-3)
CET 317	Construction Computing (3-0-3)
CET 322	Construction Regulations and Standards (3-0-3)
Math 305	Statistics for Technology (3-0-3)
Elective	(Open: GUR) (3-0-3)

2nd Semester

CET 314	Construction Procedures II (3-0-3)
CET 331	Structural Systems (3-3-4)
Mgmt 390	Principles of Management (3-0-3)
Elective	(Technical) (3-0-3)

*	Elective	(Free) (3-0-3)

SENIOR YEAR

1st Semester

CET 411	Cost Estimating (3-0-3)
CET 415	Construction Project Management (3-0-3)
CET 421	Construction Contracts (3-0-3)
CET 431	Construction Testing (2-2-3)
CET 450	Mechanical and Electrical Systems I (3-3-4)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

2nd Semester

CET 413	Environmental Science (3-3-4)
CET 416	Senior Construction Project (1-2-2)
CET 435	Design of Temporary Structures (3-3-4)
MNET 414	Industrial Cost Analysis (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Technical) (3-0-3)

Electives

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends engineering technology option majors takeEng 352 to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

* *Free:* Consult the program coordinator. Students entering with fewer than 9 credits in humanities/social science must take an appropriate humanities/social science course to fulfill the NJIT GUR. Consult your program coordinator.

Suggested Technical Electives:

CE 342	Geology (3-0-3)
CE 350	Transportation Engineering (3-0-3)
CET 441	Soils and Earthwork (3-0-3)
CET 490	Senior Project (3-0-3)
CET 492	Special Project (2-0-2)
Chem 301	Chemical Technology (2-2-3)
ET 370	Technical Product Selling (3-0-3)
MET 303	Applied Thermodynamics (3-0-3)
MET 404	Applied Heat Transfer (2-2-3)
MtSc 311	Properties of Materials (3-0-3)

Co-op

A co-op course must be approved by the faculty advisor. For the B.S.E.T. option in construction, CET 497 is taken for degree credit.

Undergraduate - Construction Management Technology (CMT)

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

The construction management technology option is a program specializing in general contracting, heavy/highway and building construction, mechanical and electrical contracting, and construction management. It prepares the holder of an associate's degree for a career in construction as a general contractor, construction executive, project manager, job superintendent, construction manager, estimator, expiditor, and many other managerial positions whose duties and responsibilities ensure that construction projects are completed on-time, on-budget and of the desired quality. This option is not yet accredited by TAC of ABET.

Typical Technology AAS Program students or other students who expect to transfer to the junior year of the B.S.E.T. program should have successfully completed most of the following courses or their equivalent.

A minimum of 64 semester hour credits is required in:

- Communications
- College Algebra and Trigonometry
- Calculus I or Chemistry I and II
- Physics I and II
- Computer Programming or Applications
- Engineering Graphics
- CAD
- Social Science/Humanities
- Surveying I
- Physical Education

Junior and Senior Year Curriculum: (68 credits)

JUNIOR YEAR

1st Semester

	CET 313	Construction Procedures I (3-0-3)
	CET 317	Construction Computing (3-0-3)
	CET 322	Construction Regulations and Standards (3-0-3)
	Math 305	Statistics for Technology (3-0-3)
	Elective	(Open: GUR) (3-0-3)

2nd Semester

	CET 314	Construction Procedures II (3-0-3)
	CET 332	Structural Systems for Construction (3-0-3)
	HRM 305	Supervision and Employee Relations (3-0-3)
	Mgmt 390	Principles of Management (3-0-3)
	Elective	(Technical) (3-0-3)
*	Elective	(Free) (3-0-3)

SENIOR YEAR

1st Semester

CET 411	Cost Estimating (3-0-3)
CET 415	Construction Project Management (3-0-3)
CET 421	Construction Contracts (3-0-3)
CET 431	Construction Testing (2-2-3)
CMT 452	Mechanical and Electrical Systems for Construction (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

2nd Semester

CET 416	Senior Construction Project (1-2-2)
CMT 414	Environmental Science for Construction (3-0-3)
CMT 436	Temporary Structures for Construction (3-0-3)
MNET 414	Industrial Cost Analysis (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Management) (3-0-3)

Electives

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends engineering technology option majors takeEng 352 to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

* *Free:* Consult the program coordinator. Students entering with fewer than 9 credits in humanities/social science must take an appropriate humanities/social science course to fulfill the NJIT GUR. Consult your program coordinator.

Suggested Technical Electives:

CET 490	Senior Project (3-0-3)
CET 492	Special Project (2-0-2)
MtSc 311	Properties of Materials (3-0-3)
ET 370	Technical Product Selling (3-0-3)

Suggested Management Electives:

Acct 115	Principles of Accounting (3-0-3)
CIS 103	Computer Science with Business Problems (2-2-3)
HRM 303	Human Resources Management (3-0-3)
HRM 310	Managing Diversity in Organizations (3-0-3)
HRM 311	Job and Work Environments (3-0-3)
Mgmt 480	Managing in a Technological Environment (3-0-3)
Mgmt 492	Business Policy (3-0-3)

Co-op

A co-op course must be approved by the faculty advisor. For the B.S.E.T. option in construction, CET 497 is taken for degree credit.

Undergraduate - Electrical and Computer Engineering Technology (ECET)

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

The electrical and computer engineering technology (ECET) option is designed as a continuation of an associate's degree program in electrical/electronics or computer engineering technology. The program emphasizes the application of electrical electronics principles and devices and computer hardware and software. Graduates of the ECET program are involved in product development and improvement, system development, management, manufacturing and engineering operational functions, in a wide variety of companies in the computer, telecommunications, medical electronics and other technical fields. Graduates also have positions in technical sales and customer service, and a significant percentage continue their studies and earn graduate degrees in engineering or management. The placement of graduating students has been excellent.

Typical Electrical/Electronics or Computer Engineering Technology AAS Program students who expect to transfer to the junior year of the B.S.E.T. program should have successfully completed most of the following courses or equivalent in their first two years of study.

A minimum of 64 semester hour credits is required in:

- Oral and Written Communications
- College Algebra and Trigonometry
- Unified Or Applied Calculus
- Physics I and II
- Computer Programming or Applications
- Social Science/Humanities
- DC Circuits
- AC Circuits
- Semiconductor Electronics I and II
- Digital Logic Circuits
- Introduction to Microprocessors
- Physical Education

Junior and Senior Year Curriculum: (66 credits)

Students may select one of four concentrations offered within the electrical and computer engineering technology curriculum: general, computer systems, telecommunications, and biomedical. These concentrations prepare students with the skills required for a particular technology area. The ECET program is accredited by TAC of ABET and all of the concentrations meet the requirements of TAC of ABET. On entering NJIT, the student is not required to immediately select a concentration and changing from one concentration to another is not difficult. Note: A semester-by-semester schedule of courses for the four concentrations is available. The student will receive this schedule during advisement.

CORE CURRICULUM: (54 credits)
Take all of the following:

Chem 301	Chemical Technology (2-2-3)
ECET 300	Circuit Analysis-Transform Methods (3-0-3)

	ECET 303	Circuit Measurements (1-3-2)
	ECET 305	Integrated Circuit Applications (2-2-3)
	ECET 310	Microprocessors I (2-2-3)
	ECET 344	Numerical Computing for Engineering Technology (2-2-3)
	ECET 365	Digital Logic and Circuit Design (3-0-3)
	ECET 401	ECET Senior Project I (2-0-2)
	ECET 402	ECET Senior Project II (0-2-1)
	ECET 410	Microprocessors II (2-2-3)
	Math 305	Statistics for Technology (3-0-3)
	Math 309	Math Analysis for Technology (4-0-4)
	Math 322	Differential Equations for Technology (3-0-3)
	Mgmt 390	Principles of Management (3-0-3)
	MNET 414	Industrial Cost Analysis (3-0-3)
	Elective	(Open: GUR) (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
*	Elective	(Free) (3-0-3)

CONCENTRATIONS:

General Electronics: (12 credits)-An ECET curriculum that allows for flexibility in terms of technical electives.

ECET 350	Computerized Industrial Control System (3-2-3)
Elective	(Technical) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Technical) (3-0-3)

Biomedical: (13 credits)-Designed for students wishing to work in companies manufacturing medical instrumentation or in clinical engineering departments of hospitals.

BME 301	Introduction to Biomedical Engineering I (1-3-4)
BME 302	Introduction to Biomedical Engineering II (3-0-3)
ECET 314	Communication Systems (2-2-3)
ECET 440	Clinical Internship (3-0-3)

Telecommunications: (12 credits)-Includes courses in general telecommunications as well as specialties for those wishing to work in the various telecommunications-oriented industries.

ECET 314	Communication Systems (2-2-3)
ECET 415	Fundamentals of Telecommunications (2-2-3)
ECET 416	Networking Applications (2-2-3)
ECET 418	Transmission Systems (2-2-3)

Computer Systems: (12 credits)-Offers a balance of hardware and software and is designed for those wishing to work in the various computer-oriented industries.

CIS 332	Principles of Operating Systems (3-1-3)
ECET 416	Networking Applications (2-2-3)
ECET 444	Design Methods for Real-Time Applications (2-2-3)
Elective	(Technical) (3-0-3)

Electives

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends engineering technology option majors takeEng 352 to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

* *Free:* Consult the program coordinator. Students entering with fewer than 9 credits in humanities/social science must take an appropriate humanities/social science course to fulfill the NJIT GUR. Consult your program coordinator.

Suggested Technical Electives (students in one concentration may take courses from another concentration as technical electives):

CPT 340	Visual Basic Technology (2-2-3)
ECET 314	Communication Systems (2-2-3)
ECET 344	Numerical Computing for Engineering Technology (2-2-3)
ECET 350	Computerized Industrial Control System (2-2-3)
ECET 395	Co-op Work Experience I (3 degree credits)
ECET 412	Power Generation and Distribution (3-0-3)
ECET 415	Fundamentals of Telecommunications (2-2-3)
ECET 491	Special Projects in ECET (1 credit)
ECET 492	Special Projects in ECET (2 credits)
ECET 493	Special Projects in ECET (3 credits)
MET 303	Applied Thermodynamics (3-0-3)
MNET 420	Quality Systems (2-2-3)

Co-op

Co-op courses must be approved by the faculty advisor in the student's major department. For the B.S.E.T. option in electrical and computer engineering technology, ECET 395may be taken as a technical elective andECET 495may be taken as additive credit.

Undergraduate - Manufacturing Engineering Technology (MNET)

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

The manufacturing option is a broad program emphasizing the quantitative methods of manufacturing and production management. It prepares the holder of an associate's degree in an appropriate field of technology for work in quality control, work measurement, reliability, cost analysis, CAD/CAM, plant layout, CNC, materials handling, and supervision.

Typical Manufacturing Engineering Technology AAS Program students who expect to transfer to the junior year of the B.S.E.T program should have successfully completed most of the following courses or equivalent in their first two years of study.

A minimum of 64 semester hour credits is required in:

Communications
College Algebra and Trigonometry
Unified Calculus
Physics I and II/Chemistry
Computer Programming or Applications
Engineering Graphics
Social Science/Humanities
Computer-Aided Drafting
Mechanisms and Machines
Surveying I
Manufacturing Processes
Automated Manufacturing
Electricity/Electronics
Physical Education

Junior and Senior Year Curricuum: (66 credits)

JUNIOR YEAR

1st Semester

	Math 309	Mathematical Analysis for Technology (4-0-4)
	MNET 300	Concepts in Machining (2-4-4)
	MNET 315	Industrial Statistics (2-2-3)
	MNET 414	Industrial Cost Analysis (3-0-3)
	Elective	(Open: GUR) (3-0-3)

2nd Semester

	Chem 301	Chemical Technology (2-2-3)
	ECET 329	Analog and Digital Electronics (2-2-3)
	MNET 303	Advanced Techniques in CAD/CAM (2-2-3)
	MNET 318	Manufacturing Process Design (2-2-3)
	MNET 420	Quality Control (2-2-3)
	Elective	(Free) (3-0-3)
*	Elective	(Free) (3-0-3)

SENIOR YEAR

1st Semester

MET 303	Applied Thermodynamics (3-0-3)
Mgmt 390	Principles of Management (3-0-3)
MNET 405	Numerical Control for Machine Tools (2-2-3)
MNET 416	Production Scheduling (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
Elective	(Technical) (3-0-3)

2nd Semester

MET 304	Applied Fluid Mechanics (2-2-3)
MNET 422	Tool Design (2-2-3)
MNET 424	Facilities Planning (1-2-2)
MNET 426	Manufacturing Project (1-3-2)
Elective	(Capstone Seminar: GUR) (3-0-3)

Electives

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends engineering technology option majors takeEng 352 to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

* *Free:* Consult the program coordinator. Students entering with fewer than 9 credits in humanities/social science must take an appropriate humanities/social science course to fulfill the NJIT GUR. Consult your program coordinator.

Suggested Technical Electives:

Chem 301	Chemical Technology (2-2-3)
IE 449	Industrial Robotics (2-2-3)
IE 473	Safety Engineering (3-0-3)
IE 445	Industrial Simulation (2-2-3)
MET 307	Plastics Technology (2-2-3)
MNET 395	Co-op Work Experience I (3-0-3)
MNET 423	Motion and Time Study Techniques (2-2-3)

Co-op

Co-op courses must be approved by the faculty advisor in the student's major department. For the B.S.E.T. option in manufacturing engineering technology,MNET 395 is taken as an elective for degree credit andMNET 495may be taken as additive credit.

Undergraduate - Mechanical Engineering Technology (MET)

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

The mechanical engineering technology (MET) program offers an opportunity for further education to students who have completed an associate's degree in mechanical engineering technology at a community college, technical institute, or who have an equivalent education.

In addition to the mandatory courses as specified in the MET program, the student must take at least two cohesive electives from the approved list of MET electives.

Typical Mechanical Engineering Technology AAS Program students who expect to transfer to the junior year of the B.S.E.T. program should have successfully completed most of the following courses or equivalent in their first two years of study.

A minimum of 64 semester hour credits is required in:

- Communications
- College Algebra and Trigonometry
- Unified Calculus
- Physics I and II/Chemistry
- Computer Programming or Applications
- Engineering Graphics
- Mechanics I and II (Statics and Dynamics)
- Social Science/Humanities
- Strength of Materials with Lab
- Kinematics/Mechanisms
- DC/AC Circuits
- Metallurgy
- Manufacturing Processes
- Computer-Aided Drafting
- Physical Education

Mechanical Engineering Technology Option : (64 credits)

JUNIOR YEAR

1st Semester

Math 309	Mathematical Analysis for Technology (4-0-4)
MET 301	Analysis and Design of Machine Elements I (2-2-3)
MET 303	Applied Thermodynamics (3-0-3)
MET 314	Dynamics of Machinery (2-2-3)
Elective	(Open: GUR) (3-0-3)

2nd Semester

Chem 301	Chemical Technology (2-2-3)
ECET 329	Analog and Digital Electronics (2-2-3)
MET 302	Analysis and Design of Machine Elements II (3-0-3)

	MET 304	Applied Fluid Mechanics (2-2-3)
*	Elective	(Free) (3-0-3)

SENIOR YEAR

1st Semester

	MET 401	Mechanical Design Project I (2-0-2)
	MET 415	Automatic Control Systems (2-2-3)
	MNET 414	Industrial Cost Analysis (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
**	Elective	(Technical) (3-0-3)
	Elective	(Technical) (3-0-3)

2nd Semester

MET 448	Mechanical Design Project II (0-2-1)
Mgmt 390	Principles of Management (3-0-3)
MNET 315	Industrial Statistics (2-2-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Technical) (2-2-3)
Elective	(Technical) (2-2-3)

Electives

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends engineering technology option majors takeEng 352 to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

* *Free:* Consult the program coordinator. Students entering with fewer than 9 credits in humanities/social science must take an appropriate humanities/social science course to fulfill the NJIT GUR.

** Computer programming or applications course.

Suggested Technical Electives:

CPT 330	Software Web Applications for Engineering Technology I (2-2-3)
CPT 340	Visual Basic for Engineering Technology (2-2-3)
MET 307	Plastics Technology (2-2-3)
MET 308	Plastics Processing Techniques (2-2-3)
MET 395	Co-op Work Experience I (3-0-3)
MET 403	Applied Thermodynamics II (2-2-3)
MET 404	Applied Heat Transfer (2-2-3)
MET 407	Structural Design (2-2-3)
MET 409	Air Conditioning and Refrigeration (2-2-3)
MET 495	Co-op Work Experience II (3-0-3)
MNET 300	Concepts in Machining (2-4-4)
MNET 303	Advanced Techniques in CAD/CAM (2-2-3)
MNET 420	Quality Systems (2-2-3)

Co-op

A co-op course must be approved by the faculty advisor. For the B.S.E.T. option in mechanical engineering technology,MET 395is taken as an elective for degree credit andMET 495may be taken as additive credit.

Undergraduate - Surveying Engineering Technology (SET)

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

Surveying involves activities such as mapping the earth above and below sea level; establishing property boundaries of private and public lands; providing information necessary for the construction of private and public works; establishing large-scale land information systems; determining facts about the size, shape and gravity field of the earth; and conducting high precision measurements for worldwide control networks and for industrial applications and scientific studies. The surveyor utilizes a wide variety of techniques and equipment on the job. Some of the equipment is terrestrial-based, other equipment is air- and space-borne.

The surveying engineering technology curriculum stresses the technical, theoretical and legal aspects of surveying. Technical surveying courses include theory and application of Global Positon Systems (GPS) and Geographic Information systems (GIS). law or law-related courses are integrated into the program in order to impart to students the legal knowledge and legal responsibility of a land surveyor. Typical Surveying Engineering Technology AAS Program students who expect to transfer to the junior year of the B.S.E.T. program should successfully complete most of the following courses or equivalent in their first two years of study.

B.S. in Surveying Engineering Technology

Information Concentration

FIRST YEAR:
1st Semester

IT 101	Introduction to Information Technology (3-0-3)
CIS 113/A	Introduction to Computer Science (3-1-3)
HSS 101	English: Writing , Speaking, Thinking (3-0-3)
Math 111	Calculus I (4-0-4)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

CE 200	Surveying (3-0-3)
CE 200A	Surveying Laboratory (0-3-1)
FED 101	Fundamentals of Engineering Designs (1-2-2)
CIS 114/A	Introduction to Computer Science (3-1-3)
Math 112	Calculus II (4-0-4)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)

SECOND YEAR:
1st Semester

SET 301	Route Surveying (3-3-4)
Mgmt 290	Legal Environment of Business (3-0-3)

HSS 202	Society, Technology and Environment (3-0-3)
Elective	Math (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

SET 207	Evidence and Procedures for Property Surveys (3-0-3)
CE 260	Civil Engineering Methods (3-0-3)
Math 305	Statistics for Technology (3-0-3)
SS 201	Economics (2-0-2)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

THIRD YEAR:
1st Semester

SET 304	Adjustment Computation (4-0-4)
SET 307	Boundaries and Adjacent Properties (3-3-4)
CE 321	Water Resources Engineering (3-0-3)
CIS 431	Database System Design and Management (3-0-3)
Elective	Communication (3-0-3)

2nd Semester

SET 407	Boundary Line Analysis (3-0-3)
SET 404	Adjustment Computation II (3-0-3)
SET 420	Geographic/Land Information Systems (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
Elective	Science (3-0-3)

FOURTH YEAR:
1st Semester

SET 302	GPS and Geodetric Control (3-3-4)
SET 303	Photogrammetry and Aerial Photo Interpretation (3-3-4)
Elective	Technical/Engineering (3-0-3)
Elective	(Open: GUR) (3-0-3)

2nd Semester

SET 401	Fundamentals of Geodesy (3-0-3)
SET 440	Land Development (2-3-3)
SET 490	Senior Project in Surveying (2-0-2)
Elective	(Management: GUR) (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)

B.S. in Surveying Engineering Technology

FIRST YEAR:
1st Semester

IT 101	Introduction to Information Technology (3-0-3)
CIS 113/A	Introduction to Computer Science (3-1-3)
HSS 101	English: Writing , Speaking, Thinking (3-0-3)
Math 111	Calculus I (4-0-4)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

CE 200	Surveying (3-0-3)
CE 200A	Surveying Laboratory (0-3-1)
FED 101	Fundamentals of Engineering Designs (1-2-2)

HSS 202	Society, Technology, and Environment (3-1-3)
Math 112	Calculus II (4-0-4)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)

SECOND YEAR:

1st Semester

SET 301	Route Surveying (3-3-4)
Mgmt 290	Legal Environment of Business (3-0-3)
Elective	Technical/Engineering (3-0-3)
Elective	Math (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

SET 207	Evidence and Procedures for Property Surveys (3-0-3)
CE 260	Civil Engineering Methods (3-0-3)
Math 305	Statistics for Technology (3-0-3)
SS 201	Economics (2-0-2)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

THIRD YEAR:

1st Semester

SET 304	Adjustment Computation (4-0-4)
SET 307	Boundaries and Adjacent Properties (3-3-4)
CE 321	Water Resources Engineering (3-0-3)
CIS 431	Technical/Engineering (3-0-3)
Elective	Communication (3-0-3)

2nd Semester

SET 407	Boundary Line Analysis (3-0-3)
SET 404	Adjustment Computation II (3-0-3)
SET 420	Geographic/Land Information Systems (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
Elective	Science (3-0-3)

FOURTH YEAR:

1st Semester

SET 302	GPS and Geodetic Control (3-3-4)
SET 303	Photogrammetry and Aerial Photo Interpretation (3-3-4)
Elective	Technical/Engineering (3-0-3)
Elective	(Open: GUR) (3-0-3)

2nd Semester

SET 401	Fundamentals of Geodesy (3-0-3)
SET 440	Land Development (2-3-3)
SET 490	Senior Project in Surveying (2-0-2)
Elective	(Management: GUR) (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)

Undergraduate - Telecommunications Management Technology (TMT)

Administered By: Department of Engineering Technology, 973-596-3228, email: engineeringtechnology@njit.edu

Administration

Chairperson	Robert English

Faculty

Professor	Robert English
Associate Professors	William Barnes, Philip Fabiano, Michael Khader, Ronald Rockland, Airjit Sengupta, Benedict Sun
Assistant Professors	Thomas Juliano, David Washington
Special Lecturers	Marie-Therese Daulard, James Miller, John Wiggins

The objective of this option is to provide students with the skills required to work with, administer and manage telecommunications networks and systems. Graduates of this program will have the technical knowledge to design, implement and procure telecommunications networks and the management skills to maximize the financial returns on these systems. This option prepares the student for such careers as telecommunications manager, network administrator, telecommunications sales representative, e-commerce developer and customer support representative.

The coursework provides the technical background to understand the underlying network architecture, protocols, and technology with a special emphasis on case studies and industrial implementations. The benefit/cost analysis of these networks and their impact on the business environment is studied in depth. This option is not yet accredited by TAC of ABET.

Typical Technology AAS Program students or other students (business majors, etc.) who expect to transfer to the junior year of the B.S.E.T. program should have successfully completed most of the following courses or equivalent in their first two years of study.

A minimum of 67 semester hour credits is required:

- Oral and Written Communications
- College Algebra and Trigonometry
- Unified Calculus
- Physical Science
- Computer Programming
- Social Science/Humanities
- Technology
- Physical Education

Junior and Senior Year Curriculum(66 credits)

JUNIOR YEAR:

1st Semester

Acct 115	Principles of Accounting I (3-0-3)
ECET 319	Electrical Systems and Power (2-2-3)
Mgmt 390	Principles of Management (3-0-3)
Math 305	Statistics for Technology (3-0-3)
TMT 301	Digital Electronics for Telecommunications (2-2-3)
Elective	(Open: GUR) (3-0-3)

2nd Semester

ECET 344	Numerical Computing for Engineering Technology (2-2-3)
ECET 415	Fundementals of Telecommunications (2-2-3)
Elective	(Free) (3-0-3)
Elective	(Marketing/Management) (3-0-3)

SENIOR YEAR:

1st Semester

CPT 340	Visual Basic for Engineering Technology (2-2-3)
	or
ECET 444	Design Methods for Real-Time Applications (2-2-3)
ECET 401	Senior Project I (2-0-2)
ECET 416	Networking Applications (2-2-3)
Mgmt 480	Managing in a Technological Environment (3-0-3)
MNET 414	Industrial Cost Analysis (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

2nd Semester

ECET 402	Senior Project II (0-2-1)
ECET 418	Transmission Systems (2-2-3)
ET 370	Technical Selling (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Marketing/Management) (3-0-3)
Elective	(Technical) (3-0-3)

Electives

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends engineering technology option majors takeEng 352 to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Economics/Management: See the advisor.

Free: Consult the program coordinator. Students entering with fewer than 9 credits in humanities/social science must take an appropriate humanities/social science course to fulfill the NJIT GUR.

Marketing/Management: Any 300- to 400-level Mgmt or Mrkt course.

Technical: Any 300- or 400-level ECET or CIS course.

Undergraduate - Environmental Engineering

Administered By: Department of Civil and Environmental Engineering

Administration

Chairperson	John Schuring

Faculty

Professors	Chan, Dresnack, Golub, Hsieh
Associate Professors	Axe, Ding, Marhaba, Olenik
Graduate Advisor	Hsin-Neng Hsieh, Phone: (973) 596-5859 (Room 219 COL) Email: hsieh@njit.edu

The Bachelor of Science (B.S.) in Environmental Engineering program is intended for students who have a strong interest in environmental issues and environmental engineering. The B.S. in Environmental Engineering closely parallels the traditional undergraduate engineering programs for the first two years. In the last two years students have the opportunity to major in the water quality option or the physical and chemical treatment processes option. Courses in both options include such diverse areas as noise, air, and solid waste pollution control; public health engineering; mass and energy transport; fluid mechanics; and water resource engineering. Graduates will be prepared to enter the workforce with a broad-based understanding of environmental engineering issues and a well defined specialty area. This program is in development and is expected to start in fall 2001.

Graduates of the program are sought by private consulting firms, as well as the industrial and corporate sectors to evaluate environmental impacts and design environmental control systems. Environmental engineers are also employed by regulatory agencies at the local, county, state, and federal levels where they oversee compliance with environmental standards and preservation of the environment. Those wishing to pursue additional education can pursue M.S. and Ph.D. degrees in environmental engineering, or they may consider graduate programs in law, business, or health related fields.

The first two years of the curriculum provide a series of basic science, mathematics and engineering science courses to prepare the student for environmental study. The last two years include courses in various disciplines such as physical and chemical processes, air pollution, noise control, public health, and pollution prevention and waste minimization. The curriculum is computer intensive and includes a number of laboratory courses that reinforce concepts and principles taught in the classroom.

■ **B.S in Environmental Engineering** (130 Credits)

FIRST YEAR

1st Semester

	Chem 125	General Chemistry I (3-0-3)
	FED 101C	Fundamentals of Engineering Design, CAD/Graphics Component (0-2.25-1)
	FED 101D	Fundamentals of Engineering Design, Design Component (0-2.25-1)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (1-0-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	Chem 126	General Chemistry II (3-0-3)
	Chem 124	General Chemistry Laboratory (0-2-1)
	CIS 101	Computer Programming and Problem Solving (2-1-2)
*	Elective	Culture History:GUR (3-0-3)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	R120:473	Ecology of Microorganisms (3-0-3)
	ChE 221	Material Balance (4-0-4)
	Math 211	Calculus III (3-0-3)
	Math 225	Survey of Prob. & Stats. (1-0-1)
	Mech 234	Engineering Mechanics (2-0-2)
**	HSS	Basic SS Requirement (3-0-3)

2nd Semester

	EnE 262	Intro. to Env. Engineering (3-0-3)
	Chem 360	Environmental Chemistry (3-0-3)
*	Elective	Cultural History:GUR (3-0-3)
	Math 222	Differential Equations (4-0-4)
	Mech 236	Dynamics (2-0-2)

THIRD YEAR

1st Semester

ChE 232	Engineering Thermodynamics (3-0-3)
CE 320	Fluid Mechanics (4-0-4)
CE 321	Water Resources Engineering (3-0-3)
CE 320A	Hydraulics Laboratory (0-3-1)
EnE 361	Solid and Hazardous Waste Engr. (3-0-3)
HSS Elective	(Lit/Hist/Phil/STS) - 300 Level (3-0-3)

2nd Semester

EnE 360	Water & Wastewater Treat. Eng (3-0-3)
EnE 363	Unit Operations (1-3-2)
CE 342	Geology (3-0-3)
SS 201	Economics (3-0-3)
IE 492	Engineering Management (3-0-3)
ChE 461	Fate and Transport of Pollutants in the Environment (3-0-3)

FOURTH YEAR

1st Semester

CE 501	Intro. To Soil Behavior (3-1-3)
Elective	Specialty Area (3-0-3)
CE 494	Senior Design I (3-0-3)
HSS Elective	Open Elective 300 level (3-0-3)
R120:470	Field Ecology (3-0-3)
EnE 460	Senior Seminar on Pollution Prevention and Waste Minimization (1-0-0)

2nd Semester

Elective	Specialty Area (3-0-3)
CE 495	Senior Design II (3-0-3)
EnE 462	Air Pollution Engineering (3-0-3)
IE 456	Intro. to Industrial Hygiene (3-0-3)
HSS Elective	Capstone Seminar-400 level (3-0-3)

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* Select two of the following:HSS 211, HSS 212, HSS 213
** HSS 202 or Rutgers course.

Undergraduate - Environmental Science

Administered By: Department of Chemistry and Environmental Science

Administration

Chairperson	Joseph W. Bozzelli
Undergraduate Advisors	James Grow, Alex Gates
Ada C. Fritz Professor of Environmental Engineering and Science	Joseph W. Bozzelli

Faculty

Distinguished Professors	Bozzelli, Venanzi
Professors	Grow, Gund, Krasnoperov, Mitra
Associate Professors	Jackson
Assistant Professors	Cohen, Malhotra, Qiu
Special Lecturer	Skawinski
Research Professor	Iqbal
Professor Emeritus	Kebbekus

Rutgers-Newark Faculty

Professors	Kafkewitz, Weis
Associate Professor	Gates
Assistant Professors	Hammerlynck, Hover, Slater

Federated Biology Faculty

Assistant Professors	Hahn

The major in environmental science is an interdisciplinary program among the NJIT Department of Chemistry and Environmental Science, the Department of Earth and Environmental Sciences at Rutgers-Newark, and the NJIT and Rutgers Federated Biological Sciences Department. The program provides students with a strong background science and fundamentals as they relate to the environment. The program is designed to prepare graduates for technical positions in the environmental industry and/or to continue their education in the graduate level. The program also prepares students to pursue positions related to the environment in the fields of law, business, sociology, health, and political science.

The Bachelor of Science in Environmental Science

with Options in:

Sustainable Earth

Biocomplexity

Environmental Policy Studies

Chemistry of the Environment

■ BS in ENVIRONMENTAL SCIENCE

Curriculum Framework Each student in the program will be required to take the following Core Curriculum (34-37* credits). Courses in Chemistry and Calculus may be taken either at NJIT or Rutgers.

R21:460:103	Planet Earth (with lab) (3-3-4)
	or
R21:460:104	Planet Earth (with lab) (3-3-4)

R21:460:206	Environmental Geology (3-1-4)
	or
R21:460:207	Environmental Geology (3-1-4)
CHEM 125	General Chemistry I (3-0-3)
CHEM 126	General Chemistry II (3-0-3)
CHEM 124	General Chemistry Lab (0-2-1)
	or
R21:120:113	General Chemistry Lab (0-3-1)
R21:120:114	General Chemistry Lab (0-3-1)
R21:160:115	General Chemistry (4-0-4)
R21:160:116	General Chemistry (4-0-4)
CHEM 360	Environmental Chemistry I (3-0-3)
CHEM 361	Environmental Chemistry II (3-0-3)
R21:120:XXX	Environmental Biology (3-0-3)
HSS 202	Society, Technology and the Environment (3-0-3)
MATH 111	Calculus I (3-0-3)
	or
R21:640:135	Calculus I (3-0-3)
R21:640:327	Probability and Statistics (3-0-3)
	or
MATH 105	Elementary Probability and Statistics (3-0-3)

Option in Chemistry of the Environment - required courses

R21:750:203	General Physics I (3-0-3)
R21:750:204	General Physics II (3-0-3)
R21:750:205	Introductory Physics Laboratory I (0-3-1)
R21:750:206	Introductory Physics Laboratory II (0-3-1)
	or
PHYS 111	Physics I (3-0-3)
PHYS 121	Physics II (3-0-3)
PHYS 111A	Physics Laboratory I (0-3-1)
PHYS 121A	Physics Laboratory II (0-3-1)
CHEM 221	Analytical Chemical Methods (0-4-2)
CHEM 222	Analytical Chemistry (3-0-3)
	or
R21:160:227	Experimental Analytical Chemistry (1-6-3)
ENE 262	Introduction to Environmental Science (3-0-3)
ENE 360	Water and Waste Water (3-0-3)
ENE 361	Solid and Hazardous Waste Engineering (3-0-3)
EvSc484	Environmental Analysis (3-0-3)
	or
EvSc612	Environmental Analysis (3-0-3)
EvSc 4XX	Toxicology (3-0-3)
EvSc 613	Environmental Problem Solving (3-0-3)
CHEM 243	Organic Chemistry I (3-0-3)
	or
R21:160:335	Organic Chemistry I (3-0-3)
	One additional Electives

Option in Sustainable Earth - required courses

R21:460:309	Geomorphology (3-0-3)
	or
STS 380	Policy Issues in the Coastal Environment (3-0-3)
R21:120:370	Plant Ecology (3-0-3)
	or
R21:120:380	Animal Ecology (3-0-3)

R21:120:470	Field Ecology (3-0-3)
	or
R21:120:381	Field Studies in Animal Ecology (1-3-3)
	or
R21:120:371	Field Studies in Plant Ecology (3-0-3)
R21:120:XXX	Environmental Microbiology (3-0-3)
R21:460:311	Geologic Field Problems (3-0-3)
R21:460:427	Hydrogeology (3-0-3)
EvSc484	Environmental Analysis (3-0-3)
	or
EvSc612	Environmental Analysis (3-0-3)
CE 321	Water Resources Engineering (3-0-3)
STS 362	Environmental Economics (3-0-3)
STS 312	Environmental Policy (3-0-3)
EvSc 613	Environmental Problem Solving (3-0-3)
	Two additional Electives

Option in Biocomplexity - required courses

R21:120:301	Foundations of Biology (3-3-4)
R21:120:XXX	Environmental Microbiology (3-0-3)
R21:120:352	Genetics (3-0-3)
R21:120:370	Plant Ecology (3-0-3)
R21:120:473	Ecology of Microorganisms (3-0-3)
R21:120:481	Marine Biology (1-3-3)
R21:120:470	Field Ecology (1-3-3)
EvSc484	Environmental Analysis (3-0-3)
	or
EvSc612	Environmental Analysis (3-0-3)
STS 360	Environmental Ethics (3-0-3)
	Three additional Electives

Option in Environmental Policy Studies - required courses

R21:120:470	Field Ecology (1-3-3)
R21:460:311	Geologic Field Problems (3-0-3)
STS313	Introduction to Environmental Policy (3-0-3)
STS 360	Environmental Ethics (3-0-3)
STS 362	Environmental Economics (3-0-3)
R21:460:309	Geomorphology (3-0-3)
	or
STS 380	Policy Issues in the Coastal Environment (3-0-3)
STS 381	Field Techniques and Research Methods (3-0-3)
HIST 334	Environmental History of North America (3-0-3)
	Four additional Electives

In all tracks the following technical electives are available (if not already required by the track):

Biology

R21:120:237	Environmental Microbiology (3-0-3)
R21:120:327	Biology of Invertebrates (1-3-3)
R21:120:311	Taxonomy of Vascular Plants (1-3-3)
R21:120:370	Plant Ecology (3-0-3)
R21:120:371	Field Studies in Plant Ecology (1-3-3)
R21:120:380	Animal Ecology (3-0-3)
R21:120:381	Field Studies in Animal Ecology (1-3-3)
R21:120:471	Physiological Ecology (3-0-3)
R21:120:472	Environmental Assessment (3-0-3)
R21:120:473	Ecology of Microorganisms (Microbial Ecology) (3-0-3)
R21:120:481	Marine Biology (1-3-3)
R21:120:487	Systems Ecology: Ecosystems in the Landscape (3-0-3)

Earth and Environmental Science

R21:460:114	Earth History (3-3-4)
R21:460:115	Earth History (3-3-4)
R21:460:309	Geomorphology (3-0-3)
R21:460:322	Petrology (3-0-3)
R21:460:406	Applied Geophysics (3-0-3)
R21:460:427	Hydrogeology (3-0-3)

Environmental Policy

HIST 334	Environmental History of North America (3-0-3)
HIST 377	Cities in History (3-0-3)
STS 257	Technology, Society and Culture: An American View (3-0-3)
STS 258	Technology, Society and Culture: A Global View (3-0-3)
STS 308	Technology and Global Development (3-0-3)
STS 312	Technology and Policy (3-0-3)
STS 313	Environmental History and Policy (3-0-3)
STS 360	Environmental Ethics (3-0-3)
STS 362	Environmental Economics (3-0-3)
STS 380	Coastal Geomorphology (currently Policy Issues in the Coastal Environment) (3-0-3)
STS 381	Field Techniques and Research Methods (3-0-3)
STS 382	Geographic Perspectives on Environment (3-0-3)
R790:310	Science, Technology, and Public Policy (3-0-3)
R790:382	Environmental Politics and Policy (3-0-3)
R920:350	Environmental Sociology (3-0-3)
R920:386	Sociology of Science (3-0-3)
PHIL 334	Engineering Ethics and Technological Practice (3-0-3)
EvSc484	Environmental Analysis (3-0-3)
	or
EvSc612	Environmental Analysis (3-0-3)

Landscape Ecology

GIS 420	Geographic Information Systems
SET 303	Photogrammetry and Aerial Photo Interpretation (3-0-3)
SET 420	Land Information Systems (3-0-3)
CE 406	Remote Sensing (3-0-3)

Physics

R750:203	General Physics (3-0-3)
R750:204	General Physics (3-0-3)
R21:750:205	Introductory Physics Laboratory I (0-3-1)
R21:750:206	Introductory Physics Laboratory II (0-3-1)
	or
PHYS 111	Physics I (3-0-3)
PHYS 111A	Physics Laboratory I (0-3-1)
PHYS 121	Physics II (3-0-3)
PHYS 121A	Physics Laboratory II (0-3-1)

Engineering

CHE 221	Material Balance (3-0-3)
SET 307	Boundaries and Adjacent Properties (3-0-3)
SET 407	Boundary Line Analysis (3-0-3)
EnE 262	Introduction to Environmental Engineering (3-0-3)
EnE 360	Environmental Engineering (Water Waste/Water Treatment) (3-0-3)
EnE 361	Environmental Problems (Solid & Hazardous Waste Engineering) (3-0-3)
EnE 363	Water Treatment (3-0-3)
EnE 462	Air Pollution Control (3-0-3)
EnE 321	Water Resources (3-0-3)

FIRST YEAR

First Semester

CHEM 125	General Chemistry I (3-0-3)
	or
R21:120:113	General Chemistry Lab (0-3-1)
R21:160:115	General Chemistry (4-0-4)
HSS 101	Writing, Speaking, Thinking (3-0-3)
MATH 111	Calculus I (4-1-4)
	or
R21:640:135	Calculus I (3-0-3)
Frsh Sem	Freshman Seminar (1-0-0)
R21:120:101	General Biology (3-1-4)

Second Semester

CHEM 126	General Chemistry II (3-0-3)
CHEM 124	General Chemistry Lab (0-2-1)
	or
R21:120:114	General Chemistry Lab (0-3-1)
R21:160:116	General Chemistry (4-0-4)
Elective	Cultural History:GUR (3-0-3)
PE	Physical Education (0-1-1)
R21:102	General Biology (3-1-4)
R21:460:103	Planet Earth (with lab) (3-3-4)
	or
R21:460:104	Planet Earth (with lab) (3-3-4)

SECOND YEAR

First Semester

CHEM 360	Environmental Chemistry I (3-0-3)
R750:203	General Physics (3-0-3)
R750:205	Introductory Physics Laboratory (0-3-1)
	or
PHYS 111	Physics (3-0-3)
PHYS 111A	Physics Laboratory (0-3-1)
HSS 202	Society, Technology, and Environment (3-0-3)
R21:640:327	Probability and Statistics (3-0-3)
	or
MATH105	Elementary Probability and Statistics (3-0-3)
PE	Physical Education (0-0-1)
CIS 113	Introduction to Computer Science (3-1-3)

Second Semester

R21:750:204	General Physics II (3-0-3)
R21:750:206	Introductory Physics Laboratory II (0-3-1)
	or
PHYS 121	Physics II (GUR) (3-0-3)
PHYS 121A	Physics Laboratory II (GUR) (0-3-1)
R460:311	Geologic Field Problems (3-0-3)
R21:460:206	Environmental Geology (with Lab) (3-1-4)
	or
R21:460:20	Environmental Geology (with Lab) (3-1-4)
Elective	Cultural History:GUR (3-0-3)
CHEM 361	Environmental Chemistry II (3-0-3)

THIRD YEAR

First Semester

STS 312	Environmental Policy (3-0-3)
	or
STS 313	Introduction to Environmental Policy (3-0-3)
	or
STS 360	Environmental Ethics (3-0-3)
	or
STS 362	Environmental Economics (3-0-3)
R21:120:XXX	Environmental Biology (3-0-3)
CHEM 243	Organic Chemistry I (3-0-3)
	or
R21:160:335	Organic Chemistry I (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

Second Semester

ENE 361	Solid & Hazardous Waste Management (3-0-3)
EnSc 484	Environmental Analysis (3-0-3)
	or
EnSc 612	Environmental Analysis (3-0-3)
Mgmt 390	Principles of Management (3-0-3)
Elective	(Lit/Hist/Phil) (3-0-3)
Elective	(Free) (3-0-3)

FOURTH YEAR

First Semester

SS 201	Economics (3-0-3)
ENE 360	Water and Waste Water (3-0-3)
EvSc 4XX	Toxicology (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

Second Semester

EvSc 613	Environmental Problem Solving (3-0-3)
HSS 4XX	Capstone (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

FIRST YEAR

First Semester

CHEM 125	General Chemistry I (3-0-3)
	or
R21:120:113	General Chemistry Lab (0-3-1)
R21:160:115	General Chemistry (4-0-4)
HSS 101	Writing, Speaking, Thinking (3-0-3)
CIS 125	Computer Programming and Problem Solving (2-1-2)
MATH 111	Calculus I (4-1-4)
	or
R21:640:135	Calculus I (3-0-3)
Frsh Sem	Freshman Seminar (1-0-0)
R21:120:101	General Biology (3-1-4)

Second Semester

	CHEM 126	General Chemistry II (3-0-3)
	CHEM 124	General Chemistry Lab (0-2-1)
		or
	R21:120:114	General Chemistry Lab (0-3-1)
	R21:160:116	General Chemistry (4-0-4)
	Elective	Cultural History:GUR (3-0-3)
	PE	Physical Education (0-1-1)
	R21:120:102	General Biology (3-1-4)
	CIS 113	Introduction to Computer Science (3-1-3)
	R21:460:103	Planet Earth (with lab) (3-3-4)
		or
	R21:460:104	Planet Earth (with lab) (3-3-4)

SECOND YEAR

First Semester

	R21:120:XXX	Environmental Biology (3-0-3)
	R21:460:206	Environmental Geology (3-1-4)
		or
	R21:460:207	Environmental Geology (3-1-4)
	R21:120:301	Foundations in Biology (3-3-4)
	HSS 202	Society, Technology, and Environment (3-0-3)
	R21:640:327	Probability and Statistics (3-0-3)
		or
	MATH105	Elementary Probability and Statistics (3-0-3)
	PE	Physical Education (0-0-1)

Second Semester

	R21:120:XXX	Environmental Microbiology (3-0-3)
	R21:460:309	Geomorphology (3-0-3)
		or
	STS 380	Policy Issues of Coastal Environment (3-0-3)
	Elective	Cultural History:GUR (3-0-3)
	SS 201	Economics (3-0-3)
	STS 312	Environmental Policy (3-0-3)

THIRD YEAR

First Semester

	Elective	Cultural History:GUR (3-0-3)
	STS362	Environmental Economics (3-0-3)
	R21:460:311	Geologic Field Problems (3-0-3)
	CHEM 360	Environmental Chemistry I (3-0-3)
	Elective	(Free) (3-0-3)

Second Semester

	R21:120:370	Plant Ecology (3-0-3)
		or
	R21:120:381	Animal Ecology (3-0-3)
	CHEM 361	Environmental Chemistry II (3-0-3)
	R21:460:427	Hydrogeology (3-0-3)
**	Mgmt 390	Principles of Management (3-0-3)
	Elective	(Lit/Hist/Phil) (3-0-3)

FOURTH YEAR

First Semester

	R21:120:470	Field Ecology (3-0-3)
		or
	R21:120:381	Field Studies in Animal Ecology (1-3-3)
		or
	R21:120:371	Field Studies in Plant Ecology (3-0-3)

	EvSc 484	Environmental Analysis (3-0-3)
		or
	EvSc 612	Environmental Analysis (3-0-3)
	CE 321	Water Resources Engineering (3-0-3)
	Elective	(Lit/Hist/Phil) (3-0-3)
	Elective	(Free) (3-0-3)

Second Semester

EvSc 613	Environmental Problem Solving (3-0-3)
HSS 4XX	Capstone (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

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* CIS 101, 103 or other CIS courses approved by the advisor can be substituted.
** Other Management courses may be substituted with advisor's approval.

FIRST YEAR
First Semester

CHEM 125	General Chemistry I (3-0-3)
	or
R21:120:113	General Chemistry Lab (0-3-1)
R21:160:115	General Chemistry (4-0-4)
HSS 101	Writing, Speaking, Thinking (3-0-3)
MATH 111	Calculus I (4-1-4)
	or
R21:640:135	Calculus I (3-0-3)
Frsh Sem	Freshman Seminar (1-0-0)
R21:120:101	General Biology (3-1-4)

Second Semester

CHEM 126	General Chemistry II (3-0-3)
CHEM 124	General Chemistry Lab (0-2-1)
	or
R21:120:114	General Chemistry Lab (0-3-1)
R21:160:116	General Chemistry (4-0-4)
Elective	Cultural History:GUR (3-0-3)
PE XXX	Physical Education (0-1-1)
R21:120:102	General Biology (3-1-4)
R21:460:103	Planet Earth (with lab) (3-3-4)
	or
R21:460:104	Planet Earth (with lab) (3-3-4)

SECOND YEAR
First Semester

R21:120:XXX	Environmental Biology (3-0-3)
R21:120:301	Foundations in Biology (3-3-4)
HSS 202	Society, Technology, and Environment (3-0-3)
R21:640:327	Probability and Statistics (3-0-3)
	or
MATH105	Elementary Probability and Statistics (3-0-3)
PE XXX	Physical Education (0-0-1)
CIS 113	Introduction to Computer Science (3-1-3)

Second Semester

R21:120:XXX	Environmental Microbiology (3-0-3)

R21:460:206	Environmental Geology (with Lab) (3-1-4)
	or
R21:460:207	Environmental Geology (with Lab) (3-1-4)
Elective	Cultural History:GUR (3-0-3)
SS 201	Economics (3-0-3)
STS 360	Environmental Ethics (3-0-3)

THIRD YEAR

First Semester

R21:120:473	Ecology of Microorganisms (3-0-3)
R21:120:352	Genetics (3-0-3)
CHEM 360	Environmental Chemistry I (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Technical) (3-0-3)

Second Semester

R21:120:370	Plant Ecology (3-0-3)
CHEM 361	Environmental Chemistry II (3-0-3)
Mgmt 390	Principles of Management (3-0-3)
Elective	(Lit/Hist/Phil) (3-0-3)
Elective	(Technical) (3-0-3)

FOURTH YEAR

First Semester

R21:120:470	Field Ecology (3-0-3)
R21:120:481	Marine Biology (1-3-3)
EvSc484	Environmental Analysis (3-0-3)
	or
EvSc612	Environmental Analysis (3-0-3)
Elective	(Lit/Hist/Phil) (3-0-3)
Elective	(Free) (3-0-3)

Second Semester

HSS 4XX	Capstone (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

FIRST YEAR

First Semester

CHEM 125	General Chemistry I (3-0-3)
	or
R21:120:113	General Chemistry Lab (0-3-1)
R21:160:115	General Chemistry (4-0-4)
R21:460:103	Planet Earth (with lab) (3-3-4)
	or
R21:460:104	Planet Earth (with lab) (3-3-4)
HSS 101	Writing, Speaking, Thinking (3-0-3)
MATH 111	Calculus I (4-1-4)
	or
R21:640:135	Calculus I (3-0-3)
Frsh Sem	Freshman Seminar (1-0-0)
PE	Physical Education (0-1-1)

Second Semester

CHEM 126	General Chemistry II (3-0-3)
CHEM 124	General Chemistry Lab (0-2-1)
	or
R21:120:114	General Chemistry Lab (0-3-1)
R21:160:116	General Chemistry (4-0-4)
R21:640:327	Probability and Statistics (3-0-3)
	or
MATH 105	Elementary Probability and Statistics (3-0-3)
HSS 202	Society, Technology & the Environment (3-0-3)
R21:460:206	Environmental Geology (3-1-4)
	or
R21:460:207	Environmental Geology (3-1-4)
PE	Physical Education (0-1-1)

SECOND YEAR

First Semester

R21:120:XXX	Environmental Biology (3-0-3)
CIS113	Introduction to Computer Science (3-1-3)
R460:309	Geologic Field Problems (2-3-3)
Elective	Cultural History:GUR (3-0-3)
Mgmt 390	Principles of Management (3-0-3)

Second Semester

Elective	Cultural History:GUR (3-0-3)
SS 201	Economics (3-0-3)
STS 313	Environmental Policy (3-0-3)
HIST 334	History of North America (3-0-3)
Elective	(Technical) (3-0-3)

THIRD YEAR

First Semester

STS362	Environmental Economics (3-0-3)
Chem 360	Environmental Chemistry I (3-0-3)
R120:470	Field Ecology (3-0-3)
Elective	(Lit/Hist/Phil) (3-0-3)
Elective	(Free) (3-0-3)

Second Semester

R21:460:309	Geomorphology (3-0-3)
	or
STS 380	Policy Issues of Coastal Environment (3-0-3)
STS 381	Field Techniques and Research Methods (3-0-3)
CHEM 361	Environmental Chemistry II (3-0-3)
Elective	(Lit/Hist/Phil) (3-0-3)
Elective	(Free) (3-0-3)

FOURTH YEAR

First Semester

STS 360	Environmental Ethics (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

Second Semester

HSS 4XX	Capstone (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Free) (3-0-3)

Elective (Free) (3-0-3)

Electives
Technical: Consult with faculty advisor for appropriate courses.

Free: Consult with faculty advisor for appropriate courses.

Environmental Technical Elective: See advisor for suggested courses.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

† *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Engineering Technology GUR: Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, or MIS 345.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Refer to the General University Requirement section of this catalog for further information on electives.

Undergraduate - Geoscience Engineering

Administration

Chairperson	John R. Schuring, NJIT
Chairperson	Alexander E. Gates, Rutgers-Newark

Faculty

NJIT Advisor	Dorairaja Raghu, Phone: (973) 596-3665 (Room 205 COL) Email: raghu@njit.edu
Rutgers Advisor	Alexander E. Gates, Phone: (973) 353-5100 (Room 411 Boyden Hall) Email: agates@andromeda.rutgers.edu

Careful stewardship of the planet is necessary to sustain a quality living environment. The geoscience engineer, at the forefront of optimizing Earth's precious resources, plays an important role given the global nature of the economy and the rapidly expanding world population.

Geoscience engineers become involved at the earliest stages of an engineering project by evaluating whether the intended land use is compatible with the natural geological conditions. They are also expert in locating water supplies for communities. In large civil works projects (building complexes, bridges, and roadways) geoscience engineers play a critical role by mapping the underlying soil and bedrock, and designing suitable foundation supports. They lead environmental initiatives to protect soil and groundwater aquifers from pollution, as well as to restore contaminated industrial sites. Geoscience engineers also supervise the extraction of mineral resources from the earth to provide essential raw materials for the manufacturing and construction industries.

Many geoscience engineers work for engineering consulting firms or construction companies as design engineers, field engineers and project managers. Geoscience engineers also join government agencies and become involved with oversight of transportation, water supply, environmental protection, and resource management. Private corporations, engaged in heavy manufacturing and mining, also employ geoscience engineers. Geoscience engineering graduates have considerable flexibility, by virtue of their course of study, to work in the allied fields of civil engineering, environmental engineering and the traditional geosciences.

The goal of the B.S. in Geoscience Engineering curriculum is to develop graduates who are capable of solving a wide spectrum of problems related to engineering, geology, and the environment. The program begins with a traditional series of basic science, mathematics and engineering science courses in the first two years followed by a blend of geoscience and civil/environmental engineering courses in the last two years. The curriculum is computer intensive and includes laboratory experiences that support the principles taught in the classroom. The student is introduced to the latest techniques of remote sensing and global positioning of land surfaces using orbiting satellites. Selected courses involve fieldtrips and fieldwork to familiarize the student with geological field mapping and electronic surveying. The B.S. in Geoscience Engineering is a joint degree offered by NJIT and Rutgers-Newark.

The curriculum as described here is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Geoscience Engineering** (132 credits)

FIRST YEAR

1st Semester

	Chem 125	General Chemistry I (3-0-3)
† *	FED 101C	Fundamentals of Engineering Design, CAD/Graphics Component (0-2.25-1)
† *	FED 101D	Fundamentals of Engineering Design, Design Component (0-2.25-1)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	Chem 124	General Chemistry Laboratory (0-2-1)

	Chem 126	General Chemistry II (3-0-3)
*	CIS 101	Computer Programming and Problem Solving (2-1-2)
**	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

CE 343	Geology (3-3-4)
Math 211	Calculus III A (3-0-3)
Math 333	Probability and Statistics (3-0-3)
Mech 235	Statics (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

Chem 365	Environmental Organic Chemistry (3-0-3)
CE 200B	Surveying Laboratory (0-3-1)
Math 222	Differential Equations (4-0-4)
Mech 236	Dynamics (2-0-2)
Mech 237	Strength of Materials (3-1-3)
Elective	(Cultural History: GUR) (3-0-3)

THIRD YEAR

1st Semester

	CE 320A	Hydraulics Laboratory (0-3-1)
	CE 320	Fluid Mechanics (4-0-4)
	R460:311	Geological Field Problems (3-0-3)
	R460:321	Mineralogy (3-3-4)
	R460:406	Applied Geophysics (3-0-3)
**	SS 201	Economics (3-0-3)

2nd Semester

CE 321	Water Resources Engineering (3-0-3)
CE 341	Soil Mechanics (3-0-3)
CE 341A	Soil Mechanics Laboratory (3-0-1)
R460:320	Structural Geology (3-3-4)
R460:427	Hydrogeology (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

FORTH YEAR

1st Semester

CE 406	Remote Sensing (3-0-3)
	or
SET 420	Land Information Systems (3-0-3)
CE 494	Civil Engineering Design I (3-0-3)
R460:309	Geomorphology (3-0-3)
Elective	(Open: GUR) (3-0-3)
Elective	(Technical) (3-0-3)

2nd Semester

CE 495	Civil Engineering Design II (3-0-3)
ME 435	Thermodynamics (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	(Technical) (3-0-3)

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* Half of the students will take these courses in reverse order. Transfer students should substitute EG 101 for FED 101C

and FED 101D.
† FED 101D is taken concurrently with either HSS 100 or HSS 101.

Electives

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

** *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Technical: Must be chosen from a list of courses available from the civil and environmental engineering department.

Refer to the General University Requirement section of this catalog for further information on electives.

Co-op

CE 311 and CE 413 are taken for additive credit.

Undergraduate - History

Administered By: Federated History Department of Rutgers-Newark and NJIT

Administration

Chairpersons	Richard Sher (NJIT), Jan E. Lewis (Rutgers-Newark)
Director, Graduate Programs	Susan Carruthers, Phone: (973) 353-5410 (ext. 34) Email: scarruth@andromeda.rutgers.edu
NJIT Graduate Coordinator	Neil Maher, Phone: (973) 596-6348 Email: maher@njit.edu
Deputy Chair (Rutgers-Newark)	Jon Cowans, Phone: (973) 353-1193 (ext. 14) Email: jonco58@aol.com

NJIT Faculty

Distinguished Professor	R. Sher
Professor	O'Connor
Assistant Professors	Maher, Pemberton
Special Lecturer	Gumienny

Rutgers-Newark Faculty

Board of Governors Distinguished Service Professor	Price
University Professors & Director, Study Abroad Program in Great Britain	Hosford
Professors	Basch, Golden, Hosford, Hunczak, Lewis, Lurie, Samatar, Wou
Associate Professors	Carruthers, Cowans, Goodman, Russell, Satter
Assistant Professors	Caplan, Deshpande, Farney

The B.A. in History is offered jointly by the Federated History Department of Rutgers and NJIT and draws on faculty and courses from both universities.

The major in history gives students a broad grasp of world history and the cultural backgrounds of many segments of contemporary society. Students learn methods of historical research and exposition that may be applied not only by the professional historian but also by those interested in pursuing careers in government, education, law, the media, business, and other fields. Although not required, proficiency in at least one foreign language is recommended, especially for students who are considering graduate study in history.

Major Requirements

The major requires 39 credits of history courses with a grade of C or higher. These courses may include offerings at NJIT (Hist prefix) and Rutgers (510 and 512 prefixes). Each program is subject to approval by an advisor or by the chairperson of the department. Specific requirements are as follows:

1. 6 credits in introductory western civilization:R510:201andR510:202. (Students who transfer into the history major after fulfilling the GUR in cultural history with different courses may, at the discretion of their advisor, substitute other courses forR510:201 and R510:202).

2. 6 credits in any U.S. history courses (any level).

3. 6 credits in any Asian, African, Latin American, World, or Comparative history courses (any level).

4. 6 credits in the two-semester Senior History Seminar (R510:489 and R510:490). Qualified juniors may enroll in R510:489 if space is available.

5. 15 additional credits in history, at least 12 of which must be taken at the 300 or 400 level.

Students considering the history major are encouraged to contact the NJIT Chair of the Federated History Department to discuss their interests and career options.

Preparing for a Career as a Social Studies Teacher

Through a special arrangement, history majors at NJIT are eligible to apply for admission to the teacher certification program in social studies offered by the Department of Education at Rutgers-Newark. Students accepted into this program use “free elective” slots in their curriculum to take appropriate courses in education, as listed in the Rutgers-Newark undergraduate catalog. Upon satisfactory completion of the program, they are qualified to apply for state certification in social studies.

Double Majors

Students may earn a second major in addition to the history major. Three of the most popular double majors with the history major are the information systems (B.A.) major, the professional and technical communication (B.S.) major, and the science, technology and society major. Contact the history department for a list of appropriate courses to complete a double major with the history major. Completion of these double majors is often feasible within four years of full-time study. For general rules about double majors, see Degree Options in the Academic Policies and Procedures section of this catalog.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2003 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.A. in History** (123 credit minimum)

FIRST YEAR

1st Semester

*	Hist 125	Mapping Human History (3-0-3)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
{	Math 111	Calculus I (4-1-4)
		or
	Math 138	General Calculus I (3-0-3)
{	CIS 113	Introduction to Computer Science I (3-0-3)
		or
	CIS 103	Computer Science with Business Problems (3-1-3)
	Elective	(Natural Sciences: GUR) (3-1-4)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	Math 105	Elementary Probability and Statistics (3-0-3)
	Elective	(Basic Social Sciences: GUR) (3-0-3)
	Elective	(Natural Sciences: GUR) (3-1-4) or (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Engineering Technology: GUR) (3-0-3)
	Elective	(American History) (3-0-3)
	Elective	(Social Sciences) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

†	SS 201	Economics (3-0-3) (3-0-3)
	Elective	(Engineering Technology: GUR) (3-0-3)
	Elective	(American History) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Free) (3-0-3)

THIRD YEAR

1st Semester

	Mgmt 390	Principles of Management (3-0-3)
	Elective	(Global/Comparative History) (3-0-3)
	Elective	(History) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Free) (3-0-3)

2nd Semester

	Elective	(Global/Comparative History) (3-0-3)
	Elective	(History) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Free) (3-0-3)

FOURTH YEAR

1st Semester

**	R510:489	(Senior Seminar – Readings) (3-0-3)
	Elective	(History) (3-0-3)
	Elective	(History) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Free) (3-0-3)

2nd Semester

**	R510:490	(Senior Seminar – Research) (3-0-3)
	Elective	(History) (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Free) (3-0-3)

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* Hist 125 is taken only by first-semester freshmen and does not count toward the 39 credits required for the major.

** All majors write a senior thesis that incorporates methods of historiography and research learned in the seminar. An honors level of scholarship is expected from students enrolled in the Albert Dorman Honors College.

Electives

Natural Sciences GUR (7 credits): Coursework totaling 7 credits in any of the following disciplines: biology, botany, chemistry, geology, and physics. Students may take a sequence of courses in one of these disciplines or courses in different disciplines. Laboratory credit must be included in the 7 credits.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark. History majors are encouraged to take R510:201: History of Western Civilization I andR510:202: History of Western Civilization II to fulfill this requirement.

American History (6 credits): Students select two American history courses, at any level.

Global/Comparative History (6 credits): Students select two courses in Asian, African, Latin American, World, or Comparative history, at any level.

History (15 credits): Students select five courses in history, at least four of which must be at the 300 or 400 level.

Free (33 credits): Students select appropriate electives in consultation with an advisor.

Physical Education GUR (2 credits): Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

† *Basic Social Sciences GUR (6 credits):* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, or Econ 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement. History majors are encouraged to take a full-year sequence in a single social science, such as anthropology or political science.

Capstone Seminar in Humanities and Social Science GUR (3 credits): All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H. HSS 404 or an appropriate section of HSS 491H-499H may be counted as a history elective. Students are still required to meet the 123-credit minimum for the degree if they choose to count HSS 404 or HSS 491H-499H as a history elective.

Refer to the General University Requirement section of this catalog for further information on electives.

Undergraduate - Human-Computer Interaction

Administered By: Information Systems Department. Guttenberg Information Technologies Center, Room 4400.

Administration

Dean, College of Computer Sciences	Stephen Seidman
Associate Dean, College of Computing Sciences	Fadi Deek
Assistant to the Dean, College of Computing Sciences	Serena Branson
Acting Chairperson, Information Systems Department	Marilyn Tremaine
Associate Chairperson, Information Systems Department	Julian Scher
Director of IS Graduate Programs	Brian Whitworth
Director of CCS Undergraduate Programs	Robert Friedman

Faculty

Distinguished Professors	Hiltz, Turoff
Professors	Deek, Goldman, Tremaine
Associate Professors	Bieber, Recce, Scher
Assistant Professors	Im, Jones, Klashner, Mendonca, Wu, Whitworth

Human-computer interaction (HCI) combines disciplines within the fields of computing and information sciences (information systems, software engineering, artificial intelligence) and the behavioral sciences (cognitive science, cognitive psychology, sociology, organizational psychology, and social psychology) to study the design, implementation, and evaluation of interactive computer-based technology. The main purpose of this field is to solve real problems in the design and human use of technology. Examples of HCI products include intelligent tutoring systems, wearable computers, and highly interactive Web applications.

The Bachelor of Science in Human Computer Interaction, a joint degree program with Rutgers-Newark, provides the student with the necessary background to conduct design activities including: eliciting from the client, formulating, and articulating functional specifications; knowing how human factors and cognitive models influence design; knowing the principles of, and having experience with, communication design; understanding how implementation constraints influence design; and incorporating evaluation results into iterated designs.

Students implement their design knowledge by using their analysis and programming skills and demonstrating their computational literacy, such as knowledge sufficient for effective communication and decision making about interface construction tools and languages, multimedia authoring tools, data structures and algorithms and systems development. They also become proficient in evaluation activities, including experimental design, survey methods, usability testing and statistical analysis.

The program includes the following options, which are four courses selected from a list provided in each department: learning systems, human systems, applications development, publishing and multimedia, communications, networks, and the Web, or tailored options in computer applications.

All students majoring in HCI are required to prepare a Program of Study Form, an approved copy of which must be on file with the IS department (for NJIT students) or psychology department (for Rutgers students). The form should be prepared as early as possible in the student’s career, and changes should be made only in consultation with the department advisor.

Students are admitted to the program by applying to either NJIT or to Rutgers-Newark. Those admitted to NJIT must satisfy the GUR at NJIT and those admitted to Rutgers-Newark must satisfy the General Educational Requirements at Rutgers-Newark.

The curriculum as described below is for students entering as freshmen in the fall of 2002 or after that date.

■ **B.S. in Human-Computer Interaction** (124 credit minimum)

FIRST YEAR

1st Semester

	CIS 113	Introduction to Computer Science I (3-1-3)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	R830:103	Introduction to Cognitive Science I (3-0-3)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	CIS 114	Introduction to Computer Science II (3-1-3)
†	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	R830:104	Introduction to Cognitive Science II (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	CIS 375	Applications Development for the WWW (3-0-3)
	Math 226	Discrete Analysis (4-0-4)
	R830:301	Statistics in the Behavioral and Cognitive Sciences (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Science) (3-1-4)

2nd Semester

	CIS 350	Computers and Society (3-0-3)
	R830:302	Experimental Methods in the Behavioral and Cognitive Sciences (3-0-3)
	R830:335	Social Psychology (3-0-3)
†	SS 201	Economics (3-0-3)
	Elective	(Science) (3-1-4)

THIRD YEAR

1st Semester

	CIS 390	Requirements Analysis and Systems Design (3-0-3)
	R830:372	Perception (3-0-3)
	Elective	(Open: GUR) (3-0-3)
	Elective	(Option) (3-0-3)
	Elective	(General) (3-0-3)

2nd Semester

	CIS 431	Database System Design and Management (3-0-3)
	Elective	(Management: GUR) (3-0-3)
	Elective	(CIS) (3-0-3)
	Elective	(Option) (3-0-3)
	Elective	(General) (3-0-3)

FOURTH YEAR

1st Semester

	CIS 447	Human-Computer Interfaces (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(CIS) (3-0-3)
	Elective	(Option) (3-0-3)
	Elective	(General) (3-0-3)

2nd Semester

	CIS 475	Evaluation of Computer Applications (3-0-3)
	Elective	(Capstone Seminar: GUR) (3-0-3)
	Elective	(CIS) (3-0-3)

Elective	(Option) (3-0-3)
Elective	(General) (3-0-3)

Electives

† *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark. The department recommends HCI majors take either Eng 352 or Eng 353.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option.

CIS: Three 300/400-level CIS electives as offered by the College of Computing Sciences

Science: A two-course related sequence (8 credit minimum) of laboratory science in physics, chemistry, biology, or as approved by advisor. These courses fulfill the Natural Sciences GUR.

General: A minimum of four courses (12 credits). At least two of the four general electives must be upper division courses. Courses may be selected, if needed, to meet prerequisite requirements for the option sequence. See below.

Options

Students choose a sequence of four (300/400-level) courses, focusing on an area and/or subject relevant to the methodologies of, the design of or the application of computing systems.

Learning systems: Studies of human learning and the systems and technology to support learning and educational processes.

Human systems: Studies of groups and organizations and their use of information and computer applications.

Applications development: Further studies of the technology for development of applications. Recommended for students aiming to work in small organizations or end user units where the designer may also be the implementer.

Publishing and multimedia: Further studies of the technology involving the production of material in multimedia forms and specialized areas such as graphics and data visualization.

Communications, networks, and the Web: Further studies of the technology involving the nature of applications in communication environments and the relationship of design to groups, communities, and organizations.

Tailored: Any possible area of computer application of particular interest to the student. This is also for students with graduate school objectives in a specific field. This choice must be developed with the approval of the department HCI advisor.

The option courses must form a coherent unit, should be chosen from a set of courses complementary to the computer and information science and psychology courses required for this major, and must be approved by the department. A list of possible courses is available from the CIS department.

Refer to the General University Requirement section of this catalog for further information on electives.

Co-op
In human-computer interaction, CIS 310 and CIS 410 are taken for additive credit.

Undergraduate - Industrial Engineering

Administered By: Department of Industrial and Manufacturing Engineering

Administration

Chairperson	Athanassios K. Bladikas
Associate Chairperson	George Abdou
Program Director	George Abdou

Faculty

Professors	Abdel-Malek, Caudill, Das, Ranky, Sebastian, Tricamo, Wolf
Associate Professors	Abdou, Bengu, Bladikas, McDermott
Assistant Professors	Jeng, Yang
Graduate Advisor	George Abdou, Phone: (973) 596-3651 (Room 2508 GITC) Email: abdou@admin.njit.edu

The industrial engineering curriculum prepares engineers to design, improve, install, and operate the integrated systems of people, materials, and facilities needed by industry, commerce, and society. Industrial engineers solve problems which arise in the management of systems by applying the principles of engineering science, product and process design, work analysis, human factors principles, and operations research. Industrial engineering leads to a wide variety of professional opportunities in manufacturing, service, research and development, and public service enterprises, and to graduate study in industrial engineering, engineering management, business administration, law, and other fields.

The industrial engineering curriculum combines three professional areas of practice: product and production process design, work analysis, and engineering management science. Students are also offered exposure to the more specialized areas of automated manufacturing systems, information systems, quality assurance, and safety engineering. In the freshman and sophomore years, the program concentrates on mathematics, physical science, and engineering science, an adequate background in these being essential to the courses presented in the later years. The courses stress fundamental principles and concepts which develop gradually and eventually culminate in a system design dealing with real engineering and management situations in an industrial, commercial or public service enterprise.

The curriculum as described here is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies. In addition to the course requirements described, students have to take the Basic Engineering Skills Test (B.E.S.T).

■ **B.S. in Industrial Engineering** (129 credit minimum)

FIRST YEAR

1st Semester

	IE 101	Introduction to Industrial Engineering (1-1-1)
	Chem125	General Chemistry I (3-0-3)
*	FED 101C	Fundamentals of Engineering Design, CAD/Graphics Component (0-2.25-1)
† *	FED 101D	Fundamentals of Engineering Design, Design Component (0-2.25-1)
	HSS 101	English: Writing, Thinking, Speaking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	Chem 126	General Chemistry II (3-0-3)
*	CIS 101	Computer Programming and Problem Solving (2-1-2)
**	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	IE 203	Applications of Computer Graphics in Industrial Engineering (1-2-2)
	Mech 234	Engineering Mechanics (2-0-2)
	Math 211	Calculus III A (3-0-3)
**	SS 201	Economics (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

IE 224	Production Process Design (2-2-3)
Mech 236	Dynamics (2-0-2)
Mech 237	Strength of Materials (3-0-3)
Mech 237B	Strength of Materials Laboratory for ME and IE (0-1-0)
Math 222	Differential Equations (4-0-4)
Elective	(Cultural History: GUR) (3-0-3)

THIRD YEAR

1st Semester

IE 331	Applied Statistical Methods (3-0-3)
IE 335	Engineering Cost Analysis and Control (3-0-3)
IE 439	Deterministic Models in Operations Research (3-0-3)
ME 339	Fundamentals of Mechanical Design (3-0-3)
Elective	(Open: GUR) (3-0-3)

2nd Semester

EE 405	Electrical Engineering Principles (3-0-3)
IE334	Engineering Economy and Capital Investment Analysis (3-0-3)
IE 339	Work Measurement and Standards (2-2-3)
IE 355	Human Factors (3-0-3)
IE 445	Industrial Simulation (2-2-3)

FOURTH YEAR

1st Semester

IE 443	Senior Project I (1-3-2)
IE 459	Production Planning and Control (3-0-3)
IE 461	Product Quality Assurance (3-0-3)
ME 435	Thermodynamics (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Technical) (3-0-3)

2nd Semester

IE 440	Stochastic Models in Operations Research (3-0-3)
IE 444	Senior Project II (1-3-2)
IE 466	Materials Handling and Facilities Layout (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Management: GUR) (3-0-3)

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* Half of the students will take these courses in reverse order. Transfer students should substitute EG 101 for FED 101C and FED 101D.

† FED 101D is taken concurrently with either HSS 100 or HSS 101.

Electives

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

** *Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Options (Technical Electives)
Students in industrial engineering may pursue a general industrial engineering program of study and select 9 credits of technical electives from a wide variety of elective courses or concentrate their choice of 9 credits of technical electives in one of the designated options. Courses from other departments may be used to substitute for technical electives. The student must consult with the undergraduate advisor for a list of qualified courses and obtain approval. Those students choosing an option must obtain the advisor's approval of their entire choice of option electives prior to registering for their first technical elective course. Listed below are four options and suggested technical electives for each:

Automated Manufacturing Systems:

IE 441	Information and Knowledge Engineering Systems
IE 449	Industrial Robotics
IE 453	Computer Integrated Manufacturing
IE 455	Automation and Programmable Logic Controllers

Information Systems:

IE 441	Information and Knowledge Engineering Systems
IE 455	Automation and Programmable Logic Controllers
IE 469	Reliability in Engineering Systems

Quality Assurance:

IE 450	Product Engineering Standards
IE 451	Industrial Measuring Systems
IE 469	Reliability in Engineering Systems

Safety Engineering:

IE 447	Legal Aspects of Engineering
IE 450	Product Engineering Standards
IE 451	Industrial Measuring Systems
IE 456	Introduction to Industrial Hygiene
IE472	Product Liability Engineering
IE 473	Safety Engineering

Refer to the General University Requirement section of this catalog for further information on electives.

Co-op
Two co-op courses taken in sequence replace a technical elective. In industrial engineering, IE 310 is taken for additive credit, and IE 411is taken for degree credit, with IE 310 as a prerequisite.

Undergraduate - Information Systems

Administered By: Department of Information Systems

Administration

Dean, College of Computer Sciences	Dr. Stephen Seidman
Associate Dean, College of Computing Sciences	Dr.Fadi P. Deek
Assistant to the Dean, College of Computing Sciences	Serena Branson
Chair, Information Systems Department	Dr. Marilyn Tremaine
Assistant to the Chair, Information Systems	Michelle Craddock-Bouler
Associate Chair, Undergraduate Programs	Dr. Julian Scher
Director of Undergraduate HCI Program	Dr. Marilyn Tremaine
Director of Graduate Program	Dr. Brian Whitworth
Director of PhD Program	Dr. Roxanne Hiltz
Co-Director of Ph.D. Program	Dr. Il Im

Faculty

Distinguished Professors	Roxanne Hiltz, Murray Turoff
Full Professors	Fadi Deek, Ricki Goldman, Marilyn Tremaine
Associate Professors	Michael Bieber, Julian Scher, Michael Recce
Assistant Professors	Il Im, Quentin Jones, Robert Klashner, David Mendonca, Brian Whitworth, Brook Wu

Information systems (IS) is a dynamic specialization area within the computing field, focusing on the study of building systems to support the informational and decision making needs of users and organizations. IS focuses on the design, application and evaluation of computers and information systems to all fields of human endeavor, including management, science, medicine, government and organizations. The IS professional must be conversant with the theory, analysis, design, implementation, application and evaluation of computerized information systems in support of users' needs. The realm of the Information Systems professional covers all aspects of the software development life-cycle, from requirements analysis, system development and design, to testing, evaluation and the deployment of the ultimate computer-based application.

The dramatic use of computers in problem solving and in support of human cognitive processes has resulted in a change in the thinking of professionals in every discipline. Modern enterprises are dependent upon Information Systems specialists, with their broad knowledge of computers and information technology, for designing their industrial and business procedures and practices. Thus, there is a significant demand upon the educational preparation of future Information Systems specialists, who will study and gain expertise in the methodologies and tools utilized in building the computer-based systems for meeting the informational and decision-making needs of managers as well as a broad spectrum of users in organizations.

NJIT's Bachelor of Science (B.S.) in Information Systems provides the student with a solid foundation in the principles of computing and information systems and their applications. The degree provides the student with the most comprehensive treatment of computers, with considerable breadth and depth in information systems topics, the sciences, mathematics and applied quantitative tools, and supporting interdisciplinary studies. Most students interested in information systems enroll in this degree program. (A special option within the BSIS provides the student with a pre-med concentration, enabling the student to satisfy the requirements for entering medical school while concurrently obtaining a mastery of information systems – this desirable concentration will also be of interest to students interested in medical informatics.)

For the student who wishes to have a strong foundation in information systems, but with more opportunity for elective choices and with slightly fewer technical requirements, the Department of Information Systems also offers the Bachelor of Arts (B.A.) in Information Systems, a joint degree program with Rutgers-Newark. Students enrolled in the B.A. in Information Systems will complete a similar set of core IS courses and general university requirements as the BSIS student, but will have somewhat more opportunity in the selection of elective courses outside of the Information Systems discipline.

The curricula for both degrees have been developed according to the foremost educational standards of the leading professional organizations in Information Systems: the Computing Accreditation Commission and the Association for Information Systems. The Department of Information Systems also has close ties with our Industrial Advisory Board. Courses are constantly being monitored and modified for relevance. New courses are introduced as warranted by new developments in the discipline.

Each of the majors offered by the College of Computing Sciences has been carefully structured to meet a specific goal each year: first year, foundations; second year, understanding the computing system; third year, theoretical foundations and applications; fourth year, integration and focus. One of the unique additional requirements in the BAIS and BSIS degree programs is a 15 credit concentration in an Information Systems environment, which requires the student to complete five elective courses in an application or methodological area related to Information Systems.

All students with majors in the Department of Computer and Information Science are required to prepare a Program of Study Form, an approved copy of which must be on file with the department. The form should be prepared as early as possible in the student's career, and changes should be made only in consultation with the department advisor. Students should enroll in CIS 113 and CIS 114 in the freshman year. Some students may be required to enroll in CIS 098, depending upon the results of their Basic Skills Examination.

The curriculum as described below is for students entering NJIT as freshmen (or transfers) in the Fall of 2003.. Students entering before that date may have a different program and should consult their CCS Advisor to learn which curriculum applies.

■ **B.S. in Information Systems** (130 credit minimum)

FIRST YEAR

1st Semester

	CIS 113	Introduction to Computer Science I (3-1-3)
	Math 111	Calculus I (4-1-4)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Elective	(Science) (3-1-4)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	CIS 114	Introduction to Computer Science II (3-1-3)
†	HSS 202	Society, Technology and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Science) (3-1-4)

SECOND YEAR

1st Semester

	CIS 265	Information Systems and Productivity Toolware (3-0-3) (3-1-3)
	CIS 280	Programming Language Concepts (3-0-3)
	Elective	Advanced Math/Statistics/Quantitative Tools elective (3-0-3)
†	SS 201	Economics (3-0-3) (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

	CIS 270	Multimedia Information Systems (3-0-3)
	CIS 332	Principles of Operating Systems (3-0-3)
	Math 226	Discrete Analysis (4-0-4)
	Eng 352	Technical report Writing (3-0-3)
	Elective	(IS Environment Concentration) (3-0-3)

THIRD YEAR

1st Semester

	CIS 350	Computers and Society (3-0-3)
	Elective	(CIS) (3-0-3)
	CIS 390	Requirements Analysis and Systems Design (3-0-3)

Math 333	Probability and Statistics (3-0-3)
Elective	(IS Environment Concentration) (3-0-3)

2nd Semester

CIS 431	Database System Design and Management (3-0-3)
CIS 455	Computer Systems Management (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
Elective	(CIS) (3-0-3)
Elective	(IS Environment Concentration-Elective) (3-0-3)

FOURTH YEAR

1st Semester

CIS 456	Open Systems Networking (3-0-3)
CIS 465	Advanced Information Systems (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	(CIS) (3-0-3)
Elective	(IE Environment Concentration-Elective) (3-0-3)
Elective	(General) (3-0-3)

2nd Semester

CIS 475	Evaluation of Computer Applications (3-0-3)
CIS 492	Information Systems Project (3-0-3)
Elective	Capstone Seminar: GUR) (3-0-3)
Elective	(CIS) (3-0-3)
Elective	(Math) (3-0-3)
Elective	(IE Environment Concentration-Elective) (3-0-3)

Electives

† *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Mathematics: One approved 300- or 400-level course in mathematics or Math 222.

Information Systems Environment: A coherent set of five courses (at least three of which must be upper division), focusing on a discipline and/or subject area relevant to the methodologies of, the design of, or the application of information systems. The courses the student selects for his/her IS Environment must form a coherent unit, can only be chosen from non-CIS courses, and must be approved by the Department of Information Systems. Representative Information System Environments include (but are not limited to) management, medical information systems, human-computer interaction, statistical information systems, graphic design and multimedia, networks, bioinformatics, actuarial information systems, financial information systems, psychology, management science-operations research, accounting, and others. (Specialized IS Environment concentrations may also be developed for a student, in consultation with an Academic Advisor, and with the approval of the Department of Information Systems).

General: An upper division course chosen by the student, often to meet a prerequisite requirement for other elective courses.

Science: A two-course related sequence (8 credits minimum) of laboratory science in physics, chemistry, biology, or as approved by advisor. These courses satisfy the Natural Sciences GUR.

Refer to the General University Requirements section of this catalog for further information on electives.

Co-op
In information systems, CIS 310 and CIS 410 are taken for additive credit. With departmental approval, students may extend the project developed in CIS 410 to be used as an individual research project in CIS 492

■ **B.A. in Information Systems** (129 credit minimum)

FIRST YEAR

1st Semester

	CIS 113	Introduction to Computer Science I (3-1-3)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Elective	(Science) (3-1-4)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	CIS 114	Introduction to Computer Science II (3-1-3)
†	HSS 202	Society, Technology and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Science) (3-1-4)

SECOND YEAR

1st Semester

	CIS 265	Information Systems and Productivity Toolware (3-0-3)
	CIS 280	Programming Language Concepts (3-0-3)
	Math 226	Discrete Analysis (4-0-4)
		or
	R640:237	Discrete Structures (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(General) (0-1-1)

2nd Semester

	CIS 270	Multimedia Information Systems (3-0-3)
	CIS 332	Principles of Operating Systems (3-0-3)
	Math 105	Elementary Probability and Statistics (3-0-3)
		or
	Math 333	Probability and Statistics (3-0-3)
†	SS 201	Economics (3-0-3)
	Eng 352	Technical Report Writing (3-0-3)
	Elective	(IS Environment Concentration-Elective) (3-0-3)

THIRD YEAR

1st Semester

	CIS 350	Computers and Society (3-0-3)
	CIS 365	File Structures and Management (3-0-3)
	CIS 390	Requirements Analysis and Systems Design (3-0-3)
	Elective	(Management: GUR) (3-0-3)
	Elective	(CIS) (3-0-3)
	Elective	(IS Environment Concentration-Elective) (3-0-3)

2nd Semester

	CIS 431	Database System Design and Management (3-0-3)
	CIS 455	Computer Systems Management (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

Elective	(CIS) (3-0-3)
Elective	(IS Environment Concentration - Elective) (3-0-3)

FOURTH YEAR

1st Semester

CIS 456	Open Systems Networking (3-0-3)
CIS 465	Advanced Information Systems (3-0-3)
Elective	(CIS) (3-0-3)
Elective	(IS Environment Concentration - Elective) (3-0-3)
Elective	(General) (3-0-3)

2nd Semester

CIS 492	Information Systems Project (3-0-3)
Elective	(CIS) (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(IS Environment Concentration - Elective) (3-0-3)
Elective	(General) (3-0-3)

Electives

† *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take HSS 211 or HSS 212 or HSS 213; or an approved 200-level history course at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Mathematics: One approved 300- or 400-level course in mathematics or Math 222.

Information Systems Environment: A coherent set of five courses (at least three of which must be upper division), focusing on a discipline and/or subject area relevant to the methodologies of, the design of, or the application of information systems. The courses the student selects for his/her IS Environment must form a coherent unit, can only be chosen from non-CIS courses, and must be approved by the Department of Information Systems. Representative Information System Environments include (but are not limited to) management, medical information systems, human-computer interaction, statistical information systems, graphic design and multimedia, networks, bioinformatics, actuarial information systems, financial information systems, psychology, management science-operations research, accounting, and others. (Specialized IS Environment concentrations may also be developed for a student, in consultation with an Academic Advisor, and with the approval of the Department of Information Systems).

General: An upper division course chosen by the student, often to meet a prerequisite requirement for other elective courses.

Science: A two-course related sequence (8 credits minimum) of laboratory science in physics, chemistry, biology, or as approved by advisor. These courses satisfy the Natural Sciences GUR.

Science/Scientific Methods Requirement: One course must be in science or a course that enhances the student’s abilities in application of scientific methods (this course must be chosen from a list of approved science courses available from the department). Note that this science course is in addition to the Science requirement.

Refer to the General University Requirements section of this catalog for further information on electives.

Co-op

In information systems, CIS 310 and CIS 410are taken for additive credit. With departmental approval, students may extend the project developed in CIS 410 to be used as an individual research project in CIS 491, which is taken as an elective in the senior year.

■ **B.A. in Information Systems** (129 credit minimum)

FIRST YEAR

1st Semester

	CIS 113	Introduction to Computer Science I (3-1-3)
	Math 111	Calculus I (4-1-4)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	R120:101	General Biology (3-3-4)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	CIS 114	Introduction to Computer Science II (3-1-3)
†	HSS 202	Society, Technology and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(General Biology II) (3-1-4)

SECOND YEAR

1st Semester

	CIS 265	Information Systems and Productivity Toolware (3-0-3)
	CIS 280	Programming Language Concepts (3-0-3)
	Elective	(Advanced Math/Statistics/Quantitative Tools elective) (3-0-3)
†	SS 201	Economics (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

	CIS 270	Multimedia Information Systems (3-0-3)
	CIS 332	Principles of Operating Systems (3-0-3)
	Math 226	Discrete Analysis (4-0-4)
	Eng 352	Technical Report Writing (3-0-3)
	Chem 125	General Chemistry I (3-0-3)

THIRD YEAR

1st Semester

	CIS 350	Computers and Society (3-0-3)
	Elective	(CIS) (3-0-3)
	CIS 390	Requirements Analysis and Systems Design (3-0-3)
	Math 333	(Probability and Statistics) (3-0-3)
	Chem 126	General Chemistry II (4 credits)
	Chem 124	General Chemistry Laboratory (0-2-1)

2nd Semester

	CIS 431	Database System Design and Management (3-0-3)
	CIS 455	Computer Systems Management (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Phys111	Physics I (3-0-3)
	Phys111A	Physics I Laboratory (0-2-1)
	Chem 243	Organic Chemistry (3-0-3)

FOURTH YEAR

1st Semester

	CIS 456	Open Systems Networking (3-0-3)
	CIS 465	Advanced Information Systems (3-0-3)
	Elective	(Management GUR) (3-0-3)

R120:301	Foundations of Biology: Cell and Molecular Biology (3-2-4)
Chem 244	Organic Chemistry II (3-0-3)

2nd Semester

CIS 475	Evaluation of Computer Applications (3-0-3)
CIS 492	Information Systems Project (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(CIS) (3-0-3)
R120:335	General Microbiology (4-0-4)
Chem 473	Biochemistry (3-0-3)

Electives

† *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take HSS 211 or HSS 212 or HSS 213; or an approved 200-level history course at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Information Systems Environment: The regular IS Environment concentration for students in the pre-med concentration of the BSIS has been predefined to include a requisite pre-med course sequence in biology and chemistry.

Refer to the General University Requirements section of this catalog for further information on electives.

Co-op

In information systems, CIS 310 and CIS 410are taken for additive credit. With departmental approval, students may extend the project developed in CIS 410 to be used as an individual research project in CIS 491.

Undergraduate - Information Technology

Administered By: College of Computing Sciences

Administration

Director, Information Technology Program	Dr. Fadi Deek
Associate Director, Information Technology Program	Dr. James McHugh
Academic Coordinator, Information Technology Program	Michael Tress

Information Technology (IT) is the applied computing degree at NJIT, addressing the integration, design, deployment and management of computing and telecommunication resources and services, as well as the development of technology infrastructures in organizations. The field of information technology is interdisciplinary, with applications to all aspects of the economy. Information technologists solve complex hardware and software problems requiring fundamental knowledge and competencies with the processes of needs assessment, technology transfer, and user support.

The College of Computing Sciences at NJIT offers the Bachelor of Science in Information Technology program with an array of concentrations from each of NJIT's colleges and schools that prepare students to enter the information economy. Students choosing to major in Information Technology are those who are interested in applying computing and telecommunication tools to a specific domain. Each program concentration requires students to understand hardware and software, but the area emphasis depends upon the student's individual interests. The program requires completion of a common IT core, concentration courses, electives, and a capstone project.

The four years of the program have been carefully structured to meet the following goals: Year 1: breadth and depth of information technology; Year 2: tools and applications of information technology; Year 3: software and hardware infrastructure of information technology; and Year 4: management and synthesis of information technology.

All Information Technology majors are required to prepare a Program of Study Form, an approved copy of which must be on file with a CCS Academic Advisor. The form should be prepared as early as possible in the student's career, and changes can be made in consultation with the advisor.

A curriculum layout for the information technology program including concentration descriptions follows.

The curriculum described below is for fresman entering NJIT in fall 2004.

■ **B.S. in Information Technology** (127 credits minimum)

FIRST YEAR

1st Semester

	IT 101	Introduction to Information Technology (3-0-3)
	CIS 113	Introduction to Computer Science I (3-1-3)
{	Math 111	Calculus I (4-1-4)
		or
	Math 138	General Calculus (3-0-3)
	Elective	(Natural Science: GUR) (3-0-3)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	IT 102	Introduction to Information Technology II (3-0-3)
	CIS 114	Introduction to Computer Science II (3-1-3)
{	Math 112	Calculus II (4-1-4)
		or
	Elective	(Mathematics) (4-1-4)
	Elective	(Natural Science: GUR) (3-0-3)
	Elective	(Natural Science Lab: 0-2-1) (3-0-3)
†	HSS 202	Society, Technology, and Environment (3-0-3)
	Elective	(Physical Education: GUR) (0-0-1)

SECOND YEAR

1st Semester

	IT 201	Information Design Techniques (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
†	SS 201	Economics (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Area) (3-0-3)

2nd Semester

	IT 202	Internet and Applications (3-1-3)
	Math 225	Survey of Probability and Statistics (1-0-1)
		or
	Math 333	Probability and Statistics (3-0-3)
		or
	Math 105	Elementary Probability and Statistics (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Concentration) (3-1-3)
	Elective	(Concentration) (3-1-3)
	Elective	(Area) (3-0-3)
	Elective	(Physical Education: GUR) (0-0-1)

THIRD YEAR

1st Semester

	CIS 431	Database System Design and Management (3-0-3)
	Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
	Elective	(Management) (3-0-3)
	Elective	(Concentration) (3-1-3)
	Elective	(Concentration) (3-1-3)
	Elective	(Area) (3-0-3)

2nd Semester

	CIS 420	Computer Systems and Networks (3-0-3)
††	Elective	(Open: GUR) (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Area) (3-0-3)

FOURTH YEAR

1st Semester

	IT490	Systems Integration (3-0-3)
	Elective	(HSS Capstone Seminar: GUR) (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Free) (3-0-3)

2nd Semester

	IT 491	Information Technology Capstone Project (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Concentration) (3-0-3)
	Elective	(Free) (3-0-3)
	Elective	(Free) (3-0-3)

Electives

† *Basic Social Sciences GUR::* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

†† IT students can selectENG 352Technical Writing to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, Hist 213, and 200-level history courses at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Management GUR: Engineering Management (IE 492) or Principles of Management (Mgmt 390). Leadership in Management I (AS 333) is acceptable only for students takining the aerospace option.

Mathematics: (7 credit minimum) At least one three-credit calculus course; the second math course is chosen in consultation with a CCS Academic Advisor. At least one credit of probability and statistics must be included in the math GUR, as approved by advisor. Depending on the concentrations, a different math sequence may be required.

Natural Sciences: (7 credit minimum) Two courses, one of which must be a Laboratory science, approved by advisor. Depending on the concentrations, a different natural science sequence my be equired.

Information Technology Core: (27 credits) The Information Technology Core is a set information technology/computer and information science courses that provide fundamental knowledge and practice in information technology functions, system development, and software.

IT Capstone Project: A culminating project experience that integrates the student's IT and concentration expertise. The IT Program strongly supports and encourages the student to implement this project in collaboration with NJIT industrial partners and/or NJIT's Enterprise Development Centers. In accordance with the need for the IT professional to have highly developed communication skills, the student will present the results of their projects at the completion of the project.

Concentration Electives: A coherent set of 12 courses, focusing on an application area relevant to Information Technology. Students may select concentrations from all four NJIT colleges and schools. A list of possible concentration areas can be obtained from a CCS Academic Advisor.

Area Electives: A minimum of three courses (9 credits to be chosen in consultation with the advisor. Courses should be selected to meet prerequisite requirements of concentration courses, if needed. In the case where prerequisites for concentration courses are already met, area electives can be free electives. See below.

Free Electives: A minimum of three courses (9 credits). At least two of the free elective courses must be upper division courses.

CO-OP

In IT, IT 311 is taken for additive credit; IT 411 is taken for degree credit.

Information Technology Concentrations: Students can choose from a partial or full array of concentrations, each consisting of 12 courses. The concentration provides coherent set of courses, focusing on an application area of Information Technology relevant to the student's interest.

Applied Math

The IT concentration in Applied Math focuses on the application of computer technology in the analytical and computational work necessary to succeed in industry, the public sector, and graduate study. Students study a broad range of mathematical techniques, modeling and problem solving strategies using computer software. This concentration culminates with a senior experience during which students will combine mathematical modeling with physical and computational experiments in the Undergraduate Mathematics Computing Laboratory.

Applied Physics

The IT concentration in Applied Physics is designed to give students the background to work in technology-based industries such as microelectronics and computers. Students obtain a thorough knowledge of modern physics and apply it to the design and manufacturing in optical science and engineering, astronomy, and microelectronics.

Architecture
The Architecture concentration focuses on skills in design, architectural technology, business practice and architectural precedent and the development of an ability to think across boundaries – creating general competencies in problem solving, organization of complex processes and systems, judgment, and creativity.

Bioinformatics
The IT concentration in Chemical processing is designed for students who wish to conduct in-depth explorations of the use of computer applications in the chemical processing industry. Students majoring in IT with a Chemical Processing concentration will be working in computer-intensive laboratory settings, both on-campus and, in their senior year, with industrial partners.

Chemical Processing
The IT concentration in Chemical Processing is designed for students who wish to conduct in-depth explorations of the use of computer applications in the chemical processing industry. Students majoring in IT with a Chemical Processing concentration will be working in computer-intensive laboratory settings, both on-campus and, in their senior year, with industrial partners.

Computer-Aided Engineering Design
The IT concentration in Computer-Aided Engineering Design focuses on the use of computer applications in the design of mechanical or civil engineering systems. Students will gain knowledge of the use of computation in engineering design, including the application programs and the underlying principles of design as they pertain to mechanical or civil engineering.

E-Commerce
The IT concentration in E-Commerce pertains to all computer and telecommunication aspects of operating an online industrial enterprise. The E-Commerce graduate will be prepared, both technically and analytically, to contribute to the success and growth of online industrial ventures. Students will work with industry partners to gain hands-on experience in the technological backbone of e-commerce. It also provides students with the specific skills and knowledge required to conduct business successfully on-line. Students will acquire the business know-how and skills to create the commercial applications organizations need to gain an edge in a worldwide marketplace. Students will work with industry partners to gain hands-on experience with the applications of e-commerce technologies.

Graphic and Design
The IT concentration in Graphics and Design is designed to provide an opportunity for students to obtain a cross-disciplinary education that will enable them to pursue careers that require knowledge in information technology, as well as the ability to creatively communicate and express information graphically in two and three dimensions. Students will take courses design to improve their visual literacy and judgment, graphic skills, and problem solving capabilities.

History
The IT concentration in History deals with technological trends and the application of technology primarily to environmental and medical issues. Students learn how to employ databases, software and network systems to address issues in historical research and archival development, preparing them for careers in law, government and other professions in which analytical skills are at a premium.

Information Technology Education
The IT concentration in Information Technology Education is designed for students interested in technology and its impact on teaching and learning. Students will examine theoretical and practical issues of education technology and technology education and will be able to participate in improving the quality of education at school, work, and community. The role of new technologies on students and teachers, on curriculum, and on communication will also be studied.

Infrastructure Systems
The IT concentration in Infrastructure Systems is designed for students who wish to pursue careers involving the design of structures in the built environment and to understand the use of computer applications as they are used to enhance knowledge of the fundamentals of structural systems. Majors in this concentration will gain experience with the computer applications central to urban planners and civil engineers.

Management of Information Systems
The IT concentration in Management of Information Systems focuses on the design of information systems that improve business effectiveness. Students will be exposed to current technologies and their impact on organizations, and examine

issues that will need to be addressed in the current and future technologically-oriented economy, both nationally and internationally.

Multimedia
The IT concentration in Multimedia offers students significant opportunities to build on fundamental principles of computer-aided graphic design, audio and video production as they are used in streaming media, web-based commerce, entertainment, education and public information services. Students will complete a combination of studio, design and systems courses that will prepare them for semester-long internships at leading multimedia production companies in New Jersey and New York.

Network Applications
The IT concentration in Network Applications focuses on the computer systems and software tools crucial to organizational-wide networks and the World Wide Web. Students will be exposed to the development of facilities and systems to aid people in organizational units, work groups, decision groups, and learning groups that deal with information and digital media.

Network Security
Network Security is a high priority for computing professionals, in business organizations, government agencies, the military, and any proprietary setting. Students choosing this concentration will come to understand the evolution of computer security; applied computer operations and security protocols; data transmission and storage protection methods via cryptography; ways of identifying, understanding and recovering from attacks against computer systems; methods of security breach prevention; network systems availability; applications security, recovery and business continuation procedures; and counter systems penetrations techniques.

Professional and Technical Communication
The Professional and Technical Communication concentration prepares students to work in a variety of fields of high-tech communications such as the World Wide Web. PTC especially considers multimedia from the point of view of the media user and emphasizes Computing, Writing, Interpersonal Communication, and Literature. Typical employment fields for the PTC student include: Multimedia and Internet design and practice, Technical Writing and Editing, Journalism, Television and Radio, Magazine and Book Publishing, and Advertising.

Robotics and Automation Engineering
The IT concentration in Automation Engineering prepares engineers to design, improve, install and operate integrated automated and robotic systems used in manufacturing, operations research and commerce. Students are offered exposure to the specialized areas of automated manufacturing systems, information systems, quality assurance and safety engineering. The curriculum stresses fundamental principles and concepts that will apply to focused areas of collaboration with industrial concerns, research laboratories and business incubators.

Society and Technology
The IT concentration in Society and Technology is designed for students who wish to explore the impacts of technology on the ethical, political and economic systems of the information age. This concentration uses information systems to explore the relation of technology to society. Students will study tools that under-gird urban social systems and the strategies employed by legal and regulatory agencies.

Software Development Management
This program of study is intended to prepare an individual to be both a participant in a development group and a first line manager of a small development team at the time of graduation. It is expected to give the student all the tools necessary for them to advance both technically and management wise in the area of software development management within and organization. This program is based upon the premeis that managers of software development activities must have a working understanding of the development technology. For those that ultimately wish to go higher in the management (beyond first line management of software development groups) process it is recommended that they consider the joint BS/Masters program at NJIT and continue with their masters in Information Systems. You should discuss this option with the advisor in during the second year of study.

Software Engineering
The IT concentration in Software Engineering is designed for students who are interested in integrating the knowledge essential for the development, implementation, design cycles, management, and marketing of software systems. Students will acquire and apply analysis, design, and entrepreneurial skills in real business settings.

Statistics
The IT concentration in Statistics focuses on the integration of statistical techniques with computer technology to address

data analysis issues. Students gain the analytical and computational skills necessary to succeed in industry, the public sector, and graduate study. This concentration teaches a broad range of mathematical techniques, data analysis methods, and problem solving strategies using computing methods.

Telecommunications

The IT concentration in Telecommunications focuses on the rapidly growing field of applications development and deployment of telecommunications in such diverse fields as banking, reservation systems, office information systems, corporate networks, and the Internet. Students graduating from this program will be prepared for the computer communications, networking and wireless communications industries.

Undergraduate - Management

Administered By: School of Management

Administration

Dean	Mark Somers
Associate Dean	Barbara Tedesco
Sponsored Chairs	Alok Chakrabarti (management of technology), Murray Turoff(Hurlburt Professor), William Rapp (Henry J. Leir Chair in International Business)
Director, Executive Program	Frank Koe, Phone: (973) 642-7499 (Room 3008 CAB) Email: Koe@adm.njit.edu

Faculty

Distinguished Professors	Chakrabarti, Kirchhoff, Turoff
Professors	Hawk, Lawrence, Rotter, Schachter, Somers, Spasovic
Associate Professors	Anandarajan, Bonitsis, Cordero, Fjermestad, Gopalakrishnan, Mehta, Sylla
Assistant Professors	Gagnon, Passerini, Kudyba, Schneider, Spencer
Visiting Professors	Gurstein, Sau, Viajayan
Special Lecturers	Bogui, Casal, Dine, Patten, Pettit, Walsh
Professional/Instructional Staff	Casal

+Joint appointee with the Department of Computer and Information Science
++Joint appointee with the School of Architecture

Changes to BSM

The B.S. in Management curriculum is designed to help students understand the many functions involved in operating a successful organization in today's digital world. The School of Management draws upon NJIT's vast resources in science and technology to present a focused program emphasizing the application and management of technology to improve decision-making and competitiveness in organizations, from the multinational conglomerate to the local small business.

The curriculum is cross-disciplinary in approach, emphasizing the intersection of information technologies, business planning, and human behavior in organizations. The program also emphasizes computing skills and utilization of current information-age technologies. Students are introduced to multimedia systems, Internet applications and the World Wide Web. Students also gain knowledge of current telecommunications technologies and their impact on business operations. Companies in both domestic and international markets increasingly seek technology-oriented business managers.

OPTIONS

The B.S. in Management offers three options: management information systems, e-commerce and marketing.

The e-commerce option introduces students to Internet technologies, Internet marketing and Internet basics for managers. The courses are designed to produce a technology savvy and skilled businessperson who will be able to create commercial applications for companies and organizations.

The management information systems option focuses on the design of information systems that improve business effectiveness. Coursework includes programming languages, database design, and applications of information technologies to business problems.

The marketing concentration focuses on business-to-business marketing with a strong emphasis on the marketing of technology-based products and innovations. Courses emphasize selling and promotion, product design and market research, and marketing information systems.

The curriculum as described below is for students entering NJIT as freshmen in the Fall of 2003 or after that date. Students entering before that date may have a different program and should consult the school to learn which curriculum applies.

■ **B.S. in Management** (124 Credit minimum)

FIRST YEAR

1st Semester

Acct 115	Principles of Accounting I (3-0-3)
CIS 103	Computer Science with Business Problems (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Math 138	General Calculus I (3-0-3)
	or
Math 111	Calculus I (4-1-4)
Elective	Free (3-0-3)
FrshSem	Frsh Sem (1-0-0)

2nd Semester

Acct 116	Principles of Accounting II (3-0-3)
Econ 265	Microeconomics (3-0-3)
MIS 246	Tools and Technologies for the Digital Firm (3-0-3)
HSS 202	Society, Technology, and Environment (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)
Elective	(Quantitative course) (3-0-3) or (4-1-4)

SECOND YEAR

1st Semester

Econ 266	Macroeconomics (3-0-3)
Math 105	Elementary Probability and Statistics (3-1-3)
	or
Math 333	Probability and Statistics (3-0-3)
Mgmt 290	Legal Environment of Business (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Natural Sciences: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

Eng 200	Communicating in Organizations (3-0-3)
HSS 251	Ethical Issues in Business (3-0-3)
Mgmt 216	Business Statistics (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Natural Sciences with laboratory: GUR) (0-1-1)

THIRD YEAR

1st Semester

Fin 315	Principles of Financial Management (3-0-3)
HRM 301	Organizational Behavior (3-0-3)
Mgmt 390	Principles of Management (3-0-3)
Mrkt 330	Principles of Marketing (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)

2nd Semester

MIS 345	Management of Information Systems (3-0-3)
OM 375	Management Science (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
Elective	(Mgmt Option Course) (3-0-3)

Mgmt 380	Principles of E-Commerce (3-0-3)

FOURTH YEAR

1st Semester

Mgmt 491	International Business (3-0-3)
Elective	(HSS Open: GUR) (3-0-3)
Elective	(Mgmt Option Course) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester

Entr 430	Entrepreneurial Strategy (3-0-3)
	or
Mgmt 492	Business Policy (3-0-3)
Mgmt 480	Managing in a Technological Environment (3-0-3)
Elective	(HSS Capstone Seminar: GUR) (3-0-3)
Elective	(Mgmt Option Course) (3-0-3)
Elective	(Free) (3-0-3)

MANAGEMENT OPTION ELECTIVES

Students must receive written approval from a faculty advisor, prior to registration, for all option electives.

Management Information Systems Concentration

9 Credits from:

CIS 114	Introduction to Computer Science II
CIS 332	Principles of Operating Systems
CIS 333	Introduction to UNIX OS
CIS 365	File Structures and Management
CIS 431	Database System Design and Management
CIS 451	Data Communications and Networks
CIS 455	Computer Systems Management
Mgmt 350	Knowledge Management
MIS 445	Decision Support Systems and OLAP

E-commerce Concentration

9 Credits from:

CIS 270	Multimedia Systems
CIS 333	Introduction to UNIX OS
CIS 375	Application Development for the WWW
CIS 456	Open Systems Networking
Mgmt 460	Management Strategies for E-Commerce
MIS 360	Survey of E-Commerce Tools & Technologies
Mrkt 360	Internet Marketing

Marketing Concentration

9 Credits from:

Mrkt 338	Product Development and Management
Mrkt 434	Business-to-Business Marketing
Mrkt 360	Internet Marketing
Entr 420	Technological Entrepreneurship
Mrkt 434	Marketing Channels

Undergraduate - Mathematical Sciences

Administered By: Department of Mathematical Sciences

Administration

Chairperson	Daljit S. Ahluwalia
Associate Chairperson	Robert M. Miura
Director(Undergraduate Program)	Amitabha Bose
Director(Graduate Program)	Demetrius T. Papageorgiou
Director(Statistics Program)	Manish C. Bhattacharjee
Departmental Coordinator	Padma Gulati

Faculty

Foundation Chair	Kriegsmann
Distinguished Professors	Aubry*, Goldberg, Kriegsmann
Professors	Ahluwalia, Andrushkiw, Bhattacharjee, Blackmore, Deek***, Lacker**, Levy, Luke, Milojevic, Miura**, Papageorgiou, Perez, Stickler, Tavantzis
Associate Professors	Bechtold, Booty, Bose, Bukiet, Chase, Dhar, Dios, Golowasch†, Kappraff, Katzen, Kondic, Lieb, Michalopoulou‡, Nadim†, Petropoulos, Plastock, Siegel, Sran, Wang
Assistant Professors	Berliner, Connell, Elmer, Goldman**, Goodman, Horntrop, Jiang, Matveev, Moore, Muratov, Raymond, Tao, Yoo, Young
Special Lecturers	Jain, khan, Rappaport, Ratnaswamy
Lecturers	Abdeljaber, Hunter, Mohebbi, Talwar, Zaleski
Post Doctoral Fellows	Moyal
Research Professors	Booth, Erneux, Georgieva, Mauri, Lott, Vanden-Broeck

*Joint appointment with Department of Mechanical Engineering
**Joint appointment with Department of Biomedical Engineering
***Joint appointment with the Department of Information Systems
†Joint appointment with the Federated Department of Biology
‡Joint appointment with the Department of Electrical and Computer Engineering

NJIT's Department of Mathematical Sciences offers a strong undergraduate program leading to:

The Bachelor of Science in Mathematical Sciences

with Options in:

Applied Mathematics

Applied Statistics

Mathematical Biology

Mathematics of Finance and Actuarial Science

This program prepares students for job opportunities in industry or government, for pursuing graduate studies in mathematics, statistics, or a related field, or for entrance into various professional schools. The Department of Mathematical Sciences is one of the few departments in this country with a strong emphasis on applied mathematics and statistics and is one of the strongest departments in North America for Applied Mathematics with excellent research groups in Mathematical Neurophysiology, Fluid Dynamics, Numerical Analysis, Combustion, Materials Science, and Electromagnetics.

MajorsThe undergraduate curriculum in Mathematical Sciences with one of the Options listed above offers training for majors in a broad range of topics, including basic courses in calculus, differential equations, probability, discrete mathematics, statistics, advanced calculus, mathematical analysis, and complex variables, as well as more advanced courses in ordinary and partial differential equations, operations research, applied numerical methods, nonlinear dynamics, mathematical biology, applied statistics, actuarial science, and methods of applied mathematics. Many of the courses in this program emphasize the techniques required to formulate physical, biological, and industrial phenomena as mathematical models and to solve the resulting mathematical problems by using analytical and computational techniques. Senior "capstone" courses provide an opportunity for students in the Applied Mathematics and Mathematical Biology options to synthesize the knowledge gained during their undergraduate experience by combining mathematical modeling with physical and computational experiments that are conducted in the Undergraduate Mathematics Computing Laboratory. Click on one of the Options above to get more information about becoming a Major in Mathematical Sciences. You will need to see a faculty advisor in the Department of Mathematical Sciences to become a Major.

MinorsStudents can easily earn a Minor in Applied Mathematics or Applied Statistics by taking only 5 courses beyond your major's requirements. Students can learn more about taking a minor by clicking on this link and should see one of the Department of Mathematical Sciences faculty advisors for the minor program.

Double Majors Students may earn a second major in addition to their primary major in Mathematical Sciences with one of the Options listed above. Two of the most popular double majors with the Mathematical Sciences major are the Computer Science (B.S.) major and the Biology (B.S.) major. Completion is usually feasible within four years of full-time study.

Contact a faculty advisor in the Department of Mathematical Sciences for a list of appropriate courses to complete a double major with the major in Mathematical Sciences. For general rules about double majors, see Degree Options in the Academic Policies and Procedures section of this catalog.

Undergraduate - Applied Mathematics

Administered By: Department of Mathematical Sciences

Administration

Chairperson	Daljit S. Ahluwalia
Associate Chairperson	Robert M. Miura
Director(Undergraduate Program)	Amitabha Bose
Director(Graduate Program)	Demetrius T. Papageorgiou
Director(Statistics Program)	Manish C. Bhattacharjee
Departmental Coordinator	Padma Gulati

Faculty

Foundation Chair	Kriegsmann
Distinguished Professors	Aubry*, Goldberg, Kriegsmann
Professors	Ahluwalia, Andrushkiw, Bhattacharjee, Blackmore, Deek***, Lacker**, Levy, Luke, Milojevic, Miura**, Papageorgiou, Perez, Stickler, Tavantzis
Associate Professors	Bechtold, Booty, Bose, Bukiet, Chase, Dhar, Dios, Golowasch†, Kappraff, Katzen, Kondic, Lieb, Michalopoulou‡, Nadim†, Petropoulos, Plastock, Siegel, Sran, Wang
Assistant Professors	Berliner, Connell, Elmer, Goldman**, Goodman, Horntrop, Jiang, Matveev, Moore, Muratov, Raymond, Tao, Yoo, Young
Special Lecturers	Jain, khan, Rappaport, Ratnaswamy
Lecturers	Abdeljaber, Hunter, Mohebbi, Talwar, Zaleski
Post Doctoral Fellows	Moyal
Research Professors	Booth, Erneux, Georgieva, Mauri, Lott, Vanden-Broeck

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*Joint appointment with Department of Mechanical Engineering
**Joint appointment with Department of Biomedical Engineering
***Joint appointment with the Department of Information Systems
†Joint appointment with the Federated Department of Biology
‡Joint appointment with the Department of Electrical and Computer Engineering

The undergraduate program in applied mathematics prepares students for analytical and computational work in industry or government, for graduate study in mathematics or a related field, or for various professional schools.

MajorsThe undergraduate curriculum provides students with training in a broad range of mathematical techniques and problem solving strategies. Many of the courses in this program emphasize the modeling of physical, biological and industrial phenomena and solving the resulting mathematical problems by using computational and analytical techniques. Senior "capstone" courses provide an opportunity for students to synthesize the knowledge gained during their undergraduate experience by combining mathematical modeling with physical and computational experiments conducted in the Undergraduate Mathematics Computing Laboratory.

Double Majors Students may earn a second major in addition to the applied mathematics major. Two of the most popular double majors with the applied mathematics major are the computer science (B.S.) major and the biology (B.S.) major. Completion is usually feasible within four years of full-time study.

Contact the Department of Mathematical Sciences for a list of appropriate courses to complete a double major with the applied mathematics major. For general rules about double majors, see Degree Options in the Academic Policies and Procedures section of this catalog.

CurriculumThe curriculum as described below is for students entering NJIT as freshmen in the fall of 2002 or after that date. Students entering before that date have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Mathematical Sciences with an option in Applied Mathematics** (127 credit minimum)

FIRST YEAR

1st Semester

Math 111	Calculus I (4-1-4)
CIS 113	Introduction to Computer Science I (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

Math 112	Calculus II (4-1-4)
CIS 114	Introduction to Computer Science II (3-1-3)
HSS 202	Society, Technology, and Environment (3-0-3)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)
Elective	(Cultural History: GUR) (3-0-3)

SECOND YEAR

1st Semester

Math 213	Calculus III (4-0-4)
Math 226	Discrete Analysis (4-0-4)
Math 244	Introduction to Probability (3-0-3)
Phys 234	Physics III (3-0-3)
Phys 231A	Physics III Laboratory (0-2-1)
Elective	(Cultural History: GUR) (3-0-3)

2nd Semester

Math 222	Differential Equations (4-0-4)
Math 240	Numerical Mathematics Laboratory (3-0-3)
Math 337	Linear Algebra (3-0-3)
SS 201	Economics (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

THIRD YEAR

1st Semester

Math 340	Applied Numerical Methods and Optimization (3-0-3)
Math 473	Intermediate Differential Equations (3-0-3)
Math 480	Introductory Mathematical Analysis (3-0-3)
Elective	(Open- Humanities and Social Science: GUR) (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester

Math 331	Introduction to Partial Differential Equations (3-0-3)
Math 332	Introduction to Functions of a Complex Variable (3-0-3)
Math 481	Advanced Calculus (3-0-3)
Elective	(Capstone Seminar-Humanities and Social Science: GUR) (3-0-3)
Elective	(Free) (3-0-3)

FOURTH YEAR

1st Semester

Math 450H	Methods of Applied Mathematics I (Capstone I) (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)
Elective	(Mathematics 300+) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester

Math 451H	Methods of Applied Mathematics II (Capstone II) (3-0-3)
Elective	(Engineering Technology) (3-0-3)
Elective	(Mathematics 400+) (3-0-3)
Elective	(Technical) (3-0-3)

General University Requirements and Electives

General University Requirements

All students are required to satisfy the General University Requirements (GUR). All GUR courses and additional mathematics, technical, and free electives are to be selected in consultation with a faculty advisor in the Department of Mathematical Sciences. Refer to the General University Requirements section of this catalog for further information on electives.

Engineering Technology GUR (6 credits): Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, or MIS 345.

Management GUR: Students take IE 492 or Mgmt 390

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Basic Social Sciences GUR: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Electives

Mathematics, Technical, and Free Electives: Any mathematics course numbered 331 or above may be used as a mathematics, technical, or free elective. Any NJIT course at or above the 100 level may be used as a technical or free elective; except a technical elective is a course that has a significant mathematical and/or scientific content. All elective courses are to be chosen in consultation with a faculty advisor in the Department of Mathematical Sciences.

Co-op Courses

In Mathematical Sciences, the co-op courses, Math 310 and Math 410, bear degree credit and count as technical or free electives, subject to approval by a faculty advisor in the Department of Mathematical Sciences.

Undergraduate - Applied Statistics

Administered By: Physics Departments of NJIT and Rutgers-Newark

Administration

Chairperson (NJIT)	Leon Buteau
Chairperson (Rutgers-Newark)	Zhen Wu
Associate Chairpersons (NJIT)	Dale Gary, Haimin Wang
Joint Graduate Programs Director and Graduate Advisor	N. M. Ravindra, Phone: (973) 596-3278 (Room 464 TIE)
Joint Director of Undergraduate Physics Programs	Roumiana Petrova
Assistant to the Chair	Renee Crawley

NJIT Faculty

Distinguished Professors	Goode, R. Levy
Professors	Buteau, Carr, Chin, Federici, Ravindra, Gary
Associate Professors	Towfik, Russo, G.Thomas, Tyson, H. Wang
Assistant Professors	Sirenko, Jermakian, Denker, Savrassov
Distinguished Research Professors	Hensel, Zirin, Lanzerotti
Research Professors/Special Lecturers	H. Opyrchal, Piatek, Fiory, Petrova

Rutgers-Newark Faculty

Professor Rank II	Murnick, Fayngold, Gokce, Maljian
Professor	Shaw
Associate Professor	Wu, T. Opyrchal, Redling
Assistant Professor	Shneidman

Administered By: Department of Mathematical Sciences, Cullimore Hall, Room 606

The undergraduate program in Mathematical Sciences with an option in Applied Statistics prepares students for the application of mathematics to designing an experiment, sampling and data collection, statistical modeling, and analytical work in industry or government. Statistical techniques are widely used in the area of business marketing, medicine and public health, developmental disabilities, education, political science and many other areas.NJIT's Department of Mathematical Sciences is one of the few departments in New Jersey with a strong program in Applied Statistics.

Majors: The undergraduate curriculum provides students with training in a broad range of mathematical techniques, problem formulation and problem solving strategies. Students learn about the many facets of data analysis through courses in sampling, regression, experimental design, time series analysis and simulation. A strong background in Computer Science and programming languages make our students even more marketable as applied statisticians.

Double Majors: Students may earn a second major in addition to their primary major in Mathematical Sciences with an option in Applied Statistics.Two of the most popular double majors with the Mathematical Sciences major are the Computer Science (B.S.) major and the Biology (B.S.) major. Completion is usually feasible within four years of full-time study.

Contact the Department of Mathematical Sciences for a list of appropriate courses to complete a double major with the major in Mathematical Sciences with an option in Applied Statistics. For general rules about double majors, see Degree Options in the Academic Policies and Procedures section of this catalog.

Curriculum: The curriculum described below is for students who entered NJIT in the Fall of 2002 or later. Students who entered NJIT before that date have been moved into this new program and should consult their faculty advisor in the Department of Mathematical Sciences if they have any questions regarding this new curriculum.

■ **B.S. in Mathematical Sciences with an Option in Applied Statistics** (126 credit minimum)

FIRST YEAR

1st Semester

Math 111	Calculus I (4-1-4)
CIS 113	Introduction to Computer Science I (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

Math 112	Calculus II (4-1-4)
CIS 114	Introduction to Computer Science II (3-1-3)
HSS 202	Society, Technology, and Environment (3-0-3)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)
Elective	(Cultural History: GUR) (3-0-3)

SECOND YEAR

1st Semester

Math 213	Calculus III B (4-0-4)
Math 226	Discrete Analysis (4-0-4)
Math 244	Introduction to Probability (3-0-3)
SS 201	Economics (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)

2nd Semester

Math 222	Differential Equations (4-0-4)
Math 240	Numerical Mathematics Laboratory (3-0-3)
Math 337	Linear Algebra (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

THIRD YEAR

1st Semester

Math 334	Operations Research (3-0-3)
Math 341	Introduction to Statistics (3-0-3)
CIS 461	Systems Simulation (3-0-3)
Elective	(Open- Humanities and Social Science: GUR) (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester

Math 340	Applied Numerical Methods and Optimization (3-0-3)
Math 344	Regression Analysis (3-0-3)
Math 477	Stochastic Processes (3-0-3)
Elective	(Capstone Seminar-Humanities and Social Science: GUR) (3-0-3)
Elective	(Free) (3-0-3)

FOURTH YEAR

1st Semester

Math 447	Applied Time Series Analysis (3-0-3)
Math 480	Introductory Mathematical Analysis (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)
Elective	(Option Elective - One of Math 443, 444, 445, 446, or other 400+ level course with advisor's approval) (3-0-3)
Elective	(Technical) (3-0-3)

2nd Semester

Math 481	Advanced Calculus (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)
Elective	(Option Elective - One of Math 443, 444, 445, 446, or other 400+ level course with advisor's approval) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Free) (3-0-3)

General University Requirements and Electives

General University Requirements

All students are required to satisfy the General University Requirements (GUR). All GUR courses and additional mathematics, technical, and free electives are to be selected in consultation with a faculty advisor in the Department of Mathematical Sciences. Refer to the General University Requirements section of this catalog for further information on electives.

Engineering Technology GUR (6 credits): Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, or MIS 345.

Management GUR: Students take IE 492 or Mgmt 390

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Basic Social Sciences GUR: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Electives

Mathematics, Technical, and Free Electives: Any mathematics course numbered 331 or above may be used as a mathematics, technical, or free elective. Any NJIT course at or above the 100 level may be used as a technical or free elective; except a technical elective is a course that has a significant mathematical and/or scientific content. All elective courses are to be chosen in consultation with a faculty advisor in the Department of Mathematical Sciences.

Co-op Courses

In Mathematical Sciences, the co-op courses, Math 310 and Math 410, bear degree credit and count as technical or free electives, subject to approval by a faculty advisor in the Department of Mathematical Sciences.

Undergraduate - Mathematical Biology

Administered By: Department of Mathematical Sciences

Administration

Chairperson	Daljit S. Ahluwalia
Associate Chairperson	Robert M. Miura
Director(Undergraduate Program)	Amitabha Bose
Director(Graduate Program)	Demetrius T. Papageorgiou
Director(Statistics Program)	Manish C. Bhattacharjee
Departmental Coordinator	Padma Gulati

Faculty

Foundation Chair	Kriegsmann
Distinguished Professors	Aubry*, Goldberg, Kriegsmann
Professors	Ahluwalia, Andrushkiw, Bhattacharjee, Blackmore, Deek***, Lacker**, Levy, Luke, Milojevic, Miura**, Papageorgiou, Perez, Stickler, Tavantzis
Associate Professors	Bechtold, Booty, Bose, Bukiet, Chase, Dhar, Dios, Golowasch†, Kappraff, Katzen, Kondic, Lieb, Michalopoulou‡, Nadim†, Petropoulos, Plastock, Siegel, Sran, Wang
Assistant Professors	Berliner, Connell, Elmer, Goldman**, Goodman, Horntrop, Jiang, Matveev, Moore, Muratov, Raymond, Tao, Yoo, Young
Special Lecturers	Jain, khan, Rappaport, Ratnaswamy
Lecturers	Abdeljaber, Hunter, Mohebbi, Talwar, Zaleski
Post Doctoral Fellows	Moyal
Research Professors	Booth, Erneux, Georgieva, Mauri, Lott, Vanden-Broeck

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*Joint appointment with Department of Mechanical Engineering
**Joint appointment with Department of Biomedical Engineering
***Joint appointment with the Department of Information Systems
†Joint appointment with the Federated Department of Biology
‡Joint appointment with the Department of Electrical and Computer Engineering

Administered By: Department of Mathematical Sciences, Cullimore Hall, Room 606

The undergraduate program in Mathematical Sciences with an option in Mathematical Biology prepares students for modelling, computational, and analytical work in industry or government, for graduate study in mathematics or a related field, or for various professional schools. NJIT's Department of Mathematical Sciences is one of the few departments in North America with such a strong program in Mathematical Biology. There are ten active researchers in Mathematical Biology, including seven in Computational Neuroscience.

Majors: The undergraduate curriculum provides students with training in a broad range of mathematical techniques and problem solving strategies. Many of the courses in this program emphasize the techniques required to formulate physical, biological, and industrial phenomena as mathematical models and to solve the resulting mathematical problems by using computational and analytical techniques. Senior "capstone" courses provide an opportunity for students to synthesize the knowledge gained during their undergraduate experience by combining mathematical modeling with physical and computational experiments conducted in the Undergraduate Mathematics Computing Laboratory.

Double Majors: Students may earn a second major in addition to their primary major in Mathematical Sciences with an option in Mathematical Biology. Two of the most popular double majors with the Mathematical Sciences major are the Computer Science (B.S.) major and the Biology (B.S.) major. Completion is usually feasible within four years of full-time study.

Contact the Department of Mathematical Sciences for a list of appropriate courses to complete a double major with the major in Mathematical Sciences with an option in Mathematical Biology. For general rules about double majors, see Degree Options in the Academic Policies and Procedures section of this catalog.

Curriculum: The curriculum described below is for students who entered NJIT in the Fall of 2002 or later. Students who entered NJIT before that date have been moved into this new program and should consult their faculty advisor in the Department of Mathematical Sciences if they have any questions regarding this new curriculum.

■ **B.S. in Mathematical Sciences with an Option in Mathematical Biology** (126 credit minimum)

FIRST YEAR

1st Semester (15 credits)

Math 111	Calculus I (4-1-4)
CIS 113	Introduction to Computer Science I (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester (15 credits)

Math 112	Calculus II (4-1-4)
SS 201	(Basic Social Sciences: GUR) Economics (3-0-3)
HSS 202	Society, Technology, and Environment (3-0-3)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)
Elective	Physical Education: GUR (0-1-1)

SECOND YEAR

1st Semester (18 credits)

Math 213	Calculus III B (4-0-4)
Math 226	Discrete Analysis (4-0-4)
Math 337	Linear Algebra (3-0-3)
R21:120:101	General Biology I (3-3-4)
Elective	(Cultural History: GUR) (3-0-3)

2nd Semester (17 credits)

Math 222	Differential Equations (4-0-4)
Math 240	Numerical Mathematics Laboratory (3-0-3)
Math 333	Probability and Statistics (3-0-3)
R21:120:102	General Biology II (4-0-4)
Elective	(Cultural History: GUR) (3-0-3)

THIRD YEAR

1st Semester (16 credits)

Math 331	Introduction to Partial Differential Equations (3-0-3)
Math 340	Applied Numerical Methods (3-0-3)
Math 430	Analytical and Computational Neuroscience (3-1-3)
R21:120:301	Foundations of Biology: Cell and Molecular Biology (3-3-4)
Elective	(Open- Humanities and Social Science: GUR) (3-0-3)

2nd Semester (15 credits)

Math 332	Introduction to Functions of a Complex Variable (3-0-3)
Math 371	Physiology and Medicine (3-0-3)
Elective	(Option Elective - One of Math 344,372,431,440,473) (3-0-3)
Elective	(Free) (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

FOURTH YEAR

1st Semester (15 credits)

Math 450H	Methods of Applied Mathematics I (Capstone I) (3-0-3)
Math 480	Introductory Mathematical Analysis (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)
Elective	(Mnagement: GUR) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester (15 credits)

Math 451H	Methods of Applied Mathematics II (Capstone II) (3-0-3)
Math 481H	Advanced Calculus (3-0-3)
Elective	(Engineering Technology) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Capstone Seminar-Humanities and Social Science: GUR) (3-0-3)

General University Requirements and Electives

General University Requirements

All students are required to satisfy the General University Requirements (GUR). All GUR courses and additional mathematics, technical, and free electives are to be selected in consultation with a faculty advisor in the Department of Mathematical Sciences. Refer to the General University Requirements section of this catalog for further information on electives.

Engineering Technology GUR (6 credits): Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, or MIS 345.

Management GUR: Students take IE 492 or Mgmt 390

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Basic Social Sciences GUR: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Electives

Mathematics, Technical, and Free Electives: Any mathematics course numbered 331 or above may be used as a mathematics, technical, or free elective. Any NJIT course at or above the 100 level may be used as a technical or free elective; except a technical elective is a course that has a significant mathematical and/or scientific content. All elective courses are to be chosen in consultation with a faculty advisor in the Department of Mathematical Sciences.

Co-op Courses

In Mathematical Sciences, the co-op courses, Math 310 and Math 410, bear degree credit and count as technical or free electives, subject to approval by a faculty advisor in the Department of Mathematical Sciences.

Undergraduate - Finance and Actuarial Science

Administered By: Department of Mathematical Sciences

Administration

Chairperson	Daljit S. Ahluwalia
Associate Chairperson	Robert M. Miura
Director(Undergraduate Program)	Amitabha Bose
Director(Graduate Program)	Demetrius T. Papageorgiou
Director(Statistics Program)	Manish C. Bhattacharjee
Departmental Coordinator	Padma Gulati

Faculty

Foundation Chair	Kriegsmann
Distinguished Professors	Aubry*, Goldberg, Kriegsmann
Professors	Ahluwalia, Andrushkiw, Bhattacharjee, Blackmore, Deek***, Lacker**, Levy, Luke, Milojevic, Miura**, Papageorgiou, Perez, Stickler, Tavantzis
Associate Professors	Bechtold, Booty, Bose, Bukiet, Chase, Dhar, Dios, Golowasch†, Kappraff, Katzen, Kondic, Lieb, Michalopoulou‡, Nadim†, Petropoulos, Plastock, Siegel, Sran, Wang
Assistant Professors	Berliner, Connell, Elmer, Goldman**, Goodman, Horntrop, Jiang, Matveev, Moore, Muratov, Raymond, Tao, Yoo, Young
Special Lecturers	Jain, khan, Rappaport, Ratnaswamy
Lecturers	Abdeljaber, Hunter, Mohebbi, Talwar, Zaleski
Post Doctoral Fellows	Moyal
Research Professors	Booth, Erneux, Georgieva, Mauri, Lott, Vanden-Broeck

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*Joint appointment with Department of Mechanical Engineering
**Joint appointment with Department of Biomedical Engineering
***Joint appointment with the Department of Information Systems
†Joint appointment with the Federated Department of Biology
‡Joint appointment with the Department of Electrical and Computer Engineering

Administered By: Department of Mathematical Sciences, Cullimore Hall, Room 606

The undergraduate program in Mathematical Sciences with an option in Mathematics of Finance and Actuarial Science prepares students for the application of mathematics to financial management, market transactions, business analysis, investments, insurance and pensions. NJIT's Department of Mathematical Sciences is one of the few departments in New Jersey with a strong program in Mathematics of Finance and Actuarial Science.

Majors: The undergraduate curriculum provides students with training in a broad range of mathematical techniques and problem solving strategies. Students learn about the many facets of financial analysis through courses in Mathematics, Accounting, Economics, and Finance. A strong background in Computers and Scientific Computing make our students an even greater asset to the industry.

Double Majors: Students may earn a second major in addition to their primary major in Mathematical Sciences with an option in Mathematics of Finance and Actuarial Science. Two of the most popular double majors with the Mathematical Sciences major are the Computer Science (B.S.) major and the Biology (B.S.) major. Completion is usually feasible within four years of full-time study.

Contact the Department of Mathematical Sciences for a list of appropriate courses to complete a double major with the major in Mathematical Sciences with an option in Mathematics of Finance and Actuarial Science. For general rules about double majors, see Degree Options in the Academic Policies and Procedures section of this catalog.

Curriculum: The curriculum described below is for students who entered NJIT in the Fall of 2002 or later. Students who entered NJIT before that date have been moved into this new program and should consult their faculty advisor in the Department of Mathematical Sciences if they have any questions regarding this new curriculum.

■ **B.S. in Mathematical Sciences with an Option in Mathematics of Finance and Actuarial Science** (129 credit minimum)

FIRST YEAR

1st Semester

Math 111	Calculus I (4-1-4)
CIS 113	Introduction to Computer Science I (3-1-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Phys 111	Physics I (3-0-3)
Phys 111A	Physics I Laboratory (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)
Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

Math 112	Calculus II (4-1-4)
Acct 115	Principles of Accounting (3-0-3)
HSS 202	Society, Technology and Environment (3-0-3)
Phys 121	Physics II (3-0-3)
Phys 121A	Physics II Laboratory (0-2-1)
Elective	(Cultural History: GUR) (3-0-3)

SECOND YEAR

1st Semester

Math 213	Calculus III B (4-0-4)
Math 226	Discrete Analysis (4-0-4)
Math 244	Introduction to Probability (3-0-3)
Econ 265	Microeconomics (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)

2nd Semester

Math 222	Differential Equations (4-0-4)
Math 240	Numerical Mathematics Laboratory (3-0-3)
Math 337	Linear Algebra (3-0-3)
Math 341	Introduction to Statistics (3-0-3)
Econ 266	Macroeconomics (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

THIRD YEAR

1st Semester

Math 334	Operations Research (3-0-3)
Math 346	Mathematics of Finance I (3-0-3)
Fin 315	Principles of Financial Management (3-0-3)
Elective	(Open- Humanities and Social Science: GUR) (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

2nd Semester

Math 340	Applied Numerical Methods (3-0-3)
Math 344	Regression Analysis (3-0-3)
CIS 461	Systems Simulation (3-0-3)
Elective	(Capstone Seminar-Humanities and Social Science: GUR) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Free) (3-0-3)

FOURTH YEAR

1st Semester

Math 447	Applied Time Series Analysis (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)
Elective	(Technical) (3-0-3)
Elective	(Option Elective - One of Fin 416, 422,423; R29:390:315, R29:390:329, R29:390:386; Math 441, 442, 480, 481) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester

Math 477	Stochastic Processes (3-0-3)
Elective	(Engineering Technology:GUR) (3-0-3)
Elective	(Mathematics 400+) (3-0-3)
Elective	(Option Elective - One of Fin 416, 422, 423; R29:390:315, R29:390:329, R29:390:386; Math 441, 442, 480, 481) (3-0-3)

General University Requirements and Electives

General University Requirements

All students are required to satisfy the General University Requirements (GUR). All GUR courses and additional mathematics, technical, and free electives are to be selected in consultation with a faculty advisor in the Department of Mathematical Sciences. Refer to the General University Requirements section of this catalog for further information on electives.

Engineering Technology GUR (6 credits): Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, or MIS 345.

Management GUR: Students take IE 492 or Mgmt 390

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Basic Social Sciences GUR: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Electives

Mathematics, Technical, and Free Electives: Any mathematics course numbered 331 or above may be used as a mathematics, technical, or free elective. Any NJIT course at or above the 100 level may be used as a technical or free elective; except a technical elective is a course that has a significant mathematical and/or scientific content. All elective courses are to be chosen in consultation with a faculty advisor in the Department of Mathematical Sciences.

Co-op Courses

In Mathematical Sciences, the co-op courses, Math 310 and Math 410, bear degree credit and count as technical or free electives, subject to approval by a faculty advisor in the Department of Mathematical Sciences.

Undergraduate - Mechanical Engineering

Administered By: Department of Mechanical Engineering

Administration

Chairperson	Nadine N. Aubry
Associate Chairperson	Ian S. Fischer
Associate Chairperson for Graduate Studies	Rajpal Sodhi

Faculty

Distinguished Professors	Altenkirch, Aubry (F. Leslie and Mildred Jacobus Chair)
Professors	Chen, Dave, Dreizin, Fischer, Geskin, Harnoy, Koplik, Rosato, Sodhi
Associate Professors	Dubrovsky, Florio, Ji, Khusid, Narh, Singh, Zhu
Assistant Professors	Rao
Special Lecturers	Giorgioni, Kountouras, Serico, Surjanhata

Mechanical Engineering is concerned with the design, development, manufacture, and operation of a wide variety of energy conversion and machine systems. Mechanical engineers employ their knowledge of materials, system design and control, production methods and mechanics to design traditional systems (such as aircraft, automobiles, engines, robots, energy-generation plants, pumps and valves, machines and household appliances), as well as systems employing new technologies (such as biomedical and nano devices), to meet design specifications for performance, economy, and ease of use as well as safety and environmental-protection requirements.

The first two years of the curriculum provide a foundation in mathematics and science for the mechanical engineering courses offered in the third year. The fourth year utilizes the knowledge acquired during the first three years to develop professional skills in applied areas such as thermal and fluid engineering, and systems design and control. Project courses are offered in the fourth year. CAD/CAM systems are used extensively throughout the curriculum.

The mechanical engineering curriculum prepares the student for professional work as well as graduate study in engineering or in other areas such as science, mathematics, management, medicine, law and business.

The curriculum as described below is for students entering NJIT in the fall of 2004 or after that date until further notice. Students entering before that date generally have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Mechanical Engineering** (128 credit minimum)

FIRST YEAR

1st Semester

	Chem 125	General Chemistry I (3-0-3)
*	FED 101	Fundamentals of Engineering Design (2-1-2)
*	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
	Math 111	Calculus I (4-1-4)
	Phys 111	Physics I (3-0-3)
	Phys 111A	Physics I Laboratory (0-2-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

	Chem 124	General Chemistry Laboratory (0-2-1)
	Chem 126	General Chemistry II (3-0-3)
*	CIS 101	Computer Programming and Problem Solving (2-1-2)
**	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 112	Calculus II (4-1-4)
	Phys 121	Physics II (3-0-3)
	Phys 121A	Physics II Laboratory (0-2-1)
	Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

	Math 211	Calculus III A (3-0-3)
	Math 225	Survey of Probability and Statistics (1-0-1)
	Mech 234	Engineering Mechanics (2-0-2)
	ME 215	Engineering Materials and Processes (2-0-3)
**	SS 201	Economics (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)

2nd Semester

Math 222	Differential Equations (4-0-4)
ME 231	Kinematics of Machinery (3-1-3)
Mech 236	Dynamics (2-0-2)
Mech 237	Strength of Materials (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)

THIRDYEAR

1st Semester

ECE 405	Electrical Engineering Principles (3-0-3)
ME 305	Introduction to System Dynamics (3-0-3)
ME 311	Thermodynamics I (3-0-3)
ME 315	Stress Analysis (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

2nd Semester

ME 304	Fluid Mechanics (3-1-3)
ME 312	Thermodynamics II (3-0-3)
ME 316	Machine Design (3-0-3)
ME 343	Mechanical Laboratory I (2-3-3)
ME 430	Computer Aided Design (3-0-3)

FOURTH YEAR

1st Semester

ME 403	Mechanical Systems Design I (2-2-3)
ME 405	Mechanical Laboratory II (1-2-2)
ME 407	Heat Transfer (3-0-3)
Elective	(Open: GUR) (3-0-3)
Elective	(Technical/ME) (3-0-3)
Elective	(Technical/ME) (3-0-3)

2nd Semester

ME 406	Mechanical Laboratory III (1-2-2)
ME 408	Mechanical Systems Design II (1-2-2)
Elective	(Technical/ME) (3-0-3)
Elective	(Technical/ME) (3-0-3)
Elective	(Management: GUR) (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)

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* Some students will take these courses in reverse order.
† FED 101 is taken concurrently with either HSS 099 or HSS 101.

Electives

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, Hist 213, and approved 200-level history courses at Rutgers-Newark.

** *Basic Social Sciences GUR:Basic Social Sciences GUR:* Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Management GUR: Students take IE 492 or Mgmt 390 or AS 333, which is acceptable only for students taking the aerospace option. Students enrolled in a dual degree program between architecture and management take HRM 601to fulfill this requirement.

Technical/ME: Must be chosen from a list of courses available from the Department of Mechanical Engineering.

Refer to the General University Requirement section of this catalog for further information on electives.

Note
Eligible students may substitute Math 213H for the combination of Math 211 and Math 225.

Co-op
Co-op courses bearing degree credit may replace a technical elective or another course approved by the faculty advisor in the student's major department. In mechanical engineering, ME 310 is taken for additive credit and ME 410 may be taken for degree credit, with ME 310 as a prerequisite.

Undergraduate - Professional and Technical Communication

Administered By: Department of Humanities

Administration

Chairperson	Robert Lynch
Program Director	Nancy Coppola

Faculty

Professors	Elliot, Lynch
Associate Professors	Coppola, Friedman, Kimmelman, Steffen-Fluhr
Assistant Professors	Funkhouser, Johnson
Lecturers	Hernandez, Kerley

Program Website: Click Here

The program in Professional and Technical Communication (PTC) offers two undergraduate degrees:the bachelor of arts (B.A.)and thebachelor of science (B.S.). The program strikes a balance between a humanistic and a technological education. The B.A. is distinguished by its global and literary emphases (including foreign language study), while the B.S. is distinguished principally by its more focused study of the complexities of communication in technological societies. Both degrees entail extensive study in computer information science.

Both degrees prepare students to work in the expanding and rapidly transforming field of high-tech communications such as the World Wide Web. In offering a broadly based educational experience, each degree readies a student to enter any one of a number of professional fields. Today, communication specialists are required for a wide range of positions in business, industry, government, journalism; and in technological, scientific, humanistic, and artistic communities. Professional communicators are needed to serve as researchers, writers, and editors; they are particularly needed for the increasingly complex and challenging task of coordinating technical materials and publications. The typical PTC graduate can work in occupations such as multimedia design and communications; technical writing; technical editing; hardware/software documentation; television; print publishing; environmental risk assessment; writing for regulatory agencies; quality assurance documentation; advertising; grant proposal writing; medical and/or scientific reporting or analysis; and technical reporting or analysis.

The bachelor's degrees also serve as the foundation for a graduate degree in writing, journalism, literature, and law. PTC majors interested in law might take a minor in legal studies and/or an accelerated program with Rutgers-Newark School of Law. Qualified students can enroll in the B.S./M.S. program in PTC, in which students earn a bachelor's and master's degree in less time than if earned separately.

Both the B.A. and B.S. have the same core curriculum including a co-op work experience consisting of two semester-long internships in appropriate fields and a senior project capstone course in which the student produces a substantial, original work consisting of either a traditional research thesis or a practical communication application. The remaining credits for the degrees are fulfilled through required and elective courses. In addition to NJIT courses, a number of courses in related areas offered at Rutgers-Newark may be taken for degree credit, with approval of the Humanities and Social Sciences department.

Double Majors

Students may earn a second major in addition to the PTC major. A double major with the B.S. in PTC and the B.A. in History, for instance, is usually feasible within four years of full-time study. For general rules about double majors, see Degree Options in the Academic Policies and Procedures section of this catalog. For further information about appropriate double majors with the PTC programs, contact the Humanities and Social Sciences department.

Program Website: Click Here

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.A. in Professional and Technical Communication** (128 credit minimum)

FIRST YEAR

1st Semester

CIS 103	Introduction to Computer Science I (3-0-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Math 138	General Calculus I (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)
Elective	(Natural Sciences: GUR) (3-0-3)
Elective	(Natural Sciences Lab: GUR) (0-2-1)
Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

Eng 352	Technical Writing (3-0-3)
HSS 202	Society, Technology, and Environment (3-0-3)
Math 105	Elementary Probability and Statistics (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Natural Sciences: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

Eng 353	Electronic Publishing (3-0-3)
SS 201	Economics (3-0-3)
Elective	(Engineering Technology: GUR) (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)
Elective	Foreign Language I (3-0-3)
Elective	(Open: GUR) (3-0-3)

2nd Semester

CIS 265	Information Systems and Productivity Toolware (3-0-3)
CIS 270	Multimedia Communication (3-0-3)
Eng 353A	Electronic Publishing Lab (0-3-2)
Elective	(Art or Architecture) (3-0-3)
Elective	(Foreign Language II) (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

THIRD YEAR

1st Semester

Eng 339	Practical Journalism (3-0-3)
Eng 369	Creative Writing (3-0-3)
Hist 345	History of Communication (3-0-3)
Lit 330	World Literature I: Noth America, Latin America and the Carribean, Australia and Oceana (3-0-3)
Elective	(Foreign Language III) (3-0-3)

2nd Semester

Lit 331	World Literature II: Africa and Middle East and Europe (3-0-3)
Lit 355	Poetry (3-0-3)
Mgmt 390	Principles of Management (3-0-3)
Elective	(PTC) (3-0-3)
Elective	(Foreign Language IV) (3-0-3)

FOURTH YEAR

1st Semester

Eng 490	Co-op Work Experience I (3-0-3)
STS 307	Fundamentals of Research in STS (3-0-3)
Lit 350	Fiction (3-0-3)
Elective	(PTC) (3-0-3)
Elective	(Free) (3-0-3)

2nd Semester

Eng 491	Co-op Work Experience II (3-0-3)
Eng 496	Senior Project (3-0-3)
STS 350	Computers and Society (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(PTC) (3-0-3)

Electives

Basic Social Sciences GUR:: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Engineering Technology GUR: Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, orMIS 345.

Cultural History GUR: Take two courses (6 credits) from amongHSS 211, HSS 212, HSS 213, and 200-level history courses at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Natural Sciences GUR: Coursework totaling 7 credits in any of the following disciplines: biology, botany, chemistry, geology, and physics. Students may take a sequence of courses in one of these disciplines or courses in different disciplines. Laboratory credit must be included in the 7 credits.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Foreign Language (I, II, III, IV): Students must take 12 credits of a foreign language. The language and choice of courses is determined in consultation with the advisor.

Art or Architecture: A number of courses offered by the New Jersey School of Architecture or Rutgers-Newark can be used to fulfill this requirement. See the advisor for appropriate courses.

PTC: Select 9 credits from Eng 340; Eng 360; Eng 364; Eng 369; SS 354; STS 304; STS 318; STS 340; STS 342; STS 348; Lit 480; Phil 251; Phil 340; any Lit course beyond the PTC core requirements and the GUR; CIS 114; CIS 375; and CIS 390. Other courses at Rutgers-Newark may apply.

Technology: See the advisor for appropriate courses.

Refer to the General University Requirement section of this catalog for further information on electives.

■ **B.S. in Professional and Technical Communication** (128 credit minimum)

FIRST YEAR

1st Semester

CIS 103	Introduction to Computer Science I (3-0-3)
HSS 101	English: Writing, Speaking, Thinking (3-0-3)
Math 138	General Calculus I (3-0-3)
Elective	(Natural Sciences: GUR) (3-0-3)

Elective	(Natural Sciences Lab: GUR) (0-2-1)
Elective	(Technology) (3-0-3)
Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

HSS 202	Society, Technology, and Environment (3-0-3)
Math 105	Elementary Probability and Statistics (3-0-3)
Eng 352	Technical Writing (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Natural Sciences: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)

SECOND YEAR

1st Semester

Eng 353	Electronic Publishing (3-0-3)
SS 201	Economics (3-0-3)
Eng 336	Advanced composition (3-0-3)
Elective	(Cultural History: GUR) (3-0-3)
Elective	(Physical Education: GUR) (0-1-1)
Elective	(Technology) (3-0-3)

2nd Semester

CIS 270	Multimedia Communication (3-0-3)
Eng 339	Practical Journalism (3-0-3)
Eng 353A	Electronic Publishing Lab (0-3-2)
Eng 360	Collaborative Communication: Community and Global Perspectives (3-0-3)
Elective	(Art or Architecture) (3-0-3)

THIRD YEAR

1st Semester

Lit 330	World Literature I: North America, Latin America and the Caribbean, Australia and Oceania (3-0-3)
Hist 385	Technology and Society in European and World History (3-0-3)
Elective	(Open: GUR) (3-0-3)
Elective	(PTC) (3-0-3)
Elective	(Open) (3-0-3)

2nd Semester

Hist 345	Communication through the Ages (3-0-3)
Hist 386	Technology in American History (3-0-3)
STS 348	Esthetics and Modern Technology (3-0-3)
Lit 331	World Literature II: Africa and Middle East and Europe (3-0-3)
Elective	(PTC) (3-0-3)
Elective	(Lit/Hist/Phil/STS: GUR) (3-0-3)

FOURTH YEAR

1st Semester

CIS 350	Computers and Society (3-0-3)
Eng 490	Co-op Work Experience I (3-0-3)
STS 307	Fundamentals of Research in STS (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(PTC) (3-0-3)

2nd Semester

Eng 491	Co-op Work Experience II (3-0-3)
Eng 496	Senior Project (3-0-3)
Mgmt 390	Principles of Management (3-0-3)
Elective	(PTC) (3-0-3)
Elective	(Free) (3-0-3)

Electives

Basic Social Sciences GUR:: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Engineering Technology GUR: Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, or MIS 345.

Cultural History GUR: Take HSS 211 or HSS 212 or HSS 213; or an approved 200-level history course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Natural Sciences GUR: Coursework totaling 7 credits in any of the following disciplines: biology, botany, chemistry, geology, and physics. Students may take a sequence of courses in one of these disciplines or courses in different disciplines. Laboratory credit must be included in the 7 credits.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Art or Architecture: A number of courses offered by the New Jersey School of Architecture or Rutgers-Newark can be used to fulfill this requirement. See the advisor for appropriate courses.

PTC: Select 9 credits from Eng 340; Eng 360; Eng 364; Eng 369; SS 354; STS 304; STS 318; STS 340; STS 342; STS 348; Lit 480; Phil 251; Phil 340; any Lit course beyond the PTC core requirements and the GUR; CIS 114; CIS 375; and CIS 390. Other courses at Rutgers-Newark may apply.

Technology: See the advisor for appropriate courses.

Refer to the General University Requirement section of this catalog for further information on electives.

Program Website: Click Here

Undergraduate - Science, Technology and Society

Administered By: Offered by the Department of Humanities

Administration

Chairperson	Rober Lynch
Director	Eric Katz
Program Administrator	Robert Friedman, Phone: (973) 596-5765

Faculty

Professors	Beaton, Elliot, Franck, Katz, Rothenberg, Schweizer
Associate Professors	N. Jackson, Kimmelman, Steffen-Fluhr
Assistant Professors	Funkhouser, Cohen
Lecturers	Brooks, Fleischer, Henry, Hetherington, Lipuma

The Bachelor of Science in Science, Technology and Society (STS) program offers a liberal education for NJIT's technological age. The STS major explores the foundations and impact of science and technology by examining the values, language, history, politics, and economics of modern technological society. The major prepares the student to integrate the scientific and technical disciplines with the humanities and social sciences. Through its multidisciplinary approach, the STS major explores the interrelated worlds of the scientist, engineer, politician, and citizen. Furthermore, the global, multicultural, and environmental perspective of STS develops ethical awareness and public responsibility.

STS graduates are in demand in many areas. They find employment in fields such as law, medicine, technical communications, government, corporate planning, business management, public policy and administration, urban development, transportation, technology assessment, and environmental planning. In addition, the STS degree provides excellent preparation for graduate study in any of these fields, as well as in liberal arts disciplines such as history, law and political science.

The STS major at NJIT is enriched by a number of special features and opportunities. Major environmental and technological issues are discussed by faculty and students at STS colloquia. Opportunities exist for internships, which enable students to develop and apply their knowledge and skills in corporate and government settings. Qualified STS students may participate in the Cooperative Education program; the combined B.S./M.S. program; and the Honors program. Because STS is a cooperative program with Rutgers-Newark, STS students have full access to a wide array of Rutgers courses in addition to those at NJIT. Qualified STS students also have access to courses offered at the graduate level.

The STS major consists of three main components: core courses, major option courses, and the senior seminar.

Core courses, which introduce students to the fundamental connections between civilization, technology, and the global environment, focus on historical and cultural foundations, basic ideas and values, dominant institutions, environmental viewpoints, policy formation, and sustainable development.

Major option courses allow students to concentrate in one of six areas. Working closely with a faculty advisor, each student selects 18 credits of coursework comprising a coherent program of study designed to fulfill personal interests and potential career goals. Courses may be selected from different disciplines at NJIT and Rutgers-Newark, and qualified students may take graduate-level NJIT courses.

The four options are: (1) environmental studies; (2) technology, culture and art; (3) ethics and history of technology; (4) technology, public policy and globalization.

The senior seminar marks the culmination of the STS curriculum. In this two-semester, 6-credit course sequence, topics that are of critical importance to each student's undergraduate program and professional future are investigated in depth. Students work closely with the seminar director and a faculty advisor to identify a subject, research it thoroughly, and compose a senior thesis.

The curriculum as described below is for students entering NJIT as freshmen in the fall of 2000 or after that date. Students entering before that date may have a different program and should consult the department to learn which curriculum applies.

■ **B.S. in Science, Technology and Society** (124 credit minimum)

FIRST YEAR

1st Semester

*	CIS 104	Computer Programming and Graphics Problems (2-1-2)
		or
*	CIS 113	Introduction to Computer Science I (3-1-3)
	HSS 101	English: Writing, Speaking, Thinking (3-0-3)
*	Math 111	Calculus I (4-1-4)
		or
*	Math 138	General Calculus I (3-0-3)
	Elective	(Science with laboratory) (3-1-4)
	Elective	(Free) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Frsh Sem	Freshman Seminar (1-0-0)

2nd Semester

†	HSS 202	Society, Technology, and Environment (3-0-3)
	Math 105	Elementary Probability and Statistics (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Science with laboratory) (3-1-4)
	Elective	(Free) (3-0-3)

SECOND YEAR

1st Semester

†	SS 201	Economics (3-0-3)
	STS 257	Technology, Society and Culture: An American View (3-0-3)
	Elective	(Cultural History: GUR) (3-0-3)
	Elective	(Engineering Technology: GUR) (3-0-3)
	Elective	(Physical Education: GUR) (0-1-1)
	Elective	(Social Science) (3-0-3)

2nd Semester

	STS 258	Technology, Society and Culture: A Global View (3-0-3)
	STS 304	Writing about STS (3-0-3)
	Elective	(Engineering Technology: GUR) (3-0-3)
	Elective	(Social Science) (3-0-3)
	Elective	(Free) (3-0-3)

THIRD YEAR

1st Semester

	STS 307	Fundamentals of Research in STS (3-0-3)
	Phil 355	The Philosophy of Science (3-0-3)
	STS 312	Technology and Policy in Contemporary America (3-0-3)
		or
	R790:310	Science, Technology, and Public Policy (3-0-3)
	Elective	(History of Science or Technology) (3-0-3)
	Elective	(Major Option) (3-0-3)

2nd Semester

	STS 310	Technology and Human Values (3-0-3)
	Elective	(History of Science or Technology) (3-0-3)
	Elective	(Major Option) (3-0-3)
	Elective	(Major Option) (3-0-3)
	Elective	(OPEN GUR) (3-0-3)

FOURTH YEAR

1st Semester

	Mgmt 390	Principles of Management (3-0-3)
	Elective	Major Option (3-0-3)

STS 490	Project and Seminar I (3-0-3)
Elective	(Major Option) (3-0-3)
Elective	(Major Option) (3-0-3)

2nd Semester

STS 491	Project and Seminar II (3-0-3)
Elective	(Capstone Seminar: GUR) (3-0-3)
Elective	(Major Option) (3-0-3)
Elective	(Major Option) (3-0-3)
Elective	(Free) (3-0-3)

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* The combination of these courses must equal at least 6 credits.

† In place of this course, students may also take an approved course at Rutgers-Newark; an approved list of courses is published each semester in the course registration bulletin.

Electives

Social Sciences: Two courses comprising a full-year sequence in a single social science discipline such as anthropology, geography, political science, psychology, or sociology.

History of Science or Technology: Two courses chosen from amongHist 385, Hist 386, STS 320, STS 321, R512:395, R512:396, and HUM 491H if the subject is in the history of science and technology.

Science with lab: Students select two appropriate electives in consultation with an advisor. These courses satisfy the Natural Sciences GUR

Advanced Economic Thought or Policy: One course such as STS 362 orSS 363 or SS 338. These courses are approved by the program director.

Major Option: Students must choose two of the following: STS 342,STS 347,STS 348,LIT 378,LIT 386,Phil 351 and other appropriate electives in consultation with an advisor. Courses may be selected from different disciplines but must comprise a coherent program of study within an option.

Basic Social Sciences GUR:: Three credits of the basic social sciences requirement must be taken in economics; acceptable courses are SS 201, Econ 265, orEcon 266. The remaining 3 credits may be satisfied by HSS 202, STS 257, or STS 258. Students also may take approved introductory courses in basic social sciences at Rutgers-Newark to fulfill this requirement.

Lit/Hist/Phil/STS GUR: Students must take one 300-level course from any of the following fields: literature; history; philosophy; or science, technology, and society (STS); or an approved 300-level course at Rutgers-Newark.

Open Elective in Humanities and Social Science GUR: Students must take one 300-level course from any of the following fields: English (Eng); history (Hist); literature (Lit); philosophy (Phil); science, technology, and society (STS); social science (SS); or theater (Thtr). Students also may satisfy this requirement with Architectural History IV (Arch 382) or by taking an approved 300-level course at Rutgers-Newark.

Engineering Technology GUR: Two courses selected from among the following: any lower division or upper division courses in engineering (including EG, FED, and Mech courses); any upper division courses in architecture, computer science, or engineering technology, orMIS 345.

Cultural History GUR: Take HSS 211 or HSS 212 or HSS 213, or an approved 200-level history course at Rutgers-Newark.

Capstone Seminar in Humanities and Social Science GUR: All students, except those enrolled in the honors college, take one of the following: HSS 403, HSS 404, HSS 405, HSS 406, HSS 407, HSS 408, HSS 409. Students enrolled in the honors college take one from HSS 491H-499H.

Physical Education GUR: Students who register as full-time undergraduates for two or more consecutive semesters must take two PE courses, one of which must be a 100-level fitness core course. Students are urged to complete the requirement as soon as possible.

Free (18 credits): Students select appropriate electives in consultation with an advisor.

Note
At least 60 credits must be earned at the 300 level or above.

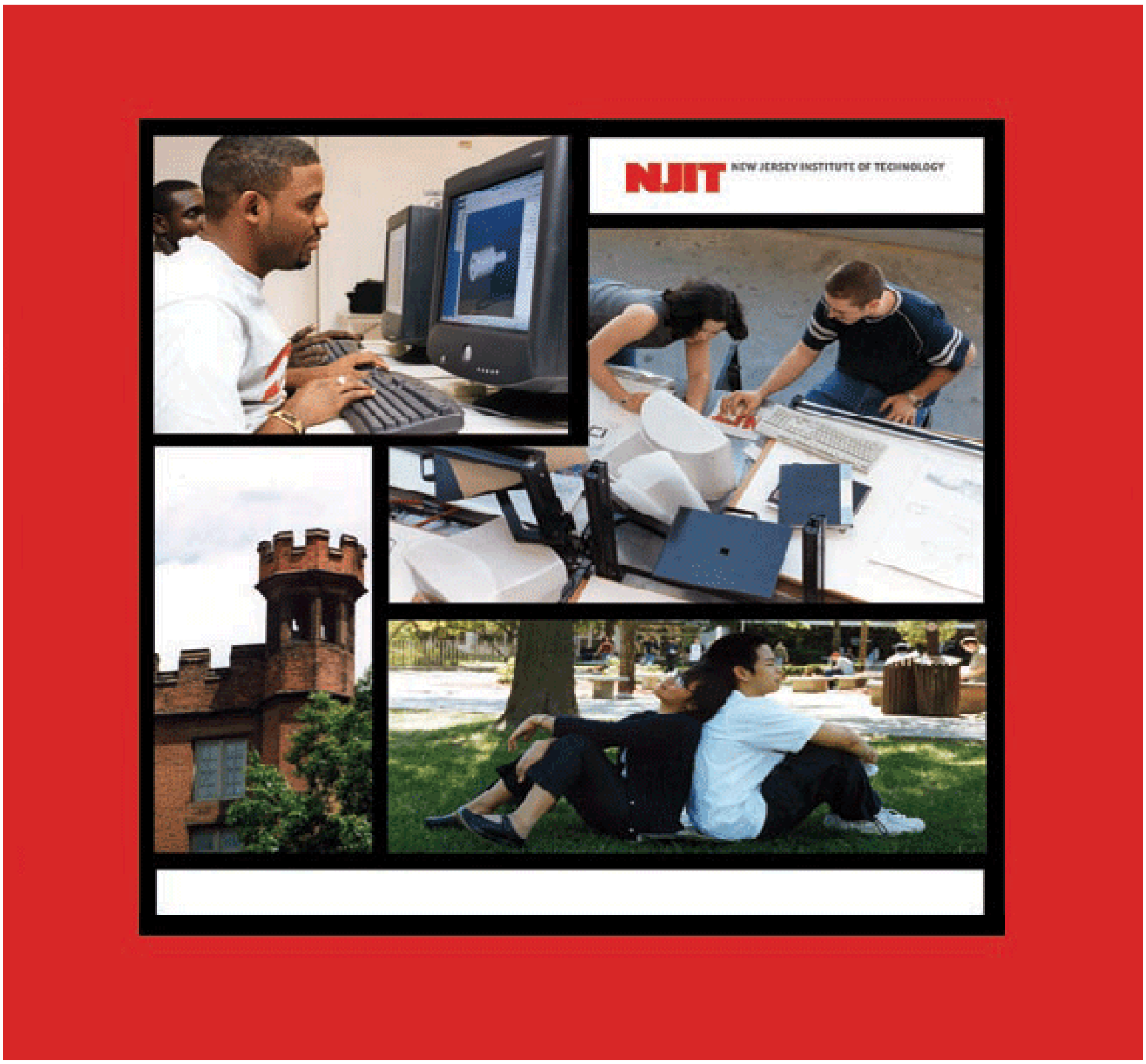
Refer to the General University Requirement section of this catalog for further information on electives.

Co-op
Co-op courses replace electives with the approval of an advisor. In science, technology and society, STS 311 and STS 411 are taken for degree credit.

NJIT
NEW JERSEY INSTITUTE OF TECHNOLOGY

2004-2005 COURSE CATALOG

UNDERGRADUATE COURSES



Accounting: Offered by the School of Management. See Management course list for faculty.

Acct 115 - Principles of Accounting I (3-0-3)

Basic accounting concepts, documents, work sheets, ledgers, and procedures for keeping accounts. Emphasis given to inventory and job order accounting methods.

Acct 116 - Principles of Accounting II (3-0-3)

Prerequisite: Acct 115. A continuation of Acct 115. Valuation, depreciation, costing methods, overhead accumulations, and distribution. Emphasis given to standard costs, cost estimating and budgets.

Acct 315 - Accounting for Managerial Decision Making (3-0-3)

This course wil concentrate on management decisions and the contribution of accounting toward making these decisions. Emphasis is upon using accounting information to solve business problems.

Acct 317 - Managerial Accounting (3-0-3)

Prerequisites: Acct 115, Acct 116. The techniques of evaluating labor, material and overhead costs. Rate of return, variance analysis, and break-even analysis.

AS 111 - The Air Force Today I (1-1.5-1)

Explores the mission and organizational structure of the United States Air Force. Introduces the student to Reserve Officer Training Corps by examining air power, customs and courtesies, officership, and core values. Examines Air Force opportunities, benefits, career choices, and installations which provides information needed to determine whether or not to pursue a career as an Air Force officer. An introduction to effective communication is included. One hour of class, and, one and a half hours of Leadership Laboratory per week (not required for those with Special Student status).

AS 112 - The Air Force Today II (1-1.5-1)

Prerequisite: AS 111 or approval of the professor of aerospace studies. Continues with the mission and organizational structure of the Air Force. A macro view of U.S. military history is introduced with emphasis on U. S. air power. Air Force communications is developed with emphasis on interpersonal communications, oral communications, and written communications. Leadership abilities are developed through group leadership problems and Leadership Laboratory. One hour of class and one and a half hours of Leadership Laboratory per week (not required for those with Special Student status).

AS 221 - U.S. Air Power: Ascension to Prominence I (1-1.5-1)

Prerequisite: AS 112 or approval of the professor of aerospace studies. Examines the development of air power from its earliest beginnings to the present, including in-depth examination of World War I, World War II, Korean Conflict, Vietnam War, Cold War, and Desert Storm. Traces the evolution of air power concepts and doctrine and continues to develop leadership abilities through Leadership Laboratory. One hour of class and one and a half hours of Leadership Laboratory per week (not required for those with Special Student status).

AS 222 - U.S. Air Power: Ascension to Prominence II (1-1.5-1)

Prerequisite: AS 221 or approval of the professor of aerospace studies. Emphasizes the concepts and skills required by the Air Force officer including oral communications, Air Force quality, leadership, followership, ethics, and values. Continues to develop leadership abilities through group leadership problems and Leadership Laboratory. One hour of class and one and a half hours of Leadership Laboratory per week (not required for those with Special Student status).

AS 333 - Leadership and Management I (3-1.5-3)

Prerequisite: AS 222 or approval of the professor of aerospace studies. Emphasizes the concepts and skills required by the successful management and leader. Curriculum includes individual motivational and behavioral processes, leadership, communication, and group dynamics, providing the foundation for developing the junior officer's professional skills. Course material stresses decision making, and the use of analytic aids in planning, organizing, and controlling in a changing environment. Develops communication skills through writing and speaking exercises. Three hours of class and one and one half hours of Leadership Laboratory per week. Note: AS 333 may be taken to satisfy the Management GUR.

AS 334 - Leadership and Management II (3-1.5-3)

Prerequisite: AS 333 or approval of the professor of aerospace studies. A continuation of AS 333. Organizational and personal ethics, management of change, organizational power, politics, and managerial strategy are discussed within the context of the military. Actual Air Force case studies are used throughout the course. Three hours of class and one and one half hours of Leadership Laboratory per week.

AS 443 - National Security Forces in Contemporary American Society (3-1.5-3)

Prerequisite: AS 334 or approval of the professor of aerospace studies. Focusing on the U.S. Armed Forces as an integral element of American society, this course examines a wide variety of topics concerning American civil and military relations and the environment in which U.S. defense policy is formulated. Specific topics include the role of the professional officer in a democratic society, socialization processes within the American military forces, and the requisites for maintaining adequate national security forces. A special emphasis is placed on further refining the student's communications skills in the context of the course material. Three hours of class and one and one-half hours of Leadership Laboratory per week.

AS 444 - Preparation for Active Duty (3-1.5-3)

Prerequisite: AS 443 or approval of the professor of aerospace studies. Focuses on the role of the Air Force officer while on active duty. Includes responsibilities as an officer, a commander, a leader, and a manager. Topics include a review of military law, nonjudicial punishment, role of the staff judge advocate, laws of armed conflict, military ethics, officer professional development, an officer's social responsibilities, fraternization, personal finances, staff work, and Air Force base services and activities. Concludes with a review of the Air Force Core Values. Three hours of class and one and one half hours of Leadership Laboratory per week.

Afro-American and African Studies : Offered by the Department of Afro-American and African Studies at Rutgers-Newark Conklin Hall (973/353-5428)

21&62:014:301 - African Cultural Retentions in the Americas (3)

Reviews cultural adaptation process made by blacks in the Americas from the era of the Atlantic slave trade to the present, using an interdisciplinary base of history, anthropology, literature, and music; introductory focus on traditional African culture; identification and importance of Africanisms which have helped to shape both the historic and contemporary identities of blacks in the U.S., Brazil, Haiti, Surinam, and the West Indies.

21&62:014:302 - Special Topics in Black Studies (3)

Selected topics are offered each term and chosen to represent a wide range of disciplines. Afro-American and African subject areas include economic development, women's roles, film history, literary genres, social institutions, and urbanization.

21&62:014:305 - Black Women in the United States (3)

Roles of black women in family life, the workplace, politics, literary and artistic achievement, education, and the struggle for women's rights; incorporates both fictional and nonfictional works to chronologically illuminate the major themes in black women's history and contemporary issues.

21&62:014:306 - Comparative Race Relations: South Africa and the United States (3)

Chronological and interdisciplinary study of the major themes in the history of race relations in South Africa and the United States; systematic comparisons of slavery, frontier expansion, and the roots of enduring racism with assessments of their long-term effects on social relations in both countries. Examines, comparatively, black rights struggles against apartheid, Jim Crow segregation, and impediments to full democracy.

21&62:014:358 - Black Writers of Africa and the Caribbean (3)

Not open to first-year students. Course conducted entirely in English. Development of the Black Consciousness Movement as reflected in the works of Cesaire, Damas, Senghor, and others; controversy surrounding the concept of Negritude; influence of African civilization and art, the Harlem Renaissance, Marxism, surrealism, and other forces on the movement.

21&62:014:403 - The Third World and The Media (3)

Prerequisite: Junior or senior standing or permission of instructor. Focuses on the importance of the third world and how it is covered by the media. Areas to be covered include: Africa, the Middle East, the Caribbean, Latin America, and Asia. The industrial and strategic importance of these areas is explored; significance of the use of stringers instead of regular staff to provide media coverage; relationship of the U.S. business community and military to the third world reviewed in terms of impact on the news.

21&62:014:465 - African Religions and Philosophical Thought Systems (3)

General interweave of religion, culture, and the philosophical system of African societies, and how these elements fuse into an organic whole. Similarities and differences in ideological systems that structure and reflect the society are pinpointed; African religions and philosophy are used to depict the African's relationship to the universe.

Anthropology: Offered by the Department of Sociology and Anthropology at Rutgers-Newark Hill Hall (973/353-5255)

21&62:070:204 - Introduction to Cultural Anthropology (3)

A study of various ways of life, from hunting and gathering to industrial societies. Topics such as marriage, economics, politics, and religion examined; comparisons made to illustrate the principles underlying cultural similarities and differences.

21&62:070:303 - Anthropology of Postcolonialism (3)

Postcolonial responses to cultural and economic domination in locations such as multinational corporations, media productions, tourist attractions, and religious sites.

21&62:070:309 - Medical Anthropology (3)

Prerequisite: 21&62:070:204 or permission of instructor. Cross-cultural perspectives on health beliefs and practices; social organization of health care institutions; sociocultural factors in physical and mental health; relationship between human health and the social environment.

21&62:070:310 - Comparative Religion (3)

Tribal and folk religions of the world in reference to their social context; socio-political and economic accompaniments of tribal and folk religions at different stages of social evolution.

21&62:070:319 - Anthropology Through Film (3)

Examination and analysis of selected societies and cultures through films and complementary written texts. Study of the process of making documentary and ethnographic films and the related problems of representing ? realities? through visual media.

21&62:070:331 - Urban Anthropology (3)

Examines the theoretical underpinnings of a variety of urban studies done by anthropologists; individual or group research project.

21&62:070:337 - Anthropology of Inequality (3)

Class, race, and gender and how they intersect with power and domination. Study of how systems of inequality work, how they are maintained, and how they are transformed.

21&62:070:340 - Comparative Roles of Women (3)

Women's roles in societies that range from hunting and gathering bands to agricultural and pastoral chiefdoms, from ancient China to socialist Cuba. Women's experience in the family and community setting, as workers, as individuals, and as leaders. The impact of class, race, and gender on women's experience and consciousness.

21&62:070:369 - New World Archaeology (3)

Examines the first peoples of the New World and subsequent cultural development; em-phasis on the rise of the high civilizations of America.

21&62:070:420 - Tribal Warfare (3)

Overview of anthropological knowledge about war. Examination of various aspects of war, cross-cultural variations in its practice, and shifting analytic approaches to the subject of war. Impact of state expansionism on indigenous warfare patterns. Readings selected for ethnographic detail and theoretical significance.

Architecture: Offered by the New Jersey School of Architecture

Arch 155 - Architectural Graphics (2-3-3)

Techniques of graphic presentation introduced as a basic language of architecture. Students work with a broad range of graphic presentation methods. Skills developed in drawing and architectural delineation. Fundamentals of perspective drawing, rendering techniques and format layout examined through an array of projects.

Arch 163 - Introduction to Design I (1-12-5)

Introduction to an array of basic principles and elements of design. Emphasis on design methods, sensitivity to context, manipulation of form and space, and representation skills. General design fundamentals presented in the lecture hour.

Arch 164 - Introduction to Design II (1-12-5)

Prerequisite: Arch 163. A continuation of Arch 163.

Arch 241 - Architectural Construction I (3-0-3)

Prerequisite: Arch 155. Introduction to the construction process and its role in architecture. Materials and methods of wood, heavy timber and masonry construction presented. Em-phasis on process, compatibility of materials and drawings as a communication tool in construction.

Arch 242 - Architectural Construction II (3-0-3)

Prerequisite: Arch 241. A continuation of Arch 241 that relates construction to architectural design. The study of materials and methods of construction concentrates on steel, precast and poured-in-place concrete. Emphasis on criteria for selection of materials and systems, materials research, standards and test methods, and forces of deterioration.

Arch 251 - History of Architecture I (3-0-3)

Introduces architectural history, theory and design, providing a conceptual framework for looking at the built environment. A critical study of selected historical and contemporary buildings presented in class and documented in readings.

Arch 252 - History of Architecture II (3-0-3)

Prerequisite: Arch 251. A survey of the social, political, technological, functional, and aesthetic concerns of architecture and urban forms from their earliest beginnings through the Middle Ages around the Mediterranean basin and Western Europe.

Arch 263 - Architecture Studio I (1-12-5)

Prerequisite: Arch 164. Utilizing knowledge and skills gained in Introduction to Design I and II, students learn about architectural design. Examination of the technological, social and environmental issues as they relate to architectural design. Lecture hour used to explore in-depth aspects of architecture.

Arch 264 - Architecture Studio II (1-12-5)

Prerequisite: Arch 263. A continuation of Arch 263. Lecture hour used to explore in-depth aspects of architectural design.

Arch 282 - Structures I (3-0-3)

Prerequisite: Phys 102, Math 113. Introduces structural statics through timber and steel design. Influences of materials and structural system choice analyzed relative to their impact on building design. Responsibilities of the architect during the structural design phase are introduced.

Arch 283 - Special Topics (3)

Investigation of problem of special interest in architecture.

Arch 310 - Co-op Work Experience I (3)

Prerequisites: completion of the third year studio class, approval of the school and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. A designated faculty member monitors and evaluates the student's work and project. Requirements include mandatory participation in seminars and completion of a report and/or project. Apply in third year.

Arch 312 - Environmental Education I (2-3-3)

Prerequisite: Arch 264. Involves architecture students in working with grade school or high school students in the solution of a joint environmental design project. Participants first work toward developing their own understanding and sensitivity of the manmade environment. Emphasis on learner-directed and discovery-guided inquiry, and educational methods to increase awareness of the physical settings created for human activities. Projects developed in nearby schools which focus on the interaction of individuals and small groups with the environment.

Arch 316 - Computer Applications to Architecture (2-3-3)

Prerequisite: CIS 104. Introduces both philosophical and technical approaches to the use of the computer in architectural design and analysis. Explores the use of existing computer programs for spatial allocation, energy analysis, life cycle costing, problem analysis, and computer simulation. Projects include development of computer programs applicable to architecture.

Arch 317 - Advanced Architectural Graphics (2-3-3)

Prerequisite: Arch 155, Arch 264. Gives students advanced techniques for architectural expression, including Chinese ink wash and air brush techniques. Emphasis on how drawing may be used to reveal the inner qualities of design. A basic knowledge of drawing methods, media, materials, and projection techniques is assumed.

Arch 318 - New York City Lab (1-6-3)

Prerequisite: Arch 364. Explores the architectural and environmental development of New York City during the past 200 years in an organized series of field trips. Each week's trip encompasses a section and/or representative aspect of the city's evolution.

Arch 328 - Urban Values (2-3-3)

Prerequisites: Arch 363. A survey of urban planning practice and historical, contemporary, and theoretical urban design approaches. Considers the physical environment as a response to human values, and explores how nature, the city, and the user influence the form and content. Case studies include cities, towns, and specialized recreation and retirement communities. Laboratory work includes field trips, demonstration exercises, and analysis of case studies.

Arch 331 - Landscape Architecture (3-0-3)

An overview of the opportunities and constraints of landscape designs. Emphasis on developing a practical understanding of the potentials of earth, water and plants in architecture. Students given an overview of social and ecological determinants of relations between land and buildings.

Arch 342 - Architecture Construction III (3-0-3)

Prerequisite: Arch 242. Develops the architect's understanding of the relationship between building material selection, building codes, testing, construction procedure, and life safety.

Arch 363 - Architecture Studio III (1-12-5)

Prerequisite: Arch 264. A continuation of Arch 264. Lecture hour explores in depth the nature of technology, environment, and social order as they relate to studio work. Students will be required to purchase course materials.

Arch 364 - Architecture Studio IV (1-12-5)

Prerequisites: Arch 363. A continuation of Arch 363. Lecture hour explores in depth the nature of technology, environment, and social order as they relate to studio work. Students will be required to purchase course materials.

Arch 381 - History of Architecture III (3-0-3)

Prerequisite: Arch 252. Continuation of Arch 251 covering the period from the 15th Century to 1900. Among its emphases are theoretical debates, technological developments, and the impact of the industrial revolution and modernity on architecture and urban forms. While the geographical focus on Western Europe and North America, case studies from other contexts are also introduced.

Arch 382 - History of Architecture IV (3-0-3)

Prerequisite: Arch 381. The last in the sequence of history surveys, this course covers the architecture of the twentieth century. The issues discussed include reactions and responses to modernism, re-evaluations of history, universalism and regionalism, utopias and anti-utopias. While the focus is on European and American architecture, developments in other parts of the world are also introduced.

Arch 383 - Structures II (3-0-3)

Prerequisite: Arch 282. Methods and details of timber and steel design summarized. Structural design taught in the context of architectural design and cost constraints.

Arch 384 - Structures III (3-0-3)

Prerequisite: Arch 383. Continuing with the content of Structures I and II, develop a systematic overview of important differences between wood, steel and concrete structural systems. Learn methods and procedures for selecting between alternative structural systems. Advanced topics such as complex structural behavior, prestressed concrete and new structural technologies are introduced.

Arch 386 - Building Performance (3-0-3)

Prerequisites: Phys 102, Phys 103. Develop an understanding of the physical concepts of heat, air movement, and thermal mass for use in architectural design. Approaches to dynamic analysis and energy conservation are examined.

Arch 387 - Environmental Control Systems (3-0-3)

Prerequisite: Arch 386. A framework for making informed selections of building systems and equipment. Students provide the necessary background to analyze the advantages and disadvantages of alternative system designs for mechanical, electrical, plumbing, and transportation systems in buildings. An introduction to working with consulting engineers and conducting life-cycle costing of building systems.

Arch 403 - The American Home and Household I (3-0-3)

Prerequisite: junior or senior standing. A cultural, architectural analysis of American homes and households throughout history. Included are the Puritan society and Colonial home, the Victorian home and family, the frontier homestead, 19th century utopian communes, immigrants, the working class poor and urban tenements, war housing, and suburban homes. Students explore the meaning, use and design of each domestic setting from the point of view of society, the family and the individual, considering differences based on race, sex and class.

Arch 404 - The American Home and Household II (3-0-3)

Prerequisite: junior or senior standing. Analyzes the architecture of 20th century American homes and households, hotels, apartment houses, war housing, suburban homes, public projects, collectives, communes, self-help housing, and housing concepts for the future. Psychological, sociological, and cultural perspectives are considered insofar as they affect the architecture of the home.

Arch 408 - Advanced Landscape Architecture (2-3-2)

Prerequisite: Arch 331. Introduces the design, construction and management of contemporary landscape projects through case studies, field trips, and personal contact with prominent practicing landscape architects. A historical perspective of landscape architecture is used as a context for discussion.

Arch 410 - Co-op Work Experience II (3)

Prerequisites: Arch 310 or approval of the school and permission of the Office of Cooperative Education and Internships. Provides major-related work experience. A designated faculty member monitors and evaluates the student's work and project. Requirements include mandatory participation in seminars and completion of a report and/or project.

Arch 419 - Architectural Photography (2-3-3)

Prerequisite: Arch 364. Gives a wide range of photographic solutions for presentations and portfolios. Lectures consist of orientation on general topics, including light and space, using relevant text selections and slide presentations for reinforcement. Includes basic demonstrations of darkroom techniques and unorthodox methods to encourage experimentation.

Arch 422 - Mythical House (3-0-3)

Prerequisites: Arch 172, Arch 252, Arch 363. Shows that the house develops not only in response to reasoning, laws of physics, and biological needs, but also in response to magic, ritual, culture, personality, fantasy, and dreams.

Arch 463 - Architecture Studio V (1-12-5)

Prerequisite: Arch 364. A continuation of Arch 364. Lecture hour explores in depth the nature of technology, environment, and social order as they relate to studio work.

Arch 464 - Architecture Studio VI (1-12-5)

Prerequisite: Arch463. A continuation of Arch463. Lecture hour explores in depth the nature of technology, environment, and social order as they relate to studio work.

Arch 472 - Architectural Programming and Project Development (3-0-3)

Prerequisite: Arch 264. Covers the essentials for programming a building and understanding the full scope of project development that precedes and follows the programming phase. Identify major stakeholders in the building design and production process and examine their roles. Lectures and assignments include: user requirements and client values, methods of pro forma analysis for project development and approval, and how the development process changes over time.

Arch 483/483H - Special Topics (3)

Group investigation of problem of special interest in architecture.

Arch 491 - Independent Study (1)

Arch 492 - Independent Study (2)

Arch 493 - Independent Study (3)

Arch 530 - Methodologies of Architectural History, Theory and Criticism (3-0-3)

Prerequisites: Arch 382. A seminar examining the salient methodologies of architectural history, theory and criticism. Structured around a series of critical texts, with each set of core readings intended to provide a basis for analyzing and assessing the approach in question.

Arch 531A - History of Renaissance Architecture (3-0-3)

Prerequisites: Arch 382. An examination of the development of Renaissance architecture and urban design in Italy and elsewhere in Europe. The re-emergence of the classical tradition is considered within the context of social, political and economic developments as well as formal intentions.

Arch 531B - History of Baroque Architecture (3-0-3)

Prerequisites: Arch 382. An investigation of architectural development from the 17th and 18th centuries in Europe and Latin America, including consideration of stylistic variations, social and political factors, and trends in garden and urban design.

Arch 531C - History of Modern Architecture (3-0-3)

Prerequisites: Arch 382. A study of major tendencies of architectural theory and practice from the mid-19th to the mid-20th centuries. Formal and stylistic transformation is considered in relation to theoretical intentions as well as social, cultural, and technical developments.

Arch 531D - History of American Architecture (3-0-3)

Prerequisites: Arch 382. An investigation of the guiding ideals and dominant stylistic trends in American architecture and planning from colonial times to the mid-20th century. Critical shifts in conception and scope of architectural production considered in relation to the prevailing cultural, socio-economic, and technical contexts out of which they evolved.

Arch 531E - History of Non-Western Architecture (3-0-3)

Prerequisites: Arch 382. An examination of major architectural traditions of China, Japan, Southeastern Asia, India, and the Middle East. Each area is considered with reference to a conceptual, iconographic and stylistic paradigm that evolved from a particular historical context.

Arch 531F - Thresholds of Architectural Theory (3-0-3)

Prerequisites: Arch 382. A seminar that investigates key thresholds of Western architectural theory, from Vitruvius to Robert Venturi, with emphasis on examining the corresponding critical theoretical texts and related didactic buildings and projects.

Arch 531H - Aspects of Urban Form (3-0-3)

Prerequisites: Arch 382. An examination of the major forms and patterns of urban development from classical antiquity to the 20th century, considered in relation to the changing conceptions of the city as well as cultural, socio-economic, and political development.

Arch 532 - Problems and Methods in Architectural Preservation (3-0-3)

Prerequisites: Arch 382. Theory and practice of preservation planning, with emphasis on current concepts, problems and techniques of area preservation in the United States. Exploration of the successive guiding ideals and _approaches to historic preservation in America, together with their European parallels and ante-edents. Discussion of theories of continuity and change in the urban environment and of planning concepts and techniques that further preservation planning objectives in relation to programs for community development and neighborhood conservation.

Arch 533 - Case Studies in Architectural Creativity (3-0-3)

Prerequisite: Arch 364. Considers creativity in architecture from psychological, philosophical and autobiographical perspectives. The buildings, writings and lives of contemporary architects are discussed in the context of general theories of creativity. Each student chooses an individual architect noted for creative accomplishments and prepares a case study of his or her life.

Arch 534 - History of Architectural Technology (3-0-3)

Prerequisites: Arch 382. Survey of the development of building methods and materials. Impact of structural and environmental technology on architectural form and the design process. The role of technology in contemporary architectural theory and practice, including the modern movement, is emphasized.

Arch 535 - History of Architectural Ideas (3-0-3)

Prerequisite: Arch 382. Discusses seminal architectural ideas in the western world from Vitruvius to the present day. Read books written by leading architectural theorists and analyze them in detail.

Arch 536 - Landscape and American Culture (3-0-3)

Prerequisite: Arch 331. As in architecture, the parallel discipline of landscape architecture involves artistic intention set in conjunction with utilitarian concerns. As such, designs on the land include the integration of the arts and sciences of human culture with nature. Discusses landscape as a manifestation of American culture.

Arch 537 - Advanced Structures (3-0-3)

Prerequisite: Arch 384. Covers advanced material in structures related to steel and wood design including: steel industrial buildings, rigid frames and earthquake design, wood structures under axial loads, and combined bending and axial loads.

Arch 538 - Sustainable Architecture (3-0-3)

Follows two precepts: accepting responsibility for the consequences of design decisions upon human well-being, and the long-term viability of natural systems. Topics include sustainable site design and development, environmentally sensitive building materials, lifecycle cost benefit analysis of building systems, and adaptive reuse.

Arch 539 - Advanced Construction (3-0-3)

Pre-requisite: Arch 242. Explores the relationship between an architect's design intention and the construction document. Design a small building or addition and complete construction drawings of the design. Addresses problems and procedures encountered by an architect during the construction documents phase.

Arch 540 - Acoustics (3-0-3)

Prerequisites: Arch 241, Arch 242, Arch 342. Architectural acoustics: how we hear, physics of sound and materials, aesthetics of design and the processes of construction. Audible sounds, their interaction, perception of echo and directional hearing are applied to interior and exterior building transmission, room acoustics, and setting acceptable acoustical environments.

Arch 543 - Lighting (2-2-3)

Prerequisites: Arch 386 and Arch 387 or equivalents. Explores, through modeling and calculation, the means by which architectural form and detail influence the luminous environment. Perceptual responses such as visual comfort and delight are examined. Topics include daylighting footprints, model design and testing, and computer-assisted light level analysis. Areas of investigation include the relationship between daylight and electric light in architecture; the variations of light with time; analysis of seasonal and weather differences; role of task in lighting strategies; and means of control for light quantity and quality.

Arch 545 - Case Studies in Architectural Technology (3-0-3)

Prerequisite: senior standing. Technological systems involved in the construction and use of buildings. Students conduct in-depth investigation of technology-related problems in architecture and construction. Case study method is used. Construction documents and reports are analyzed. Field visits are required.

Arch 546 - Designing and Optimizing the Building Enclosure (3-0-3)

Prerequisites: Arch 386, CIS 104. Considers the "building envelope,?? the boundary dividing the inside of a structure from the outside environment. Study and design optimal enclosures considering energy exchange, the relationship between energy and light, and life cycle costs.

Arch 547 - Special Topics in Computer Applications (2-2-3)

Prerequisite: senior standing. Evaluation, utilization, and development of computer programs for analysis, simulation and information management. Programs range from energy analysis, building structures analysis, and mechanical systems design to spatial allocation, graphics and computer-aided design. Different theories of information transformation and delivery used in terms of architectural applications. Course hardware ranges from computer-aided design and drafting systems, through micro and mini, to mainframe computers.

Arch 549 - Life Safety Issues in Contemporary Buildings (3-0-3)

Prerequisites: Arch 386, Arch 387. A variety of life safety and comfort situations studied in terms of specific building types. Topics include building evacuation, compartmentalization, fire fighting and suppression, evaluation and testing of new building materials and systems, systems control and management. Special emphasis is on such building types as multi-use, high-density, schools, hospitals, and other institutional categories.

Arch 550 - Building Economics (3-0-3)

Prerequisite: senior standing. Economic issues and methods of analysis influencing the building process and product are presented. The focus is on relations between architectural decisions and economic consequences. Students use computer models to manage building cost data and conduct life cycle costing.

Arch 552 - Real Estate Analysis for Architects (3-0-3)

Prerequisite: completion of the third year. Introduction to the economic, financial and political aspects of real estate and their effect on architectural decision-making. Topics include needs assessment, real estate appraisal, financial instruments, regulations and real estate, design as value-adding, and the effect of tax policies on real estate development.

Arch 556 - Systems Approach to Design and Construction (3-0-3)

Prerequisite: completion of the third year. Lectures, case studies and student projects on understanding human aspiration and needs through design. Topics include land, finance, management, technology, and labor.

Arch 557 - Problems in Modern Housing (3-0-3)

Prerequisite: Arch 382 Historical approach places housing in its social, economic, and political context. Attempts to provide decent, affordable and well-designed housing for broad segments of society are examined. Dwelling is examined through analysis of proto-typical design solutions in urban environments.

Arch 558 - Professional Architectural Practice (3-0-3)

Prerequisite: Arch 364. A forum for examination of the structure and practices of the profession of architecture. The formal and informal relationships between architects, and between architects and clients, government officials, and consultants are studied. Basic principles of office management for the small and large architectural firm are introduced.

Arch 559 - Social Issues in Housing (3-0-3)

Lecture/seminar explores the historical, economic, social, technological, and political basis for current American housing policy and practice. Examines government, community-based and private sector attempts, both failed and successful, at providing decent, affordable, and well-designed housing for broad segments of society. Student teams analyze and discuss, in a series of classroom debates, the housing and planning implications of controversial social problems?from homelessness and racial segregation to caring for the elderly and people with HIV/AIDS?with an emphasis on the role of the architect.

Arch 563 - Architecture Studio VII (1-12-5)

Prerequisites: Arch464. All 100-, 200-, and 300-level architecture core courses must be completed. A continuation of Arch464. Lecture hour explores in depth the nature of technology, environment, and social order as they _relate to studio work.

Arch 564 - Architecture Studio (1-12-5)

Prerequisite: Arch 563. All 100-, 200-, and 300-level architecture core courses must be completed. A continuation of Arch 563.

Arch 565 - Comprehensive Studio Lab (0-3-1)

Prerequisites: Arch464. Corequisite: Arch 563 or Arch 564. Held in design studio each week, the lab consists of presentations by the instructor on relevant technical and life safety -issues and student exercises applying these principles to their current design studio project or to existing buildings.

Arch 566 - Senior Thesis (0-15-5)

Prerequisite: Arch 563. An independent study option, which may be chosen by the student with the approval of the school, and in place of Arch 564.

Arch 571 - Everyday Life in the Public Realm (3-0-3)

A significant portion of everyday life takes place in the public realm of streets, sidewalks, parks, transit stations, government buildings, commercial establishments, and cultural institutions. Focuses on recent descriptions and critiques of public space and proposals for change.

Arch 572 - Architecture and Social Change (3-0-3)

Prerequisite: senior standing. Architectural form is analyzed in relation to political, economic and technological change, and change in social values. Buildings and other designed environments such as parks, streets and neighborhoods are studied relative to the social processes and institutions that generate and transform them. The role of the design professions in initiating or supporting change also is considered

Arch 573 - Technologies for Community and Urban Design (3-0-3)

Prerequisite: senior standing. Advanced and traditional technologies analyzed with regard to their role in community and city design, construction and reconstruction. Emphasis on technological systems influencing location, configuration and use. Examples are infrastructures, communication systems and construction technologies. Develops skills in using methods to evaluate alternative technologies relative to their social, economic and physical promise, problems and feasibility.

Arch 574 - Case Studies in Community and Urban Design (3-0-3)

Prerequisite: senior standing. In-depth investigation of specific real-world problems of urban or community design carried out using case method approach. Current practices in the U.S. and other countries studied using interviews with designers, developers, community groups and government agencies. Site visits, reports and other documents provide important sources of information. Final report with supporting documentation required.

Arch 576 - The Architecture of Utopia (3-0-3)

Prerequisite: senior standing. Seminar for the review of utopian projects that have attempted to embody and strengthen social ideas through transformations in the structuring of space. Architectural implications of different literary and philosophical utopias analyzed with an emphasis on those experimental proposals which were realized, in whole or in part, in built form.

Arch 583/583H - Special Topics (3)

Group investigation of problem of special interest in architecture.

Arch 584 - Video and Animation (3-0-3)

Prerequisite: Arch 363. Presents the concepts of 3-D surface modeling, rendering, key frame animation, and video production in the context of the design process using the computer program ALIAS STUDIO. Emphasizes the underlying geometric principles of surface modeling, the components of color theory and texture mapping, the principles of key frame animation, and video production. The project for the semester is a short animated video. Also discusses scene Description Language programming.

Arch 585 - Imaginary Worlds: Architecture in Motion Pictures (3-0-3)

Prerequisites: Arch 363, Arch 381. Like childhood photographs in family albums, movies are part of our collective memories and become a unique way of "remembering?? an era or place even one that has never existed or could exist. The study of imaginary worlds in motion pictures provides students with opportunities to gain an awareness of architecture and study it from different perspectives. Movies studied will be limited to those that postulate new, or unique, environments rather than those films that faithfully document reality. Discussions will focus on architectural issues raised by the movies studied as well as those found in critical essays.

Arch 588 - Architoons (3-0-3)

Prerequisite: Arch 364. Through the medium of film, applies literary devices to architectural contexts, including caricature, parody, lampoon, satire and farce. Studies historical and contemporary animations and short films for their treatment of meaning, story line and sequence, timing, environmental and psychological mood, atmosphere and emotion. Using 3-D modeling and animation software, each student produces an animated short subject illustrating an architectural principle or providing a humorous look at architectural history and theory.

Arch 591 - Independent Study (1)

Arch 592 - Independent Study (2)

Arch 593 - Independent Study (3)

Art: Offered by the New Jersey School of Architecture

21&62:080:102 - Design Fundamentals (3)

Open to nonmajors. No previous art experience needed. Basic studio course to develop visual literacy and skill; basic vocabulary of art and experience in manipulating this vocabulary through actual projects; principles of composition, color theory, and concepts of space; training in use of pencil, pen, paint, and collage techniques.

21&62:080:103 - 3-D Design Fundamentals (3)

Open to nonmajors. No previous art experience needed. Basic course to develop an awareness of three-dimensional space through plane, volume, form, light, and rhythm; variety of tools and procedures are used to manipulate space; analysis of a problem through materials, processes, and concepts; basic skills involved in structuring space.

21&62:080:121 - Introduction to Drawing (3)

No previous art experience needed. Basic studio course to develop skills in representational drawing; trains students in the perception of real world form and space and the transfer of that perception into two-dimensional images; experience in drawing still life, land and cityscape, and the figure; materials include pencil, conte crayon, and other drawing media.

21&62:080:231 - Graphic Design I (3)

Open to nonmajors. Prerequisites: 21&62:080:102,121, and sophomore standing or permission of instructor. Fundamental design problems emphasizing the use of letterforms (typography), while exploring problem solving in a variety of visual forms, conceptual and analytical approaches, and technical processes. The use of pictographic image-making, symbol design, semantics, visual sequencing and transformation in developing a visual language. One research paper.

21&62:080:245 - Introduction to Computer Art (3)

Open to nonmajors. Prerequisites: 21&62:080:102,103,121. Bridges the historical traditions of art making with aesthetics of computer technology. Painting, drawing, and photo-image manipulation using Macintosh computers.

21&62:080:251 - Introduction to Painting (3)

Open to nonmajors. Prerequisites: 21&62:080:102,121. Studio course introducing the fundamental concepts of painting; various materials and approaches, both abstract and representational, used to deal with form and image.

21&62:080:261 - Introduction to Photography (3)

Open to nonmajors. All aspects of black and white photography, including creative use of the camera and related darkroom work; the development and history of photographic techniques; demonstration and illustrated lectures and critiques.

21&62:080:273 - Introduction to Printmaking (3)

Open to nonmajors. Prerequisites: 21&62:080:102,121. Studio introduction to printmaking, covering the techniques of the screenprint, linocut, woodcut, monoprint, collograph and digital applications. Emphasis is upon developing visual vocabulary and effective forms; history and contemporary roles of printmaking. Field trips.

21&62:080:362 - Photography Workshop (3)

Open to nonmajors. Prerequisite: 21&62:080:261 or permission of instructor. Advanced work in all areas of photography based on projects designed to fit individual needs; emphasis on development of aesthetic and critical dimensions in photography. Students carry out ideas and techniques independently.

21&62:080:370 - Computers in Graphic Design (3)

Open to nonmajors. Prerequisite: 21&62:080:232 or permission of instructor. Corequisite: 21&62:080:331. Advanced typographic workshop using Macintosh computers. Stresses design and typographic principles while exploring the language of signs in compositional exercises. Typesetting, image making, scanning software, electronic page makeup, pre-press, and printing production procedures.

21&62:080:373 - Advanced Printmaking (3)

Open to nonmajors. Prerequisite: 21&62:080:273 or 276. Advanced studio in printmaking; emphasis on exploration of previously learned printmaking techniques to develop personal imagery. Proof and print a minimum of five prints; research paper on the history of printmaking; field trips.

21&62:080:378 - Printmaking Book Arts Workshop (3)

Prerequisite: Permission of instructor. Studio course in book arts. Emphasis is upon traditional bookbinding as well as innovative forms and printing techniques. Printmaking techniques including letterpress are explored within the context of book arts. Research on book design, artists? books. Field trips.

21&62:082:101 - Art Appreciation: Arts Past (3)

Recommended for nonmajors. Emphasizes the significance and meaning of art in our civilization; selective overview of Western and some non-Western art from prehistoric times to the Renaissance; the important arts of major cultures and periods addressed through illustrated lectures, readings, and museum visits.

21&62:082:102 - Art Appreciation: Arts Present (3)

Recommended for nonmajors. Survey of art of the past few centuries; emphasis on tendencies leading to modern developments; develop the ability to respond to and to feel at ease with contemporary art forms, and to gain familiarity with major works of art and important artists. Illustrated lectures and readings, museum and gallery visits.

21&62:082:201 - History of Non-Western Art (3)

Open to nonmajors. Prerequisites: 21&62:082:101, 102. Examines the form, function, content, and style of art in several cultures and civilizations around the world from past to present?Asian, Pacific, African, Islamic, and native American. Slide lectures, museum visits, and research paper.

21&62:082:202 - History of Design (3)

Open to nonmajors. Prerequisites: 21&62:082:101, 102. Focuses on graphic design from nineteenth century to present. Includes analysis of the arts and crafts movement, art nouveau, art deco, de Stijl, and later developments such as the international style, modernism, postmodernism, and beyond. Slide lectures, research papers, museum and gallery visits.

21&62:082:350 - Development of Modern Art (3)

Open to nonmajors. Prerequisites: 21&62:082:101, 102, or permission of instructor. Traces the development of modern art from 1770 to 1945, focusing on major trends from neoclassicism to surrealism. Slide lectures and museum trips.

Biology: Offered by the Federated Department of Biological Sciences at NJIT and Rutgers-Newark

Biol 410 - Senior Project (3-0-3)

Prerequisite: senior standing in biology. Complete a research project under the individual guidance of a faculty member affiliated with the program.

21&62:120:101-102 - General Biology (4,4)

Lec. 3 hrs.; lab. self-paced, averaging 3 hrs. per wk. Lectures, laboratories, and small group discussions on major biological principles and their relevance to humans. Topics in 101 include the anatomy, physiology, and ecology of animals and plants. Topics in 102 include cell biology, genetics, and evolution.

21&62:120:104 - Human Health and Disease (3)

Intended for students with no previous college biology or chemistry. May not be used for credit toward biology, botany, or zoology majors. Provides an introduction to the functions of the healthy human body and the mechanisms and consequences of various pathologic conditions.

21&62:120:109 - Basic Plant Science (3)

Not open to students who have taken or plan to take 21&62:120:101-102 or to majors. Introduction to basic botany and the applied plant sciences; plant biology with applications to ecology and conservation, food and drug problems, horticulture, and agriculture; demonstrations in greenhouses, experimental gardens, and campus plantings.

21&62:120:110 - Basic Plant Science Laboratory (1)

Not open to students who have taken or plan to take 21&62:120:101-102 or to majors. May be taken with 21&62:120:109 to fulfill the laboratory science requirement when taken with 21&62:120:206,207. Laboratory exercises in the areas covered in the description of 21&62:120:109.

21&62:120:203 - Plant Biology (3)

Not open to biology, botany, or zoology majors. An evolutionary survey of the plant kingdom, with emphasis on the flowering plants, their structure, and major life processes.

21&62:120:204 - Economic Botany (3)

May not be used for credit toward biology, botany, or zoology majors. The influence of plants and plant cultivation on the economic, social, and cultural history of man; introduction to economically important plants and their products, especially as sources of food, shelter, clothing, drugs, and industrial raw materials; current problems of agriculture, plant industry, and medicine; the use and conservation of natural plant resources.

21&62:120:205 - Environmental Issues (3)

May not be used for credit toward the biology, botany, or zoology majors. Basic ecological principles; the human population and attempts to control it; human impact on the environment, air and water pollution, land use and misuse, conservation of resources.

21&62:120:206 - General Horticulture (3)

May not be used for credit toward biology, botany, or zoology majors. Basic principles of horticultural science; environmental control of plant growth; theories and methods of plant propagation and cultivation; introduction to ornamental plants.

21&62:120:207 - Horticulture Laboratory (1)

Pre- or corequisite: 21&62:120:206. May not be used for credit toward biology, botany, or zoology majors. May be taken with 21&62:120:206 to satisfy laboratory science requirement in conjunction with 21&62:120:109 and 110. Practical experience in horticulture; emphasis on plant growth, propagation and maintenance in laboratory greenhouse, experimental gardens, and growth chambers.

21&62:120:208 - Human Sexuality (3)

May not be used for credit toward the biology or zoology major or minor. Reproductive biology, including anatomy and development of sexual structures, menstrual cycle, pregnancy, and childbirth; self-examination, contraception and abortion, and sexually transmitted diseases; role of emotions, communication skills, and values in sexuality; diversity of sexual behavior and legal and commercial aspects of sexuality.

21&62:120:211 - Plant Kingdom (4)

Lec. 3 hrs., lab. 3 hrs. Pre- or corequisite: 21&62:120:101-102 or permission of instructor. A survey of the major groups in the plant kingdom; the morphology, reproduction, and evolution of the vascular plants with emphasis on their role in nature and the importance to man.

21&62:120:230 - Biology of Seed Plants (4)

Lec. 3 hrs., lab. 3 hrs. Pre- or corequisite: 21&62:120:101-102 or permission of instructor. The morphology, physiology, and reproduction of flowering plants, plant structures, functions, and products essential to human life; the cultural and applied aspects of plant science.

21&62:120:235 - Microbiology (3)

Lec. 2 hrs., lab 3 hrs. Prerequisites: 21&62:120:241-242 or equivalent. Open only to students in the College of Nursing. Fundamentals of microbiology, including the distinguishing characteristics of the various groups of microbial cells; microbial control, including physical and chemical agents and chemotherapeutic agents; applications in personal and public health and in industry; mechanisms of disease production and host resistance; prevention and control of disease.

21&62:120:241-242 - Anatomy and Physiology (4,4)

Lec. 3 hrs., lab. 3 hrs. May not be used for credit toward the biology or zoology major. Examination of human body in which structure and function are integrated.

21&62:120:301 - Foundations of Biology: Cell and Molecular Biology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisites: 21&62:120:101-102 or placement exam, and 21:160:115. Lectures, discussions, and laboratory exercises in cell structure, thermodynamics, membrane biology, energy utilization and trans-fer, and nucleic acid structure and function, transcription, translation, and genetic regulation.

21&62:120:311 - Taxonomy of Vascular Plants (4)

Lec. 3 hrs., lab. and field trips 3 hrs. Pre-requisite: 21&62:120:211or 230 or permission of instructor. The principles of taxonomy, with an emphasis on vascular plants. The relation of modern taxonomy to genetics and evolution; local spring-flowering plants identified and collected.

21&62:120:320 - Comparative Anatomy of Vertebrates (4)

Lec. 3 hrs., lab. 3 hrs. Pre or corequisite: 21&62:120:101-102. Phylogeny of gross structure and structural integration in the vertebrates; laboratory work on amphioxus, lamprey, dogfish, and cat.

21&62:120:322 - Evolution (3)

Prerequisites: 21&62:120:301,352. Recommended: 21&62:120:356. Principles and mechanisms of evolution and history of evolutionary theory; mechanisms of animal speciation and adaptive radiation; the role of population and genetics in understanding microevolution.

21&62:120:325 - Animal Parasites (3)

Pre- or corequisites: 21&62:120:301 plus one advanced course in zoology. The parasitic protozoa, flatworms, roundworms, and arthropods in relation to their hosts.

21&62:120:326 - Laboratory Exercises in Parasitology (1)

Lab. 3 hrs. Prerequisites: 21&62:120:301 plus one advanced course in zoology. Corequisite: 21&62:120:325. Visualization, preparation, and identification of parasitic animals (protozoa, flatworms, roundworms, and arthropods) and host-parasite interactions.

21&62:120:327 - Biology of Invertebrates (4)

Lec. 3 hr., lab. 3 hrs. Prerequisites: 21&62:120:101-102. The major animal phyla; emphasis throughout on reasoning about the interrelationships of structure, function, and behavior in their ecological and evolutionary contexts. Laboratory work emphasizes living animals; supplemented by fieldwork. One weekend field trip required.

21&62:120:328 - Ornithology (3)

Lec. 3 hrs. Prerequisites: 21&62:120:101-102. A survey of birds and their biology. The course includes such topics as the diversity of birds and how they live; avian evolution; classification; structure and physiology; embryology and development; flight; migration and navigation; breeding biology; social organization and communication; instinct, learning and intelligence; birds and people. Lectures are supplemented by films and optional visits to museums and a field trip.

21&62:120:330 - Plant Physiology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisites: 21&62:120:301 or permission of instructor. Growth and metabolism of plants; water relations, photosynthesis, inorganic nutrition, metabolism of organic materials, and plant growth regulators.

21&62:120:335 - General Microbiology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisites: 21&62:120:301 and 21&62:160:331. Biology of pro-karyotic organisms: their taxonomy, physiology, metabolism, and significance in nature.

21&62:120:340 - Mammalian Physiology (4)

Lec. 3 hrs. Prerequisite: 21&62:120:301. The physiology of the human species as a mammal. Function and homeostatic regulation of neuromuscular, cardiovascular, respiratory, endocrine, digestive, and excretory systems.

21&62:120:342 - Developmental Biology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:120:301. Recommended: 21&62:120:320. Descriptive and experimental approaches to molecular, cellular, and organismal changes during development; mechanisms of cell differentiation, organogenesis, morphogenesis, and pattern formation.

21&62:120:352 - Genetics (3)

Prerequisite: 21&62:120:101-102.The basic principles and mechanisms of genetics and their application to current problems.

21&62:120:355 - Cell Biology (3)

Prerequisites: 21&62:120:301, 21&62:160:116 and one term of organic chemistry. Emphasis on the cell as the structural and functional unit of life; recent advances in molecular biology are integrated with recent knowledge of the ultrastructure and function of cells; includes features of prokaryotes and eukaryotes of plants and animals and an introduction to viruses.

21&62:120:356 - Molecular Biology (3)

Prerequisite: 21&62:120:301. The molecular basis of gene regulation in eukaryotic cells, including DNA technology, chromosome structure, gene organization and expression.

21&62:120:358 - Microanatomy of Cells and Tissues (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:120:301. Open to juniors and seniors only. Structure and function of cells, organelles, tissues, and organs.

21&62:120:360 - Elementary Biochemistry (3)

Prerequisites: 21&62:120:301; 21&62:160:335. Corequisite: 21&62:160:336. The chemistry and metabolism of proteins, carbohydrates, lipids, nucleic acids, and other biologically important compounds.

21&62:120:370 - Plant Ecology (3)

Pre- or corequisite: 21&62:120:101-102. Study of plants in relation to their environment; emphasis on local plant communities, modern methods of analysis, and applications to forestry and conservation.

21&62:120:371 - Field Studies in Plant Ecology (3)

Prerequisite: 21&62:120:370 or permission of instructor. Modern and classical methods are employed in the study of plant communities and plant geography across the region.

21&62:120:380 - Animal Ecology (3)

Pre- or corequisite: 21&62:120:101-102. The principles of ecology, with emphasis on vertebrate animals; factors affecting their distribution and abundance.

21&62:120:381 - Field Studies in Animal Ecology (2)

Lec. 1 hr., lab. and field trips 3 hrs. Prerequisites: 21&62:120:380 and permission of instructor. Basic field techniques for the study of animals in their natural habitats; principles of animal ecology as demonstrated in field and laboratory work.

21&62:120:382 - Animal Behavior (3)

Pre- or corequisite: 21&62:120:101-102. From the genetic and neurobiological bases of behavior through animal communication and social systems; evolutionary processes that shape the behaviors of animals in their natural environment.

21&62:120:403 - Biological Ultrastructure (3)

Lec. 2 hrs., lab. 3 hrs. Prerequisites: 21&62:120:301 and permission of instructor. For the student who has some histological background, makes the transition from light microscopy to electron microscopy; the ultra-structural appearance and functions of the subcellular organelles.

21&62:120:404 - Light and Electron Microscopy (4)

Lec. 2 hrs., lab. 6 hrs. Prerequisite: 21&62:120:403. Processing of pieces of tissue through to finished light microscope slides and electron micrographs; the techniques involved in producing micrographs; paper interpreting what is in the micrographs required.

21&62:120:413 - Mycology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:120:301 or permission of instructor. Morphology, physiology, and reproduction of the fungi; emphasis given to cytomorphology, evolution of the principal families of the fungi, and the important relationships between fungi and other organisms, including man.

21&62:120:414 - Phycology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:120:211. The structure, function, reproduction, and evolutionary relationships of the algae, with emphasis on ecological and physiological aspects.

21&62:120:415 - Paleobotany (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:120:211 or 21&62:120:230 or permission of instructor. Survey of evolutionary trends in the plant kingdom; comparative study of the morphology, anatomy, and reproduction of fossil plants and their survivors, with emphasis on the vascular plants.

21&62:120:430 - Plant Growth and Development (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisites: 21&62:120:230 and 21&62:120:330, or permission of instructor. Study of the dynamics of growth and development of plants as influenced by physiological and environmental factors. Laboratory focuses on plant tissue culture and applications to biotechnology.

21&62:120:435 - Microbial Physiology and Metabolism (3)

Prerequisite: 21&62:120:335, 21&62:120:360. Biology of prokaryotic organisms. Emphasis on those physiological, biochemical, and ecological aspects that are unique to bacteria.

21&62:120:443 - Immunology (3)

Prerequisite: 21&62:120:301 or permission of instructor. The capability of the body to respond to disease organisms; the immune response, current theories of antibody formation, transplantation, hypersensitivity, and response to cancer viruses and carcinogens.

21&62:120:445 - Endocrinology (3)

Prerequisites: 21&62:120:301, 21&62:160:113-114, and 115-116. The structures and functions of the endocrine glands and their role in the integration of the organism.

21&62:120:451 - Laboratory in Cellular and Molecular Biology I: Cellular Biophysics (4)

Lec. 3 hrs., lab. 3 hrs. Admission by permission of instructor only. Prerequisites: 21&62:120:330 or 355 or 356; 21&62:160:115, 116; 21&62:750:203, 204. Laboratory intensive course with lectures and discussion covering the physical principles governing eukaryotic cell function. Emphasis placed on the electrical properties of excitable cells and model membrane systems. Introduction to the principles underlying light and electron microscopy.

21&62:120:452 - Laboratory in Cellular and Molecular Biology II: Molecular Biotechniques (4)

Lec. 3 hrs., lab. 3 hrs. Admission by permission of instructor only. Prerequisites: 21&62:120:301, 356. Lecture and laboratory course on principles and techniques of molecular bio-technology. Emphasis on recent techniques in molecular biology. Laboratory exercises include isolation, cloning, and sequencing of genetic material; protein purification; gel electrophoresis of proteins and nucleic acids; DNA synthesis; RFLP's and PCR techniques; construction and screening of cDNA and genomic libraries. Industrial applications of molecular biology are presented.

21&62:120:455 - Molecular Cell Biology (3)

Lec. 3 hrs. Prerequisites: 21&62:120:355,356. Rec-ommended: 21&62:120:360. Advanced analysis of cellular systems with emphasis on cytoplasmic structure and function.

21&62:120:456 - Virology (3)

Prerequisite: 21&62:120:335 or permission of instructor. Structure and function of viruses; modes of infection, virus-host interaction, and viral reproduction.

21&62:120:470 - Field Ecology (3)

Prerequisites: 21&62:120:101-102 and permission of instructor. Field-oriented study of plants and plant communities; field and laboratory work are combined to demonstrate and analyze plant communities; modern instruments and techniques are used in a problem-solving approach.

21&62:120:471 - Ecological Physiology (3)

Prerequisite: 21&62:120:380. The physiological and ecological factors that permit and facilitate the adaption of animal populations to diverse environments.

21&62:120:472 - Environmental Assessment (3)

Prerequisite: 21&62:120:370 or permission of instructor. Lectures, readings, field work, practical demonstration and evaluations used to study the science of environmental assessment and to explore regulatory framework in which the science may be applied to real world situations, i.e., natural resource inventories, polluted soil and water, wetlands.

21&62:120:473 - Ecology of Microorganisms (3)

Prerequisite: 21&62:120:335. Lectures and problem sets on interactions between microorganisms and the environment, and their role in element cycling in pristine and contaminated, terrestrial and aquatic habitats.

21&62:120:481 - Marine Biology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:120:101-102. Recommended: 21&62:120:327, 380. Basic ecology of the marine environment; primary producers, zooplankton, benthic ecology, human impact on the sea, including fisheries and pollution. Field trips to nearby salt marsh, mud flat, rocky shore, and sandy beach habitats plus a shipboard experience.

21&62:120:486 - Tropical Field Biology (2)

Course is for two weeks at the University of Puerto Rico. The course fee includes round trip airfare, housing, local transportation, and all expenses except meals. Because vigorous outdoor activity is required, students must be in good physical condition. Prerequisite: Written permission of instructor. Enrollment limited to 12 students. An intensive two-week course in tropical biology given in Puerto Rico. Emphasis on principles of ecology and diversity of organisms. Extensive field trips include: tropical rain forest, desert, mangrove swamp, Karst topography, coral reef, and commercial plantations.

21&62:120:491,492 - Problems in Biology (BA,BA)

Outstanding juniors and seniors may enroll in this course under the supervision of a qualified faculty member with written permission of the faculty member and the department chairperson. No more than six problems credits may be used toward the botany, biology, or zoology majors without written permission of the student's academic adviser and the department chairperson.

21&62:120:493,494 - Seminar in Biology (1,1)

Open to juniors and seniors with a cumulative GPA of at least 3.0 and with permission of instructor. Discussion of selected topics.

Biomedical Engineering: Offered by the Department of Biomedical Engineering

BME 101 - Introduction to Biomedical Engineering (1-0-0)

This course is open only to freshmen and new transfer students. Faculty members describe their research in biomedical engineering.

BME 102 - Survey of Human Physiology (1-0-1)

This course is open only to freshmen and new transfer students. An overview of human physiology is taught as an introduction to subsequent core courses in the Biomedical Engineering curriculum.

BME 301 - Electrical Fundamentals of Biomedical Engineering (1-3-3)

Prerequisites: Math 111, Math 112, Phys 111, Phys 121. Course lectures and laboratories will address important issues covering bio-electric signals, biomedical instrumentation, computer software, hardware and interfacing, medical imaging and image processing. Laboratory work will provide hands-on experience in all of these topics and more. The course will also address issues in design and manufacture of medical devices, scientific research, and clinical practice. This course is offered in Studio format that involves the integration of lectures and labs into one highly participatory structure.

BME 302 - Mechanical Fundamentals of Biomedical Engineering (1-3-3)

Prerequisites: Math 111, Math 112, Phys 111, Phys 121. BME 301 is not a prerequisite. The format is identical to that of BME 301. Course lectures and laboratories will address important issues covering the mechanical fundamentals that are important bases for later learning experiences. This course introduces the students to biomaterials (tissues), biomechanics (forces and motion), biofluids and biostatistics, and then integrates them with a final design project on neuromuscular engineering.

BME 303 - Biological and Chemical Foundations of Biomedical Engineering (3-0-3)

Prerequisites: General Chemistry; General Physics and Chem 337. This course covers organic chemistry, biochemistry and cellular mechanics in sufficient depth to give biomedical engineering students a strong enough background for them to understand the introductory aspects of biomedical engineering, which focus on the application of engineering principles to medicine and surgery.

BME 310 - Biomedical Computing (3-0-3)

Prerequisites: CIS 113 and BME 301. This course covers the application of digtal signal processing to biomedical problems. Labview, a graphical programming language common in engineering, is used for both signal acquisition and processing. Applications include analysis of the electrocardiogram and other electrical signals generated by the body.

BME 314 - Biomedical Signals and Systems (3-0-3)

Prerequisites: Math 222 and BME 310. This course covers the mathematical tools required to analyze the signals and systems found in biomedical engineering. Tools such as the Laplace and Fourier Transforms, time-frequency analysis are introduced. Applications include signals and noise, mathematics of imaging and derivation of useful physiological parameters from input signals.

BME 372 - Biomedical Electronics (3-0-3)

Prerequisite: BME 310. The first of a two-semester sequence. It covers the design of electronic circuits for Biomedical applications. This course covers basic operational amplifier circuits as well as the operation of semiconductor diodes and transistors. An introduction to digital logic circuits is also provided. Pspice computer simulation as well as hands-on breadboarding of electronic circuits are used throughout the course to supplement the lectures.

BME 373 - Biomedical Electronics II (3-0-3)

Prerequisite: BME 372. A continuation of BME 372 emphasizing biomedical applications of oscillators, active filters, and wave-shaping circuits.

BME 381 - Engineering Physiology I (3-0-0)

Prerequisites: Math 112, Phys 121 and BME 102. Mathematical models of organs and organ systems are described from an engineering viewpoint. Anatomy and physiology are quantified. No biology course is required. Heart and circulation, gas exchange in the lungs, electrical properties of excitable membranes, renal countercurrent mechanism and muscle mechanics are among the topics covered. Emphasis will be placed on feedback control, mathematical modeling and numerical simulation.

BME 382 - Engineering Physiology II (3-0-3)

Prerequisites: Math 112, Phys 121 and BME 102. BME 381 is not a prerequisite. Mathematical models of organs and organ systems are described from an engineering viewpoint. Anatomy and physiology are quantified. No biology course is required. Heart and circulation, gas exchange in the lungs, electrical properties of excitable membranes, renal countercurrent mechanism and muscle mechanics are among the topics covered.

BME 402 - Biophotonics (0-3-3)

Prerequisites: Physics 121. A laboratory/studio style course in which the applications of light an electrical energy are explored to study the body s normal surface characteristics and to diagnose medical problems related to aberrations of the surface. Interaction of light with biotissues. Measurement of tissue absorption and scattering. Fiber optics and endoscopy. Basics of laser surgery. Simulation of light propagation in tissues. Same as OPSE 310.

BME 410 - Co-op Work Experience (3 additive credits)

Prerequisites: completion of sophomore year, approval of department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated by the co-op office and approved by the department. Mandatory participation in seminars and completion of a report.

BME 420 - Biomaterials and Compatibility (3-0-3)

Prerequisites: Physics 121, Chemistry 126, Mech 320. An introduction to the field of biomaterials. The goal of this course is to understand material selection and the limitations imposed by current materials on device performance. The first part of the course will provide an overview of the current medical devices/implants with respect to their clinical relevance. Subsequently, the structure and properties of metals, ceramics, and polymers will be discussed. Properties include mechanical behavior, thermal, and surface characteristics. The second part of the course will discuss biocompatibility and implant design. Immunological and various histological responses will be described. Material properties of hard and soft tissues, their response to implants and the material selection for such tissues will be discussed.

BME 422 - Biomaterial Characterization (3-0-3)

Prerequisite: BME 420. The goal of the course is to understand the issues involved in the selection of materials for use in medical devices to be used in-vivo. The course will fisrt focus on bulk characterization of metal, ceramic and polymeric biomaterials, emphasizing characterization under biologically relevant conditions. This will be followed by characterization of in-use properties of biomaterals such as mechanical-, barrier-, and surface properties. Material stability in-vivo, bioerosion, effect of sterilization and methods to predict/retard aging of biomaterials.

BME 427 - Biotransport (3-0-3)

Prerequisite: Math 222. Introduction to basic concepts in thermodynamics and transport phenomena as applied to biological systems. The structure and composition of the body will be covered followed by an exploration of the properties of the blood and its flow in the cardiovascular system, and the body as a heat source and as a series of compartments involved in the mass transfer of materials (such as those in the kidneys and lungs). Design of artificial kidneys and heart-lung machines is also explored.

BME 430 - Principles of Tissue Engineering (3-0-3)

Prerequisite: BME 420. This course is an introduction to the field of tissue engineering. New and functional living tissue can be fabricated using living cells combined with a scaffolding material to guide tissue development. This course will cover the design of surfaces and scaffolding materials in order to optimize cell proliferation, tissue growth and the rate of repair of organs.

BME 467 - Pathophysiology of the Heart (3-0-3)

Prerequisites: BME 301, BME 302 and BME 303. This course addresses heart disease as an example of how biomedical engineering contributes to the diagnosis and management of patients. Topics include how the normal heart works and how diseases can disrupt normal heart function. Techniques used to measure cardiac function as well as treatments for common heart diseases such as acute myocardial infarction, heart failure and chronic ischemic heart disease are discussed. Student presentations are a major part of this course. Each student will be assigned a recent research paper in cardiology.

BME 469 - Introduction to Human Physiology (3-0-3)

This course is not open to Biomedical Engineering students. Available to non-biomedical engineering students who have an interest in going on to medical, dental or allied health careers. An introduction to mammalian physiology, particularly the heart, circulation, lungs and kidneys.

BME 474 - Biomechanics of Living Tissues: Solids (3-0-3)

Prerequisites: Math 222 and Mech 327. Measurements of deformation and strain resulting from stress on bone, muscle, spinal discs, cartilage, skin, blood vessels, etc.. Fiber reinforcement in tissues (anisotropy) and viscoelastic properties of tissues. Review of methods for testing and describing mechanical behavior of tissues. Long term adaptation of living tissues to mechanical environment (growth and atrophy). Overview of mechanics at the cellular level.

BME 476 - Physiological Mechanics of Fluids (3-0-3)

Prerequisites:Math 222 and BME 302. Newtonian and non-Newtonian fluid mechanics. Pulsatile flow, vortex control of valve motion, and regurgitation will be described. The thixotropic nature of blood. Shear-rate and time-dependent viscosity of blood. Other biological fluids such as mucous and spinal fluid will also be covered. Overview of airway flow in the lung and the effects of aerosols.

BME 479 - BioMicroElectroMechanical Systems (3-0-3)

Prerequisites: Knowledge of mechanics, optics, electromagnetism and general chemistry. Micro- and nanosystems used in advanced analytical techniques for microfluidic devices, implantable chips, non-invasive biomedical sensors, DNA chips and microelectronic array systems. Microelectronic processing design for micromaching and piezoelectric materials for biomedical applications. Biomedical sensors and actuators. BioMEMS active ultrasonic transducers for medical imaging, for micro-valves and for implantable medication delivery systems are studied.

BME 489 - Medical Instrumentation (3-0-3)

Prerequisites: BME 301, 302 and 310. The hardware and instrumentation needed to measure variables from different physiological systems. Electrodes, sensors and transducers. Bioelectric amplifiers. Hardware for measurement of the ECG, EEG, EMG, respiratory system, nervous system . Clinical laboratory instruments. Medical ultrasound. Electrical safety. Computers in biomedical instrumentation.

BME 491 - Capstone Design I (1-0-1)

Prerequisite: Senior standing. Planning and execution of engineering projects. Intellectual property: publications and priority documents; invention disclosures and patents. Safety: engineering codes and standards. Engineering ethics. Professional organizations. Professional registration. Preparation of a technical proposal for a senior project and its approval are required.

BME 492 - Capstone Design II (1-2-3)

Prerequisite: BME 491. A biomedical engineering design project, selected by the student, which has been approved in BME 491. Involves information from the professional literature, research, design and prototype testing. An oral presentation and a written report are required.

BME 495 - Capstone Design I (1-0-1)

Prerequisites: Senior standing or permission of the instructor To provide students with the guidance to choose a capstone design topic and advisor and to prepare the design proposal. The course introduces the student to the definition of design as well as introducing issues of intellectual property, bioethics and safety, and professional societies.

BME 496 - Capstone Design 2 (2-3-3)

Prerequisites: BME 495 Implementation of the project approved in BME 491. This portion of the project includes library research, time and cost planning, oral and written reports, as well as construction, troubleshooting and demonstration of a working prototype.

CDS 201 - Career Development Seminar (1-0-0)

This eight-week long course is a requirement for all Career Advancement Program (CAP) sophomore students and is open to all students with higher than first-year standing who have an interest in career exploration and development. Learn effective job search strategies, how to explore and develop career objectives, prepare resumes and cover letters, how to research organizations, and improve interviewing skills. Through discussion, group exercises and actual interview practice sessions, become better prepared to begin the career development and job search process. Guest lecturers from the private and public sectors add a ?real-world? perspective to the classroom experience.

Chemical Engineering : Offered by the Otto H. York Department of Chemical Engineering.

ChE 101 - Introduction to Chemical Engineering (1-0-0)

Prerequisites: None. An introduction to the field of chemical engineering and to the Otto H. York Department of Chemical Engineering. Topics include the curriculum, tours of department teaching laboratories and computing facilities, undergraduate research opportunities, cooperative employment, and student professional societies. Also included are visits by alumni who discuss their careers after graduation from the department.

ChE 221 - Material Balances (4-0-4)

Prerequisites: Chem 126 or Chem 123, and Math 112. Co-requisites: CIS 101, FED 101. An introduction to the analysis of chemical processes with special emphasis on steady state mass balances. The course introduces mass balances in unsteady state.

ChE 232 - Chemical Engineering Thermodynamics I (2-2-3)

Prerequisite: ChE 221. Corequisite: Chem 231. A course emphasizing the concepts of energy balances and energy balance calculations. Uses engineering correlations and thermodynamics to estimate properties used in batch and flow systems.

ChE 310 - Co-op Work Experience I (3 additive credits)

Prerequisites: completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report. Cannot be used for degree credit.

ChE 311 - Co-op Work Experience II (3 additive credits)

Prerequisites: ChE 310. Continuation of ChE 310. Cannot be used for degree credit.

ChE 342 - Chemical Engineering Thermodynamics II (3-0-3)

Prerequisites: ChE 232, Math 211. Corequisites: Chem 235, Math 222. The principles and methods developed in ChE 232 are extended to multicomponent systems, and used to treat phase and chemical equilibrium as well as such applications as chemical reactors and refrigeration systems.

ChE 349 - Kinetics and Reactor Design (3-0-3)

Prerequisites: Chem 235, ChE 232, Math 222. Derive and solve species and energy balances for single chemical reactors; introduces heterogeneous catalysis, non-ideal reactors as ideal reactor combinations, and special topics such as polymeric or biochemical reactions.

ChE 363 - Transport Operations I (3-0-3)

Prerequisites: ChE 232, Phys 111, CIS 101, and FED 101. Corequisite: Math 222 Considers principles of the molecular and turbulent transport of momentum, particularly as they apply to pressure drop calculations in piping systems, packed columns, and other flow devices. Also considered is flow around submerged objects.

ChE 364 - Transport Operations II (3-0-3)

Prerequisites: ChE 232, Math 222. Corequisite: ChE 363. The principles of molecular and turbulent transport of energy are considered, particularly as they apply to design of heat exchangers. Also considered is radiant heat transfer.

ChE 367 - Diffusional Systems (3-0-3)

Prerequisites: ChE 363, Math 222. Covers principles of molecular and turbulent transport of mass, particularly as they apply to design of packed columns, and other mass transfer devices.

ChE 375 - Structure, Properties and Processing of Materials (3-0-3)

Prerequisites: Chem 235. Corequisite: Mech 320. Tailoring materials properties by engineering their microscopic/macroscopic structures via processing is central to product design and development in the chemical industry. This course introduces the principles of materials engineering from the perspective of structure-property-processing relationships. Instead of covering different types of materials separately, this course will use the principles common to engineering of all important materials as an underlying theme. These are atomic/molecular structure, nanoscale, morphology, principles of phase transformation, structure development during processing, and property dependence on structure. All these topics will be introduced through the paradigm of comparing metals, ceramics and polymers. Besides single component systems, advanced materials such as multiphase and/or multicomponent systems (e.g. composites and gels) and nanomaterials will be discussed based on these principles. An integral part of this course will be the criteria for selection of materials for the chemical process industry.

ChE 380 - Introduction to Biotechnology (3-0-3)

Prerequisites: Chem 123 or Chem 126. Basic principles of molecular biotechnology with selected examples of applications.

ChE 402 - Applied Optics in Chemical Engineering (3-0-3)

Prerequisites: Junior os senior standing in chemical engineering. Combined laboratory and lecture course emphasizing photonics and laser applications in chemical engineering.

ChE 427 - Biotransport (3-0-3)

Prerequisites: ChE 232 and Math 222. Introduction to basic concepts of transport phenomena as applied to biological systems. Topics include the structure and composition of the human body, the properties of the blood and its flow in the cardiovascular system, and the body as a heat source and as a series of compartments involved in the mass transfer of materials (such as those in the kidneys and lungs). Students learn to analyze solute transport in biological systems and apply it to the design of biomedical devices.

ChE 444 - Introduction to Polymer Engineering (3-0-3)

Prerequisites: ChE 349, ChE 363, ChE 364. Introduction to the basic concepts of polymer engineering. Topics covered include rheology, heat transfer, and kinetics of polymerization reactors.

ChE 461 - Fate and Transport of Pollutants in the Environment (3-0-3)

Prerequisites: Math 222, Chem 235 or Chem 360, ChE 363 or CE 320. The overall objective of this course is to introduce students to concepts, mechanisms, and models used to describe the transport of chemicals in the environment. Two of the most important parameters in mass transport are the driving force or concentration gradient and the transport mechanism. Methods for defining these parameters are discussed during the first six weeks of the class. Concept and models presented in the first six weeks are applied to air-water, sediment-water, and soil-air interfaces during the rest of the term. The semester ends with a group project, where students are asked to apply material from the course to resolve a comprehensive problem.

ChE 466 - Pollution Control in Chemical Processes (3-0-3)

Prerequisites: ChE 349, ChE 367. A course applying chemical engineering principles to the appropriate treatment of gaseous and liquid effluents from manufacturing and utility plants. The course will take into consideration toxicity, safety, and economic constraints. A case study approach is used to evaluate processes and pinpoint pollution sources. Quantitative designs and calculations will be required.

ChE 468 - Air Pollution Control Principles (3-0-3)

Prerequisites: ChE 367, ChE 349. A course focusing on the sources and control of air pollution. The course emphasizes design of modern air pollution control equipment and associated economics.

ChE 471 - Equilibrium Stage Processes (3-0-3)

Prerequisite: ChE 342, ChE 364. Corequisite: ChE 367. Covers the design of distillation columns, extraction columns, leaching, and other stagewise separation processes.

ChE 472 - Process and Plant Design (4-0-4)

Prerequisites: ChE 349, ChE 367, ChE 471. A capstone course in the chemical engineering program. This class is divided into three- or four-person groups. Each group must complete an open-ended process design problem, including equipment specification and economics.

ChE 472H* - Process and Plant Design Honors (4-0-4)

Same as ChE 472, with special projects for Honors students.

ChE 473 - Mathematical Methods in Chemical Engineering (3-0-3)

Prerequisites: Math 222, ChE 349, ChE 364, ChE 367. An introduction to the use of differential equations to solve chemical engineering problems.

ChE 476 - Introduction to Biochemical Engineering (3-0-3)

Prerequisites: Chem 244, ChE 349. The application of chemical engineering to biochemical processes. Topics include enzyme reactions, dynamics of microbial populations, fermentation equipment, bioreactor design, and sterilization.

ChE 477 - Process Dynamics and Control (4-0-4)

Prerequisites: ChE 349, ChE 363, ChE 364. Mathematical description of transient and steady state behavior of chemical engineering processes. Study of the open-loop response of output process variables to varying inputs. Theory and applications of chemical process control.

ChE 485 - Chemical Engineering Laboratory I (1-6-4)

Prerequisites: Chem 235A, ChE 363, ChE 364, Math 225. Engineering experimentation and data analysis. Experiments are conducted in the areas of fluid mechanics and heat transfer. Bench and pilot-scale equipment is used. Results are presented in both oral and written reports.

ChE 486 - Chemical Engineering Laboratory II (0-8-4)

Prerequisites: ChE 349, ChE 367, ChE 471, ChE 485. Corequisite: ChE 477. Engineering experimentation and data analysis. Experiments are conducted in the areas of distillation, extraction, and chemical/biochemical reactions. Bench and pilot-scale equipment is used. Results are presented in both oral and written reports.

ChE 486H - Chemical Engineering Laboratory II Honors (0-8-4)

Same as ChE 486, with special projects for Honors students.

ChE 490 - Special Topics in Chemical Engineering (3-0-3)

Prerequisites: ChE 349, ChE 367. Topics of current interest in chemical engineering, such as supercritical fluid extraction, combustion research, environmental problems, biotechnology, technologies in hazardous and toxic substance management, etc. As interests develop, other topics will be considered.

ChE 491 - Research and Independent Study I (3-0-3)

Prerequisites: senior standing in chemical engineering, agreement of a department faculty advisor, and approval of the associate chairperson for undergraduate studies. Normally a GPA greater than 3.0 is required to participate in the course. Provides the student with an opportunity to work on a research project under the individual guidance of a member of the department. A written report is required for course completion.

ChE 491H - Research and Independent Study I Honors (3-0-3)

Same as ChE 491, with special projects for Honors students.

ChE 492 - Research and Independent Study II (3-0-3)

Prerequisite: ChE 491. A continuation of ChE 491.

ChE 492H - Research and Independent Study II Honors (3-0-3)

Prerequisite: ChE 491H. Same as ChE 492, with special projects for Honors students.

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* pending approval

Chemistry: Offered by the Department of Chemistry and Environmental Science

Chem 105 - Applied Chemical Principles (3-2-4)

Prerequisite: high school algebra or equivalent. The fundamentals and relation of chemistry to living in today's society. Suitable laboratory experiments illustrate the course material. Not open to engineering or science students, or students who have completed a college level chemistry course.

Chem 108 - College Chemistry I (3-1-3)

Prerequisites: a one-year college prep high school chemistry course, high school math including algebra and trigonometry. Delivered as a telecourse, the course provides the first of a two-semester sequence of college chemistry for high school students and other distance learners seeking college credit and/or preparation for the AP Examination. Matriculated undergraduates may not receive credit for this course.

Chem 109 - College Chemistry II (3-1-3)

Prerequisite: Chem 108. A continuation of Chem 108.

Chem 121 - Fundamentals of Chemistry I (3-0-3)

Prerequisites: high school math including algebra and trigonometry; chemistry placement examination required. The first semester of a three-semester sequence in chemistry, designed for underprepared students. Introduces the basic concepts of chemistry, including chemical reactions, electronic structure, gases and thermochemistry. Enrollment in Chem 121, 122, 123 is determined by a placement exam prior to initial registration. This sequence takes the place of Chem 125, 126. However, 3 credits of Chem 121, 122, 123 are additive only. The remaining 6 credits count toward degree requirements.

Chem 122 - Fundamentals of Chemistry II (3-0-3)

Prerequisite: Chem 121. Continuation of the Chem 121 sequence. This course introduces the student to the basic concepts of chemistry, including molecular structure, solutions and solids, and equilibrium.

Chem 123 - Fundamentals of Chemistry III (3-0-3)

Prerequisite: Chem 122. Continuation of the Chem 121 sequence. Introduces the student to the basic concepts of chemistry, including equilibrium in solution, kinetics and thermo-dynamics. Students should also register for Chem 124.

Chem 124 - General Chemistry Laboratory (0-2-1)

Corequisite: Chem 123 or Chem 126. Chemical principles studied in the Chem 125 and 126 or Chem 121, 122 and 123 sequence are illustrated and reinforced by performance of laboratory experiments.

Chem 124H - General Chemistry II Honors Laboratory (0-2-1)

Corequisite: Chem 126H. The laboratory consists of special research projects and other developmental labs.

Chem 125 - General Chemistry I (3-0-3)

Prerequisites: high school math including algebra and trigonometry; chemistry placement examination required. The first semester of a two-semester sequence in chemistry. Introduces the basic concepts of chemistry, including chemical reactions and bonding, electronic and molecular structure, gases and thermochemistry.

Chem 125H - General Chemistry I Honors (3-0-3)

Admission is by invitation only. An honors chemistry course which parallels Chem 125 but is more comprehensive and rigorous. Field trips, molecular model building, laboratory projects, journal reading assignments and reports, and supplementary problems are required -aspects of the program.

Chem 126 - General Chemistry II (3-0-3)

Prerequisite: Chem 125 or equivalent. The second semester of a two-semester sequence in chemistry. Introduces the basic concepts of chemistry, including equilibrium, chemical kinetics, thermodynamics, and electrochemistry. Students should also register for Chem 124.

Chem 126H - General Chemistry II Honors (3-0-3)

Prerequisite: Chem 125H. A continuation of Chem 125H, which parallels the course content of Chem 126. An individual research project is completed. Chem 124H must be taken concurrently.

Chem 221 - Analytical Chemical Methods (0-4-2)

Prerequisite: Chem 123 or Chem 126, Chem 124. Laboratory introducing quantitative chemical analyses by gravimetry, titration, spectroscopy, chromatography, and potentiometry.

Chem 222 - Analytical Chemistry (3-0-3)

Prerequisite: Chem 123 or Chem 126, Chem 124. Lecture course introducing concepts of chemical analyses by gravimetry, titration, spectroscopy, chromatography, and potentiometry.

Chem 231 - Physical Chemistry I (3-0-3)

Prerequisites: Chem 123 or Chem126, Phys 111. Corequisite: Math 211. The topics covered include the properties of ideal and non-ideal gases and liquids, solutions, thermochemistry, thermodynamics, the phase rule, and phase equilibria.

Chem 235 - Physical Chemistry II (3-0-3)

Prerequisite: Chem 231. A continuation of Chem 231. The topics include homogeneous and heterogeneous chemical equilibria, ionic equilibria, electrochemistry, kinetic theory of gases, transport phenomena, kinetics, and irreversible processes.

Chem 235A - Physical Chemistry II Laboratory (0-4-2)

Prerequisite: Chem 221, Chem 235. Corequisite: Math 225 (special section for chemical engineering and chemistry majors). Laboratory experiments apply and extend the basic knowledge of physical chemistry acquired in the lecture. Reports and presentations are an essential part of the course.

Chem 243 - Organic Chemistry I (3-0-3)

Prerequisite: Chem 123 or Chem 126. The preparation and properties of the various classes of organic compounds are discussed, with attention given to industrial sources such as coal and petroleum. Also covers the commercial utilization of these materials in the synthesis of useful products used in areas such as foods, cosmetics, textiles, plastics, and pharmaceuticals.

Chem 244 - Organic Chemistry II (3-0-3)

Prerequisite: Chem 243. A continuation of Chem 243.

Chem 244A - Organic Chemistry II Laboratory (0-4-2)

Prerequisite: Chem 124. Corequisite: Chem 244. Synthesis and characterization of organic compounds are performed in a unique multi-scale manner: micro, macro and a kilo scale.

Chem 301 - Chemical Technology (2-2-3)

Prerequisites: high school algebra and trigonometry or equivalent. Designed for engineering technology majors. Not open to students who have completed a college level chemistry course. Covers principles of chemistry, with a focus on chemical energetics and chemistry of materials. Suitable laboratory experiments illus-trate the course material.

Chem 310 - Co-op Work Experience I (3 additive credits)

Prerequisites: completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report. Cannot be used for degree credit.

Chem 311 - Co-op Work Experience II (3 additive credits)

Prerequisites: ChE 310. Continuation of ChE 310. Cannot be used for degree credit.

Chem 336 - Physical Chemistry III (3-0-3)

Prerequisite: Chem 235. An introduction to quantum mechanics, statistical mechanics, spectroscopy, and solid state.

Chem 340 - Chemistry and Engineering of Materials (3-0-3)

Prerequistes: Chem 235, Chem 244. Emphasizes processing/property relationships for a variety of engineering materials, including polymers, metals, ceramics, composites, semiconductors, optical fibers, and biomaterials. Introduces concepts of chemical structure, bonding and crystallinity. Covers important chemical, physical, electrical, and mechanical properties and corrosion and materials degradation. Also includes materials selection in the chemical process industries.

Chem 350 - Industrial Chemistry (3-0-3)

Prerequisite: Chem 244. Applications of chemistry to the development of products from basic research and development through scale-up and marketing. Covers inorganic and organic processes, environmental considerations, industrial catalysis, and cost calculations.

Chem 365 - Environmental Organic Chemistry (3-0-3)

An introduction to organic chemistry intended for students studying environmental science or environmental engineering. Covers the traditional functional groups, but focuses on their environmental impact and industrial synthesis. Not open to students who have taken organic chemistry.

Chem 412 - Inorganic Chemistry (3-0-3)

Prerequisite: Chem 231. A lecture-recitation-laboratory course in practical inorganic chemistry. Covers the chemistry of most of the elements and their compounds. Preparation in the laboratory is followed by purification and characterization.

Chem 440 - Fundamentals of Polymers (3-0-3)

Prerequisites: Chem 235, Chem 244. An introduction to the important fundamental aspects of polymers including preparation, structure, physical states and transitions, molecular weight distributions, viscous flow, and mechanical properties.

Chem 443 - Introductory Polymer Laboratory (1-4-3)

Prerequisite: Chem 440. Practical methods useful in the preparation and characterization of macromolecules, including radical, ionic, emulsion, and condensation polymerization. Various methods useful in characterizing polymers, such as solution and bulk viscosity, light scattering, osmometry, thermal analysis, and various spectroscopic techniques. Melt spinning and extrusion of polymers along with mechan-ical properties.

Chem 448 - Preparation and Analysis of Organic Compounds (0-4-2)

Prerequisites: Chem 244 and Chem 244A. The application of laboratory techniques learned in Chem 344A laboratory to the synthesis and characterization of organic compounds.

Chem 473 - Biochemistry (3-0-3)

Prerequisite: Chem 244. Covers the fundamentals of biochemistry including buffers, blood, proteins, enzymes, carbohydrates, fats, and nucleic acids. Emphasis on the relationship of biochemistry to biotechnology and medicine.

Chem 480 - Instrumental Analysis (0-4-2)

Prerequisite: Chem 221, Chem 222 or equivalent, R160:207. Laboratory exploring the principles of operation of modern instruments for chemical analysis. Ultra-violet and infrared spectroscopy, mass spectrometry, gas chromatography, high performance liquid chromatography, voltametry, and potentiometry are among the instruments utilized. Apply calibration methods, statistical data treatment, and sample preparation techniques are applied.

Chem 484 - Modern Analytical Chemistry (1-4-3)

Prerequisite: Chem 235. Basic principles and techniques of quantitative analysis, with emphasis on application of modern analytical instrumentation. Atomic and molecular spectroscopy, chromatography, and electrochemical methods are studied and applied in the laboratory. Calibration, sampling methodology and sample preparation are also treated.

Chem 490 - Special Topics in Chemistry (3-0-3)

Prerequisite: depends upon the nature of the course given. Course is offered in specific areas as interest develops.

Chem 491 - Research and Independent Study I (3-0-3)

Prerequisite: senior standing in chemistry or chemical engineering. Provides an opportunity to work on a research project under the individual guidance of a member of the department.

Chem 491H - Honors Research and Independent Study I (3-0-3)

Same as Chem 491, with special projects for Honors students.

Chem 492 - Research and Independent Study II (3-0-3)

Prerequisite: Chem 491. A continuation of Chem 491.

Chem 492H - Research and Independent Study II ? Honors (3-0-3)

Prerequisite: Chem 491H. Same as Chem 492, with special projects for Honors students.

21&62:160:108 - Organic Biochemistry (3)

Emphasis on biochemical aspects of organic chemistry.

21&62:160:207 - Structure And Bonding (3)

Prerequisite: 21&62:160:116.Introduction to mathematical topics necessary for understanding physical chemistry. Additional topics include atomic structure, symmetry and group theory, and an introduction to molecular orbital theory.

21&62:160:227 - Experimental Analytical Chemistry (3)

Lec. 1 hr., lab. 6 hrs. Prerequisites: 21&62:160:113-114,115-116. A course for students requiring additional training in analytical techniques; analyze unknowns chosen to illustrate basic techniques and some newer instrumental methods.

21&62:160:333 - Organic Chemistry Laboratory (2)

Lab. 3 hrs. Prerequisites: 21&62:160:113-114,115-116. Pre- or corequisites: 21&62:160:335-336. Introduction to the techniques and the safety precautions of practical organic chemistry; the synthesis, isolation, purification, and behavior of compounds representing important classes.

21&62:160:335-336 - Organic Chemistry (3,3)

Prerequisites: 21&62:160:113-114.. Co- or post-requisites: 21&62:160:333-334. Study of carbon compounds with emphasis on the prin-cipal classes of aliphatic and aromatic compounds; molecules and systems of biological interest.

21&62:160:345/346 - Physical Chemistry (3,3)

Prerequisites: 21&62:160:116, 207; 21&62:640:136; and 21&62:750:203-204 or 213-214.The gaseous, liquid, and solid states: phase equilibria, properties of solution, fugacity and activity, free energy changes of chemical reactions, and surface and colloid chemistry; atomic and molecular structure, crystal chemistry, the chemical bond, chemical kinetics, and statis-tical thermodynamics.

21&62:160:413 - Inorganic Chemistry (3)

Prerequisites: 21&62:160:207, 345, 346. Atomic and molecular structure, transition metal chemistry, descriptive chemistry of the representative elements, and some special topics.

Civil Engineering: Offered by the Department of Civil and Environmental Engineering

CE 200 - Surveying (3-0-3)

Prerequisite: Math 111. Angle and distance measurement; leveling; topographic mapping; traverse and area computations; horizontal and vertical curves; cross sections; triangulation; state plane coordinates; global positioning system. Emphasis on the use of the computer for solving typical field and office problems. Lab should be taken concurrently.

CE 200A - Surveying Laboratory (0-3-1)

Corequisite: CE 200. Field exercises in conjunction with the classroom exercises in CE 200 utilizing classical and electronic instruments and COGO/CAD software.

CE 200B - Surveying Laboratory (0-3-1)

For geoscience engineering majors. Field exercises using survey instruments including tapes, levels, theodolites, and total stations. Covers principles of topographic mapping, traverses, triangulation, and computer data reduction.

CE 210 - Construction Materials and Procedures (3-0-3)

Prerequisites: HSS 101. Introduction to construction management organization, contracts, construction safety, engineering economics, and engineering ethics. Studies current practices of heavy construction including soil and rock excavation productivity, and building construction materials and procedures. Field trips to construction sites provide opportunities to directly view many of the practices.

CE 260 - Civil Engineering Methods (3-0-3)

Prerequisite: HSS 101 and FED 101. Provides students with in-depth experience in computer applications in civil engineering and with written and oral communication.

CE 307 - Geometric Design for Highways (3-0-3)

Prerequisite: CE 200, CE 200A. Highway design based on a study of traffic distribution, volume, and speed with consideration for the predictable future. Analysis of elements of at-grade intersections and interchanges and the geometrics of highway design and intersection layout with advanced curve work including compound and transition curves.

CE 311 - Co-op Work Experience I (3)

Prerequisites: completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a -report.

CE 320 - Fluid Mechanics (4-0-4)

Prerequisites: Mech 235. Corequisite: Mech 236. This course is designed to present the fundamental laws relating to the static and dynamic behavior of fluids. The emphasis is placed on applications dealing with the flow of water and other incompressible fluids. These include flow in pipe systems and natural channels.

CE 320A - Hydraulics Laboratory (0-3-1)

Prerequisite or corequisite: CE 320. Explores the principles of fluid mechanics through laboratory experiments. Investigates various hydraulic phenomena with both physical and computer models. Demonstrates basic civil engineering design principles for pipe networks, open channel systems, and ground water regimes.

CE 321 - Water Resources Engineering (3-0-3)

Prerequisite: CE 200, CE 200A, Math 225. Training in methods of developing water supplies and the means to treat supplies for consumptive use. Covers hydrologic techniques such as surface and ground water yield, hydrograph and routing analyses, and probabilistic methods related to hydrologic studies.

CE 322 - Hydraulic Engineering (3-0-3)

Prerequisites: CE 320, CE 321. The objective is to provide the tools required to design water distribution systems, storm drains, and sanitary sewers. Examines related hydrologic and hydraulic techniques.

CE 332 - Structural Analysis (3-0-3)

Prerequisites: Mech 237. A working knowledge of free body diagrams, equilibrium conditions for force systems and moments. The primary objective is an understanding of the various methods of analyzing determinate and indeterminate beams, frames, and trusses encountered in practice.

CE 333 - Reinforced Concrete Design (3-0-3)

Prerequisites: CE 332. The student must have a working knowledge of structural analysis including determinate and indeterminate beams and frames. Primary objectives include the following: to acquaint the student with the properties of concrete and steel and with the behavior of reinforced concrete as a structural material; also, to develop methods for the design of reinforced concrete structural members such as beams, slabs, footings, and columns. Both ultimate strength design and working stress method will be studied.

CE 341 - Soil Mechanics (3-0-3)

Prerequisite: Mech 237 or equivalent. Corequisite: CE341A. A study of soil types and properties is made with the objective of developing a basic understanding of soil behavior. The methods of subsurface investigation and compaction are presented. Fundamentals pertaining to permeability, seepage, consolidation, and shear strength are introduced. Settlement analysis is also presented. Lab must be taken concurrently.

CE 341A - Soil Mechanics Laboratory (0-3-1)

Corequisite: CE 341. Students perform basic experiments in soil mechanics.

CE 342 - Geology (3-0-3)

Prerequisite: consult the advisor. Studies science of geology with emphasis on physical geological processes. Stresses the principle of uniformity of process in the context of rock and soil formation, transformation, deformation, and mass movement. Includes aspects of historical geology and geomorphology.

CE 343 - Geology with Laboratory (3-3-4)

Covers the material given in CE 342 with the addition of a laboratory component. It provides a more in-depth understanding of geology through rock and mineral identification, laboratory experiments, field trips, and selected case studies.

CE 350 - Transportation Engineering (3-0-3)

Prerequisite: CE 200, CE 200A. A study of the principal modes of transportation, with emphasis on the planning, design and construction of facilities for modern transportation systems.

CE 406 - Remote Sensing (3-0-3)

Prerequisite: Phys 234. Principles of remote sensing are covered including general concepts, data acquisition procedures, data analysis and role of remote sensing in terrain investigations for civil engineering practices.

CE 410 - Construction Scheduling and Estimating (3-0-3)

Prerequisites: CE 210. Quantity take off, cost estimate and CPM computer analysis of typical building or highway projects. A study is made of construction project organization, contract requirements and management control techniques with an introduction to computer applications.

CE 412 - Construction Codes and Specifications (3-0-3)

Prerequisite: CE 210. Code and specification aspects of engineered construction. Topics include professional ethics, contracts, specifications, bidding procedures, building codes such as B.O.C.A. and New Jersey Uniform Construction Code, Energy Code Provisions, construction safety, and the impact of the EPA on construction.

CE 413 - Co-op Work Experience II (3)

Prerequisites: CE 311 or equivalent, approval of the department, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience. Mandatory participation in seminars and completion of requirements including a report and/or project.

CE 414 - Engineered Construction (3-0-3)

Prerequisites: CE 210, CE 332, CE 341. Design, erection, and maintenance of temporary structures and procedures used to construct an engineering project. Business practices, codes, design philosophies, construction methods, hardware, inspection, safety, and cost as they pertain to engineered construction projects.

CE 431 - Construction Materials Lab (0-3-1)

Prerequisites: Mech 237, CE 210. This course provides an understanding of the basic properties of construction materials, and presents current field and laboratory standards and testing requirements for these materials. Students select a material or component assembly for testing, design a testing procedure, and present their results.

CE 432 - Steel Design (3-0-3)

Prerequisites: CE 332. A working knowledge of structural analysis including determinate and indeterminate beams and frames is essential. The development of current design procedures for structural steel elements and their use in multistory buildings, bridges, and industrial buildings.

CE 443 - Foundation Design (3-0-3)

Prerequisites: CE 341, CE 341A. Site investigation, selection of foundation types and basis for design, allowable loads, and permissible settlements of shallow and deep foundations. Computations of earth pressure and design of retaining walls.

CE 450 - Urban Planning (3-0-3)

Prerequisite: junior engineering standing. Introduction to urban planning, its principles, techniques, and use. Topics include development of cities, planning of new towns, redevelopment of central cities, and land use and transportation planning.

CE 490 - Civil Engineering Projects (3-0-3)

Prerequisites: senior standing in civil engineering and approval of the department. Work on an individually selected project, guided by the department faculty advisor. The project may include planning, research (library or laboratory), engineering reports, statistical or analytical investigations, and designs. Any of these may follow class-inspired direction or the student may select his or her own topic. The project must be completed and professionally presented by assigned due dates for appropriate review and recording of accomplishment.

CE 490H - Honors Civil Engineering Projects (3-0-3)

Prerequisites: senior standing, enrolled in Honors College, and approval of the department. Same as CE 490.

CE 491H - Honors Research Experience in Civil Engineering (3-0-3)

Prerequisites: Junior standing, agreement of a department faculty advisor, and approval of the associate chairperson for undergraduate studies. This course provides the student with an opportunity to work on a research project under the individual guidance of a member of the department. A written report is required for course completion. Open to students with a GPA of 3.0 or higher.

CE 494 - Civil Engineering Design I (3-0-3)

Prerequisite: senior standing in civil engineering. Simulates the submission and acceptance process normally associated with the initial design phases for a civil engineering project. Familiarizes students with the preparation of sketch plats, preliminary engineering design, and a related environmental assessment. Requirements include written submittals and oral presentations in defense of the project.

CE 494H - Honors Civil Engineering Design I (3-0-3)

Prerequisites: senior standing, enrolled in Honors College. Same as CE 494.

CE 495 - Civil Engineering Design II (3-0-3)

Prerequisite: senior standing in civil engineering. Provides students with the type of design experience they would receive if engaged in civil and environmental engineering design practice. Students can select from these design areas: structures, geotechnical engineering, transportation and planning, and sanitary and environmental engineering.

CE 495H - Honors Civil Engineering Design II (3-0-3)

Prerequisites: senior standing, enrolled in Honors College. Same as CE 495.

Classics: Offered by the Department of Classical and Modern Languages and Literatures at Rutgers-Newark

21&62:190:310 - Ancient Technology (3)

Relationship between technological advance and cultural change in the ancient Mediterranean world; water control, metallurgy, food production, engineering, transport, and the technology of the arts.

Computer and Information Science: CCS Departments: Department of Computer Science, Department of Information Systems and the Information Technology Program

CIS 098 - Fundamentals of Computers and Programming (2-1-2)

Prerequisite: recommendation of the CIS department. A fundamentals course for potential CIS majors who have little or no background in computers and programming and who need additional preparation before entering CIS 113. Topics include: the attributes of hardware and software, interacting with an operating system, information representation and binary arithmetic, document preparation with word processing software, algorithms and flow diagramming. Extensive practice in programming fundamentals in a high level language is included. (This course, by itself, will not satisfy the CIS 100-level course requirement.)

CIS 101* - Computer Programming and Problem Solving (2-1-2)**

An introductory course in computer science, and programming in a high-level language (such as FORTRAN, C, etc.) and its use in solving engineering and scientific problems. The emphasis is on the logical analysis of a problem and the formulation of a computer program leading to its solution. Topics include basic concepts of computer systems, software engineering, algorithm design, programming languages and data abstraction, with applications. Designed for students not specializing in computer science. For students taking a minor in CIS or changing to a CIS major, a combination of department approval and CIS 105 and CIS 101 may be substituted for CIS 113.

CIS 101H* - Honors Computer Programming and Problem Solving (2-1-2)**

Prerequisite: departmental approval and/or permission of the director of the Honors College. This course covers the same material as CIS 101 but in greater depth. Designed for students not specializing in computer science.

CIS 102* - Computer Science with Problem Solving (3-1-3)**

An introductory course in computer science, with applications to engineering and technology problems. Emphasis on programming methodology using a high level language (such as FORTRAN) as the vehicle to illustrate concepts. Topics include basic concepts of computer systems, software engineering, algorithm design, programming languages and data abstraction, with applications.

CIS 103* - Computer Science with Business Problems (3-1-3)**

An introductory course in computer science, with applications to business and managerial decision making. Emphasis on programming methodology using the COBOL language as the vehicle to illustrate concepts. Topics include basic concepts of computer systems, software engineering, algorithm design, programming languages and abstraction, with applications.

CIS 104* - Computer Programming and Graphics Problems (2-1-2)**

Corequisite: Math 138. An introductory course in computer science with applications in computer graphics for architecture. Emphasis on programming methodology using a high level language (such as Pascal, C, etc.) as the vehicle to illustrate the concepts. Topics include basic concepts of computer systems, software engineering, algorithm design, programming languages and data abstraction, with applications.

CIS 104H* - Honors Computer Programming and Graphics Problems (2-1-2)**

Prerequisite: departmental approval and/or permission of the director of the Honors College. Corequisite: Math 138. This course covers the same material as CIS 104, but in greater depth.

CIS 105 - Computer Programming (1-1-1)

Prerequisite: 100-level GUR course in CIS. Details of programming in one particular computer language. Problems will be coded and run on a computer. Languages include ADA, APL, C, C++, FORTRAN, LISP, MODULA-2, Pascal, PROLOG, or others. May be repeated for credit when a different language is used. Students may repeat CIS 105 with different, department approved languages, and may combine three one-credit courses (including CIS 305) to be used as a technical elective in a CIS degree program. For students taking a minor in CIS or changing to a CIS major, a combination of an approved CIS 105 and CIS 101 may be substituted for CIS 113.

CIS 112 - Introduction to Computing (3-2-5)

This course is designed for talented high school students who are interested in computer science and/or are considering computer science as a major field of study for their future. Fundamentals of computer science are introduced. Emphasis is on programming methodology, problem solving, structure and representation of data. Topics include algorithm design, data abstraction, logical data structures (lists, stacks, queues, trees, etc.) physical representation of data, design and analysis of algorithms operating on the structures including internal searching, sorting, recursion and string processing. The course also covers program specifications, correctness and efficiency, and techniques for program development and debugging.

CIS 113* - Introduction to Computer Science (3-1-3)**

Prerequisite:: CIS 098. Open only to science and liberal arts major. Fundamentals of computer science are introduced, with emphasis on programming methodology and problem solving. Topics include basic concepts of computer systems, software engineering, algorithm design, programming languages and data abstraction, with applications. A high level language (such as Pascal, C, etc.) is fully discussed and serves as the vehicle to illustrate many of the concepts. CIS majors should enroll in CIS 113. Students who receive degree credit for CIS 113 may not receive degree credit for CIS 213.

CIS 113H* - Honors Introduction to Computer Science I (3-1-3)**

Prerequisite: Satisfactory performance on placement exam and/or departmental approval. A course similar to CIS 113, but material is covered in greater depth. Honors students contemplating a major in computer science, or who plan to take advanced electives in computer science, should take CIS 113H instead of CIS 101H. Students who receive degree credit for CIS 113H cannot receive degree credit for CIS 213.

CIS 114 - Introduction to Computer Science II (3-1-3)

Prerequisites:; CIS 113 or completion of a required 100 level GUR course in CIS, plus an approved CIS 105. A study of advanced programming topics with logical structures of data, their physical representation, design and analysis of computer algorithms operating on the structures, and techniques for program development and debugging. Course covers program specifications, correctness and efficiency, data abstraction, basic aspects of simple data structures, internal searching and sorting, recursion and string processing. Algorithmic analysis is also discussed. Students receiving degree credit for CIS 114 cannot receive degree credit for CIS 335 or CIS 505.

CIS 114H - Honors Introduction to Computer Science II (3-1-3)

Prerequisites: CIS 113H or department approval; A course similar to CIS 114, but material is covered in greater depth. Students receiving degree credit for CIS 114H cannot receive degree credit for CIS 335 or CIS 505.

CIS 150 - Web Authoring and Development (2-2-3)

This course, designed for high school students, introduces the technologies and techniques of the Internet's World Wide Web. Covers basic issues of design and coding in HTML, the common language for Web development, including discussions on incorporating graphics, frames, and tables into pages. Also introduces the concepts of TCP/IP, HTTP protocols, Web architectures, and MIME types. Introduces FrontPage and Net Object Fusion.

CIS 151 - Advanced Web Development and Site Management (2-2-3)

Prerequisites: knowledge of windows, experience with any programming language, good knowledge of the Internet and HTML language. This course, designed for high school students, will introduce advanced technologies and techniques of the Internet's World Wide Web. Covers the use of Internet development tools, the use of server scripts, CGI and non-CGI related solutions to database access, server configuration, Internet protocols, proxy servers, security issues, and digital commerce.

CIS 213 - Introduction to Computer Science (3-0-3)

Prerequisite: 100-level GUR course in CIS. The course covers a study of the representation of data, its structures, and algorithms. Programming topics in Pascal and assembly language are included. Designed for students not majoring in computer science. Students receiving degree credit for CIS 213 cannot receive degree credit for CIS 113.

CIS 231 - Machine and Assembly Language Programming (3-1-3)

Prerequisites: CIS 113, or CIS 213, or completion of a required 100-level GUR course in CIS plus an approved CIS 105. Fundamentals of machine organization and machine language programming. Representation of computer instructions and data in machine, assembly and macro-assembly languages together with intensive practice in formulating programming, running, and debugging programs for both numerical and logical problems. Assemblers and loaders are discussed. Students receiving degree credit for CIS 231 cannot receive degree credit for CIS 510.

CIS 240 - Principles of Bioinformatics (3-0-3)

Prerequisites: Math 211, R120:301, CIS 114 or permission of the instructor. This course provides an introduction to the field of bioinformatics. It includes a description of the molecular basis of genomics and proteomics, the computer-based and mathematical methods used in bioinformatics, and the application of these methods toward understanding biological systems at the cellular and molecular level. It also includes a description of the application of bioinformatics to drug discovery.

CIS 241 - Foundations of Computer Science I (3-0-3)

Prerequisites: CIS 114, Math 112. An introduction to the foundations of computer science with emphasis on the development of techniques for the design and proof of correctness of algorithms and the analysis of their computational complexity. Reasoning techniques based on propositional and predicate logic and relational calculus operations with applications to databases will also be introduced. Auxiliary topics such as combinatorics of finite sets, functions and relations, and graph-theory definitions and graph storage alternatives will also be examined.

CIS 251 - Computer Organization (3-0-3)

Prerequisite: CIS 113. An introduction to computer system structure and organization. Topics include representation of information, circuit analysis and design, register-transfer level, processor architecture and input/output.

CIS 252 - Computer Organization and Architecture (3-0-3)

Prerequisite: CIS 113. An introduction to the organization and architecture of computer systems, beginning with the standard Von Neumann model and then moving forward to more recent architectural concepts. Among the topics covered are digital logic, data representation, assembly language organization, memory addressing schemes, memory systems, interfacing and functional organization.

CIS 265 - Introduction to Information Systems (3-0-3)

Prerequisite: 100-level Computer Science GUR course. Information systems is the study of how organizations use information technology. This course is an overview of the information systems discipline, the role of information systems in organizations, and the changing nature of information technology. Computer tools for analysis and presentation are used.

CIS 270 - Multimedia Information Systems (3-0-3)

Prerequisite: Same as CIS 114. Multimedia combines text, graphics, sound, video, and animation in a single application. Preparation for creating multimedia information systems, and understanding the crucial issues involving technology, design and effectiveness of multimedia applications. Programming techniques for integrating video, sound, animation, and graphics, and design strategies for multimedia information systems

CIS 280 - Programming Language Concepts (3-0-3)

Prerequisite: CIS 114 or equivalent. Conceptual study of programming language syntax, semantics and implementation. Course covers language definition structure, data types and structures, control structures and data flow, run-time consideration, and interpretative languages.

CIS 288 - Intensive Programming Practicum (3-0-3)

Prerequisite: CIS 114 or equivalent, CIS 280. The objective of this course is to raise the level of students' programming maturity by a combination of discussion of fundamental concepts and intensive practice in programming intermediate software applications. Students will use a modern development environment that offers comprehensive project management capabilities, and an appropriate programming language to develop their programs using object oriented and generic programming techniques. The course will be organized around a number of programming projects of intermediate size chosen by the faculty to illustrate a spectrum of programming development requirements and techniques. At least one project will be an introduction to programming of modern GUI applications. In addition students will be introduced to standard and commercial API's, class libraries and template libraries.

CIS 305 - Community Service Internship (0-2-1)

Prerequisite: CIS 350. Increasingly, computer scientists are recognizing their ethical responsibility to provide advice and assistance that will improve the ability of government and social service agencies to use computers to serve the public. This course involves approximately 40 hours of internship in a community agency, arranged through the NJIT Cares Program. The interns will use their skills to improve the effectiveness of the use of computers at the agency. Bi-weekly progress reports will be submitted, with required meetings with the course supervisor, and a final report. (CIS 305 may be combined with two approved credits of CIS 105 and used as a technical elective in a CIS degree program.)

CIS 310 - Co-op Work Experience I (3)

Prerequisites: completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the Co-op office. Mandatory participation in seminars and completion of a report.

CIS 332 - Principles of Operating Systems (3-1-3)

Prerequisite: CIS 114 or equivalent. Organization of operating systems covering structure, process management and scheduling; interaction of concurrent processes; interrupts; I/O, device handling; memory and virtual memory management and file management.

CIS 332H - Honors Principles of Operating Systems (3-1-3)

Prerequisite: CIS 114 or equivalent. A course similar to CIS 332, with a project of greater depth and scope.

CIS 333 - Introduction to UNIX Operating Systems (3-0-3)

Prerequisite: CIS 332 or equivalent and knowledge of C language. The course covers the UNIX system kernel including initialization, scheduling, context switching, process management, memory management, device management, and the file system. The course also includes the organization of shells, editors, utilities, and programming tools of the UNIX operating system.

CIS 341 - Foundations of Computer Science II (3-0-0)

Prerequisites: CIS 241 or MATH 226 and CIS 280. This course provides an introduction to automata theory, computability theory, and complexity theory. Theoretical models such as finite state machines, push-down stack machines, and Turing machines are developed and related to issues in programming language theory. Also, the course covers undecidability and complexity theory, including the classes P and NP.

CIS 341H - Honors Introduction to Logic and Automata (3-0-3)

Prerequisites: completion of a 100-level GUR course in CIS; CIS 280, Math 226 or Math 326. A course similar to CIS 341, with a project of greater depth and scope.

CIS 350 - Computers and Society (3-0-3)

Prerequisites: completion of a 100-level GUR course in CIS; one basic SS course; HSS 111. Examines the historical evolution of computer and information systems and explores their implications in the home, business, government, medicine and education. Topics include automation and job impact, privacy, and legal and ethical issues. Co-listed as STS 350.

CIS 350H - Honors Computers and Society (3-0-3)

Prerequisites: completion of a 100-level GUR course in CIS; one basic SS course; HSS 111. A course similar to CIS 350, with a project of greater depth and scope.

CIS 352 - Parallel Computers and Programming (3-1-3)

Prerequisites: CIS 251 or CoE 252, CIS 332. A course introducing parallel computers and parallel programming. General structures and design techniques of parallel computers are described. Programming paradigms and algorithm design considerations for parallel processors will be discussed

CIS 353 - Advanced Computer Organization (3-0-3)

Prerequisite: CIS 251 or instructor approved equivalent. This course emphasizes the basic design principles of various components in a computer, as well as how the components are organized to build a computer. Topics include: design methodology, arithmetic and logic unit design, control unit design, memory hierarchy, memory system design, input and output devices, peripheral devices, and interfacing computers using software. A software simulation package is used to help the learning process. By the end of the semester, students will have built simulated computer.

CIS 365 - Computer Applications to Commercial Problems (3-0-3)

Prerequisite: CIS 280, or CIS 114 and knowledge of COBOL. Covers design and implementation of commercial application software systems. Concepts of organization and management of data and files including file operations and organization of sequential access, relative access, indexed sequential access, virtual storage access and multi-key access methods. The COBOL language is used to illustrate these concepts and to implement application systems. The design and implementation of commercially oriented computer systems. Emphasis is placed on modern computers as a tool for solving business problems. The COBOL programming language will be extensively studied and utilized in developing the programming techniques for the solution of these problems.

CIS 370 - Introduction to Artificial Intelligence (3-1-3)

Prerequisites: CIS 114, Math 226. An exploration of concepts, approaches and techniques of artificial intelligence. Emphasizes both underlying theory and applications. Topics include knowledge representation, parsing language, search, logic, adduction, uncertainty, and learning. LISP and Prolog programming languages used extensively. Students are required to do programming assignments, complete a programming term project and review case studies.

CIS 370H - Honors Introduction to Artificial Intelligence (3-1-3)

Prerequisites: CIS 114, Math 226. A course similar to CIS 370, with a project of greater depth and scope.

CIS 371 - Logic with Applications to Computer Science (3-0-3)

Prerequisites: CIS 114; Math 211 and Math 226. An introduction to both the syntax and semantics (basic model theory) of first-order logic, covering one set of inference rules, sequent calculus or a tableau system and prove the completeness theorem for the proof system. You will also cover a relatively modern (and simpler) form of Incompleteness theorems and relate it to computational issues such as the halting problem, as well as issues related to automating logical reasoning. These will include Herbrand's theorem, resolution, and logic programming.

CIS 371H - Honors Logic with Applications to Computer Science (3-0-3)

Prerequisites: CIS 114; Math 211 and 226. A course similar to CIS 371, with a project of greater depth and scope.

CIS 373 - World Wide Web Standards (3-0-3)

Prerequisites: CIS 114 and junior standing. This course covers the standards that are emerging for formatting, accessing, displaying, transmitting and structuring information, including the standards and protocols existing and under development today. Topics include: Standards, Rationale, Pros and Cons, the Standards Process; Standards Bodies & Participating on Standards Bodies; How Companies Influence Standards; How Developers Incorporate Standards in their Programs; Planning for Emerging Standards; Company Policies Regarding Web Standards; Standards and Legal Issues.

CIS 375 - Applications Development for the World Wide Web (3-0-3)

Prerequisite: CIS 114. A state-of-the-art computer programming language/environment, such as Java and related tools, is studied and used as a vehicle to build applications that involve graphical user-interfaces, simple graphics, multithreading, images, animation, audio, database connectivity, remote objects, and networking.

CIS 390 - Requirements Analysis and Systems Design (3-0-3)

Prerequisite: CIS 114. A study of the information systems development life-cycle, from the initial stages of information requirements analysis and determination to the ultimate activities involving systems design. Theory, methodologies and strategies for information requirements analysis, including the assessment of transactions and decisions, fact-finding methodologies, structured analysis development tools, strategies of prototype development, and an overview of computer-aided software engineering (CASE) tools. Theory, methodologies and strategies for systems design, including design of user-interfaces, particularly menu-driven and keyword dialogue strategies, and issues in the proper design of computer output.

CIS 392 - Text Processing, Retrieval & Mining (3-0-3)

Prerequisites: CIS 114 and Math 333. Text retrieval concerns the representation, organization, storage, and retrieval of text elements. Students will learn methods of text and data organization, as well as numerical data storage methods in commercial databases. Topics include techniques such as automatic indexing, query expansion, and how to use these techniques to improve retrieval effectiveness and efficiency.

CIS 405 - Internship in Community Service (1-0-1)

Prerequisite: CIS 305 or its equivalent, approval of the department, and permission of the Office of Service Learning and Career Development Services. This course involves approximately 40 hours of internship in a community agency, arranged through the NJIT Cares Program. The interns will use their skills to improve the effectiveness of the use of computers at the agency. Bi-weekly progress reports will be submitted, with required meetings with the course supervisor, and a final report.

CIS 408 - Cryptography and Internet Security (3-0-3)

Prerequisite: Math 226. Covers security require-ments for telecommunication over the Internet and other communication networks, various conventional and public-key encryption protocols, digital encryption standard, RSA and ElGamal cryptographic systems, digital signature algorithm and analysis of its cryptoimmunity, and access sharing schemes. Students receiving credit for CIS 408 may not enroll in CIS 608.

CIS 410 - Co-op Work Experience II (3 additive credits)

Prerequisites: CIS 310 or its equivalent, approval of the department, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience as co-op/internship. Mandatory participation in seminars and completion of requirements that include a report and/or project.

CIS 421 - Numerical Algorithms (3-0-3)

Prerequisite: completion of a 100-level GUR course in CIS. Corequisite: Math 222. This course deals with fundamentals of numerical methods, including discussion of errors, interpolation and approximation, linear systems of equations, solution of nonlinear equations, and numerical solution of ordinary differential equations. The algorithmic approach and the efficient use of the computer are emphasized.

CIS 431 - Database System Design and Management (3-0-3)

Prerequisite: CIS 114 or equivalent. Database system architecture; data modelig using the entity-relationship model; storage of databases; the hierarchical, network and relational data models; formal and commercial query languages; functional dependencies and normalization for relational database design; relation decomposition; concurrency control and transactions management. Student projects involve the use of a DBMS package.

CIS 431H - Honors Database System Design and Management (3-0-3)

Prerequisite: CIS 114 or equivalent. A course similar to CIS 431, with a project of greater depth and scope.

CIS 432 - Advanced Operating Systems (3-0-3)

Prerequisites: CIS 251, CIS 332. A survey of the design and implementation of distributed operating systems, both by introducing basic concepts and considering examples of current systems. Topics include: communication, synchronization, processor allocation, and distributed file systems.

CIS 433 - Electronic Commerce Requirements and Design (3-0-3)

Prerequisites: CIS 431; CIS 390 or CIS 490. Introduces critical concepts emerging in the field of electronic commerce, such as business to consumer (B2C), business to business (B2B), supply chain management (SCM) systems, and peer to peer (P2P). The course provides concepts and practical skills for building effective, usable, and secure electronic commerce systems, offering a conceptual framework for the study of electronic commerce as well as hands-on skills for building systems for electronic commerce.

CIS 434 - Advanced Database Systems (3-0-3)

Prerequisites: CIS 431. The course covers the basic concepts of traditional files and file processing, provides a "classic" introduction to the relational data model and its languages, and discusses database design methodology and application developments. Students are expected to learn the design of database application systems through a small project and to get some practical hands-on experience with commercial database management systems (DBMS) by writing application programs using the commercial DBMS query languages.

CIS 434H - Honors Advanced Database Systems (3-0-3)

Prerequisites: CIS 431. A course similar to CIS 434, with a project of greater depth and scope.

CIS 435 - Advanced Data Structures and Algorithm Design (3-0-3)

Prerequisite: CIS 114 or CIS 335, and Math 226. Advanced topics in data structures and algorithms, including mathematical induction, analysis and complexity of algorithms, and algorithms involving sequences, sets, and graphs such as searching, sorting, order statistics, sequence comparisons, graph traversals, etc. Optional topics include geometric, algebraic, and numeric algorithms.

CIS 435H - Honors Advanced Data Structures and Algorithm Design (3-0-3)

Prerequisite: CIS 114 or CIS 335, and Math 226 and Math 333. A course similar to CIS 435, with a project of greater depth and scope.

CIS 438 - Interactive Computer Graphics (3-0-3)

Prerequisites: completion of a 100-level course in CIS, plus knowledge of Pascal or C. This course introduces fundamental concepts of interactive graphics oriented toward computer-aided design systems. Such systems emerge in engineering, architecture, and manufacturing. Topics include computer data structures for representation of two- and three-dimensional objects and algorithms for definition, modification, and display of these objects in applications. This course will also discuss a selection of special topics in interactive graphics.

CIS 439 - Image Processing and Analysis (3-0-3)

Prerequisites: CIS 114 and Math 333. This course is an intensive study of the fundamentals of image processing, analysis and understanding. Topics to be covered include: a brief review of the necessary mathematical tools, human visual perception, sampling and quantization, image transformation, enhancement, restoration, compression, reconstruction, image geometric transformation, matching, segmentation, feature extraction, representation and description, recognition and interpretation.

CIS 439H - Honors Image Processing and Analysis (3-0-3)

Prerequisites: CIS 114 and Math 333. A course similar to CIS 439, with a project of greater depth and scope.

CIS 440 - Computer Vision (3-0-3)

Prerequisite: Math 333. This course introduces basic concepts and methodologies of computer vision, and focuses on material that is fundamental and has a broad scope of applications. Topics include contemporary developments in all mainstream areas of computer vision e.g., Image Formation, Feature Representation, Classification and Recognition, Motion Analysis, Camera Calibration, Stereo Vision, Shape From X (shading, texture, motion, etc.), and typical applications such as Biometrics.

CIS 441 - Geographic Information Systems (3-0-3)

Prerequisite: CIS 431. Geographic Information Systems (GIS) allow individuals and organizations to pose, explore and answer a variety of public- and private-sector questions using spatial data. In this course the student will learn to identify, manipulate and analyze spatial data using state-of-the-art software. The course is project-driven and hands-on: students will define and address real problems using real data. The course will also cover selected topics in information visualization as they relate to the use of GIS.

CIS 441H - Honors Geographic Information Systems (3-0-3)

Prerequisite: CIS 431. A course similar to CIS 441, with a project of greater depth and scope.

CIS 447 - Human-Computer Interfaces (3-0-3)

Prerequisite: CIS 390. This course covers the design and evaluation of the human-computer interface in interactive computer systems. Among the topics covered are approaches to interface design such as menus, commands, direct manipulation; screen layout strategies; metaphor models; models of human information process; evaluation approaches such as protocol for analysis, interactive monitoring, use of surveys; and requirements for documentation and help. Students are expected to design interface mockups and evaluate them.

CIS 451 - Data Communications and Networks (3-1-3)

Prerequisite: CIS 114. Fundamental concepts in data communications. Topics include: circuit and packet switching, layered network architecture, ISO Network protocols, performance analysis of data communication systems, flow control and alternate routing strategies and algorithms, various types of networks and their interconnections, network security and privacy. Additional topics include systems analysis and design, traffic engineering, planning and forecasting methodologies as applied to data communication networks.

CIS 455 - Computer Systems Management (3-0-3)

Prerequisite: completion of a 100-level GUR course in CIS. An overview of computing centers and their organization for accomplishing specific objectives. Includes a classification of systems, analysis of cost and size, layout of equipment, methods of accessing computer facilities, equipment selection, and facilities evaluation.

CIS 456 - Open Systems Networking (3-0-3)

Prerequisite: CIS 114. An introduction to internetworking, including an in-depth study of the architecture of network interconnections, the internet services, and the protocols needed to provide these services. Topics include: architecture of interconnected networks, internet addresses and the address resolution problem, internet protocols, the domain name system, the socket interface, the client-server model of interaction, the OSI transport and application support protocols, and the TCP/IP application protocols.

CIS 461 - Systems Simulation (3-0-3)

Prerequisites: completion of a 100-level GUR course in CIS; Math 333. This course introduces computer simulation as an algorithmic problem solving technique. Includes discrete simulation models, elementary theory, stochastic processes, use of simulation languages, random number generators, simulation of probabilistic processes, design of simulation experiments, validation of models, queueing systems, and applications to the design and analysis of operational systems. The GPSS language is covered in detail.

CIS 465 - Computer Techniques for Management Information Systems (3-0-3)

Prerequisite: CIS 431. Design and programming concepts are presented for automation of management information systems. Includes the organization of files and techniques for processing information based upon organizational requirements and available hardware and software. Some case studies are presented.

CIS 465H - Honors Computer Techniques for Management Information Systems (3-0-3)

Prerequisite: CIS 431. A course similar to CIS 465, with a project of greater depth and scope.

CIS 467H - Honors Efficient Algorithm Design (3-0-3)

Prerequisite: CIS 435 or CIS 335; Math 333. The course focuses on presenting techniques for efficient sequential and parallel algorithm design. Algorithms for numerical and combinatorial problems will be discussed. The use of randomization in the solution of algorithmic problems will be explored. Applications to be considered include string matching, polynomials and FFT algorithms, sorting networks, algebraic computations and primality testing and factoring, matrix operations, randomized algorithms for sorting and selection, and data compression.

CIS 475 - Evaluation of Computer Applications (3-0-3)

Prerequisite: a course in probability and statistics, or social science research methods. Methods for identifying usability problems and for testing the relative merits of alternative designs for interactive systems. Following a review of ** pending approval usability heuristics, students read journal articles about and practice five different methods: semi-structured interviews, protocol analysis, cognitive walkthroughs, user surveys, and controlled experiments.

CIS 478 - Software Tools for Solving Problems (3-0-3)

Prerequisites: junior or senior standing, permission of instructor. Provides students with an opportunity to interact directly with industry and solve actual problems using various -information-systems software tools. At the beginning of the semester, company representatives present actual problems they are facing, and the students work in groups to develop a solution, which they present at the end of the term. Presentation skills, working in groups, and using software tools for problem solving are stressed.

CIS 480 - Theory of Languages (3-0-3)

Prerequisite: CIS 280 and CIS 341. The formal treatment of programming language translation and compiler design concepts. Emphasis on theoretical aspects of parsing context-free languages, translation specifications and machine-independent code optimization. A programming project to demonstrate the concepts covered in the course is required in addition to class work and examinations.

CIS 482 - Data Mining (3-0-3)

Prerequisite: CIS 431. The course covers the concepts and principles of advanced data mining systems design; presents methods for association and dependency analysis, classification; prediction; and clustering analysis.

CIS 482H - Honors Data Mining (3-0-3)

Prerequisite: CIS 431. A course similar to CIS 482, with a project of greater depth and scope.

CIS 484H - Honors Principles of Component Programming (3-0-3)

Prerequisite: CIS 288. A comprehensive study of the fundamental concepts and techniques of software development in a component-based environment. Topics include object-oriented Windows programming, components as objects in separate linkage units (DLL's), components in visual programming environments, introduction to CORBA, SOM, COM, and VCL technologies, components as windows or graphics objects, non-visual components, and error reporting from components.

CIS 485 - Special Topics in Computer Science I (3-0-3)

Prerequisites: junior standing and/or department approval. The study of new and/or advanced topics in an area of computer science not regularly covered in any other CIS course. The precise topics to be covered in the course, along with prerequisites, will be announced in the semester prior to the offering of the course. A student may register for no more than two semesters of Special Topics.

CIS 486 - Special Topics in Computer Science II (3-0-3)

Prerequisites: Same as for CIS 485. A continuation of CIS 485.

CIS 488 - Independent Study in Computer Science (3-0-3)

Prerequisites: open only to students in the Honors Program who are computer science majors and who have the prior approval of the department and the CIS faculty member who will guide the independent study. Independent studies, investigations, research, and reports on advanced topics in computer science. Students must prepare, in collaboration with their faculty mentor and in the semester prior to enrolling in this course, a detailed plan of topics and expected accomplishments for their independent study. This must have the approval of both the department and the faculty mentor. A student may register for no more than one semester of Independent Study.

CIS 488H - Honors Independent Study in Computer Science/Information Systems (3-0-3)

Prerequisites: honors college computer science or information systems majors who have the prior approval of the department and the CIS faculty member who will guide the independent study. Independent studies, investigations, research, and reports on advanced topics in computer science. Students must prepare, in collaboration with their faculty mentor and in the semester prior to enrolling in this course, a detailed plan of topics and expected accomplishments for their independent study. This must have the approval of both the department and the faculty mentor. A student may register for no more than one semester of independent study

CIS 490 - Guided Design in Software Engineering (3-0-3)

Prerequisite: senior standing or departmental approval. This course focuses on the methodology for developing software systems. Methods and techniques for functional requirements analysis and specifications, design, coding, testing and proving, integration and maintenance are discussed. Students will prepare a proposal for a project which includes its functional specifications and preliminary design.

CIS 491 - Computer Science Project (3-0-3)

Prerequisites: CIS 490, senior standing and project proposal approval. An opportunity for the student to integrate the knowledge and skills gained in previous computer science work into an individual research project. The project involves investigation of current literature as well as computer implementation of either a part of a large program or the whole of a small system. The topic should be consonant with the emphasis of direction chosen by the students in their computer science studies. To register for this course, a student must have a written project proposal approved by the department. The proposal must be submitted and approved in the prior semester, usually the third week of November or April.

CIS 491H - Honors Computer Science Project (3-0-3)

Prerequisites: CIS 490, senior standing in the Honors College and project proposal approval. A course similar to CIS 491, with a project of greater depth and scope.

CIS 492 - Information Systems Project (3-0-3)

Prerequisites: CIS 465, senior standing, and, in a prior semester, project proposal approved by the faculty advisor. Integration of knowledge and skills gained in previous information systems courses into an individual research project. The project entails investigation of current literature and the design, implementation and evaluation of an information system.

CIS 492H - Honors Information Systems Project (3-0-3)

Prerequisites: CIS 465, senior standing in the honors college, and, in a prior semester, project proposal approval by the faculty advisor. Similar to CIS 492, with a project of greater depth and scope. * All students at NJIT are required to complete at least one 100-level 2-credit or 3-credit CIS course. The Department of Computer and Information Science offers a set of 100 level courses to satisfy this requirement, and the student should select one based upon his or her intended major. It is imperative that students speak with their advisors prior to enrolling to determine the appropriate CIS course.

CS 444 - Pattern Recognition and Applications (3-0-3)

This course introduces basic concepts and methodologies of pattern recognition and applications, and focuses on material that is fundamental and has a broad scope of application. Topics include statistical estimation, classifier design, parameter estimation and unsupervised learning, nonparametric techniques, linear discriminant functions, feature extraction, and clustering, with applications such as human face recognition, fingerprint recognition, iris recognition, and voice recognition.

*** All students at NJIT are required to complete at least one 100-level 2-credit or 3-credit CIS course. The Department of Computer and Information Science offers a set of 100 level courses to satisfy this requirement, and the student should select one based upon his or her intended major. It is imperative that students speak with their advisors prior to enrolling to determine the appropriate CIS course.

Computer Engineering: Offered by the Department of Electrical and Computer Engineering
For current course offerings, please see description under Electrical Engineering

CoE 101 - Introduction to Electrical and Computer Engineering (1-0-0)

Prerequisite: None. Familiarize students with various disciplines, career opportunities and curricula in electrical and computer enginneering. Invited speakers include faculty and industrial representatives.

CoE 225 - Digital Electronics (3-1-3)

Prerequisite: EE 231. Emphasizes the digital applications of electronic devices including diodes, bipolar transistors, and MOS transistors. Topics include inverters based upon bipolar and MOS devices, logic gates, program-mable logic arrays, and memory circuits. Studies the design of interface circuitry in digital/analog systems, including digital/analog conversion, analog/digital conversion, and operational amplifier circuits. Students receiving credit for EE 271 and EE 372 cannot receive credit for CoE 225.

CoE 252 - Microprocessors (3-0-3)

Prerequisites: EE 251 and CIS 101 or CIS 113. An introduction to microprocessor system organization and assembly language programming. Covers the architecture, instruction set and assembly language of a specific microprocessor. Other topics includememory organization, input/output interfacing, interrupt processing as well as exception processing. Also covers the problems associated with the design of a single board computer. Students receiving credit for CIS 453 cannot receive credit for CoE 252. Co-listed as EE 352.

CoE 301 - Engineers in Society (2-1-2)

Prerequisites: HSS101, HSS202 or their equivalents; two from HSS 211, HSS212, HSS213 or their equivalents. The professional aspects of an engineering career are presented. Topics include ethics and responsibility, the role of the professional society, the importance of communication, and the realities of the workplace. Issues examined include intellectual property rights, privacy and databases, computer crime, computer safety, and civil liberties. Conduct field studies of working engineers. Stresses teamwork and presentation skills. Co-listed as STS 305.

CoE 328 - Signal Transmission (2-0-2)

Prerequisites: EE 232, EE 251. Familiarization with signal transmission both within and between digital systems. Topics include the telegrapher's equations, wave propagation, lattice diagrams, transients in digital systems, crosstalk, proper termination for high-speed logic, and the transmission characteristics of various interconnecting geometries.

CoE 345 - Digital Test (2-0-2)

Prerequisites: EE 251 or equivalent, Math 333 or equivalent. Covers theory and practice related to test technology. Topics include fault modeling, test generation, fault simulation, design for testability, fault diagnosis, built-in self-test, scan design, and many others. Surveys several industrial design for testability structures.

CoE 353 - Computer Organization and Architecture (3-0-3)

Prerequisites: CoE 252, CoE 395. Emphasizes the hardware design of computer systems. Topics include register transfer logic, central processing unit design, microprogramming, ALU design, pipelining, vector processing, micro-coded arithmetic algorithms, I/O organization, memory organization and multiprocessing.

CoE 394 - Digital Systems Lab (0-3-1)

Prerequisites: CoE 225, CoE 252. Experiments emphasize digital design from basic electronic circuits to complex logic. Topics include switching speed, operational amplifier circuits, basic sequential circuits, the arithmetic/logic unit, and computer memories.

CoE 395 - Microprocessor Lab (0-4-2)

Prerequisites: EE 291 and either CoE 252 or EE 352. Applies theoretical knowledge of both the hardware and software aspects of microprocessors. Requires construction of a microprocessor based single board computer (SBC), with adequate interfacing capabilities to be able to perform some useful control tasks. Programming of the device is done in assembly language. Some of the experiments that follow the construction project deal with software while others deal with the problems of interfacing of microprocessors.

CoE 414 - Introduction to Computer Engineering Project (1-0-1)

Prerequisite: Senior standing or permission of instructor. Computer Engineering students will develop a project proposal for the senior design project. Inivited faculty and industrial speakers will present project ideas and real examples.

CoE 421 - Digital Data Communications (3-0-3)

Prerequisites: EE 232, Math 333. Covers communications basics and some topics in digital communications most germane to data communication. Topics include signal classification, correlation, spectral analysis, energy and power spectral density, white noise, signal transmission through linear systems, sampling and quantization, and principles of digital data transmission.

CoE 444 - Introduction to Discrete Event Systems (3-0-3)

Prerequisites: EE 251 or CIS 251 or equivalent, and Math 333 or EE 321 or equivalent. Introduces logical models, timed models, and stochastic timed models of discrete event systems. Applies petri net methodology to the modeling of computer systems, flexible manufacturing systems, communication networks, and robotics. Contrasts the approaches of _simulation, elementary queueing theory, and Markov processes.

CoE 453 - Advanced Computer Architecture I (3-0-3)

Prerequisites: CoE 353. Focuses on dvanced concepts in computer systems design, and the interaction between hardware and software components at various levels (i.e., hardware/_software codesign). Introduces common performance measures used by hardware and software designers to facilitate comparative analysis. Main topics are: advanced pipelining, good instruction sets, CISC and RISC microprocessors, introduction to parallel computing, and a brief historical survey of computer designs.

CoE 456 - Advanced Computer Architecture II (3-0-3)

Prerequisite: CoE 453. Topics include memory allocation, single-instruction stream parallelism, parallelism by message passing, shared-resource systems, protection and security, stack-oriented systems, systolic array systems, and data-flow systems. Discusses the relationships between software and hardware levels of system implementation and -operation.

CoE 459 - Optical Communication Networks (3-0-3)

Prerequisites: EE 232 and either EE 231 or Math 333. Focuses on digital optical networks, architecture, modulation techniques, and detection noise. Related topics are wireless communication, infrared link, and CATV. Computer simulations of network systems are done with commercial software packages.

CoE 473 - Wireless Communication Systems (3-0-3)

Prerequisites: EE 481 or CoE 421. Introduction to wireless system design and engineering. Develops an understanding and appreciation of the wireless engineering problems such as cellular layout design, resource allocation, mobility management, capacity and performance and signaling load calculations. Introduces physical layer building blockssuch as modulation, synchronization, coding, diversity, equalization, and spreading. Note: EE shows as Co-listed as with EE 473.

CoE 475 - Digital Image Processing (3-0-3)

Prerequisites: Foundation of discrete linear systems and Fourier transform or instructor approval. An introduction to the fundamental techniques for digital image processing. Covers human visual sstems, image sensing and acquisition, image sampling and quantization, 1-D and 2-D systems, image enhancement, image restoration, image degradation, features extraction, and image segmentation.

CoE 479 - Computer Communications Networks (3-0-3)

Prerequisites: EE 321 or Math 333. Introduction to the fundamental concepts of computer communication networks. Topics include the OSI reference model, the physical, data link, network, and transport layers, TCP/IP, LANs (including token ring, token bus, and ethernet), ALOHA, routing and flow control. Co-listed as EE 479.

CoE 483 - Data Communications Networking Devices (3-0-3)

Prerequisites: CoE 421 or EE 481. Corequisites: CoE 479 or CIS 451. Provides a working knowledge of data communication networking devices, including modems, routers, multiplexers, switches, and concentrators and are used as building blocks in the implementation, modification, or optimization of data communications networks. Emphasizes device design, functionality and physical layer protocols.

CoE 485 - Computer Systems Design Lab (1-4-3)

Prerequisites: CoE 353, CoE 394. Preparation for putting into practice the concepts learned in CoE 353. Emphasizes hardware design and debugging. Topics include combinational and sequential logic design using CAD tools, design based upon PLA/PLD devices, computer interface design using hardware and software, and an open-ended design project such as a central processing unit design.

CoE 494 - Computer Communications Lab (0-3-1)

Prerequisites: CoE 421 and CoE 394. Experiments cover signals and circuits in both time and frequency domains, modulation techniques, spectral analysis, transmission technology, signal generation, measurements and detection, distortion analysis, and white noise measurements.

CoE 495 - Computer Engineering Project (3-0-3)

Prerequisites: CoE 485 and an approved project proposal. Projects must involve the design and execution of both hardware and software or firmware, and include library research, cost estimation and time budgeting. An oral pres-entation and demonstration of the project must be given. A final written report must be submitted.

CoE 496 - Independent Study (3-0-3)

Prerequisites: CoE 485 and an approved project proposal. Students work on various individually selected projects guided by the department faculty. The project(s) of each student must be completed and professionally presented by assigned due dates for appropriate review and recording of accomplishment. An oral presentation will be made at a meeting of all students and faculty advisors involved in the course. A formal written report will be presented to the faculty advisor at the end of the course. If the course is used in lieu of CoE 495, the project must meet CoE 495 guidelines.

CoE 496H - Honors Independent Study (3-0-3)

Prerequisites: CoE 485 and an approved project proposal. Open to students enrolled in the Honors College. Requirements are the same as CoE 496, but projects are more comprehensive and are of greater depth.

CoE 498 - Advanced Computer Systems Design Lab (0-3-1)

Prerequisites: CoE 453, CoE 485. Corequisite: CoE 456. Design laboratory component of the advanced computer systems technical track offered to CoE majors in the senior year. Experiments emphasize advanced CPU design concepts, such as RISC approaches and exception handling, multiprocessor and systolic array computers, and FPGAs. Develop software programs to test the capabilities of these hardware designs.

Criminal Justice: Offered by the School of Criminal Justice at Rutgers-Newark

21&62:202:307 - Culture and Crime (3)

Anthropological approach to crime as a pattern of social behavior. Examines crime and punishment in other societies, especially non-Western societies which lack institutional systems of criminal justice; the social evolution of crime and crime-related institutions in U.S. history; anthropological studies of people and organizations on both sides of the crime problem.

Economics: Offered by the School of Management. See Management course list for faculty.

Econ 256 - Microeconomics (3-0-3)

The theory of price determination and resource allocation under various market structures. The theory of demand, production, costs, factor and product pricing, income distribution, market failure, implications of government intervention in the market, and comparison of the free enterprise and alternative systems. Students who have received credit for SS 201 may not subsequently receive credit for Econ 256.

Econ 265 - Microeconomics (3-0-3)

The theory of price determination and resource allocation under various market structures. The theory of demand, production, costs, factor and product pricing, income distribution, market failure, implications of government intervention in the market, and comparison of the free enterprise and alternative systems. Students who have received credit for SS 201 may not subsequently receive credit for Econ 265.

Econ 266 - Macroeconomics (3-0-3)

The theory of national income determination. The determinants of aggregate production, employment and prices, as well as money and banking, business cycles and monetary and fiscal policy. Students who have received credit for SS 201 may not subsequently receive credit for Econ 266.

21&62:220:102 - Introduction to Economics, Macro (3)

Major issues confronting the American economy; the nature of our private enterprise system, the role of government, the influence of the banking system, the problem of controlling inflation and deflation, and the requisites for a high level of national income and employment and a rising standard of living.

21&62:220:304 - Economics of Labor (3)

Analysis of the market forces determining employment, wages, hours, and productivity in the firm and economy; influence of union organization, collective bargaining, and public policy on the labor market; historical and cyclical behavior of the labor force and earnings.

21&62:220:322 - Introduction to Econometrics (3)

Prerequisite: 21&62:220:231. Application of regression and other statistical techniques to economic problems; classical linear regression model developed with analysis of the under-lying assumptions and the consequences of their violation; use of econometric techniques in micro- and macro-economic problems; computer-assisted applications.

21&62:220:323 - Intermediate Microeconomic Theory (3)

Development of the fundamental tools of price and distribution theory; analysis of commodity and factor price determination under competitive and noncompetitive market conditions from the standpoint of the household and the firm; introduction to welfare economics.

21&62:220:324 - Intermediate Macroeconomic Theory (3)

Theoretical analysis of national income, employment, and price-level determination; roles of consumer and investor demand, interest rates, money supply, and fiscal and monetary policy considered within the framework of Keynesian, post-Keynesian, monetarist, and new classical theories.

21&62:220:327, 328 - History of Economic Thought (3,3)

First term: the evolution of economic doctrines from the Middle Ages to about 1870, emphasizing the writings of Smith, Ricardo, Malthus, Mill, Marx, and their critics. Second term: neoclassical and Keynesian theory.

21&62:220:335,336 - International Economic Relations (3,3)

Theoretical and practical considerations underlying international trade and finance; economic effects of tariffs and exchange restrictions; foreign investment and the problems of underdeveloped areas; a review of the U.S. foreign aid program and of the work of international financial institutions.

21&62:220:339 - Economic Development (3)

Review the alternative theories of economic development and examine the process of economic development in an international perspective. Examination of the broad diversity of experience in selected Pacific-rim countries is used as a point of departure to illustrate the validity of alternative development theories. Although emphasis is placed on East Asian countries, comparison between East Asian and Latin American countries is made in the context of the political-economic approach.

21&62:220:402 - Advanced Econometrics (3)

Prerequisite: 21&62:220:322. Intensive introduction and extension of the classical regression model; simultaneous model estimation, simulation, and evaluation; specification error analysis, nonlinear estimation; and time series methods.

Electrical and Computer Engineering: Offered by the Department of Electrical and Computer Engineering

ECE 101 - Introduction to Electrical and Computer Engineering (1-0-0)

Prerequisite: None. Familiarize students with various disciplines, career opportunities and curricula in electrical and computer enginneering. Invited speakers include faculty and industrial representatives.

ECE 231 - Circuits and Systems I (3-1-3)

Prerequisites: CIS101 or CIS 113, Phys 121, Math 112. The basic concepts of electric circuit theory and system analysis. Topics include basic circuit elements, loop and node analysis, network theorems, sinusoidal steady-state analysis, power, resonance, mutual inductance, and ideal transformers.

ECE 232 - Circuits and Systems II (3-1-3)

Prerequisite: ECE 231. Corequisite: Math 222. A continuation of circuits and systems with special emphasis on transient response. Topics include Laplace transform analysis, transfer functions, convolution, Bode diagrams, and Fourier series.

ECE 251 - Digital Design (3-1-3)

Prerequisites: Phys 121 and FED 101C and FED 101D. The design of combinational and sequential logic circuits used in digital processing systems and computers. Basic register transfer operations are covered. Topics include Boolean algebra, minimization techniques and the design of logic circuits such as adders, comparators, decoders, multiplexers, counters, arithmetic logic units, and memory systems.

ECE 252 - Microprocessors (3-0-3)

Prerequisites: ECE 251 and CIS 101 or CIS 113. An introduction to microprocessor system organization and assembly language programming. The course covers the architecture, instruction set and assembly language of a specific microprocessor. Other topics included are memory organization, input/output interfacing, interrupt processing as well as exception processing. The problems associated with the design of a single board computer are also covered. Students receiving degree credit for CIS 453 cannot receive degree credit for ECE 352. Co-listed as CoE 252.

ECE 271 - Electronic Circuits I (3-1-3)

Prerequisite: ECE 231. Electronic circuits and devices, particularly junction diodes, bipolar transistors and field-effect transistors. Solid-state device physics is studied in sufficient detail to understand the basic models of semiconductor devices for dc and ac analysis.

ECE 291 - Electrical Engineering Laboratory I (0-3-1)

Prerequisites: ECE 231, HSS 101. Corequisites: ECE 232, ECE 251. Laboratory work in the areas covered in ECE 231, ECE 232 and ECE 251. Emphasizes the construction, testing and analysis of both digital and analog circuits. Emphasizes basic measurement techniques throughout. Introduction to the use of PSpice for solving dc, ac and transient problems on the personal computer.

ECE 310 - Co-op Work Experience I (3 additive credits)

Prerequisites: completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report.

ECE 321 - Random Signals and Noise (3-0-3)

Prerequisite: ECE 232. Corequisite: ECE 333. Random processes occurring in electrical engineering. An introduction to probability and random variables is followed by stochastic processes and noise. Topics include auto- and cross-correlation functions, power spectral density, response of linear systems to random signals, and noise figure calculations.

ECE 333 - Systems and Signals (3-0-3)

Prerequisites: ECE 232, Math 222. A continuation of circuits and systems. Topics include signal models, system representations and properties, convolution, Fourier transform, sampling, z-transform, and an introduction to IIR and FIR filter design.

ECE 341 - Energy Conversion (3-0-3)

Prerequisite: ECE 231. Magnetic materials and their applications including the design of singly- and multiply-excited magnetic circuits and transformers, and the steady-state performance of dc and ac electromechanical energy converters.

ECE 353 - Computer Organization and Architecture (3-0-3)

Prerequisites: ECE 252, ECE 395. Emphasizes the hardware design of computer systems. Topics include register transfer logic, central processing unit design, microprogramming, ALU design, pipelining, vector processing, micro-coded arithmetic algorithms, I/O organization, memory organization and multiprocessing.

ECE 354 - Digital Test (2-0-2)

Prerequisites: ECE 251 or equivalent, Math 333 or equivalent. Covers theory and practice related to test technology. Topics include fault modeling, test generation, fault simulation, design for testability, fault diagnosis, built-in self-test, scan design, and many others. Surveys several industrial design for testability structures.

ECE 361 - Electromagnetic Fields I (2-0-2)

Prerequisites: ECE 231, Math 213, Phys 234. Vector analysis and calculus, static electric and magnetic fields, capacitance and inductance, electric currents, resistance, time dependent fields and introduction to Maxwell's equations.

ECE 362 - Electromagnetic Fields II (3-0-3)

Prerequisites: ECE 361. Maxwell's equations solutions, reflection and refraction of plane waves in dielectric and conducting media, transmission lines; transients and frequency domain solutions in lossy and lossless lines, Smith chart and its applications, parallel plate and rectangular waveguides.

ECE 368 - Signal Transmission (2-0-2)

Prerequisites: ECE 232, ECE 251. Familiarization with signal transmission both within and between digital systems. Topics include the telegrapher's equations, wave propagation, lattice diagrams, transients in digital systems, crosstalk, proper termination for high-speed logic, and the transmission characteristics of various interconnecting geometries.

ECE 372 - Electronic Circuits II (3-0-3)

Prerequisites: ECE 232, ECE 271. Principles of FET and BJT small signal amplifiers: Q point design, input and output impedance, gain, and signal range limitations for the six different single stage configurations. Design of analog integrated circuits including current sources, differential amplifiers, noise sources, active loads, and CMOS circuits. Transistor high frequency models, Miller effect, and frequency response of multistage amplifiers. Feedback with multistage amplifiers and two-port network theory.

ECE 373 - Electronic Circuits III (3-0-3)

Prerequisites: ECE 372, ECE 392. Topics include operational amplifier fundamentals, linear op-amp circuits, instrumentation amplifiers, feedback theory, active filters, practical op-amp limitations, Schmitt triggers, oscillators, multivibrators, timers, and waveform generators.

ECE 392 - Electrical Engineering Laboratory II (1-2-2)

Prerequisite: ECE 291. Corequisites: ECE 333, ECE 372. Laboratory work in some of the areas covered in ECE 251, ECE 333 and ECE 372. Covers the practical design and testing of electrical and electronic circuits. Introduces engineering design, manufacturing and measurement concepts by the use of selected design projects. Design, construct and test electronic circuits using own components.

ECE 394 - Digital Systems Lab (0-3-1)

Prerequisites: ECE 271, ECE 252. Experiments emphasize digital design from basic electronic circuits to complex logic. Topics include switching speed, operational amplifier circuits, basic sequential circuits, the arithmetic/logic unit, and computer memories.

ECE 395 - Microprocessor Laboratory (0-4-2)

Prerequisites: ECE 291, ECE 252. In this laboratory the students are expected to learn to apply their theoretical knowledge of both the hardware and software aspects of microprocessors. To attain this objective the students are required to construct a microprocessor based single board computer (SBC), with adequate interfacing capabilities to be able to perform some useful control tasks. Programming of the device is done in assembly language. Some of the experiments that follow the construction project deal with software while others deal with the problems of interfacing of microprocessors.

ECE 405 - Electrical Engineering Principles (3-0-3)

Prerequisites: Phys 121. (No credit for ECE students.) For non-electrical engineering majors. Topics include basic dc and ac circuits, basic electronics, an introduction to electromechanical energy conversion and control theory.

ECE 410 - Co-op Work Experience II (3 credits)

Prerequisites: ECE 310, approval of the department, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience. Mandatory participation in seminars and completion of requirements that include a report and/or project. May count as EE or approved elective.

ECE 413 - Introduction to Electrical Engineering Practice (1-0-1)

Prerequisite: senior standing or permission of the instructor. Planning and execution of engineering projects. Intellectual property: publications and proprietary documents, invention disclosures and patents. Safety: the role of engineering codes and standards. Engineering ethics. Professional organizations. Professional registration. Preparation of a technical proposal for a senior project and its approval required.

ECE 414 - Introduction to Computer Engineering Project (1-0-1)

Prerequisite: Senior standing or permission of instructor. Computer Engineering students will develop a project proposal for the senior design project. Inivited faculty and industrial speakers will present project ideas and real examples.

ECE 415 - Electrical Engineering Project (1-2-2)

Prerequisites: ECE 373, ECE 413, ECE 494. A synthesis and focusing of previous experience, in and out of college, upon one or more electrical engineering projects selected by the student. Involves library research, design, cost analysis, construction and testing. Projects are shared in final project presentations.

ECE 416 - Computer Engineering Project (3-0-3)

Prerequisites: ECE 495 and an approved project proposal. Projects must involve the design and execution of both hardware and software or firmware, and include library research, cost estimation and time budgeting. An oral pres-entation and demonstration of the project must be given. A final written report must be submitted.

ECE 417 - Independent Study (3-0-3)

Prerequisites: ECE 413 or ECE 414 and an approved project proposal. Students work on various individually selected projects guided by the department faculty. The project(s) of each student must be completed and professionally presented by assigned due dates for appropriate review and recording of accomplishment. An oral presentation will be made at a meeting of all students and faculty advisors involved in the course. A formal written report will be presented to the faculty advisor at the end of the course.

ECE 421 - Digital Data Communications (3-0-3)

Prerequisites: ECE 232, Math 333. Covers communications basics and some topics in digital communications most germane to data communication. Topics include signal classification, correlation, spectral analysis, energy and power spectral density, white noise, signal transmission through linear systems, sampling and quantization, and principles of digital data transmission.

ECE 422 - Computer Communications Networks (3-0-3)

Prerequisites: ECE 321 or Math 333. Introduction to the fundamental concepts of computer communication networks. Topics include the OSI reference model, the physical, data link, network, and transport layers, TCP/IP, LANs (including token ring, token bus, and ethernet), ALOHA, routing and flow control.

ECE 423 - Data Communications Networking Devices (3-0-3)

Prerequisites: ECE 421 or ECE 481. Corequisites: ECE 479 or CIS 451. Provides a working knowledge of data communication networking devices, including modems, routers, multiplexers, switches, and concentrators and are used as building blocks in the implementation, modification, or optimization of data communications networks. Emphasizes device design, functionality and physical layer protocols.

ECE 424 - Optical Communication Network (3-0-3)

Prerequisites: ECE 232 and either ECE 231 or Math 333. Focuses on digital optical networks, architecture, modulation techniques, and detection noise. Related topics are wireless communication, infrared link, and CATV. Computer simulations of network systems are done with commercial software packages.

ECE 425 - Wireless Communication Systems (3-0-3)

Prerequisites: ECE 481 or ECE 421. Introduction to wireless system design and engineering. Develops an understanding and appreciation of the wireless engineering problems such as cellular layout design, resource allocation, mobility management, capacity and performance and signaling load calculations. Introduces physical layer building blockssuch as modulation, synchronization, coding, diversity, equalization, and spreading.

ECE 429 - Computer Communications Lab (0-3-1)

Prerequisites: ECE 421 and ECE 394. Experiments cover signals and circuits in both time and frequency domains, modulation techniques, spectral analysis, transmission technology, signal generation, measurements and detection, distortion analysis, and white noise measurements.

ECE 431 - Systems and Virtual Instrumentation (3-0-3)

Prerequisites: ECE 252, ECE 333. Builds upon mathematics and electrical engineering science background to analyze and design feedback control and instrumentation systems. Emphasizes performance specifications, stability and modeling. The computer is used as an essential design and analysis tool.

ECE 432 - Control Systems Elective (3-0-3)

Prerequisites: ECE 431. Corequisite: ECE 496. A continuation of the study of automatic control systems with emphasis on computer-aided design and problem solving. Topics covered include state feedback control, observers, industrial regulators, linear quadratic regulators, and the analysis of various common system nonlinearities. Implementation techniques on both analog and digital platforms will be addressed.

ECE 439 - Control Systems Laboratory (0-4-2)

Prerequisites: ECE 431, ECE 494. Corequisite: ECE 432. Laboratory work in the design and synthesis of control systems, closely coordinated with the control systems elective.

ECE 441 - Power Electronics (3-0-3)

Prerequisites: ECE 373. Electronic devices and circuits used to energize various apparatus and systems. Topics include circuits, freewheeling diodes, thyristors, firing and commutation of silicon-controlled rectifiers, converters, dc choppers, and power supplies.

ECE 442 - Power Systems Elective (3-0-3)

Prerequisite: ECE 341. Introduction to power plants and power networks. Topics include transmission line parameters, system modeling, economic operations of power systems, load flow studies, short circuit analysis, and power system stability.

ECE 449 - Power Systems Laboratory (0-4-2)

Prerequisites: ECE 431, ECE 494. Corequisite: ECE 442. Laboratory work in the design and synthesis of power systems, closely coordinated with the power systems elective.

ECE 451 - Advanced Computer Architecture (3-0-3)

Prerequisites: ECE 353. Focues on dvanced concepts in computer systems design, and the interaction between hardware and software components at various levels (i.e., hardware/_software codesign). Introduces common performance measures used by hardware and software designers to facilitate comparative analysis. Main topics are: advanced pipelining, good instruction sets, CISC and RISC microprocessors, introduction to parallel computing, and a brief historical survey of computer designs.

ECE 452 - Advanced Computer Architecture II (3-0-3)

Prerequisite: ECE 451. Topics include memory allocation, single-instruction stream parallelism, parallelism by message passing, shared-resource systems, protection and security, stack-oriented systems, systolic array systems, and data-flow systems. Discusses the relationships between software and hardware levels of system implementation and -operation.

ECE 453 - Introduction to Discrete Event Systems (3-0-3)

Prerequisites: ECE 251 or CIS 251 or equivalent, and Math 333 or ECE 321 or equivalent. Introduces logical models, timed models, and stochastic timed models of discrete event systems. Applies petri net methodology to the modeling of computer systems, flexible manufacturing systems, communication networks, and robotics. Contrasts the approaches of _simulation, elementary queueing theory, and Markov processes.

ECE 457 - Digital Image Processing (3-0-3)

Prerequisites: Foundation of discrete linear systems and Fourier transform or instructor approval. An introduction to the fundamental techniques for digital image processing. Covers human visual sstems, image sensing and acquisition, image sampling and quantization, 1-D and 2-D systems, image enhancement, image restoration, image degradation, features extraction, and image segmentation.

ECE 459 - Advanced Computer Systems Design Lab (0-3-1)

Prerequisites: ECE 451, ECE 495. Corequisite: ECE 452. Design laboratory component of the advanced computer systems technical track offered to CoE majors in the senior year. Experiments emphasize advanced CPU design concepts, such as RISC approaches and exception handling, multiprocessor and systolic array computers, and FPGAs. Develop software programs to test the capabilities of these hardware designs.

ECE 461 - Microwave and Integrated Optics (3-0-3)

Prerequisite: ECE 362 or equivalent. The analysis and design of microwave transistor amplifiers and oscillators using scattering parameter techniques. Topics include transmission line theory, scattering parameters, matching networks, signal flow graphs, amplifier design considerations (power gain stability, noise and band width), and negative resistance oscillator design.

ECE 462 - RF/Fiber Optics Systems Elective (3-0-3)

Prerequisite: ECE 362. Corequisite: ECE 461 or permission of instructor. Topics include dielectric waveguides and optical fibers, semiconductor optical sources and detectors; rf/microwave modulation and demodulation of an optical carrier; design concepts in optical transmitters and receivers; and usage of CAD software tools for rf/ microwave simulations.

ECE 469 - RF/Microwave and Fiber Optics Systems Laboratory (0-4-2)

Corequisite: ECE 462. Laboratory work in characterization of RF/microwave transmission structures and optical fibers, sources and detectors, spectral and time domain (OTDR) measurements in micro-waves and optics. Experiments in microwave and fiber optic links. Usage of CAD software tools for RF/microwave simulations.

ECE 471 - Active Network Design (3-0-3)

Prerequisite: ECE 373. Topics include the basic theorems of network synthesis; the design of LC and RC networks; the design of second-order active RC low-pass, high-pass, band-pass and notch filters; and the design of high-order filters with Butterworth, Chebyshev, Elliptic, and Bessel response. Also, switched-capacitor circuit designs and other selected topics.

ECE 472 - Pulse Techniques (3-0-3)

Prerequisite: ECE 373. Topics in electronics including linear and non-linear operational-amplifier circuits, the frequency compensation of operational-amplifiers, higher-order active filters including switched-capacitor designs, waveform generators, multi-vibrators, timers, waveshapers, converters, and other selected topics.

ECE 475 - VLSI Circuits (3-0-3)

Prerequisite: ECE 372. Topics include MOSFETs, their characteristics and use in analog and digital circuit design, static and dynamic circuits; memory cells; differential stages; symbolic layout of NMOS and CMOS circuits; fundamentals of silicon processing technology and associated design rules and methodology; calculation of chip performance including power, speed and area; logic arrays.

ECE 476 - Microelectronic Devices and Circuits (3-0-3)

Prerequisite: ECE 372. Thorough study of basic principles of semiconductor electrical behavior (particularly as applied to junction, the MOS field effect, and optoelectronic devices) in order to understand their operation and characteristics. Devices include Schottky barrier and PN junction diodes, bipolar and FET transistors, solar cells, photoconductive and photovoltaic detectors, LEDs, and semiconductor lasers. Emphasis on characteristics important for circuit design, e.g., dynamic switching behavior.

ECE 478 - VLSI Circuits (3-0-3)

Prerequisite: ECE 372. Topics include MOSFETs, their characteristics and use in analog and digital circuit design, static and dynamic circuits; memory cells; differential stages; symbolic layout of NMOS and CMOS circuits; fundamentals of silicon processing technology and associated design rules and methodology; calculation of chip performance including power, speed and area; logic arrays.

ECE 481 - Communications Systems (3-0-3)

Prerequisites: ECE 321, ECE 333, ECE 373. An introduction to communications systems and modulation theory. Topics are AM and FM systems, including methods of generation and detection, signal spectra, and bandwidth requirements; thermal noise, calculation of signal-to-noise ratios and the effect of noise on the communications system analyzed; pulse code modulation systems with consideration given to bandwidth requirements, quantization noise and the effects of transmission errors.

ECE 482 - Communications Systems Elective (3-0-3)

Prerequisites: ECE 481. Corequisite: ECE 495. A continuation of the study of communications systems with selected topics from different areas of communications theory such as sampled-data communications, information theory and noise.

ECE 489 - Communications Systems Laboratory (0-4-2)

Prerequisites: ECE 395, ECE 394. Preparation for putting into practice the concepts learned in ECE 353. Emphasizes hardware design and debugging. Topics include combinational and sequential logic design using CAD tools, design based upon PLA/PLD devices, computer interface design using hardware and software, and an open-ended design project such as a central processing unit design.

ECE 494 - Electrical Engineering Laboratory IV (1-2-2)

Prerequisites: ECE 341, ECE 373, ECE 392. A continuation of laboratory work into the areas covered in ECE 341, ECE 352 and ECE 373.

ECE 495 - Computer Systems Design Lab (1-4-3)

Prerequisites: ECE 353, ECE 394. Preparation for putting into practice the concepts learned in ECE 353. Emphasizes hardware design and debugging. Topics include combinational and sequential logic design using CAD tools, design based upon PLA/PLD devices, computer interface design using hardware and software, and an open-ended design project such as a central processing unit design.

ECE 497 - Computer Systems Laboratory (0-4-2)

Prerequisite: ECE 494. Corequisite: ECE 487. Laboratory work in the design and synthesis of computer systems, closely coordinated with the computer systems elective.

Engineering Design: Coordinated by the Office of the Dean, Freshman Studies and through the Office of the Dean, Newark College of Engineering

FED 101 - Fundamentals of Engineering Design (2-1-2)

Corequisite: HSS 099 or HSS 101 and Math 103 or Math 104 or Math 111. Teams of students work on open-ended engineering projects. Sections are offered to represent an introduction to real-world engineering design problems in a specific engineering discipline. Topics covered include introduction to basic engineering design elements, processes, measurements, product and project design and development, with hands-on experiments in a specific major area. Students also learn to use engineering tools for computer-aided design and simulation. Technical writing and oral presentation along with project management skills are emphasized. Students are required to take an FED section corresponding to their declared major. Undecided students will be placed in FED sections which best correspond to their interests according to space availability.

FED 101C - Fundamentals of Engineering Design, Computer Aided Design/Graphics Component (0-2.25-1)

Corequisite: HSS 100 in the spring or HSS 101 in the fall. Study technical graphics and the computer as a technical drawing tool. Introduces projections and multiview drawings and visualization. Discuss geometry commonly used in engineering design graphics, orthographic projections, dimensioning techniques, tolerancing and introduction to auxiliary and sectional views. Apply software program pro/ENGINEER to various problems. Interdisciplinary course coordinated by the Office of the Dean, Freshman Studies and through the Office of the Dean, Newark College of Engineering.

Engineering Graphics: Offered by the Department of Mechanical Engineering. See Mechanical Engineering course list for faculty.

EG 101 - Engineering Graphics (1-2-2)

Engineering students are introduced to the fundamentals of engineering graphics. Representative topics covered are sketching, isometric and orthographic drawings, dimensioning and scales. In addition, students are taught the principles of charts and graphs including graphical calculus. Applications in the various engineering disciplines are studied by means of graphical vectors in force analysis, piping symbols and diagrams, electrical symbols and diagrams, and plot plans. An introduction to CAD is implemented in creating three-dimensional solid models and detailed drawings. Students who have completed FED 101C and FED 101D are not eligible for EG 101.

ESC 491 - Research and Independent Study I (3-0-3)

Prerequisite: senior standing in engineering science. Provides the student with an opportunity to work on a research project under the individual guidance of a program faculty member.

ESC 491H - Honors Research and Independent Study I (3-0-3)

Prerequisite: senior standing in engineering science and enrolled in the Honors College. Same as ESC 491, but projects are more comprehensive and are of greater depth.

ESC 492 - Research and Independent Study II (3-0-3)

Prerequisite: ESC 491. A continuation of ESC 491.

ESC 492H - Honors Research and Independent Study II (3-0-3)

Prerequisite: ESC 491 and enrolled in the Honors College. A continuation of ESC 491H.

Engineering Technology: Offered by the Department of Engineering Technology

ET 370 - Technical Product Selling (3-0-3)

Prerequisite: Eng 352. Corequisite: Mgmt 390. Consideration of all the decisions in selling high-technology goods or services. Sales organization, communication skills, the industrial purchasing structure and the sales process in the context of selling products in the technological area. Examples, case studies, and simulation of real life situations, including developing engineering solutions, to complete a sale. Contact database management and presentation software is used.

ET 459 - Computer Adaptations for Persons with Disabilities (2-2-3)

Prerequisite: CIS 101 or equivalent. Specific needs of persons with sensory impairments, speech impairments, learning disabilities and orthopedic handicaps. Laboratory experience with actual adaptive equipment.

CPT 310 - Computer Design Fundamentals for Computer Technology (2-2-3)

Prerequisite: enrolled in the computer technology option. Boolean algebra, gates, combinational and sequential logic. Memory, microprocessor, and I/O control IC's. Sequential bus architecture.

CPT 330 - Software Web Applications for Engineering Technology I (2-2-3)

Common software applications using software objects. The use of software objects in the management of programming projects. Projects illustrate concepts.

CPT 335 - Networks Applications for Computer Technology I (2-2-3)

Prerequisites: C++, Visual Basic, UNIX utilities. Covers common gateway interface (CGI), servers, network protocols, network administration, server and network per-formance.

CPT 340 - Visual Basic for Engineering Technology (2-2-3)

Creation of windows with text, controls, menus and graphics. Events detection. Files and _objects management.

CPT 395 - Co-op Work Experience I (3 degree credits)

Prerequisites: Approval of the department and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report.

CPT 401 - Senior Project (0-4-2)

Prerequisites: senior standing in computer technology, MIS 345. Project management and development, scheduling, proposal writing, documentation of software projects, technical presentations. The successful completion of the project consists of research on a recent computer software and/or hardware product, and the application of the findings to the development of a project, which must include a software component. The senior project may be replaced by a cooperative education experience course, subject to advisor's approval.

CPT 430 - Software Web Applications for Engineering Technology II (2-2-3)

Prerequisite: CPT 330. Common applications using software objects. The use of software objects in the management of programming projects. Projects are used to illustrate concepts.

CPT 435 - Networks Applications for Computer Technology II (2-2-3)

Prerequisite: CPT 335. Network security. Database implementations. Scaling.

CPT 440 - Visual Basic Applications for Engineering Technology (2-2-3)

Prerequisite: CPT 340. PC-based control techniques, embedded systems. Database control. Real-time control. Network data acquisition. Man-machine interface and ergonomics considerations.

CPT 491 - Special Projects in Computer Technology (1-0-1)

Prerequisite: Senior standing in computer technology. The student works on selected projects guided by the department staff.

CPT 492 - Special Projects in Computer Technology (2-0-2)

See CPT 491.

CPT 493 - Special Projects in Computer Technology (3-0-3)

See CPT 492.

CET 313 - Construction Procedures I (3-0-3)

Corequisite: CET 317. An introduction to heavy construction practices. Emphasis is on construction equipment, site preparation, earthmoving, compaction, dewatering, piles, drilling and blasting, and tunnelling. Case studies in heavy construction are used.

CET 314 - Construction Procedures II (3-0-3)

Prerequisites: CET 313; CET 317. An introduction to building construction practices and building materials. Emphasis is on structural systems, construction materials and detailed finishing operations required to make a serviceable structure. Case studies in building construction are used.

CET 317 - Construction Computing (3-0-3)

Prerequisites: CIS 101 or equivalent; basic courses in steel and concrete design, fluids/_hydraulics, and surveying; access to a personal computer is also needed. An introduction to construction computing using menu-driven software programs. Application of available software to construction-related computing problems, including: strength of materials, structural analysis, fluids/ hydraulics, surveying, scheduling, cost estimating, and computerized drafting (CAD).

CET 322 - Construction Regulations and Standards (3-0-3)

Corequisite: CET 317. An introduction to the New Jersey Uniform Construction Code, the BOCA National Building Code, NJ DOT Standard Specifications and the CSI specification format. Also includes current OSHA regulations which govern safe methods, procedures and equipment to be used on all types of construction projects. A code analysis of a typical project is undertaken and a safety program established for its construction.

CET 331 - Structural Systems (3-3-4)

Prerequisite: Strength of materials and basic course in steel and concrete design; CET 317. Study of types and behavior of modern structures using both analytical and intuitive techniques. Examples include beam and column, one- and two-way slab systems, wood and ma-sonry systems, and wind and seismic analysis.

CET 411 - Cost Estimating (3-0-3)

Prerequisites: CET 313, CET 314, CET 317. Take off of quantities of materials from typical building and highway projects. Pricing for labor, materials, and equipment. Crew sizes, productivity and manpower leveling. Computerized cost estimating and take off methods. Prepare a complete bid estimate for a construction project.

CET 413 - Environmental Science (3-3-4)

Prerequisites: CET 313, CET 314, CET 431. An introduction to construction-related environmental science topics, including basic environmental chemistry, geology, ground water hydrology, basic air quality, surface water run-off, erosion and sedimentation control, indoor air quality, and vibration analysis. Case studies cover various construction activities with respect to their effect on the environment and the manner in which they can be controlled.

CET 415 - Construction Project Management (3-0-3)

Prerequisites: CET 313, CET 314. Corequisite: CET 421. An introduction to construction management and administration methods and procedures including the design and construction process, project organizational structure, construction planning, contract administration, records and reports, financial management, risk analysis, manual and computerized GANTT and CPM scheduling, change orders and extra work, claims and disputes, cost accounting and document tracking.

CET 416 - Senior Construction Project (1-2-2)

Prerequisite: CET 415; second semester senior standing in construction and contracting engineering technology. Simulates the methods and procedures used to successfully manage a construction project. Provides familiarization with constructability analysis, value engineering, productivity improvement, quality control, advanced field and office administration techniques, problem solving, and construction auto-mation. Extensive use of construction-related computer software. Written submittals and oral presentations required.

CET 421* - Construction Contracts (3-0-3)

Legal aspects of the various types of construction contracts and specifications. Scope, format, and use of various types of contracts such as owner-contractor and contractor-sub-contractor.

CET 431 - Construction Testing (2-2-3)

Prerequisite: CET 331. Exposure to a variety of construction-related field tests and field testing equipment. Includes concrete mix design, concrete testing, soil density and compaction, asphalt tests, load testing of wood, mortar analysis and testing, brick and CMU testing, and quality control methods and procedures for finishes.

CET 435 - Design of Temporary Structures (3-3-4)

Prerequisite: CET 331. Analysis of loadings on, and design of, temporary structures required in construction. Formwork, shoring and scaffolding systems, temporary bridges, trenching, and temporary retaining walls are among the subjects covered. Construction safety associated with temporary structures is stressed.

CET 441 - Soils and Earthwork (3-0-3)

Prerequisite: Strength of materials, CET 317. A study of the significant soil types and tests. Problems are investigated relating to soil mechanics, soil supported foundations for engineering structures. Appropriate field trips are made.

CET 450 - Mechanical and Electrical Systems I (3-3-4)

Prerequisite: College physics. This course provides a technical working knowledge of the various systems used in the building construction industry. Such topics as site work; thermal control systems including plumbing, heating, ventilating, and air conditioning; electrical power distribution and lighting are discussed in detail. Lectures presented using residential, industrial and commercial applications from industry. Class projects included in the laboratory.

CET 451 - Mechanical and Electrical Systems II (3-0-3)

Prerequisite: CET 450. A continuation of CET 450 from a more advanced viewpoint. Specifications will be studied along with mechanical and electrical designs as related to overall architectural studies. These comprehensive designs will require decisions of a more sophisticated nature.

CET 490 - Senior Project (3-0-3)

Prerequisite: Senior standing in construction engineering technology. The student works on one or more individually selected projects guided by the department staff. The project must be construction related and may include planning, research (library or lab), engineering report, and statistical, analytical, or field investigation. Any of these may follow class-inspired direction, or the students may branch out on their own. The project(s) of each student must be completed and professionally presented by assigned due date for appropriate review and recording of accomplishments.

CET 491 - Special Project (1-0-1)

Prerequisite: Senior standing in construction engineering technology. The student works on an individually selected project guided by the department staff. The project may be design- or construction-related and may include research, engineering design, technical report, or field investigation. Requirements will include a written submittal.

CET 492 - Special Project (2-0-2)

Prerequisite: Senior standing in construction engineering technology. The student works on a selected project guided by the department staff. The project may be design- or construction-related and may include research, engineering design, technical report or field investigation. Requirements will include a written submittal.

CET 497 - Co-op Work Experience (3 degree credits)

Prerequisites: Approval of the department, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience as co-op/intern. Mandatory participation in seminars and completion of requirements that include a report and/or project.

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* Same as EM 640 and Tran 640 course designations pending

CMT 332 - Structural Systems for Construction (3-0-3)

Study of the types and behavior of building structural systems using qualitative analysis techniques. Systems to be covered will include those involving structural steel, reinforced concrete, wood and timber, and plain and reinforced masonry. The effect of wind and seismic events on these systems is reviewed.

CMT 414 - Environmental Science for Construction (3-0-3)

An introduction to construction-related environmental topics, including environmental chemistry, geology, ground water hydrology, outdoor air quality, surface water run-off, erosion and sedimentation control, indoor air quality, asbestos abatement, radon remediation, and noise and vibration.

CMT 436 - Temporary Structures for Construction (3-0-3)

Prerequisite: CMT 332. Study of the types of the various temporary systems and structures used in field construction activities, including concrete forming and falsework, sheeting and shoring for excavations, scaffolding, barricades, ladders, and temporary bridges and ramps. Construction safety with respect to the systems is covered.

CMT 452 - Mechanical and Electrical Systems for Construction (3-0-3)

Study of the different types of water supply, plumbing, fire protection, heating, ventilation, air conditioning and electrical systems commonly employed in residential and commercial buildings. Case studies include an overview of the design of these systems and their installation in the field.

ECET 300 - Circuit Analysis: Transform Methods (3-0-3)

Prerequisites: DC and AC circuit analysis (AAS level). Corequisite: Math 322. The principles, theorems and techniques of circuit analysis are reviewed. The technique of waveform and circuit transforms is introduced. Laplace transforms are studied and applied in the solution of circuit problems with a variety of input functions. Fourier analysis also is introduced. Extensive use of computer simulation software.

ECET 303 - Circuit Measurements (1-3-2)

Prerequisite: Electricity and electronics (AAS level). Corequisites: Eng 352 and Math 309. Lecture and laboratory sessions are designed to develop techniques for the measurement of various circuit parameters as well as the theoretical prediction of these parameters. Extensive use of computer simulation software.

ECET 305 - Integrated Circuit Applications (2-2-3)

Prerequisite: ECET 303. Corequisite: ECET 300. Provides a working knowledge of the characteristics and applications of integrated circuits. Topics include how linear ICs work, the most common circuit configurations in which ICs are used, and how to design the most commonly needed circuits with ICs, using manufacturers? specification sheets.

ECET 310 - Microprocessors I (2-2-3)

Prerequisites: Courses in digital logic and introduction to microprocessors (AAS level). Develops a working knowledge of the characteristics and applications of microprocessors. Emphasis is put on the architecture and instruction set of an advanced microprocessor. Representative data handling problems are studied and tested in the laboratory.

ECET 314 - Communication Systems (2-2-3)

Corequisite: ECET 300. A study of amplitude modulation, frequency modulation, and pulse modulation systems of transmission and recep-tion, including applications of these systems in radio, television, and telemetry. Introduces the latest digital communications theory and applications. Perform appropriate laboratory exercises and projects.

ECET 319 - Electrical Systems and Power (2-2-3)

Prerequisites: Physics I and calculus (AAS level). For non-ECET majors only. The fundamentals of ac and dc circuit theory are studied. Transistor and diode theory and their applications in amplifiers and filters are investigated. Electrical machines are also included in this course. Computer simulation as well as appropriate laboratories are required.

ECET 329 - Analog and Digital Electronics (2-2-3)

Prerequisite: ECET 319 or equivalent. For non-ECET majors. Building on ECET 319, a study of more advanced topics in electronics including op-amps, digital logic and the logic families, an introduction to microprocessors and interfacing, with particular attention to the common buses used in instrumentation and data acquisition. Computer simulation as well as laboratories are required.

ECET 344 - Numerical Computing for Engineering Technology (2-2-3)

Corequisite: Math 309. An introduction to the use of a computer to analyze and solve problems common in engineering technology. Write original programs in C language, integrating existing mathematical routines in programs.

ECET 365 - Digital Logic and Circuit Design (3-0-3)

Prerequisite: A course in digital logic (AAS level). Develops the mathematics and minimization techniques together with the circuit implementation for the design of combinational and sequential digital solid-state logic circuits. Studies decoders, mulitplexers, counters, registers and PLDs. Computer and communications circuits are used as examples. Projects employ computer simulation of digital circuits.

ECET 395 - Co-op Work Experience I (3 degree credits)

Prerequisites: Approval of the department and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report.

ECET 401 - EET Senior Project I (2-0-2)

Prerequisites: All required 300-level courses. Corequisite: ECET 406 or ECET 410. The introduction to ECET 402. Project management, concurrent engineering, proposal development, library research, and computer usage are stressed. Develop a formal proposal, technical specifications, Gantt chart, and design specifications for the senior project to be implemented in ECET 402. The project is appropriate to the student's concentration.

ECET 402 - EET Senior Project II (0-2-1)

Prerequisite: ECET 401 (within one year). Apply technical knowledge to the implementation of the project approved in ECET 401. Complete design specifications, computer analysis and/or simulation and a formal test procedure. This portion of the project includes library research, time and cost planning, oral and written reports, as well as construction, trouble-shooting and demonstration of a working -prototype.

ECET 406 - Control Systems and Transducers (3-3-4)

Prerequisite: ECET 305. Class and laboratory study of analog and digital automatic control. Using Laplace transforms, principles of analysis and design of control systems are introduced. Transducer characteristics and their application in instrumentation and control are investigated. Several experiments are implemented using Programmable Logic Controllers (PLCs).

ECET 410 - Microprocessors II (2-2-3)

Prerequisites: ECET 310 and ECET 365. Covers the operations, bread boarding, and interfacing of devices peripheral to microcom-puters. Emphasizes embedded applications of microprocessers to systems requiring both hardware and software development. Advanced topics include programmable peripheral I/O controllers, interrupts and local ISA, PCI and USB buses.

ECET 412 - Power Generation and Distribution (3-0-3)

Prerequisite: ECET 300. Electrical power generation systems, including hydroelectric, steam, and nuclear plants. Substation and transmission line topics are included as part of the distribution system.

ECET 415 - Fundamentals of Telecommunications (2-2-3)

Prerequisite: ECET 314 or equivalent. Topics include transmission media, transmission facilities such as T1 and T3, emerging technologies including SONET, ATM and spread spectrum, switching systems, with emphasis on data communications, data communication protocols, and the open system interface (OSI).

ECET 416 - Networking Applications (2-2-3)

Corequisite: ECET 344. Introduces students to the technology of networking with a particular focus on local area networks (LANs). Comprises two components: concept/theory and hands-on/applications in the laboratory. Topics include: overview of telecommunications systems; networking concepts, protocols and standards; wide area networks, (LANs), the enter-prise network, LAN topology, media access control, transport control protocol (TCP), internet protocol (IP), routing in the Internet, the asynchronous transfer mode (ATM) networks, and other topics related to installation, configuration and troubleshooting of local area networks.

ECET 418 - Transmission Systems (2-2-3)

Prerequisites: ECET 305, ECET 314. A study of wireless and terrestrial transmission systems with an emphasis on fiber optics and the latest wireless techniques. The lectures examine the technologies as well as the advantages and disadvantages of the various transmission techniques. The laboratories are a mixture of fiber optic, microwave, and wireless experiments providing hands-on experience in these important areas.

ECET 440 - Clinical Internship (3 credits)

Prerequisites: ECET 401, BME 302. Consists of 200 hours of experience in the clinical engineering department of a hospital. The student is under the supervision, and is evaluated by, the director of clinical engineering at the hospital. A final report is submitted to and graded by the NJIT faculty advisor.

ECET 444 - Technology Applications of Object-Oriented Programming (2-2-3)

Prerequisites: ECET 344. Brings together prior software knowledge and applies it to the World Wide Web. Comprises theory and hands-on applications in the laboratory. Concepts in modular/structured design and object-oriented design with C++ and Java will be combined with Internet real-time applications. Examine several case studies during the last few weeks. Design, construct and test a practical software project.

ECET 491 - Special Projects in ECET (1 credit)

Special projects course for ECET students with subject matter to be arranged by instructor and approved by program coordinator.

ECET 492 - Special Projects in ECET (2 credits)

See ECET 491.

ECET 493 - Special Projects in ECET (3 credits)

See ECET 491.

ECET 495 - Co-op Work Experience II (3 additive credits)

Prerequisites: ECET 395 or its equivalent, approval of the department, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience as a co-op/intern. Mandatory participation in seminars and completion of requirements that include a report and/or project.

MNET 300 - Concepts in Machining (2-4-4)

Applications in the machining of various materials. Topics include speeds and feeds calculations, tooling concepts, gauging techniques and prototype construction.

MNET 303 - Advanced Techniques in CAD/CAM (2-2-3)

Applications including hands-on experience with CAD/CAM systems. Emphasis is on understanding how displayed objects are represented and manipulated on the computer. Laboratory experiences contribute to an understanding of the advantages and limitations of CAD/CAM systems.

MNET 315 - Industrial Statistics (2-2-3)

Introduction to statistics covering data collection, analysis and presentation. Specialized topics include probability, control charts, correlation, regression, hypothesis testing, and -experimentation.

MNET 318 - Manufacturing Process Design (2-2-3)

A development of the principles of production, methodology and economics in view of production requirements with respect to materials, tolerances and finish. Production processes are matched to the product requirements. Laboratory work supports the lecture. Computer problem solving is incorporated in the course.

MNET 395 - Co-op Work Experience I (3 degree credits)

Prerequisites: Completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments are facilitated by the co-op office. Mandatory participation in seminars and completion of a report.

MNET 405 - Numerical Control for Machine Tools (2-2-3)

Prerequisite: MNET 300 or equivalent. Fundamental concepts of numerical control systems. Assignments include mill and lathe programming techniques, sheet metal processing, and CNC economics.

MNET 414 - Industrial Cost Analysis (3-0-3)

An introduction to general costing techniques. Time value of money concepts are introduced to decision-making matters such as equipment justification, design selection and fabrication costs.

MNET 416 - Production Scheduling (3-0-3)

Prerequisite: MNET 315. A study of manual and computerized methods for setting schedules. Gantt charts, CPM, PERT, PERT/COST, and Line of Balance are some of the topics treated. Problems of line balancing and machine loading are discussed.

MNET 420 - Quality Systems (2-2-3)

Prerequisite: Basic statistics. Introduction in quality control that emphasizes design quality, total quality management and statistical process control. Additional topics include quality economics, ISO, reliability, service quality, measurement and acceptance sampling.

MNET 422 - Tool Design (2-2-3)

Prerequisite: MNET 300 and MNET 303. Introduction to the design of cutting tools with emphasis on speeds, feeds, and power requirements. Covers design of jigs, fixtures, punch and dies, gaging and inspection tooling with emphasis on current industrial practices.

MNET 423 - Motion and Time Study Techniques (2-2-3)

A study of the basic principles of motion study concerning workplace design and related techniques involving process analyses, man-machine charts and micromotion study. Covers stopwatch time study techniques as well as predetermined time standards, work sampling and wage incentive system.

MNET 424 - Facilities Planning (1-2-2)

Prerequisites: MNET 318. Operational principles and techniques of plant design. Topics are plant organization, plant location, layout, materials handling, production planning and control, inspection, methods and standards.

MNET 426 - Manufacturing Project (1-3-2)

Prerequisite: Senior standing. A ?capstone? project requiring a formal written report and oral presentation.

MNET 491 - Special Projects in MNET (1 credit)

Special projects for MNET students with subject matter to be arranged by instructor and approved by program coordinator.

MNET 492 - Special Projects in MNET (2 credits)

See MNET 491.

MNET 493 - Special Projects in MNET (3 credits)

See MNET 491.

MNET 495 - Co-op Work Experience II (3 additive credits)

Prerequisites: MNET 395 or its equivalent, approval of the department, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience as a co-op/intern. Mandatory participation in seminars and completion of requirements that include a report and/or project.

MET 301 - Analysis and Design of Machine Elements I (2-2-3)

Prerequisites: Elementary strength of materials, calculus (AAS level), Physics I, C++ or BASIC. The principles of strength of materials are applied to mechanical design. Topics include theory of failure, stress concentration factors and fatigue, the design and analysis of shafts subjected to static and dynamic loadings, and critical speed of a rotating shaft.

MET 302 - Analysis and Design of Machine Elements II (3-0-3)

Prerequisite: MET 301. A continuation of MET 301, including analysis and design of power screws, brakes, clutches, belts, chain drives, gears, gear trains, bearings, and other machine elements.

MET 303 - Applied Thermodynamics (3-0-3)

Prerequisites: Calculus (AAS level), C++ or BASIC, Physics II. Basic principles of thermodynamics and their applications to internal combustion engines, turbines, compressors, power generating and refrigeration systems.

MET 304 - Applied Fluid Mechanics (2-2-3)

Prerequisites: Math 309, Physics II, calculus (AAS level), C++ or BASIC. An introduction to fluid statics and the basic laws of fluid flow; conservation of mass, momentum and energy. Applications of the basic laws to internal and external incompressible flow, including specific topics in pipe flow systems, centrifugal pumps and fans, streamlining, and fluid flow meters.

MET 307 - Plastics Technology (2-2-3)

Prerequisite: MET junior standing. An introduction to the basic concepts of plastics conversion, resin classification, processing techniques and significant engineering properties.

MET 308 - Plastics Processing Techniques (2-2-3)

Prerequisites: MET junior standing, MET 307. A study of the various processing techniques for both thermoset and thermoplastic materials. Topics include extrusion, injection molding, blow molding, compression moldings, and casting processes.

MET 314 - Dynamics of Machinery (2-2-3)

Prerequisites: Dynamics or kinematics (mechanisms), calculus (AAS level), C++ or BASIC. Acquaints students with motion and forces in machines. Topics include velocity and accelerations in linkages, gears, cam and gear trains, static and dynamic forces, and torques in linkages.

MET 395 - Co-op Work Experience I (3 degree credits)

Prerequisites: Junior standing, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report.

MET 401 - Mechanical Design Project I (2-0-2)

Prerequisites: , MET 302, MET 303, MET 304, MET 314, ECET 329, Eng 352. Project and lecture applies the principles learned in all technical courses to more advanced design situations. Proposal of a typical mechanical engineering system is presented by an individual or by small groups. The proposal must meet the approval of course instructor. A formal proposal is required.

MET 403 - Applied Thermodynamics II (2-2-3)

Prerequisites: Math 309, MET 303 or its equivalent, MET 304. Builds on a first course on thermodynamics and covers thermodynamic properties of steam, first and second law of thermodynamics. Topics include power and refrigeration cycles, psychrometric chart and combustion.

MET 404 - Applied Heat Transfer (2-2-3)

Prerequisites: Math 309, MET 303, MET 304. An introduction to the fundamental theories and applications of heat transfer. Emphasizes understanding and practical problem solving in covering the three fundamental modes of heat transfer: conduction, convection, and radiation.

MET 407 - Structural Design (2-2-3)

Prerequisites: C++ or BASIC, elementary strength of materials. Acquaints students with the fundamentals of structural design. Topics include analysis and design of structural members due to various loadings (tension, compression, bending, torsion, and shear), deflections of structural members, truss analysis, stress analysis of weldment.

MET 409 - AirConditioning and Refrigeration (2-2-3)

Prerequisites: MET 303, MET 304. Calculation of building cooling and heating loads, psychrometric charts, air distribution and duct design. Topics also include compression and absorption refrigeration cycles, automatic control of refrigeration systems, and building energy management.

MET 415 - Automatic Control Systems (2-2-3)

Prerequisites: MET senior standing. Introduction to programmable logic controllers (PLC) as a tool for industrial controls of machines and process. Includes selections of hardware and software, ladder logic programming, wiring methods, maintenance and trouble shooting of.

MET 448 - Mechanical Design Project II (0-2-1)

Prerequisite: MET 401. Continuation of project MET 401. Oral presentation and formal written report are required.

MET 491 - Special Projects in MET (1-0-1)

One-credit special project course for MET students. Must have an instructor agreeing to sponsor the project. Approval by program coordinator is required.

MET 492 - Special Projects in MET (2-0-2)

Two-credit special project course for MET students. Must have an instructor agreeing to sponsor the project. Approval by program coordinator is required.

MET 493 - Special Projects in MET (3-0-3)

Three-credit special project course for MET students. Must have an instructor agreeing to sponsor the project. Approval by program coordinator is required.

MET 495 - Co-op Work Experience II (3 additive credits)

Prerequisite: MET 395. Approval of the department, and permission of the Office of Cooperative Education and Internships. Full-time work experience for approximately one semester. Provides major-related work experience. Mandatory participation in seminars and completion of requirements that include a report and/or project.

SET 207 - Evidence and Procedures for Property Surveys (3-0-3)

Prerequisites: CE 200. Introduction to surveying law and to the concept of evidence related to boundary locations as discoverable on the ground and through deeds or other written records. Understanding of the principles of property law, titles, land ownership, transfer of land ownership, deed descriptions, evidence recovery and conflict resolutions.

SET 301 - Route Surveying (Surveying III) (3-3-4)

Prerequisites: Two courses in surveying (AAS level). Horizontal and vertical curves computation and layout with regard to highway design. Special emphasis on complex curves. Topics include control, positioning, error analysis, highway design problems, and layout. Also included is a review of the concepts of right-of-way surveys.

SET 302 - Geodetic Control Surveying (Surveying IV) (3-3-4)

Prerequisites: Two courses in surveying (AAS level). A study of the higher order methods and techniques of surveying such as Global Positioning System (GPS) with observations of HARNs, 1st, 2nd and 3rd Orders of Accuracy along with the requisite computations to reduce these observations to measurements and the applications of these measurements to the State Plane Coordinate systems and the geoid.

SET 303 - Photogrammetry and Aerial Photo Interpretation (3-3-4)

Prerequisite: Junior standing. A review of the principles of photography, including the physical science of optics as related to the use of aerial photos, to engineering and land surveying projects. Includes the necessary mathematics of photogrammetry and the process of designing and establishing the required data for proper acquisition of photogrammetric information.

SET 304 - Adjustment Computations I (4-0-4)

Prerequisites: Unified Calculus. A course designed to give the student the necessary knowledge to reduce survey observations to measurements; to analyze the data to determine the relationship of adjusted measurements to the observations; to verify that the mathematical constraints have been met; and to introduce approximate and least squares adjustments of surveying observations.

SET 307 - Boundaries and Adjacent Properties (3-3-4)

Prerequisite: Junior standing. A course on legal principles regarding boundaries and the constructive solutions of the problems of boundary surveying by a consideration of deed descriptions and examples of their application to -surveying.

SET 401 - Fundamentals of Geodesy (Surveying V) (3-0-3)

Prerequisite: SET 302. Geodesy and its relation to surveying and other disciplines. Topics include geometric, physical and satellite geodesy. Also includes the concept of map projection.

SET 404 - Adjustment Computations II (4-0-4)

Prerequisite: SET 304. Introduction to the concepts of observations and models. A continuation of the theory of least squares and the mathematical weighting of observations. Also includes the statistical evaluation of least square results.

SET 407 - Boundary Line Analysis (3-3-4)

Prerequisite: SET 307. Develops the analytical synthesis of real property law, land surveying procedures, and scenario development compatible with current case law decisions for the development of most probable scenarios of boundary location for the court's consideration.

SET 420 - Land Information Systems (3-0-3)

Prerequisites: Course in CADD, or permission of instructor. Topics include the function and design of multipurpose cadastre systems; the components of a digital Geographical/Land Infor-mation System (GIS/LIS); overview on design, implementation and evaluation problems of LIS.

SET 435 - Land Surveying Field Exercise (0-8-3)

Prerequisite: SET 302 or permission of instructor. A ?real world? surveying project is carried out, presented with a descriptive request for a survey, similar to a common work order from a client. The student prepares a survey (work) plan, carries out the survey, completes data processing and submits a final map. The map will have two forms, a hardcopy surveying plate and a database in an LIS format.

SET 490 - Senior Project in Surveying (2-0-2)

Prerequisite: Senior standing. The student works on an individual surveying project guided by the department staff. The project should concentrate on a specific aspect of surveying, not necessarily on field measurements. Project includes library research, written report and oral presentation of findings.

TMT 301 - Digital Electronics for Telecommunications (2-2-3)

Studies the fundamentals of digital electronics including combinational and sequential logic. Emphasizes those signals and configurations commonly employed in telecommunication systems. Theory is reinforced in hardware and simulation laboratory exercises.

English: Offered by the Department of Humanities. See Humanities course list for faculty.

Eng 095 - General Skills in English as a Second Language (4.5-1-5)

Intended for students in need of extensive practice in speaking, listening, reading, and writing in English prior to enrolling in HSS 099S.

Eng 200 - Communicating in Organizations (3-0-3)

Prerequisite: HSS 101. Allows students to understand the need for writing in an information-based corporate culture. Students write intensively in a variety of forms for a variety of audiences. Attention is given to editing, graphic design, communications ethics, and desktop publishing. At the conclusion of the course, students prepare a portfolio of their work.

Eng 301 - Advocacy and the Law (3-0-3)

Prerequisite: Eng 300, SS 300. Offers opportunities to explore the retrieval and use of legal and law-related materials while developing skills in oral advocacy and in writing persuasive legal documents, such as motion memoranda and briefs. Includes learning to listen to participants in the legal process as well as developing effective styles and forms of speech in the classroom.

Eng 336 - Advanced Composition (3-0-3)

Prerequisite: HSS 101. Advanced written and oral communication. Involves writing assignments in a variety of rhetorical modes. Emphasis is on the writing process and on word processing as a tool for better writing.

Eng 339 - Practical Journalism (3-0-3)

Prerequisite: HSS 101. A descriptive and analytic survey of news systems. Assignments include practice in writing straight news items, sports writing, feature writing, science writing, interviewing, and editing?with emphasis on understanding methods. The survey of printed and broadcast news systems includes the influence of technological, economic, legal, ethical, and historical factors.

Eng 340 - Oral Presentations (3-0-3)

Prerequisite: HSS 101. Instruction and practice in effective oral presentations. Students deliver a wide range of presentations adapted to the needs of a variety of audiences. Topics include voice and diction, presentation skills, the effective use of visual aids, reporting technical mate-rial and audience analysis.

Eng 347 - Technical, Professional and Scientific Writing for Publication (3-0-3)

Prerequisite: HSS 101. A journalism course that prepares students to write and publish scientific or technical papers. Working with their interests and knowledge, students learn writing for popular and specialized audiences, journal conventions, publishing process, article marketing, and editing techniques. Includes editorial committees, guest speakers, and technical advisors.

Eng 352 - Technical Writing (3-0-3)

Prerequisite: HSS 101. An advanced writing course. Combines current theory with actual practice to prepare students as technical writers. Analyze complex communication situations and design appropriate responses through tasks that involve problem solving, rhetorical theory, document design, oral presentations, writing teams, audience awareness, ethical considerations, and gender equity issues.

Eng 353 - Electronic Publishing (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; Eng 352. Explores information structuring via print and digital media; how computer technology has influenced the ways in which information is presented in modern culture. Focuses on the optimal ways to prepare and present information for technical and commercial use. Important concepts such as visual literacy and effective design are discussed and addressed.

Eng 353A - Electronic Publishing Lab (0-3-2)

Prerequisites: HSS 101, HSS 202 or their equivalents; Eng 352 and Eng 353. Seminar and laboratory-based course designed for PTC majors; open to others with appropriate backgrounds and interests and permission of instructor. Follow up of Eng 353, explores information structuring via digital media, and how computer technology has influenced the ways in which information is presented in contemporary culture. Through guided interactive research, present information for technical and commercial use. Projects involve use of html editors, graphical software, and NJIT networks.

Eng 356 - Technical Writing in Distributed Environments (3-0-3)

Prerequisite: HSS 101. Prepare distance-learning students to communicate technical information in collaborative computer systems. Uses both real-time and asynchronous communication tools in tasks that involve problem solving, rhetoric, information design, writing teams, audience awareness, and ethical considerations. ENG 356 will satisfy the ENG 352 Technical Writing requirement for distance learning students whose academic majors require ENG 352.

Eng 360 - Collaborative Communication: Community and Global Perspectives (3-0-3)

Prerequisites: HSS 101, HSS 202, or their equivalents. The central focus is on the challenge for cooperative communication to solve local and global problems. Examines how technological advances have altered the way we gather resources to solve problems. Today's information is too vast, too diverse, and changes too rapidly to be used to solve social dynamics problems in traditional ways. Using the resources of all available technology--e-mail, video conferencing, satellite communications, etc.--the goal is to bring all stakeholders together in order to build consensus and/or solve problems.

Eng 364 - Theory of Rhetoric (3-0-3)

Prerequisite: HSS 101. Examines theories of rhetoric from ancient to contemporary times. Special attention is paid to Aristotle, Peter Ramus, James Kinneavy, Walter Ong, and -Jurgen Habermas. Focuses on the ways in which theories inform the practice of communication. In the course project, students design and conduct field research based on rhetorical theory.

Eng 369 - Creative Writing (3-0-3)

Prerequisite: HSS 101. Focuses on the complexities of creating literary texts. Analyzes student writing in genres such as fiction, creative non-fiction, poetry, and drama. Considers these genres from theoretical perspectives. Topics include character development, plot, dia-logue; meter, rhyme, figurative language; audience analysis, ethos, and narrative theory. Students write, edit and critique their own work with the aim of publication.

Eng 490 - Co-op Work Experience I (3-0-3)

Prerequisites: junior standing, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments are facilitated and approved by the co-op office. Requires mandatory participation in seminars and completion of a report.

Eng 491 - Co-op Work Experience II (3-0-3)

Prerequisites: Eng 490, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments are facilitated and approved by the co-op office. Requires mandatory participation in seminars and completion of a report.

Eng 496 - Senior Project (3-0-3)

Prerequisites: all PTC core courses, at least two PTC electives. For professional and technical communication majors only. Provides students with a capstone experience. Offers PTC students the opportunity to enhance their understanding of communication through their integration of skills and knowledge gained in prior courses. The resultant research thesis or field project, of substantial length and originality, represents the culmination of the undergraduate disciplinary experience. Utilizing both a seminar and workshop approach, entails intense and sustained collaboration between student and instructor, and cooperation among students.

21&62:350:254 - Literature and Politics in the Third World (3)

Revolutionary movements and literatures of the peoples and nations of the third world. The development of national liberation and socialist revolution in the historical context of colonization and its aftermath. Detailed exploration of exemplary literature and film from Africa, Asia, Latin America, and the Caribbean.

Entr 410 - New Venture Management (3-0-3)

Prerequisites: Mgmt 390, Mrkt 330, Fin 315. Provides an understanding of the process of start up and early stage management of new, technology based, small firms. Emphasis is on recognizing, evaluating and deciding on a new business idea, as well as preparation for and management of the start up process. Preparation and execution of a new business plan.

Entr 420 - Technological Entrepreneurship (3-0-3)

The course is organized around three fundamental issues that entrepreneurs need to understand: 1) how innovations evolve over time, 2) how and whys some innovations are successful and some are not and 3) how one manages a new venture that was formed to develop new technologies. It is intended to help students understand the issues associated with a new venture and to develop a business plan to launch a technology based firm.

Entr 430 - Entrepreneurial Strategy (3-0-3)

Prerequisites: HRM 301, Mrkt 330, MIS 345, Fin 315, Acct 317, OM 375, Mgmt 491. Integrates knowledge of the different aspects of business learned in previous course work. In addition, provides an understanding of the decisions that guide the overall operations of a business organization and how the organization interacts with its markets, competitors, and suppliers. For the student who is considering starting or managing a small business. Combines classroom instruction in business strategy along with case analysis of small firms.

Environmental Engineering: Offered by the Department of Civil and Environmental Engineering. See Civil Engineering course list for faculty.

EnE 262 - Introduction to Environmental Engineering (3-0-3)

Prerequisites: Chem 126, Math 112, and Phys 121. Introduction to the integrated engineering, design and management concepts of environmental facilities. Topics include environmental regulations and standards, environmental parameters, mass balance and natural systems, water quality management, water and wastewater treatment, air pollution, noise pollution, and solid and hazardous waste management. Presentations of written reports are required.

EnE 360 - Water and Waste Water Engineering (3-0-3)

Prerequisites: EnE 262 and junior standing. Training in the methods used for water pollution control. Topics include the chemical, physical, and biological processes that occur in waste treatment design and in receiving waters; modeling schemes to determine allowable loadings in various bodies of water; and waste treatment processes used for water pollution control.

EnE 361 - Solid and Hazardous Waste Engineering (3-0-3)

Prerequisites: EnE 262 and junior standing. Exposure to the area of air pollution control, solid waste disposal, and radioactive waste disposal. Topics include the chemistry of contaminated atmospheres; the influence on meteorological conditions of dispersion of pollutants; abatement processes used in the control of emissions; classification and nature of solid waste, and solid waste disposal techniques; sources and methods for the disposal of radioactive contaminants; and related health effects.

EnE 491H - Honors Research Experience in Environmental Engineering (3-0-3)

Prerequisites: Junior standing, agreement of a department faculty advisor, and approval of the associate chairperson for undergraduate studies. This course provides the student with an opportunity to work on a research project under the individual guidance of a member of the department. A written report is required for course completion. Open to students with a GPA of 3.0 or higher.

Financial Management: Offered by the School of Management

Fin 315 - Principles of Financial Management (3-0-3)

Prerequisites: Acct 115, Acct 116. Principles of funding the business enterprise domestically and internationally with an emphasis on technology-based organizations. Topics covered include access to capital, means of long- and short-term financing, financial instruments, capital budgeting, and analysis of financial statements. Extensive use of electronic spreadsheets.

Fin 401 - Securities in Financial Markets (3-0-3)

This course offers a quantitative approach to evaluating fixed income securities and to managing bond portfolios. Specific topics include: modern theory of bond pricing, pricing of high risk bonds, derivatives, and risk management.

Fin 402 - Financial Risk Measurement and Management (3-0-3)

This course offers an in-depth analysis of the measurement and management of risk in financial markets. Topics include: assessing overall market risk, credit risk, liquidity risk, settlement risk, volatility risk, measuring portfolio risk, and extreme value risk.

Fin 403 - Financial Statement Analysis (3-0-3)

This course offers comprehensive coverage of analysis of financial statements so that students can: a) evaluate the financial position of a firm; b) assess the firm's inherent value and the value of its securities; c) assess the firm's obligations and its ability to meet them; and d) analyze sources and uses of cash.

Fin 404 - Financial Management Using ERP Systems (3-0-3)

Enterprise Resource Planning (ERP) systems are covered in-depth as tools for increasing a firm's profitability, reducing its costs, and for improving its competitiveness. ERP platforms from PeopleSoft and Microsoft as used throughout the course to demonstrate financial management using integrated, firm wide information systems.

Fin 416 - Corporate Finance (3-0-3)

Prerequisite: Fin 315. Advanced corporate finance with an emphasis on the financial management of technology-based organizations. Case studies are used for comparative analysis. Emphasis is on organizational productivity and profitability.

Fin 422 - International Finance (3-0-3)

Prerequisite: Fin 315. Introduction to the international financial management of the firm with an emphasis on technology-based organizations. Topics covered include hedging currency risk, capital budgeting internationally, raising funds internationally. Global competitiveness is addressed with comparative analysis of the financial management practices of American, European and Japanese firms.

Fin 423 - Risk Analysis (3-0-3)

Prerequisite: Fin 315. The management of risk in the business enterprise. Topics include meas-urement of risk and hedging strategies, sources of liability, property and liability insurance, and insurance administration.

29:390:315 - Investments (3)

Prerequisite: 29:390:329. Introduction and analysis of the dimensions of risk and return. Portfolio theory and its application in the management and performance evaluation of investment poartfolios. Equilibrium theories of risk and return capital asset pricing model and the arbitrage pricing model. Interest rate theory, yield curve, linkage between short-term and long-term rates, credit risk, and interest rate risk. Analysis of individual securities: money market securities, bonds and mortgage-backed securities, common and preferred stocks, and derivatives' futures and options.

29:390:329 - Finance (3)

Prerequisites: 29:010:202, 21&62:220:101, 102, 231, 29:623:220, and junior standing. Financial concepts and methods of analysis. The time value of money and its relation to such concepts as net present value and internal rate of return. Principles of valuation. Financial markets. The use of capital budgeting, management of cash-flow, and working capital management.

29:390:386 - Futures and Options (3)

Prerequisite: 29:390:329. Introduction to derivatives' futures and options contracts on commodities, interest rates, and equities. Historical development, institutional features, and economic functions of the futures and options markets. Pricing of the contracts. Understanding the role of expectations, arbitrage, and the relationship to their cash market counterparts. Analyzing risk exposures and exploring the hedging and speculative potential of the markets. Implementing and evaluating hedges in commodity, interest rate, and equity markets.

FOS 301 - Introduction to Forensic Science (3-0-3)

Emphasizes the recognition, identification, individualization, and evaluation of physical evidence by applying the natural sciences law to law-science matters. Covers basic principles, types of evidence, and the role of forensic science in criminal and civil investigations.

FOS 310 - Criminal Investigation (3-0-3)

Presents the rules and procedures of preliminary and follow-up investigations, the art of inter-rogation, recording of statements, confessions, and the collection and preservation of physical evidence at the crime seen. Examines methods used in scientific interpretation of evidence and the preparation of criminal cases for trial.

FOS 311 - Criminal Law (3-0-3)

Prerequisite: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Introduction to the scope, purpose, and definitions of substantive criminal law. Covers criminal liability, major elements of statutory and common law crimes and -offenses, and significant defenses. Analyzes the behavioral principles that apply to criminal cases and the criminal law system as a means to influence human behavior.

FOS 312 - Forensic Principles of Evidence (3-0-3)

Prerequisite: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Introduction to forensic evidence and its relationship to the criminal justice system: rules, pre-trial and trial techniques emphasizing the procedure, evidentiary, tactical, and ethical process; admissibility and standards; witnesses, testimony, search and seizure, confessions, and eye witness identifications.

French: Offered by the Department of Classical and Modern Languages and Literatures at Rutgers-Newark. See Classics course list for faculty.

21:420:101-102 - Elementary French (3,3)

Intended for students with little or no previous knowledge of French. Both terms must be completed to receive credit. The fundamentals of grammar with drill in speaking and reading. A minimum total of ten hours of language laboratory work per term is required in NCAS elementary language courses.

21:420:311,312 - French Literature in English Translation (3,3)

Prerequisite: 21&62350:102. Open to all students except French majors. In-depth reading of major works in French literature; content varies each term. When the theme of ?Sexual Politics in the Novel as Drama? is taught, 3 credits toward the women's studies minor are granted. Other themes include ?The Novel as Social Document? and ?The Many Faces of Love in Various Genres.?

62:420:131,132 - Intermediate French (3,3)

Practice in speaking, reading, and writing French; review of grammar; readings from representative authors and contemporary French texts. Students are urged to do supplementary work in the language laboratory.

Geology: Offered by the Department of Geological Sciences at Rutgers-Newark

21&62:460:103 - Planet Earth (3)

Not open to students who have taken 460:101. The earth as a dynamic, evolving planet; its origin and nature considered as the interaction of solid earth, hydro-sphere, and atmosphere; physical geology of our planet and the complex problems of environment and natural resources.

21&62:460:104 - Planet Earth Laboratory (1)

Pre- or corequisite: 21&62:460:103. Laboratory exercises on the following: the physical properties and identification of earth materials (materials and rocks); the use of maps and aerial photographs in the study of landforms and earth processes. Field trips to field stations in New Jersey and New York.

21&62:460:106 - Environmental Geology (3-0-3)

Prerequisite: 21&62:460:103. Geologic controls on environmental problems and methods for mitigation are studied in a topical approach and with emphasis on urban-suburban settings. Topics include groundwater pollution and processes, soil pollution, air pollution and weather, slope stability, radiation, earthquake hazards, and coastal processes.

21&62:460:206 - Environmental Geology (3)

Prerequisites: 21&62:460:103,104. For science majors only. The geologic controls on environmental problems and methods for mitigation are studied in a topical approach and with emphasis on urban-suburban settings. Topics include groundwater pollution and processes, soil pollution, air pollution and weather, slope stability, radiation, earthquake hazards, and coastal processes.

21&62:460:207 - Environmental Geology Laboratory (1)

Pre- or corequisite: 21&62:460:206. For science majors only. Applied hands-on exercises to demonstrate the processes of groundwater movement, slope stability, soil pollution, water chemistry, air pollution and weather, evolution, and earthquakes. One class field trip held.

21&62:460:309 - Geomorphology (3)

Lec. 2 hrs., lab. 3 hrs. Prerequisite: 21&62:460:322 or permission of instructor. A study of landform-making processes and their relation to climate and structure, as illustrated by landscapes and their elements.

21&62:460:311 - Geologic Field Problems (3)

Prerequisite: 21&62:460:314 or permission of instructor. Geologic field methods, the collection and recording of data in the field in a variety of geologic terrains; preparation of a geologic map and technical reports based on individual fieldwork.

21&62:460:320 - Structural Geology (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:460:321 or permission of instructor. Stress/strain and deformation of the earth and resultant structures; field and laboratory work in structural analysis and projections (stereographic, map, cross-section); basic mechanics and material science; structures of mountain belts, rifts, and other tectonic settings.

21&62:460:321 - Mineralogy (4)

Lec. 3 hrs., lab. 3 hrs. Prerequisite: 21&62:460:113 or 114 or permission of instructor. Introductory study of minerals; their origin, occurrence, crystal systems, properties, and uses; emphasis on sight identification based on simple physical and chemical tests; X-ray analysis methods.

21&62:460:406 - Applied Geophysics (3)

Lec. 2 hrs., lab. 3 hrs. Prerequisites: 21&62:460:114,115, 21&62:640:114 or 21&62:640:119,120; or permission of instructor. Theory and practical application of geophysical prospecting methods including seismology, reflection and refraction seismology, gravity, magnetics, and resistivity. Field use of geophysical equipment.

21&62:460:427 - Hydrogeology (3)

Lec. 2 hrs., lab. 3 hrs. Prerequisite: 21&62:460:322 or permission of instructor. Geologic factors influencing the occurrence and distribution of surface and ground water and its effects on man; principles of hydrology; water-systems analysis and planning; water quality and pollution; exploration and development of water resources; field studies in New Jersey.

History: Offered by the Federated History Department of NJIT and Rutgers-Newark

HIST 213** - The Twentieth-Century World (3-0-3)**

Prerequisite: HSS 101. Uses case studies to provide an interdisciplinary view of the 20th-century world. Selected literary, philosophical, and artistic movements are discussed in the context of the major historical developments of the century. This course satisfies three credits of the GUR in Cultural History. Honors Note: See HSS 101.

Hist 125 - Mapping Human History (3-0-3)

An introduction to the relationship of time and space in human history, using selected case studies drawn from a wide range of historical periods and places. Students learn to read and use maps, with a particular emphasis on the critical examination of evidence.

Hist 334 - Environmental History of North America (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. The history of interactions between humans and their natural environment on the North American Continent. Considers perceptions of, use of, and alteration of the environment. Traces the cultural, intellectual, economic, political and technological transformations from early colonial times to the late 20th century. Addresses the diverse environmentalisms that have emerged the last several decades.

Hist 341 - The American Experience (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. American history from the colonies to the 20th century, with concentration on several selected themes basic to an understanding of the changing cultural patterns and social values of American civilization.

Hist 343 - African-American History I (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Introduction to African-American history from pre-colonial West Africa to emancipation in the mid-19th century. Topics include the African slave trade, the economics and politics of slavery, gender and culture in the slave community, and the free black experience in both the north and south.

Hist 344 - African-American History II (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Introduction to African-American history from the mid-19th century to the present. Covers race relations and the civil rights movement, as well as migration, black social and political thought, gender roles, and class formation.

Hist 345 - Communication through the Ages (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Modes of communication, ancient and modern, in their social and cultural context?from cave painting to computers. Topics include literacy and economic development in the West; the technological revolution in media beginning with Daguerre, Samuel Morse, and Alexander Graham Bell; the institutional development of mass media and popular culture; and contemporary trends in world communication and interaction.

Hist 351 - Ancient Greece and the Persian Empire (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. The political, institutional, and cultural developments of Ancient Greece and the Persian Empire from the Mycenaean period to the King's Peace (386 B.C.).

Hist 352 - The Hellenistic States and the Roman Republic (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. The political and cultural developments of the Hellenistic states and their influence on the Republic of Rome to 30 B.C.

Hist 359 - History of the Middle East I (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. The political, cultural, and institutional developments in the Middle East from the Parthians to the capture of Constantinople by the Ottoman Turks. Four periods will be analyzed: the Parthian, the Sassanid Persian, the Caliphate, and the Seljuk and Ottoman Turks.

Hist 360 - History of the Middle East II (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. The political, cultural, and institutional developments in the Middle East from the capture of Constantinople by the -Ottoman Turks to the impact of the Arab-Israeli conflict on the world today.

Hist 361 - The Founding of the American Nation (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. North America in the colonial and revolutionary periods, with emphasis on patterns of cultural and institutional development from early settlement through the ratification of the Constitution.

Hist 363 - The United States as a World Power (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. American domestic and foreign policy in the 20th century. Topics include imperialism, the Progressive Era, the Depression, the New Deal, World Wars I and II, the Cold War, America and the world today.

Hist 365 - Comparative Colonial History (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. A comparative analysis of the relationship between expanding Western nations and selected regions of Africa, Asia, and South America, from 1500 to 1970. A case study approach illuminates key historical processes, with a special emphasis on economic development and cultural change in colonial settings. Topics include European perceptions of culturally different peoples, race relations in colonial societies, forms of rebellion and resistance to European rule, nationalist movements.

Hist 366 - Gender, Race and Identity in American History (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Surveys the social construction of gender in America from the s17th century to the present. Examines the changing gender roles and relations that have characterized and structured the historical experiences of different racial and ethnic groups. In a multicultural framework, covers the impact that colonization, industrialization, slavery, immigration and migration, urbanization, war, and social movements have had on the ways that women and men think of themselves in terms of gender as well as their respective roles in families and larger social networks.

Hist 368 - Comparative Economic History (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. A comparative analysis of the history of economic development, with particular attention to industrialization, shifting patterns of global trade, and changing labor markets. Topics include the Industrial Revolution, the rise of the world economy, the transformation of non-Western economies, labor migration, and newly industrializing countries.

Hist 369 - Law and Society in History (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Uses historical case studies to illustrate and evaluate various approaches to the study of law and society. Topics include criminality and the rise of incarceration as a legal penalty in the 19th century; the comparative law of slavery; and the evolution of American Indian law.

Hist 372 - Contemporary Europe (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. European society in the 20th century, Nationalism, imperialism, totalitarianism, movements toward European unity, and prominent cultural developments.

Hist 374 - Modern Russian Civilization (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Russia under the last tsars, the 1917 upheavals, rise of the Soviet state to world power under Lenin, Stalin, and others, until the collapse of the communist dictatorship.

Hist 377 - Cities in History (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Examines social, cultural and economic changes in urban areas. Regions and themes vary and may include urbanization in Europe, the rise of cities in Latin America, and urban change in contemporary America.

Hist 379 - History of Medicine (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Focuses on the evolving institutions, values, concepts, and techniques through which doctors attempted to control the impact of disease and preserve the health of Americans, beginning with the shaman and colonial physician through post-World War II changes in the system of medical care.

Hist 380 - History of Public Health (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Attempts to protect the health of human populations from the Black Death in medieval Europe to recent threats from epidemics and chemical and biological terrorism. Shiftings patterns of disease and the emergence and growth of public health as a domain of expert knowledge and policy. Topics include: epidemiology and statistical modes of inquiry; the tension between civil liberties and public health; the economics of health and disease; and the relationship between medicine and public health.

Hist 381 - Germs Genes & Body: Sci. & Tech. in Modern Medicine (3-0-3)

Examines how science and technology came to play critical roles in the rise of modern medicine. Readings, lectures, and discussion focus on the specific innovations in ideas, practices, and technologies that helped transform Western medicine in the 19th and 20th centuries. The course also considers how medicine and the biomedical sciences both inform and reflect attitudes about the human body in Western society. **Effective From: Spring 2005**

Hist 382 - War and Society (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents.The evolution of warfare and the impact of war on political, economic, cultural, and social institutions, including the two World Wars and post-1945 conflicts.

Hist 383 - The Making of Modern Thought (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. The formation of contemporary images of human nature since the mid-19th century. Emphasis on Marx, Darwin, and Freud and their legacy to 20th century thought. Theories of the family, sexuality, and the changing role of women in society are explored.

Hist 385 - Technology and Society in European and World History (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. An introduction to the social history of European and global tech-nology from the Middle Ages to the second Industrial Revolution of the late 19th century. Emphasis on such themes as the process of technological innovation, the nature of technological systems, the diffusion of technology, the interaction of Western and non-Western technology, the changing relations of science and technology, and the role of technology in broader historical movements.

Hist 386 - Technology in American History (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents.Survey of the history of American technology emphasizing the social and economic environments of technological change. Topics include the transfer of technology in building canals and cities, the rise of the factory system, the emergence of the American system of manufacture, and the development of major technological systems such as the railroad, telegraph, electric light and power, and automobile production and use. Focus on the professionalization of engineering practice, the industrialization of invention, and the growing links between engineers and corporate capitalism in the 20th century.

Hist 388 - Britain in the 20th Century (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. A survey of British history from the death of Queen Victoria to 1964 with emphasis on the social and political trans-formation resulting from Britain's declining economy and world position. Topics include: the causes and impact of the two World Wars, the transition from liberal democracy to welfare state, the turn from Empire to Europe, social and economic trends as well as foreign -relations.

Hist 390 - Historical Problems of the 20th Century through Film (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. A study of selected problems in the 20th century using film as a ?window into history.? Such topics as the rise of Nazi Germany, America in the thirties, World War II and American society, the development of cities, and the emergence of the ?Third World? will be considered. In any one semester only two topics will be selected for study. The material for the course will include documentary films, newsreels, TV news films, and theatrical feature films as well as selected readings.

Hist 401, 402 - Independent Studies in History (1-0-1, or 2-0-2, or 3-0-3)

Prerequisites: junior or senior standing; and before registering, permission from one of the following: NJIT history department chairperson, associate chairperson or history minor advisor. Pursuit of special interests in history not covered in a regular elective course. A history faculty member provides guidance and assigns readings and papers.

Hist 489H - Senior History Honors Seminar: Readings (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Limited to senior history majors who are enrolled in the Albert Dorman Honors College or who receive permission from the undergraduate history advisor. Meets with 510:489 but includes more advanced readings.

Hist 490H - Senior History Honors Seminar: Research (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HSS 213 or their equivalents. Limited to senior history majors who are enrolled in the Albert Dorman Honors College or who receive permission from the undergraduate history advisor. Meets with 510:490 but includes more rigorous research and writing requirements.

510:201-202 - History of Western Civilization (3,3)

Both terms must be completed to receive credit toward the history requirement. The main developments in history of ideas and institutions from earliest times to the present; consideration of historical material serves as a point of departure for discussion of present-day problems.

510:207,208 - History of Latin America (3,3)

Survey of the Indian and Iberian background of Latin America; conquest and colonization; cultural clash and fusion; institutions and economic activities of the colonial period; the wars of independence; political, economic, social, and cultural history and international relations of the Latin-American countries to the present.

510:226,227 - Topics in History (1.5,1.5)

Mini courses run either twice a week for seven weeks or once a week for fourteen weeks; topics change from year to year; courses may not be used to fulfill any distribution requirement, but may be used as general credit for graduation; information about topics may be obtained from the department chairperson.

510:235,236 - The Ancient World (3,3)

Civilization of the ancient Near East and of the Mediterranean littoral from their emergence during the fourth millennium B.C. to the fall of the Roman Empire in the West; political, social, and economic life of the ancient peoples; the evolution of religions, law, science, and the arts.

510:249 - An Introduction to China (3)

Development of Chinese civilization from the past to the present, with reference to geographical implication, government structure, social institutions, economy, literary development, and Asian-American heritage.

510:263,264 - History of Africa (3,3)

Political, religious, economic, and social development of the peoples of Africa south of the Sahara from about 500 A.D. to the present.

510:287,288 - History of Islamic Civilization (3,3)

The history, culture, and institutions of the Islamic world, from the age of the prophet Muhammad to the present. First term: evolution of classical Islamic civilization in its Near and Middle Eastern heartland. Second term: the Ottoman, Safavid, and Mughal empires; Islam in central, east, and southeast Asia; traditional Islamic society, and the problems of colonialism, imperialism, and modernization.

510:297,298 - Far Eastern History (3,3)

Major developments in Far Eastern history, particularly in China and Japan, from early times to the present; cultural, economic, and political aspects and contemporary problems.

510:317 - History of the Caribbean (3)

Caribbean history from the colonial period to the present; the development of a sugar economy; the competition among foreign powers for control; 19th-century struggles for independence; contemporary social upheavals.

510:319,320 - The Classical World: Greece and Rome (3,3)

The political, intellectual, and cultural development of the Greek, Hellenistic, and Roman civilizations.

510:321 - Military History of the Western World (3)

History of warfare in the western world from the Middle Ages to the 20th century. Interrelationships between technological, economic, political, and social developments. A society's warfare as a reflection of that society.

510:323,324 - History of Puerto Rico (3,3)

History of Puerto Rico from the Pre-Columbian period to the 19th century; Taino, Spanish, and black civilizations and their significance in the evolution of Puerto Rico's national consciousness.

510:325 - History of Mexico and Central America (3)

Historical development of Mexico and Central America from the pre-Columbian civilizations to the present. Contemporary issues affecting the region.

510:327,328 - Civilization of the Middle Ages (3,3)

Western Europe from the Barbarian invasions to the close of the 13th century; the structure of society and its economic organization; readings provide a basis for the study of feudalism, agrarian life, and the rise of the towns; religious developments and conflicts, church-state relationships, the Crusades; the rise of the feudal monarchies; cultural achievements.

510:329,330 - Civilization of Medieval Eastern Europe and the Near East (3,3)

History and civilization of the Later East Roman/Byzantine Empire; the Islamic lands of the Eastern Mediterranean and Slavic Eastern Europe in the Middle Ages.

510:331,332 - British History (3,3)

British history from the Roman occupation to the present; emphasis on the interrelationship between constitutional and social developments. First term: medieval England and the Tudor-Stuart period. Second term: changes in politics and society resulting from the industrial revolution.

510:333 - History of Imperialism (3)

The historical background of imperialism; the expansion of empires; the effects on the relations among the great powers; the development in the colonial territories since World War II.

510:334 - 20th-Century Fascism (3)

The roots of fascism and its triumph in Germany and Central Europe in the 20th century; the rise of fascism viewed against a background of declining liberalism, the growth of socialism, and other nonliberal political movements; the role and nature of fascism and neo-fascism since World War II.

510:335,336 - History of Socialism and Communism (3,3)

Socialist and communist movements, with emphasis on their origins, development, and major social-political implications in the nineteenth and 20th centuries. First term: the Industrial Revolution; the emergence of an urban proletariat; the origins of socialist movements, their development and role within individual countries, and their attempt to forge international unity before World War I. Second term: the impact of World War I and the Russian Revolution on socialist movements; the relations between socialist and communist parties during the interwar period; the expansion of socialist and communist influence after World War II.

510:337 - The History of Iran (3)

History of Iran from ancient times to the present; the forces that have shaped modern Iran.

510:338 - The Ottoman Empire (3)

History of the Ottoman state from its origins as a Ghazi state (13th century) to its collapse in the twentieth century; the Ottoman impact, politically and culturally, on the peoples of Eastern Europe.

510:340 - Women in European History (3)

Changes in women's economic, social, and legal position from classical times to the pres-ent; women and the family; women and the Industrial Revolution; witchcraft; women in politics, war, and revolution; women under socialism and fascism; women and sexuality; the development of the modern feminist movement.

510:341,342 - The Age of the Corporation: 1880 - 1920 (3,3)

The great transformation wrought by the French and Industrial Revolutions; the emergence of modern concepts of democracy, popular sovereignty, nationalism, liberalism, republicanism, and socialism; advent of industrial societies in England and on the continent, and the creation of a revolutionary tradition throughout Europe.

510:343,344 - Renaissance and Reformation (3,3)

Features of European civilization in the 15th and 16th centuries, and of representative modes of feeling and thought. First term: political and cultural developments in Italy. Second term: the great religious revolt of the 16th century in northern Europe and its political and cultural repercussions.

510:346 - Medieval Legal History (3)

Legal systems of continental Europe; the barbarian law codes; church penitentials and canon law; medieval Roman law; feudal and manorial customs; mercantile law; commercial custom; urban and royal law.

510:349,350 - Modern European Diplomatic History (3,3)

The development of the diplomatic institutions, practices, and interests of the European states; relates diplomacy to internal developments in the various states from 1815 to modern times.

510:351,352 - History of France (3,3)

First term: survey of French history from the late middle ages through the French Revolution: Second term: French history from 1815 to the present. Emphasizes ideas, politics, culture, and the development of national cohesion and identity.

510:353,354 - Modern China (3,3)

Evolution of the Chinese nation from the Opium War to the establishment of the People's -Republic; problems arising out of rebellion, reform, and revolution discussed in connection with modernization and acculturation.

510:355 - Traditional China: Institutions and Society (3)

Chinese history from the Shang to the Ming dynasties (1766 B.C.?1643 A.D.); patterns of social change and social mobility; feudalism; dynastic cycles; modernization; Oriental Despotism.

510:356 - History of the People's Republic of China (3)

The revolutionary experience of the Chinese people; the efforts of the Chinese communists to modernize the nation; the processes and problems of adapting to a communist system.

510:357,358 - Modern Europe: War and Revolution (3,3)

Significant political, economic, social, and diplomatic developments during the past century. First term: industrialization, imperialism, and international rivalries before 1914. Second term: readjustment efforts after 1918; the rise of totalitarianism, World War II; the Cold War.

510:361 - The Near and Middle East (3)

Introduction to the modern Near and Middle East. Review of the formation of classical -Islamic civilization in the region. Political, economic, social, and ethnic problems resulting from Western influences and the dismemberment of the Ottoman empire. Modern Iranian development and the creation of Israel.

510:364 - Contemporary Issues in Puerto Rican History (3)

Prerequisite: 510:324. Selected topics in contemporary Puerto Rican history, covering both the island community and the Puerto Rican community in the United States since 1945. Emphasis on the modernization of the economy, political evolution of self-government, and social problems that brought about the exodus of nearly one-third of Puerto Rico's population.

510:366 - History of Poland (3)

History, social concerns, and culture of Poland and the Polish people from the time of their conversion to Christianity and early kings to the present.

510:367,368 - History of Russia and the Soviet Union (3,3)

First term: Russian politics and civilization from the founding of Kiev to 1864. Second term: the history of Russia from 1865 to the present time, with emphasis on Soviet affairs.

510:369 - Modern Eastern Europe (3)

Political, social, and cultural developments in Eastern Europe in the seventeenth, eighteenth, and nineteenth centuries; 20th century, World War I, the revolutions, the successor states, and their relations with the U.S.S.R.

510:370 - History of Modern Ukraine (3)

Ukrainian history from the 16th century to the present. Emergence of Cossacks, the religious controversy, the rise and fall of the Cossack State, and the national revival in the 19th century.

510:371,372 - Intellectual and Cultural History of Modern Europe I, II (3,3)

A study of the major currents of thought?political, religious, social, economic?from the Renaissance to the present.

510:373 - The English Novel in History (3)

The novel as a reflection of English society during the last 150 years; emphasizes the historical development of Great Britain.

510:379 - Colonialism and Decolonization (3)

The final century of colonialism, focusing on imperialist thought and justifications for empire, mutual perceptions of colonizers and colonized, and the growth of anti-imperialism.

510:380 - History of the Mass Media in Europe (3)

History of cinema, radio, and television in 20th-century Western Europe. Initial reactions to these new media and their impact on society and culture.

510:385,386 - A History of Southern Africa (3,3)

History of southern Africa from 1000 A.D. To the present; pre-colonial African societies; European colonization; European impact; industrial development; the Zulu and Boer Wars; the evolution of apartheid; the African nationalist movements.

510:391,392 - The History of Germany (3,3)

Germany from the 18th century to the present. First term: the rise of Prussia, the impact of the French Revolution and the Empire, the growth of nationalism and liberalism, the Revolution of 1848, and unification. Second term: internal developments, foreign policy, and intellectual movements after 1871; examines Germany in the First World War, the Weimar Republic, the rise of Nazism, the drive for European domination in the Second World War, and the postwar era.

510:394 - The Peoples and Cultures of Central Asia (3)

Introduction to the history and cultures of the Iranian, Turkic, Mongolian, and Tungus-Manchu peoples of the Eurasian steppes and inner Asian borderlands of China from earliest times to the 17th century; the cultural significance of this region as the recipient of Chinese, Indian, Muslim, and Eastern Christian cultural and religious influences.

510:399 - Tudor-Stuart England (3)

Selected topics in British history from the accession of Henry VII through the Revolution of 1688; cultural, economic, political, and social issues; developments in the transition from medieval to early modern England; background of the empire.

510:401 - Topics in European History (3)

Prerequisites: 510:201,202 or permission of instructor.

510:402 - History of Spain and Portugal (3)

History of Spain and Portugal from their unification to the present, focusing on politics, culture, and the development of national and regional identities.

510:403 - Topics on Social History (3)

Prerequisites: 510:201,202 or permission of instructor.

510:404 - Topics in Intellectual History (3)

Prerequisites: 510:201,202 or permission of instructor.

510:431,432 - Topics in Africa in the Nineteenth and Twentieth Centuries (3,3)

Prerequisites: 510:201,202 or 510:263,264, or permission of instructor.

510:433 - Topics in Islamic History (3)

Prerequisites: 510:201,202 or permission of instructor.

510:435 - Topics in Medieval and Early Modern History (3)

Prerequisites: 510:201,202 or permission of instructor.

510:441,442 - Topics in Latin American and Caribbean History (3,3)

Prerequisites: 510:201,202 or permission of instructor.

510:449,450 - Topics in Asian, Chinese, and Far Eastern History (3,3)

Prerequisites: 510:201,202 or permission of instructor.

510:451,452 - Topics in the History of Eastern Europe and the Soviet Union (3,3)

Prerequisites: 510:201,202 or permission of instructor.

510:458 - Topics in Women's History (3)

Prerequisites: 510:201,202 or permission of instructor.

510:461 - Topics in Comparative History (3)

Prerequisites: 510:201,202 or permission of instructor.

510:479,480 - Readings in Non-American History (3,3)

Prerequisite: Written permission of department chairperson and instructor. Designed for the history major who desires to undertake extensive reading in a particular historical area, selected in close consultation with a member of the department. Limited to students whose grade-point average within the department is 2.0 or higher. Only one reading course may be taken during a term, and no more than 9 credits in reading courses may be applied toward the history major.

510:489 - Senior Seminar: Readings (3)

510:490 - Senior Seminar: Research (3)

510:491,492 - Honors Program in Non-American History (3,3)

Research and writing for candidates for honors in history.

510:497 - Honors Project: History (3)

Open only to honor students. Prerequisite: Permission of program adviser. An individual research project.

510:499 - Individual Study in Historical Research, Non-American(BA) ()

Prerequisite: Permission of department chairperson and instructor. Restricted to history majors in their senior year. Introductory historical research on a more systematic level than is normally possible in lecture courses.

512:121,122 - Community and Character in American History (3,3)

Introduction to the study of American culture. The relationship of the individual to the community. The development of individualism, the tensions between the individual and the community, and the creation of diverse communities divided by gender, race, and class.

512:201-202 - Development of the United States (3,3)

Both terms must be completed to receive credit toward the history requirement. Political, economic, and social phases of American history that have influenced or determined the development of the United States from 1607 to the present.

512:303 - Topics in the History of Newark (3)

Major economic, social, and political developments in Newark from 1830 to the present; focus on late 19- and 20th-century trends in demography, housing, and community development.

512:309,310 - A History of American Thought (3,3)

Origins and developments in American thinking on social, economic, and political questions and in the fields of the arts and sciences, religion, and philosophy.

512:311 - Colonial America (3)

The colonial origins of the United States and divergence from England; relations with the Indians; slavery; Puritanism and the waning and revival of religion; family and gender roles; role of the colonies in the British empire; and the transformation of colonial political culture, leading to the Revolution.

512:318 - Labor History (3)

The impact of industrialization on the work force in the U.S.; examines economic pressures; technological developments; immigration patterns; entrepreneurial policies; ethnic and black subcultures; the emergence of urban institutions as they relate to the working class and class consciousness.

512:330 - History of American Immigration (3)

The central role of immigration in American history; English migration in the 17th century, involuntary African migration in the 18th century, Irish migration in the mid-19th century, southern and eastern European migrations, Asian migration, and the more recent Mexican, Cuban, Puerto Rican, and West Indian migrations; comparisons and contrasts of experiences; the tensions of cultural assimilation and separatism and the concept of American national identity.

512:333,334 - Afro-American History (3,3)

The black American's role in the United States from the 17th century to the present.

512:337 - History of the Family in the United States (3)

The changing nature of the American family; the Puritan family; the Victorian family and the cult of true womanhood; the black family; childhood, marriage, and old age.

512:343 - The Creation of the American Republic (3)

The history of the United States from 1776 to 1820. The Revolutionary War, the writing of the Constitution, establishment of political parties, and contrasting philosophies of Jefferson and Hamilton. Emphasis on changes in religion, gender roles, race relations, social structure, and political thought.

512:344 - The Democratic Age in American History: 1820 - 1880 (3)

Development of democracy in America and its trial in the Civil War. Jacksonian democracy, revivalism and reform, slavery, abolitionism, the cult of true womanhood, and the growth of sectionalism. The origins, course, and consequences of the Civil War through the end of Reconstruction.

512:349 - Antebellum Reform Movements (3)

Explores the origins, evolution, and impact of evangelical, utopian, and philanthropic movements committed to the reform of American culture and institutions during the first half of the 19th century.

512:357,358 - American Economic and Business History (3,3)

Survey of the economic development of the United States from colonial times to the present; the nation's westward march; relationships between the American economy and the economies of other nations; the changing emphasis and growing complexity of American economic life.

512:361,362 - Urban History of the United States (3,3)

The history of the American city and its role in American social, economic, and political development.

512:365,366 - American Legal History (3,3)

The interaction between political and economic forces and the role of law in American history; readings from the fields of history, political science, and Constitutional development.

512:367 - The Age of the Corporation: 1880?1920 (3)

Survey of American history from 1880?1920, focusing on economic and societal transformation and the Populist and Progressive response. Industrialization, the rise of modern corporate power, and social and intellectual currents.

512:368 - Modern America (3)

Survey of the history of the United States between 1890 and 1945, with emphasis on immigration, migration, and battles waged over labor, leisure, and definitions of American identity.

512:369 - America in World War II and the Postwar Period (3)

The relationship between domestic politics, economic developments, and social change in a wartime situation that began with World War II and culminated with the Korean War; the international and domestic factors related to the rise of the cold war.

512:371 - Contemporary America (3)

Survey of the history of the United States from 1945 to the present, with emphasis on corporate liberalism, McCarthyism, the rise of suburbia, the Vietnam War, the counterculture of the 1960s, and the ?Reagan Revolution.?

512:373,374 - History of Women in the United States (3,3)

The role of women in American life from colonial times to the present; the nature of men and women and their relations; women's roles in social change; the organizational mechanisms by which their influence has been exerted.

512:383 - United States Foreign Policy in the Era of the Cold War (3)

Selected topics, such as the origins and nature of the cold war, the United States and the Arab-Israeli dispute, policy in Africa, Asia, and Latin America since 1945, and the Indo-China War.

512:385,386 - History of American Politics (3,3)

The formation and development of politics in the U.S.; function and history of political parties in America; changes in elections, campaigns, voting behavior, and the American party system; the rise of bossism and machine politics; periodic attempts to reform American politics.

512:395,396 - History of Science (3,3)

History of science in the United States from colonial times to the mid-20th century.

512:397,398 - American Foreign Affairs (3,3)

Analysis of American foreign policy from the colonial period to the present; emphasis on power politics, geopolitics, world trade, public opinion, and the interrelation between domestic and foreign affairs.

512:402 - Topics in American Intellectual History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:403 - Topics in American Political History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:404 - Topics in American Business and Economic History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:405 - Topics in the History of Science (3)

Prerequisites: 510:201,202 or permission of instructor.

512:408 - Topics in American Social and Cultural History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:410 - Topics in the History of American Foreign Policy and Diplomacy (3)

Prerequisites: 510:201,202 or permission of instructor.

512:438 - Internship: Administration of Historical Manuscripts (3)

Prerequisite: Permission of department chairperson. Basic principles and techniques of modern archives administration with emphasis on accession, appraisal, arrangement, description, and conservation. The practicum for this course may entail the full processing of a historical manuscript collection; requires approximately seventy hours.

512:452 - Topics in Legal History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:462 - Topics in Recent American History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:472 - Topics in Afro-American History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:473 - Topics in Women's History (3)

Prerequisites: 510:201,202 or permission of instructor.

512:499 - Readings in American History (3)

Prerequisite: Written permission of department chairperson and instructor. Designed for the history major who desires to undertake extensive reading in a particular historical area, selected in close consultation with a member of the department. Limited to students whose grade-point average within the department is 2.0 or higher. Only one reading course may be taken during a term, and no more than 9 credits in reading courses may be applied toward the history major.

**** Special Honors sections are available; permission of Honors College or Humanities Department required.

Humanities and Social Sciences: Offered by the Department of Humanities and Social Sciences

HSS 099 - English Composition: Reading, Writing, Speaking I (3-0-3 additive credit)

The first course of the two-semester sequence, HSS 099-HSS 100. Focuses on the reading, writing and speaking skills necessary for success in a university curriculum. Emphasizes reading strategies, understanding main ideas, classifying ideas according to their importance, inferring meaning, vocabulary development, preparing written and oral summaries, developing a thesis, and other steps toward writing expository essays including a research essay. Mandatory weekly writing labs are held in conjunction with the course work. **Effective Until: Summer 2005**

HSS 099S - English Composition: Reading, Writing, Speaking I (6-0-6 additive credit)

The first course of the two-semester sequence, HSS 099S-HSS 100S. Intended for students for whom English is a second language. Focuses on the reading, writing and speaking skills necessary for success in a university curriculum, while strengthening English language proficiency. Emphasizes reading strategies, understanding main ideas, vocabulary development, grammar, developing a thesis, organizing an essay, and writing different kinds of expository essays, including a research essay. Mandatory weekly writing labs are held in conjunction with the course. **Effective Until: Summer 2005**

HSS 100 - English Composition: Reading, Writing, Speaking II (3-0-3)

Prerequisite: HSS 099. The second course of the two-semester sequence, HSS 099-HSS 100. Focuses on essay writing strategies, clear expression, correct syntax, grammar and diction; basic organizational principles, researching ideas, documenting reference sources, reading longer, more complex material, determining flaws in an argument, and presenting group oral reports. Mandatory weekly writing labs are held in conjunction with course work. The sequence HSS 099-HSS 100 satisfies the English GUR. **Effective Until: Summer 2005**

HSS 100S - English Composition: Reading, Writing, Speaking II (3-0-3)

Prerequisite: HSS 099S. The second course of the sequence, HSS 099S-Hss 100S. Continues the development of English language proficiency at a more advanced level and focuses on essay writing strategies, clear expression, correct syntax, grammar and diction, basic organizational principles, research ideas, documenting reference sources, reading longer complex material, and presenting oral reports. Mandatory weekly writing labs are held in conjunction with the course work. The sequence HSS 099S-HSS 100S satisfies the English GUR. **Effective Until: Summer 2005**

HSS 101** - English Composition: Writing, Speaking, Thinking (3-0-3)**

Provides instruction in written and oral communication in the context of the first-year curricula. Emphasizes critical thinking as essential in producing effective expository writing, with readings and writing assignments drawn from the Humanities, Engineering, and the Social and Natural Sciences. Placement in this course is based on performance on standardized composition and reading tests. This course satisfies the English GUR. Note: Special Honors sections are available; permission of Honors College or Humanities Department required. **Effective Until: Summer 2005**

HSS 202** - Society, Technology, and Environment (3-0-3)**

Prerequisite: HSS 101. Uses case studies to examine the relationships between the creation and use of technologies, the human and natural environment, and the development of social and cultural institutions. Its central theme is the manner in which human society structures the environment in which it lives: nature and culture, city and country, civilization and development. This course satisfies 3 credits of the Basic Social Sciences GUR. Honors Note: See HSS 101. **Effective Until: Summer 2005**

HSS 211**** - The Pre-Modern World (3-0-3)

Prerequisite: HSS 101. Compares and contrasts world cultures prior to 1400. Case studies focus on differing forms of material culture, belief systems, aesthetic norms, and artistic productions to develop an understanding of ancient and medieval world views. This course satisfies three credits of the GUR in Cultural History. **Effective Until: Summer 2005**

HSS 212 - The World and the West (3-0-3)

Prerequisite: HSS 101. The central theme is changing global relations between 1400 and 1900. Uses case studies to examine such key processes as the expansion of global trade and the formation of a global economy, European perceptions of non-Western cultures, and the roots and legacy of imperialism. This course satisfies 3 credits of the Cultural History GUR. Honors Note: See HSS 101. **Effective Until: Summer 2005**

HSS 251 - Ethical Issues in Business (3-0-3)

Prerequisite: HSS 101. An examination of the ethical problems and moral foundations of business from the perspective of moral philosophy. Among the questions explored are: What are the rights of employees and employers in the workplace? Do corporations and managers have an obligation to society at large? What is the relationship between personal and business morality? Is there a moral justification for the free market? **Effective Until: Summer 2005**

HSS 401- 402 - Independent Studies in Humanities (3-0-3)

Prerequisites: HSS 101; completion of the Cultural History GUR (6 credits); permission of instructor. Pursue areas of special interest in humanities not covered in regular electives. Students are assigned readings and write reports under the guidance of a member of the humanities faculty. **Effective Until: Summer 2005**

HSS 403 - Literature Capstone Seminar (3-0-3)

Prerequisites: completion of the GUR in English (3 credits), Cultural History (6 credits), Basic -Social Sciences (6 credits) and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The capstone seminars allow students the opportunity to work closely with an instructor in a specific area of the instructor's expertise. Students are required to bring together interests and skills developed in previous courses. Students make in-depth oral and written presentations. A list of capstone seminars is published each semester in the course registration bulletin. Also see HSS 491H-HSS 499H. Honors students are not permitted to take this course to fulfill the Capstone in HSS GUR. They choose from HSS 491H-HSS 499H. **Effective Until: Summer 2005**

HSS 404 - History Capstone Seminar (3-0-3)

Prerequisites: completion of the GUR in English (3 credits), Cultural History (6 credits), Basic Social Sciences (6 credits) and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The capstone seminars allow students the opportunity to work closely with an instructor in a specific area of the instructor's expertise. Students will be required to bring together interests and skills developed in previous courses. Students make in-depth oral and written presentations. A list of capstone seminars is published each semester in the course registration bulletin. Also see HSS 491H-HSS 499H. Honors students are not permitted to take this course to fulfill the Capstone in HSS GUR. They choose from HSS 491H-HSS 499H. **Effective Until: Summer 2005**

HSS 405 - Philosophy Capstone Seminar (3-0-3)

Prerequisites: completion of the GUR in English (3 credits), Cultural History (6 credits), Basic Social Sciences (6 credits) and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The capstone seminars allow students the opportunity to work closely with an instructor in a specific area of the instructor's expertise. Students will be required to bring together interests and skills developed in previous courses. Students make in-depth oral and written presentations. A list of capstone seminars is published each semester in the course registration bulletin. Also see HSS 491H-HSS 499H. Honors students are not permitted to take this course to fulfill the Capstone in HSS GUR. They choose from HSS 491H-HSS499H. **Effective Until: Summer 2005**

HSS 406 - English Capstone Seminar (3-0-3)

Prerequisites: completion of the GUR in English (3 credits), Cultural History (6 credits), Basic Social Sciences (6 credits) and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The capstone seminars allow students the opportunity to work closely with an instructor in a specific area of the instructor's expertise. Students will be required to bring together interests and skills developed in previous courses. Students make in-depth oral and written presentations. A list of capstone seminars is published each semester in the course registration bulletin. Also see HSS 491H-HSS 499H. Honors students are not permitted to take this course to fulfill the Capstone in HSS GUR. They may choose from HSS 491H-HSS 499H. **Effective Until: Summer 2005**

HSS 407 - Theater Capstone Seminar (3-0-3)

Prerequisites: completion of the GUR in English (3 credits), Cultural History (6 credits), Basic Social Sciences (6 credits) and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The capstone seminars allow students the opportunity to work closely with an instructor in a specific area of the instructor's expertise. Students will be required to bring together interests and skills developed in previous courses. Students make in-depth oral and written presentations. A list of capstone seminars is published each semester in the course registration bulletin. Also see HSS 491H-HSS 499H. Honors students are not permitted to take this course to fulfill the Capstone in HSS GUR. They choose from HSS 491H-HSS 499H **Effective Until: Summer 2005**

HSS 408 - Science, Technology, and Society Capstone Seminar (3-0-3)

Prerequisites: completion of the GUR in English (3 credits), Cultural History (6 credits), Basic Social Sciences (6 credits) and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The capstone seminars allow students the opportunity to work closely with an instructor in a specific area of the instructor's expertise. Students will be required to bring together interests and skills developed in previous courses. Students make in-depth oral and written presentations. A list of capstone seminars is published each semester in the course registration bulletin. Also see HSS 491H-HSS 499H. Honors students are not permitted to take this course to fulfill the Capstone in HSS GUR. They choose from HSS 491H-HSS 499H. **Effective Until: Summer 2005**

HSS 409 - Social Science Capstone Seminar (3-0-3)

Prerequisites: completion of the GUR in English (3 credits), Cultural History (6 credits), Basic Social Sciences (6 credits) and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The capstone seminars allow students the opportunity to work closely with an instructor in a specific area of the instructor's expertise. Students will be required to bring together interests and skills developed in previous courses. Students make in-depth oral and written presentations. A list of capstone seminars is published each semester in the course registration bulletin. Also see HSS 491H-HSS 499H. Honors students are not permitted to take this course to fulfill the Capstone in HSS GUR. They choose from HSS 491H-HSS 499H. **Effective Until: Summer 2005**

HSS 491- HSS 499** - Honors Seminars in the Humanities (3-0-3)**

Prerequisites: enrolled in the Honors College or permission of the instructor; completion of the General University Requirements in English (3 credits), Cultural History (6 credits), Basic Social Sciences (6 credits), and either the Lit/Hist/Phil/STS (3 credits) or the Open Elective in Humanities and Social Science (3 credits). The remaining 300-level course may be taken as a co-requisite of the seminar. The subjects are announced at the time of registration. Each seminar is limited to 16 students. These courses satisfy the Capstone Seminar in Humanities and Social Science Electives GUR for students enrolled in the honors college only. **Effective Until: Summer 2005**

**** Special Honors sections are available; permission of Honors College or Humanities Department required.

Human Resources Management: Offered by the School of Management. See Management course list for faculty.

HRM 301 - Organizational Behavior (3-0-3)

Prerequisite: upper division standing. A foundation course in individual and group behavior in organizations. Processes such as perception, motivation and leadership are examined with a focus on issues central to technology-based organizations (innovation, creativity, managing technical professionals).

HRM 303 - Human Resources Management (3-0-3)

Covers basic human resources concepts including recruitment, selection, EEO, training, labor relations, and human resources information systems. Human resources management practices in technology-based firms are studied in detail.

HRM 305 - Supervision and Employee Relations (3-0-3)

The nature of supervision, particularly at the first line. Qualifications, duties, and responsibilities of supervisors. Planning the job, making work assignments, progressing, and controlling employees. Techniques of employee relations, such as conducting job instruction, maintaining discipline, appraising performance, and handling grievances. The supervisor's interrelationships with upper management and labor union representatives. The conference method and case study techniques are utilized.

HRM 310 - Managing Diversity in Organizations (3-0-3)

Analyzes issues that arise in managing a diverse work force. After examining the demographic environment of contemporary organizations, significant attention is paid to developing strategies to recruit, train, motivate, and retain employees with diverse personal characteristics. While the emphasis is on developing broad-based interpersonal skills, the impact of federal and state laws and regulations is also studied. In addition, students examine the implications of technological developments for managing a diverse population (e.g., the use of new technologies in retaining the differently abled).

HRM 311 - Job and Work Environments (3-0-3)

Prerequisite: HRM 301. The effect of job and work environments on the individual and on the organization. Covers fit between the worker and the workplace including issues such as: the micro environment of job layout and design, physical conditions of the workplace, the social environment of work, and macro environments of the workplace within a regional context.

HRM 407 - Social Insurance and Employee Benefits (3-0-3)

Prerequisites: Econ 265 and Econ 266, or SS 201. The causes of economic insecurity in an urban, industrial society and the personal and social consequences. Social Security, unemployment insurance, workers? compensation, public assistance, and other government programs. Private programs of employee benefits. Analysis of trends in coverage, benefits, and benefit levels, and the impact of demographic, economic, and technological developments on the viability of present and proposed programs.

HRM 411 - Employee Training and Development (3-0-3)

Prerequisite: HRM 303. Training and development is studied from the standpoint of employee contributions to gaining competitive advantage, with an emphasis on firms in technology-intensive industries. Topics include needs analysis, skills utilization, design and delivery of training programs, manpower planning, and employee development.

HRM 415 - Organizational Design and Development (3-0-3)

Prerequisite: HRM 301. Focuses on the design of modern organizations with an emphasis on effectively responding to environmental and technological change. Design issues include analyzing organizational structures, understanding the process of organizational learning, and evaluating organizational cultures. Development issues focus on employee empowerment, vertical and horizontal communication in organizations, and self-managed work teams.

Industrial Engineering: Offered by the Department of Industrial and Manufacturing Engineering

IE 101 - Introduction to Industrial Engineering (1-1-1)

An Introduction to the field of Industrial Engineering, the functions performed by industrial engineers, career paths and opportunities in the field, introduction to the student and senior professional societies, and initiation of a mentoring program.

IE 203 - Applications of Computer Graphics in Industrial Engineering (1-2-2)

Prerequisites: CIS 101, FED 101C and FED 101D. Areas of graphical communication germane to manufacturing and production are stressed. Provides mathematical and practical knowledge of graphical standards necessary to meet the requirements of today's industrial engineering practices. Introduction to the use of up-to-date software for computer-aided graphics, databases, spreadsheet, general programming, statistical analysis. Also, ProEngineer, Database, Lotus, Fortran/C/ Pascal, and SAS.

IE 224 - Production Process Design (2-2-3)

Prerequisite: sophomore standing. Introduction to the theory and practice of manufacturing processes. Study covers the fabrication of metallic, plastic, and electrical products, operation of NC and other automatic equipment, and economics of the design and production process.

IE 310 - Co-op Work Experience I (3 additive credits)

Prerequisites: junior standing, approval of co-op faculty advisor, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their aca-demic program. Work assignments facilitated by the co-op office and approved by the co-op faculty advisor. Mandatory participation in seminars and completion of a report.

IE 331 - Applied Statistical Methods (3-0-3)

Prerequisite: Math 211. A presentation of statistical analysis techniques and their applications. Topics include the statistical measures describing data, frequency distributions, probability distributions, sampling parameter estimation, hypothesis testings, regression analyses, and analyses of variance. Special emphasis on their application to industrial fields.

IE 334 - Engineering Economy and Capital Investment (3-0-3)

Prerequisite: junior standing. Introduction to the principles of engineering economics for utilization and evaluation of capital investments, including time value of money, depreciation, cost of capital, life cycle cost, net present value, and payback. Consideration of decisions involving multiple choice replacement, uncertainty, and risk.

IE 335 - Engineering Cost Analysis and Control (3-0-3)

Prerequisite: junior standing. The tools and techniques applicable for cost analysis and control including standard costs, variance analysis, cost volume relationships, cost estimation, and utilization of accounting data for control of operations.

IE 339 - Work Measurement and Standards (2-2-3)

Prerequisites: IE 203, IE 224. Emphasizes the measurement and evaluation of existing work methods and how improvement can be achieved. Topics include visual and micro-motion study techniques, motion economy, time study, and work sampling. The development and use of standard data and computerized techniques. Also, hands-on experience through a series of laboratory experiments.

IE 355 - Human Factors (3-0-3)

Prerequisite: junior standing. Human-machine systems analysis including study of workplace layout, measurement of employee efficiency and productivity, criteria for tool and fixture design or selection, industrial fatigue, environmental influences on performance including the effects of illumination, noise, vibration, thermal, and other atmospheric factors. Basic ideas of industrial hygiene; the impact of OSHA; and special techniques for experimenting with human subjects, via demonstrations and supervised experiments.

IE 411 - Co-op Work Experience II (3 additive credits)

Prerequisites: IE 310, approval of co-op faculty advisor, and permission of the Office of Cooperative Education and Internships. Full-time work experience of approximately one semester's duration. Provides major-related work experience as a co-op/intern. Mandatory participation in seminars and completion of requirements that include a report and an oral presentation to IE faculty.

IE 436 - Cost Analysis and Engineering Economics (3-0-3)

Prerequisite: junior or senior standing. Not open to industrial engineering majors. Focuses on the economic factors of concern to manufacturing engineers. Major topics include justification of proposed capital expenditures, equipment retirement and replacement decisions, cost determination, profitability studies, and manufacturing budget construction and utilization for cost control.

IE 439 - Deterministic Models in Operations Research (3-0-3)

Prerequisite: Math 222 or equivalent. The deterministic techniques of operations research. Topics include the applications of linear, nonlinear, integer, and dynamic programming methods and network flows analysis to solve industrial and systems engineering problems.

IE 440 - Stochastic Models in Operations Research (3-0-3)

Prerequisites: IE 331, Math 222 or their equivalent. Probabilistic techniques of operations research. Topics include the applications of Markov chains, queueing and inventory control models to analyze and evaluate systems performance.

IE 441 - Information and Knowledge Engineering (3-0-3)

Prerequisite: junior or senior standing. Introduction to recent advances in the application of computers in industrial engineering and database structures, both sequential and random. Description of methods for organizing data, database modeling, information storage and retrieval. Also, applications of expert systems concepts and techniques.

IE 443 - Senior Project I (1-3-2)

Prerequisite: senior standing. Introduction to senior design project. Selection of specific system design for the project, establishment of initial contacts, preliminary collection and analysis of system data. Concepts of system design analysis emphasizing simulation modeling and analysis, model verification, and model validation.

IE 444 - Senior Project II (2-2-3)

Prerequisite: IE 443. Senior design project, in which the concepts of industrial engineering systems, principles, and procedures are integrated and applied in industrial projects or case studies.

IE 445 - Idustrial Simulation (2-2-3)

Prerequisites: CIS 101, IE 331 or equivalent. Introduction to the application of simulation modeling for the analysis of complex industrial and manufacturing service systems. Examples are chosen from real-life situations such as warehousing, material handling, robotics, transportation, and hospital emergency rooms. Verification/validation as well as statistical analysis of both input/output data are introduced.

IE 447 - Legal Aspects of Engineering (3-0-3)

Prerequisite: junior or senior standing. Familiarization with the U.S. system of case law, statutes and regulations applicable to professional relationships involving the engineer. Includes contracts, property, product liability and other torts, governmental regulatory bodies such as OSHA, EPA, and NRC, professional liability, and role of codes and standards.

IE 449 - Industrial Robotics (2-2-3)

Prerequisites: CIS 101, Phys 121, junior or senior standing. Robotics in manufacturing systems. The field of robotics is studied with emphasis given to the role of programmable robots in manufacturing. Hands-on experience with hardware and software necessary for various industrial robot systems through laboratory experience.

IE 450 - Product Engineering Standards (3-0-3)

Prerequisite: senior standing. Developing and using standards in the design, manufacturing, and use of products. Topics include economics of parts standardization, drawing and assembly techniques, and use of national and international standards. Review of the role of standards-setting bodies and methods for the development of product testing standards used in industry and commerce.

IE 451 - Industrial Measuring Systems (2-2-3)

Prerequisite: IE 331. Reviews contemporary measuring systems and provides a basic under-standing of the various methods, their accuracy, reliability, and relative costs to perform. Includes measuring methods needed for compliance evaluation in accordance with occupational and safety legislation, industrial processes, and product design.

IE 453 - Computer Integrated Manufacturing (2-2-3)

Prerequisite: junior or senior standing. Examines the components of computer integrated manufacturing (CIM) including the design of information frameworks and network protocols required to orchestrate full manufacturing automation. Study of CAD, CAPP, robotics, NC, CNC, computer interfacing, and database systems in the context of a CIM environment. Exposure to state-of-the-art CIM software and hardware.

IE 455 - Automation and Programmable Logic Controllers (2-2-3)

Prerequisites: junior or senior standing. Introduction to the design and implementation of programmable logic controllers for use in industry in the areas of automotive assembly, pharmaceutical manufacturers, the chemical industry, and others. Includes ladder logic, input/output ports, continuous process control, timing and counting functions, chaining sequences, and digital gate logic.

IE 456 - Introduction to Industrial Hygiene (3-0-3)

Prerequisite: IE 355. Analysis of the effects of various environmental stressors on people at work, including their interference with performance and the development of acute and chronic health problems. Study of how numerous airborne contaminants, noise, thermal extremes, ionizing and nonionizing radiation, etc., affect workers alone and in combination. Topics include measurement and evaluation techniques, TLVs, control methodologies, legal requirements for employers.

IE 459 - Production Planning and Control (3-0-3)

Prerequisites: IE 221, IE 439, junior or senior standing. A study of the components and functioning of integrated production, planning, and control systems. Forecasting, aggregate planning, scheduling, and recent models of production and inventory control for optimizing continuous and intermittent manufacturing operations. MRP basics. Introduction to using a computer to apply scheduling models.

IE 460 - Measuring Techiniques and Quality Control (3-0-3)

Prerequisite: understanding of basic probability. Not open to industrial engineering majors; intended for other engineers, inspection supervisors, and management. Various types of control charts and acceptance sampling systems and procedures. These techniques are used widely in industry to improve product quality and reduce costs.

IE 461 - Product Quality Assurance (3-0-3)

Prerequisite: IE 331. Methods used to achieve higher product quality, to prevent defects, to locate chronic sources of trouble, to measure process capability, and to use inspection data to regulate manufacturing processes are emphasized. Preparation of statistical control charts and selection of suitable sampling plans

IE 466 - Material Handling and Facilities Layout (3-0-3)

Prerequisite: IE 439. Analysis of organized human activities typified by industrial and office operations. Recent methods are applied to optimize location and layout of facilities. Introduction to modern material handling systems, expert systems in plant layout, logistics of motion of people and materials, flow analysis, plant layout, and material handling techniques.

IE 469 - Reliability in Engineering Systems (3-0-3)

Prerequisites: IE 331 or equivalent, senior standing. Emphasizes the determination of systems reliability from a knowledge of characteristics and reliability of individual system components. Topics include reliability concepts, failure rates, systems analysis, optimization, maintenance, etc. Covers techniques for the formulation and evaluation of reliability models.

IE 472 - Product Liability Engineering (3-0-3)

Prerequisite: junior or senior standing. The techniques available to the engineer to minimize the hazards of design and manufacturing that result in product liability cases. The effect of legal precedents on design, manufacturing, advertising, marketing, and using a product within developing technical disciplines such as: reliability prediction and analysis methods, assuring the quality of manufactured products, loss control systems, safety engineering precepts, human factors principles and design review. Review of government regulations for safety and protection.

IE 473 - Safety Engineering (3-0-3)

Prerequisite: junior or senior standing. The principles and practices of safety engineering in product and facilities design. Safe practices and hazard control, safety standards and codes, inspection procedures, the role of insurance, governmental regulations, and safety statistics. Participation in current safety engineering research studies. The Occupational Safety and Health Act and related legislation.

IE 480 - Special Studies in Industrial Engineering for Non-Majors (3-0-3)

Prerequisite: permission of the IE faculty advisor. Not open to industrial engineering majors. Individual investigations under faculty guidance through consultation, readings, and visits with recognized authorities and institutions, dealing with specialized industrial engineering problems. Explore in depth an area of interest and give a report in a seminar setting, and submit a written project report.

IE 481 - Investigations in Industrial Engineering I (3-0-3)

Prerequisites: junior or senior standing, per-mission of the IE faculty advisor. Individual investigation under faculty guidance through consultation, readings, and visits with recognized authorities and institutions, dealing with specialized industrial engineering design problems. Explore in depth an area of interest and give a report in a seminar setting, and submit a written project report.

IE 481H - Investigations in Industrail Engineering I (3-0-3)

Prerequisites: junior or senior standing, permission of the IE faculty advisor, enrolled in Honors College. Same as IE 481, but investigation is in more comprehensive and in greater depth.

IE 482 - Investigations in Industrial Engineering II (3-0-3)

Prerequisites: IE 481, permission of the IE faculty advisor. Further individual investigations, a continuation of IE 481.

IE 482H - Investigations in Industrial Engineering II (3-0-3)

Prerequisites: IE 481, permission of the IE faculty advisor. Further individual investigations, a continuation of IE 481H.

IE 492 - Engineering Management (3-0-3)

Prerequisite: junior or senior standing. An introduction for engineering majors to the fundamentals of engineering economics and the management process for engineering and development. Major topics include capital investment justification methods, project organization, scheduling and control techniques, legal, quality, and staffing issues.

IE 492H - Engineering Management (3-0-3)

Prerequisite: junior or senior standing and enrolled in Honors College. Same as IE 492, but topics are treated more comprehensively and in greater depth.

Management Information Systems: Offered by the School of Management

MIS 245 - Introduction to Management Information Systems (3-0-3)

Concepts of information systems, business process, hardware, software, systems analysis, e-commerce, enterprise systems and computer applications in organizations, techniques of systems analysis, systems designs, implementations, and information management (both technical and behavioral)are studied in the organizational context of management information needs. **Effective From: Spring 2005**

MIS 246 - Tools and Technologies for the Digital Firm (3-0-3)

This course is designed to provide students with an introduction to the applications being used by digital firms, companies that rely extensively on the use of information technology to support all their functions and processes. Although function specific systems (e.g. accounting information systems, financial information systems) are introduced the emphasis is on enterprise wide systems such as those offered by SAP, Oracle and Peoplesoft. A basic introduction to the technologies underlying the applications used in business is also provided.

MIS 345 - Management of Information Systems (3-0-3)

Prerequisites: CIS 103 or CIS 113, MIS 246. Training managers or entrepreneurs to use and manage information systems. The evolution of the computer as a management information tool and a demonstration of how this tool can be used to improve both the effectiveness and efficiency of managers.

MIS 360 - Survey of E-Commerce Tools & Technologies (3-0-3)

Prerequisite: MIS 246. Covers the current technologies behind e-commerce solutions such as dynamic Web sites, database integration, server-side scripting, client-side scripting, and XML.

MIS 376 - Information Systems and Operations Management (3-0-3)

This course will integrate information systems with operations management. The role information systems play in the operations management functions for both the goods and services sectors of a global economy. Topics to be covered are mission and strategy development, demand forcasting, capacity planning, facility location, process strategy, inventory management, project management and total quality management. The way information systems integrates these concepts with ERP, SCM, CRM and other business systems will be discussed. **Effective From: Spring 2005**

MIS 445 - Decision Support Systems and OLAP (3-1-4)

Prerequisites: MIS 345 and OM 375.Introduces students to the use of decision support systems (DSS) to support management decisions. Topics include: DSS software tools, model management, and DSS design and use.

MIS 463 - Systems Analysis and Design for Managers (3-0-3)

This course focuses on the analysis and development of systems to meet the increasing need for information within organizations. Topics include systems development life cycle, analysis and design techniques, information systems planning and project identification and selection, requirements collection and structuring, process modeling, data modeling, design of interface and data management, system implementation and operation, system maintenance, and change management implications of systems. **Effective From: Spring 2005**

Information Technology: Offered by the Information Technology Committee

IT 101 - Introduction to Information Technology (3-0-3)

Overview of emerging information technologies and the principles behind these developments. Discusses applications developed around evolving Internet infrastructure and their impact on business and information technology professionals and society. Covers such topics as multimedia systems and standards, e-commerce applications, distributed design and manufacturing, geographical information systems, all in the context of problem solving and program development, which is integrated throughout the course by using the Java language as a vehicle to illustrate the concepts.

IT 102 - Introduction to Information Technology II (3-0-3)

Prerequisites IT101, CIS 113. This is the second in a two-semester course sequence whose objective is to develop an understanding of the concepts and techniques used in object-oriented, event-driven, and networked programming. The course aims to provide both depth and breadth foundation for the subsequent courses in the IT Core. Topics include classes, objects, inheritance, polymorphic interfaces, graphical user interfaces, event-driven programming, network programming with sockets, client/server programming, multithreading and multimedia applications, exception handling and IO classes. The programming language Java is used as the vehicle for realizing the programming concepts introduced in the course. Substantial programming assignments will be given.

IT 201 - Information Design Techniques (3-0-3)

The course is an overview of the theory and practice of information design. Students learn how to design, implement and interpret representations of visual, aural and tactile data. Topics to be covered include the fundamentals of human computer interaction, and multimedia standards for information design. Advanced software tools are used in all stages of the course, with a focus on designing effective data and graphical representations.

IT 202 - Internet and Applications (3-0-3)

A comprehensive overview of computer communication networks from data transmission to applications software. Topics include FTP; Telnet; Information Architecture, Infrastructure, and Lifecycle; and Client-side Scripting Languages.

IT 220 - Wireless Networks (3-0-3)

This course introduces the students to the applied topic of Wireless Networks, focusing on applied methods, tools and technologies, as well as practical experience in designing & implementing wireless networks. Topics include hardware, software, data, applications, communication, design & installation of wireless networks, together with the implementation, performance, security and limitations of such systems.

IT 230 - Computer and Network Security (3-0-3)

This course introduces the applied topic of Computer Security, presenting the evolution of computer security, the main threats, attacks & mechanisms, applied computer operations & security protocols, main data transmission & storage protection methods via cryptography, ways of identifying, understanding & recovery from attacks against computer systems, various methods of security breach prevention, network systems availability, applications security, recovery & business continuation procedures and counter systems penetrations techniques and the role of the US Government in security of national computer infrastructure.

IT 310 - E-commerce Technology (3-0-3)

An overview of the technologies relevant to electronic commerce. Communications and networking, web authoring tools, system security, databases and archiving, EDI, transaction processing, and factory/warehouse data networks. Provides competency to appraise tools such as HTTP servers, secure transaction software and firewalls, low and high-end database systems, heterogeneous networks, NNTP Servers, client software, procurement systems, and intelligent agents. Covers e-commerce models including agent-based and Java-based, electronic contracts and the electronic exchange of technical data, electronic cash systems and user security.

IT 311 - Co-op Work Experience I (3-0-3)

Prerequisite: Completion of the sophomore year, approval of the program coordinator, and permission of the Office of Cooperative Education and Internship. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the Co-op office. Mandatory participation in seminars and completion of a report.

IT 320 - Virtual Instrumentation (3-0-3)

Cross-listed with OPSE 310. Prerequisite: CIS 113. Covers the basics of virtual instrumentation including use of IEEE GPIB, RS232 interfaces, and data acquisition boards. Interface a computer to various instruments for data acquisition and instrument control using a state-of-the-art software platform such as National Instrument s LABVIEW. Emphasis is on the practical aspects of interfacing a computer to various instruments including timing issues, real-time data acquisition and instrument control, instrument status, and acquisition speed.

IT 330 - Computer Forensic (3-0-3)

Prerequisites: IT 230, CIS 332. This course introduces students to the applied topic of Computer Forensic, the study of obtaining and analyzing digital information from computers that have been used to commit illegal actions (computer crime), for use as evidence in civil, criminal, or administrative cases.

IT 360 - Programming for Computer Graphics (3-0-3)

Introduction to programming graphics and animation through the use of an appropriate application interface such as openGL. Topics include 2D and 3D graphics with mappings from the real world coordinates to graphics display. Perspective display will be provided by an interface. Basic vector and matrix operations which underlie the concepts of perspective will be covered.

IT 380 - Educational Software Design (3-0-3)

Prerequisites: IT 201. Educational Software design employs the instructional principles of constructivist pedagogy such as anchoring learning activities to a larger task or problem, supporting the learner in developing ownership for the overall problem or task, designing an authentic task, and giving the learner ownership of the process used to develop a solution to develop courseware for K-8 audience. The course builds on the participatory design model of software engineering in order to develop integrated learning environments that support visual and verbal literacy; encourage learners to construct their own paths to knowledge; and to develop methodologies that offer a better understanding of what children want and need when using technology. This course enables the student to be able to plan, organize, and systematically develop instructional materials. This course implements instructional design theory and pedagogy in order to create an actual application for a computer-based environment. **Effective From: Spring 2005**

IT 411 - Co-op Work Experience (3-0-3)

Prerequisite: Completion of the sophomore year, approval of the program coordinator, and permission of the Office of Cooperative Education and Internship. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the Co-op office. Mandatory participation in seminars and completion of a report.

IT 420 - Computer Systems and Networks (3-0-3)

This course provides students with an understanding of methods, tools and technologies required to work with computer systems and networks. It includes a detailed discussion of Internet/intranet issues, including standards, connectivity, performance, protocols, network configurations, network design, wireless technology, management and simulation through practical cases, covering both hardware and software systems.

IT 485 - Special Topics in Information Technology I (3-0-3)

Prerequisites: junior standing and/or advisor approval. The study of new and/or advanced topics in an area of information technology and its application not regularly covered in any other IT course. The precise topics to be covered, along with prerequisites, are announced in the semester prior to the offering of the course. A student may register for no more than two semesters of special topics courses.

IT 486 - Special Topics in Information Technology II (3-0-3)

Prerequisites: same as for IT 485. A continuation of IT 485.

IT 488 - Independent Study in Information Technology (3-0-3)

Prerequisites: open only to Information Technology majors who have the prior approval of the program director and the IT faculty who will guide the independent study taking the form of investigations, research, and reports on advanced topics in information technology. Students must prepare, in collaboration with their faculty mentor and in the semester prior to enrolling in this course, a detailed plan of topics and expected accomplishments for their independent study. This must have the approval of both the program director and the faculty mentor. A student may register for no more than one semester of independent study.

IT 488H - Honors Independent Study in Information Technology (3-0-3)

Prerequisites: open only to Honors College Information Technology majors who have the prior approval of the program director and the IT faculty who will guide the independent study taking the form of investigations, research, and reports on advanced topics in information technology. Students must prepare, in collaboration with their faculty mentor and in the semester prior to enrolling in this course, a detailed plan of topics and expected accomplishments for their independent study. This must have the approval of both the program director and the faculty mentor. A student may register for no more than one semester of independent study.

IT 490 - Systems Integration (3-0-3)

The course will introduce the major design, implementation & distributed deployment issues regarding system integration, Network Operating Systems (NOS), cross platform database integration, e-commerce and e-business applications implementation, cross-servers & multiple locations e-sessions migration and the related communications security.

IT 491 - IT Capstone Project (3-0-3)

Prerequisites: senior standing. An opportunity for students to integrate the knowledge and skills gained in previous information technology work into a team research project. The project involves investigation of current literature as well as implementation of either a part of a large application or the whole of a small system.

IT 491H - Honors IT Capstone Project (3-0-3)

Prerequisites: senior standing in the Honors College and project proposal approval. Similar to IT 491, with a project of greater depth and scope.

MR INTL - Study Abroad (12 maintenance-of-registrations credits)

Prerequisite: permission from the Office of International Students and Faculty. NJIT, through direct exchange agreements and through membership in an engineering educational exchange consortium, offers students the opportunity to study abroad for a semester or an academic year. Students may select any of the courses that meet their degree requirements with written approval from the academic advisor. Transfer credits will be awarded for pre-approved courses successfully completed at the end of the exchange period. Open to all majors.

Italian: Offered by the Department of Classical and Modern Languages and Literatures at Rutgers-Newark. See Classics course list for faculty.

Journalism, Writing and Media: Offered by the Department of English at Rutgers-Newark. See Rutgers English course list for faculty.

21&62:570:201 - Journalism and Communications Media (3)

Introductory seminar introducing the historical and philosophical development of journalism and media operations in the United States. First term: Analysis and evaluation of the functions, practices, policies, and responsibilities of media institutions in the dissemination of information to the public. Emphasis on ethical and aesthetic issues related to newspapers, magazines, books, other print-based media, and new communications technologies. Second term: offered in the Department of Visual and Performing Arts.

Literature: Offered by the Department of Humanities. See Humanities course list for faculty

LIT 320 - American Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. A survey of major works of American literature. Provides a foundation for understanding the currents of American thought and experiences. Special emphasis is paid to American literature within a global context.

LIT 321 - British Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. A survey of the major works of British literature. Provides a foundation for understanding the currents of British thought and experience. Special emphasis is paid to British literature within a global context.

LIT 330 - World Literature I: North America, Latin America and the Caribbean, Australia and Oceania (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Enhances understanding of other cultures and of past and contemporary global interactions.

LIT 331 - World Literature II: Africa and the Middle East, Asia, and Europe (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Enhances the under-standing of other cultures and of past and contemporary global interactions.

LIT 340 - Contemporary Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Focuses on the study of literary works published within the last ten years. Considers how contemporary issues and problems are addressed in a variety of literary works.

LIT 350 - Fiction (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Explores the short story and the novel from varied countries and eras. Emphasis is given to narrative methods, representative themes, and global perspectives.

LIT 352 - 20th Century European Fiction (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Examines themes ranging from war and occupation, revolution, Fascism, and Communism to individual liberation and self-discovery, existen-tialism, absurdism, and feminism.

LIT 355 - Poetry (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Explores the problems, devices, and techniques of poetry'sound, rhythm, meter; diction and tone; connotation, metaphor, and symbol?as a means of demystifying the reading of poems. Emphasis is given to the place and purpose of poetry in a technological society.

LIT 360 - Drama (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Follows the development of play structure from folkloric origins to contemporary theater. Emphasis is on text, history of text development, and the changing purpose of theatrical presentations.

LIT 361 - 20th Century American Drama (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents.. Examines the development of 20th century American drama with emphasis on the ways, often experimental, in which the playwrights reflect the spirit of the times.

LIT 362 - Non-Western Drama (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Explores clas-sical and contemporary theater and drama in China, Japan, India, Africa, and the Middle East.

LIT 363 - Ethnic and Minority Drama (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents.. Using con-tem-porary dramas as social, historical, and cultural artifacts, examines the experience of Latinos, Asian Americans, Native Americans, and African Americans.

LIT 364 - Modern Continental and British Drama (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An examination of some of the dramas from the late nineteenth and twentieth centuries with the purpose of gaining some understanding of how dramatists, in both subject matter and technique, reflect the spirit of the times. Representative playwrights include Ibsen, Shaw, Wilde, Strindberg, Synge, Chekhov, O? Casey, Pirandello, Anouilh, Brecht, Ionesco, and Pinter.

LIT 365 - Non-Fiction (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Examines the ways that writers examine cultural issues through the use of literary non-fiction. Emphasis is placed on autobiographical, persuasive, and narrative techniques.

LIT 370 - Literature and Diversity (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Allows students to explore the literature of human difference, including the literature of cross-cultural experience and sexual difference.

LIT 372 - African-American Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Allows students to explore themes and styles particular to literary works by and about African-Americans.

LIT 374 - Women and Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents.. Allows students to explore literature by and about women from around the world. Special attention is paid to autobiographical narratives

LIT 376 - Latin American Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Examines the ways that writers of Latin America and the Caribbean explore their respective culture through techniques such as dream, myth, and legend to achieve an authentic and unique -vision. Special emphasis is given to 20th-century authors.

LIT 378 - Literature and Nature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Literature as it reveals and interprets the natural world. Examines the ways that nature has been used in fiction, drama, poetry, and non-fiction. Students learn to describe the natural world in their writing. Co-listed as STS 378.

LIT 380 - Historical Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Sources of fiction and drama are often based on historical personalities and actual incidents. Examines a number of such works. Original historical material is compared with the literary work it inspired, thus providing insights into the nature of the creative process and the purposes of the historian and the creative writer.

LIT 382 - The Comic Tradition in English and American Literature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Presents great comic works from the 14th century to the present. Students study verse narratives, plays, novels, and essays. Emphasis is given to the classical roots and international connections of the comic tradition in English, the relationship between form and function in comedy, and elucidation of comedy's social and philosophical ends.

LIT 384 - American Musical Theater (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Experience a unique American theatrical tradition. Special attention is paid to contemporary productions.

LIT 386 - Science Fiction (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Explores the distinctive characteristics of science fiction as a literary genre and its function as a social criticism. Special attention is given to the ways in which cultural gender coding surfaces in the text. Films and video are used.

LIT 388 - The Russian Novel and Short Story (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Focuses on Russian fiction of the 19th and 20th centuries. Approaches material both as evidence of artistic vision and as social documents of Russian history.

Management: Offered by the School of Management

Mgmt 190 - Industrial Organization and Management (3-0-3)

Introduction to business enterprise, including organization structure, basis of authority and responsibility, financial systems, marketing, and the interaction of government and business. The interrelationships of the broad economic, political, psychological, and social influences upon business.

Mgmt 216 - Business Statistics (3-0-3)

Prerequisite: Math 105 or Math 333. Introduction to business data analysis for application in management decision-making processes. Productivity measures, employment trends, national income data, and consumer price changes. Methods for collection of business and economic data, presentation of data and computer applications, index numbers, historical analysis trend projections, survey sampling, and planning for business research.

Mgmt 290 - Legal Environment of Business (3-0-3)

The basic principles of common and statutory law applicable to business and professional relationships, emphasizing contracts, negotiable instruments, sales of goods, agency and business organizations.

Mgmt 310 - Co-op Work Experience I (3 additive credits)

Prerequisites: junior standing, approval of the school, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report.

Mgmt 350 - Knowledge Management (3-0-3)

The purpose of this course is to introduce students to Knowledge Management. This term is used to refer to the ways in which organizations create, gather, manage and use the knowledge. Emphasis is placed on the information systems needed to capture and distribute knowledge and how knowledge can be used to gain competitive advantage.

Mgmt 380 - Principles of E-Commerce (3-0-3)

This course is designed to provide an overview of electronic commerce technologies, e-commerce strategies and their implications for work organizations. The course focuses on how the Internet has transformed business and the emergence of the digital firm.

Mgmt 390 - Principles of Management (3-0-3)

Prerequisite: junior or senior standing. The broad basic principles of the managerial process that are fundamental to the successful operation of various types of enterprises. Emphasizes the role of management at all levels of responsibility. Organization, motivation and morale; scientific management and human relations; the functions of planning, directing, and controlling. A rational synthesis of research and concepts, which together constitute the subject matter of management.

Mgmt 390H - Honors Principles of Management (3-0-3)

Prerequisites: member of the Honors College or permission of the instructor

Mgmt 410 - Co-op Work Experience II (3 credits)

Prerequisites: Mgmt 310 or equivalent, approval of the school, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience as a co-op/intern. Mandatory participation in seminar and completion of requirements that include a report and/or project.

Mgmt 460 - Management Strategies for E-Commerce (3-0-3)

Prerequisite: MIS 360. Learn about the Internet, intranets and extranets and incorporating them into business planning and operations

Mgmt 480 - Managing in a Technological environment (3-0-3)

Prerequisite: Mgmt 390. Introduction to an array of technologies affecting management functions to provide an appreciation and understanding of the importance of new technologies as critical success factors for modern organizations. An integrative approach is taken in analyzing how changes in technology affect individual, group, and organizational effectiveness.

Mgmt 491 - International Business (3-0-3)

A basic understanding of the activities in international business providing a framework for understanding them from the perspective of a company manager. Covers international trade, multinational enterprises, foreign exchange, foreign direct investment, international financial institutions, barriers to international trade, accounting of taxation, industrial relations, multinational enterprise, and world order

Mgmt 492 - Business Policy (3-0-3)

Prerequisite: senior standing. A capstone course in the area of business administration focusing on the integration of concepts taught in various functional courses such as marketing, finance, operations management, accounting, organizational behavior. Issues related to corporate responsibilities and ethical behavior are also incorporated in this course. Emphasis on application of concepts to real life situation is achieved through case discussion and projects.

Mgmt 492H - Honors Business Policy (3-0-3)

Prerequisites: member of the Honors College, senior standing.

Mgmt 496* - Introduction to Transportation (3-0-3)

Prerequisite: upper division standing. Introduction to transportation systems and the transportation industry. Survey of the various modes of transportation, organizational structure and operation of private and public carriers. The role of government in the regulation of the U.S. transportation industry. Management of traffic and physical distribution operations. Cost and service comparisons of competing modes of transportation. Organized labor and associated costs.

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* pending approval

Marketing Management: Offered by the School of Management

Mrkt 330 - Principles of Marketing (3-0-3)

Fundamentals of marketing in a global context are covered using lectures, cases and class projects. Topics include product management, buying behavior, segmentation, total quality management, and social responsibility.

Mrkt 338 - Product Development and Management (3-0-3)

Prerequisite: Mrkt 330. The process of product development is studied in detail with specific emphasis on technology-driven innovation. Techniques for getting closer to customers including TQM principles are also covered.

Mrkt 339 - Selling and Promotion (3-0-3)

Prerequisite: Mrkt 330. Focusing on developing the skills and knowledge necessary to influence decision makers in organizational buying centers and in other relevant areas. Techniques studied include personal selling, sales promotion, advertising, and publicity. Also covers ethical issues are also covered.

Mrkt 360 - Internet Marketing (3-0-3)

Prerequisite: Mrkt 330. Covers electronic markets, data collection and market research, and Internet-based marketing programs.

Mrkt 430 - Marketing Research (3-0-3)

Prerequisite: Mrkt 330. The process of marketing research is studied in detail from study design through report preparation. A hands-on, experiential approach is taken with an emphasis on secondary research and multivariate statistical methods. Data analysis is conducted using SAS and/or SPSS.

Mrkt 434 - Marketing to Organization (3-0-3)

Prerequisite: Mrkt 330. Techniques for marketing industrial products to organizations in the manufacturing, service, government, and non-profit sectors are covered within the context of a global marketplace. Emphasis is on the marketing of high technology products using a customer-driven approach.

Mrkt 435 - Marketing Channel Management (3-0-3)

Prerequisite: Mrkt 330. This course helps students to understand the role of the distribution system from a management standpoint. The course discusses the promotion and flow of goods through a marketing channel from the producer to the final consumer. Key topics to be studied include channel design, channel management, channel strategy, selection of middlemen, motivation of intermediaries and channel member performance evaluation. It will also discuss the very important aspect of electronic channels that have become pervasive with the advent of the Internet revolution.

Materials Science and Engineering: Offered by the Materials Science and Engineering Committee

MtSE 301 - Principles of Material Science and Engineering (3-0-3)

Prerequisites: Phys 111 and Phys 121, Chem 125 and Chem 126, Math 111 and Math 112 or equivalent. Examines the interrelationships among structure, properties, and performance of engineering materials. Topics to be covered include atomic structure, crystallography, solid state imperfections and diffusion. The properties of metals, semiconductors, polymers, ceramics, and composites as well as their behavioral response to mechanical, chemical, optical, electrical, and magnetic stimuli are examined in light of their performance in service.

MtSE 311 - Properties of Materials (3-0-3)

Prerequisite: two semesters of college physics or equivalent. Intended for engineering technology students and is an introduction to the principal metallic and nonmetallic engineering materials, including their physical properties, response to heat treatment, and corrosion -resistance.

MtSE 318 - Engineering Materials (3-2-4)

Prerequisites: Physics III; Chem 126. Introduces the student to such engineering materials as metals, viscoelastic materials, ceramics, polymers, and semiconductors. The approach is interdisciplinary with stress upon the structure of materials. Various mechanical and thermal treatments are discussed and related to the stability of the resultant properties. The laboratory sessions implement and emphasize the effects of these mechanical and thermal treatments on the materials.

MtSE 319 - Engineering Materials (3-0-3)

Prerequisites: Physics III; Chem 126. This course is identical to MtSE 318, with the laboratory omitted.

MtSE 450 - Electron Microscopy (2-2-3)

Prerequisites: Physics III; Chem 126. Combines the lecture and laboratory in introducing the field of electron microscopy. Topics include magnetic electron lenses, electron optical systems, selected area diffraction, sample preparation, thin foil techniques, and photography.

MtSE 451 - X-Ray Diffraction (2-2-3)

Prerequisites: Physics III; Chem 126. Combines the lecture and laboratory in introducing the methods of X-ray diffraction. Topics include directions and intensities of diffracted beams, diffractometer methods, Laue methods, power photographs, reciprocal lattice constructions, and the rotating crystal method.

MtSE 452 - Materials Science I (3-0-3)

Prerequisites: Physics III; Chem 126; ME 435 or Phys 335. Emphasizes the structure and properties of materials and the relationships between them. The primary topics include the thermodynamics of solids, fracture mechanisms, diffusion, elasticity, plasticity, fatigue strength, viscosity, and creep.

MtSE 453 - Materials Science II (3-4-5)

Prerequisite: MtSE 452. Emphasizes the electronic properties of materials in conjunction with an introduction to ceramics. Topics include semiconductors, thermoelectricity, magnetism, conductivity, dielectric, optical properties, and an introduction to the properties and behavior of ceramics.

Mathematics: Offered by the Department of Mathematical Sciences

Math 098 - Introduction to College Math (4-1-4)

Topics include: Elementary Algebra, Introduction to Graphs and Functions, Linear Functions, Equations, Inequalities, Systems of Linear Equations, Radicals and Complex Numbers, Quadratic Equations, Rational Expressions and Rational Functions, Functions and Relations, Exponential and Logarithmic Functions and Equations. Introduction to the logistics of applied calculus. Diverse applications will be emphasized throughout the course. **Effective From: Spring 2005**

Math 103 - University Mathematics I (4-1- 4 additive credits)

Prerequisite: Math 098 with a grade of C or better or placement by performance on standardized entrance examinations. Consists of a series of projects, many of which introduce and use elementary differentiation and/or integration in which the students perform sustained algebraic and trigonometric computations. The projects involve the following topics: polynomials, rational expressions, expressions involving radicals, exponential and logarithmic functions, right triangle trigonometry, and the solution of linear and quadratic equations. This course may not be used to satisfy degree requirements in any program.

Math 104 - University Mathematics II (4-1- 4 additive credits)

Prerequisite: Math 103 with a grade of C or better or placement by performance on standardized entrance examinations. Consists of a series of projects, many of which introduce and use elementary differentiation and/or integration in which the students perform sustained algebraic and trigonometric computations. The projects involve the following topics: radian measure, conic sections, trigonometric functions and identities, law of sines and cosines, logarithmic equations, partial fraction decomposition, systems of linear and nonlinear equations, functions in polar coordinates, and hyperbolic functions. This course may not be used to satisfy degree requirements in any program.

Math 105 - Elementary Probability and Statistics (3-0-3)

Prerequisite: (Intended for students who are not in Science or in Engineering.) Math 104 with a grade of C or better or placement by performance on standardized entrance examinations. Considers notions of probability. Topics include the binomial and normal distributions, expected value, and variance. The notions of sampling, hypothesis testing, and confidence intervals are applied to elementary situations.

Math 111 - Calculus I (4-1-4)

Prerequisite: Math 104 with a grade of C or better or placement by performance on standardized entrance examinations. Topics include limits, differentiation, applications of differentiation, and integration.

Math 111H - Honors Calculus I (4-1-4)

Admission to this course is by invitation, based on standardized entrance exams. Topics enhance those of Math 111 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 112 - Calculus II (4-1-4)

Prerequisite: Math 111. Topics include integration, applications of integration, series, exponential and logarithmic functions, transcendental functions, polar coordinates, and conic sections.

Math 112H - Honors Calculus II (4-1-4)

Prerequisite: grade of B or better in Math 111H or grade of A in Math 111. Topics enhance those of Math 112 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 113 - Finite Mathematics and Calculus I (4-0-4)

Prerequisite: (Intended for Architecture students.) Math 104 with a grade of C or better or placement by performance on standardized entrance examinations. An introduction to differential and integral calculus. Applications include area, volumes, curve lengths, surface area, centroids, and moments. Focus is on application throughout the course.

Math 114 - Finite Mathematics and Calculus II (4-0-4)

Prerequisite: (Intended for Architecture students.) Math 113. Topics include numerical methods, set theory and counting, series, descriptive statistics and basic probability, matrices, and optimization.

Math 138 - General Calculus I (3-0-3)

Prerequisite: (Intended for students who are not in Science or in Engineering.) Math 104 with a grade of C or better or placement by performance on standardized entrance examinations. An introduction to differential and integral calculus of a single variable.

Math 211 - Calculus III A (3-0-3)

Prerequisite: Math 112. Topics include vectors, curvature, partial derivatives, multiple integrals, line integrals, and Green's theorem. Students who are considering a major in Mathematical Sciences or who are undecided about their major should take Math 213.

Math 213 - Calculus III B (4-0-4)

Prerequisite: Math 112. Topics include vectors, curvature, partial derivatives, multiple integrals, line integrals, and Green's, divergence, and Stokes' theorems.

Math 213H - Honors Calculus III (4-0-4)

Prerequisite: grade of B or better in Math 112H or grade of A in Math 112. Topics enhance those of Math 213 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 222 - Differential Equations (4-0-4)

Prerequisite: Math 211 or Math 213. Methods for solving ordinary differential equations are studied together with physical applications, Laplace transforms, numerical solutions, and series solutions.

Math 222H - Honors Differential Equations (4-0-4)

Prerequisite: grade of B or better in Math 213H or grade of A in Math 211 or Math 213. Topics enhance those of Math 222 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 225 - Survey of Probability and Statistics (1-0-1)

Prerequisite: Math 112. Topics include descriptive statistics, elements of probability, random variables and distributions; mean and variance; introduction to estimation and inference. This course satisfies the Mathematics GUR in probability and statistics. However, degree credit will not be granted for both Math 225 and any other upper level course in probability and/or statistics.

Math 226 - Discrete Analysis (4-0-4)

Prerequisite: Math 112. An introduction to discrete mathematics. Topics include elementary set theory, logic, combinatorics, relations, graphs and trees, algebraic systems.

Math 226H - Honors Discrete Analysis (4-0-4)

Prerequisite: grade of "B"or better in Math 112H or grade of "A" in Math 112. An introduction to discrete mathematics. Topics enhance those of Math 226 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 238 - General Calculus II (3-0-3)

Prerequisite: (Intended for students who are not in Science or in Engineering.) Math 138. A continuation of Math 138. Topics include applications of integral calculus and an introduction to ordinary differential equations.

Math 240 - Numerical Mathematics Laboratory (3-0-3)

Prerequisite: Math 112, and CIS 113 or knowledge of FORTRAN, C, or C++. Introduction to basic concepts and processes of numerical mathematics with emphasis on practical issues of implementation, use of numerical algorithms and software, and interpretation of numerical data. Weekly projects involving writing computer programs, presenting numerical results in tables and graphs, evaluation and approximation of standard numerical functions, round-off errors and loss of significance, basic iterative processes, matrix arithmetic, random number generation, and Monte Carlo methods. Students gain experience using a programming language, such as C, and mathematical software, such as MATLAB.

Math 244 - Introduction to Probability Theory (3-0-3)

Prerequisite: Math 112. Topics include basic probability theory in discrete and continuous sample space, conditional probability and independence, Bayes' theorem and event trees, random variables and their distributions, joint distribution and notion of dependence, expected values and variance, moment generating functions, useful parametric families of distributions including binomial, geometric, hypergeometric, negative binomial, exponential, gamma, normal and their applications, simple case of central limit theorem and its uses.

Math 245 - Multivariate Probability and Stochastic Processes (3-0-3)

Prerequisite: Math 244 or Math 333. Topics include discrete and continuous multivariate distributions and their moments, multivariate normal distributions, order statistics, discrete and continuous Markov chains, Poisson processes, and Brownian motion processes.

Math 305 - Statistics for Technology (3-0-3)

Prerequisite: (Intended for students in Engineering Technology.) Math 309. An introduction to the modern concepts of statistics needed by engineering technologists. Topics include organization of data, descriptive statistics, discrete and continuous probability distributions, sampling distribution and designs, estimation -- one and two populations, tests of hypotheses.

Math 309 - Mathematical Analysis for Technology (4-0-4)

Prerequisites: (Intended for students in Engineering Technology.) Calculus I or Unified Calculus. Emphasis on integration techniques; applications such as related rates, curve sketching, maximum and minimum, area, moments, centroids, volumes, approximate methods, partial derivatives, vector calculus, parametric equations, and infinite series.

Math 310 - Co-op Work Experience I (3 Credits)

Prerequisites: Completion of the sophomore year, departmental approval, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report.

Math 322 - Differential Equations for Technology (3-0-3)

Prerequisite: (Intended for students in Engineering Technology.) Math 309. An applied science study using differential equations as the vehicle for comprehension of the unknown. Introduction to first-order differential equations and their applications to motion, cooling and electromechanical systems followed by higher order differential equations and their solutions. Study of methods of undetermined coefficients, variation of parameters, and many series and numerical methods. Includes Laplace transforms, matrix methods, and eigenvalue problems.

Math 326 - Discrete Analysis for Computer Engineers (3-0-3)

Prerequisite: Math 112. An introduction to mathematical logic, Boolean algebra, and Karnaugh maps. Other topics include functions, equivalence relations and partially ordered sets, counting, graph theory and finite state machines. The emphasis is on computation but proofs will be addressed. Students cannot receive credit for both Math 226 and Math 326.

Math 331 - Introduction to Partial Differential Equations (3-0-3)

Prerequisite: Math 222. Partial differential equations in science and engineering. Topics include initial- and boundary-value problems for parabolic, hyperbolic, and elliptic second-order equations. Emphasis is placed on separation of variables, special functions, transform methods, and numerical techniques.

Math 331H - Honors Introduction to Partial Differential Equations (3-0-3)

Prerequisite: grade of "B" or better in Math 222H or grade of "A" in Math 222. Topics enhance those of Math 331 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 332 - Introduction to Functions of a Complex Variable (3-0-3)

Prerequisite: Math 222. Functions of a complex variable: Cauchy-Riemann equations, Cauchy-Goursat theorem, integration, series, residues, poles, geometrical aspects. Emphasis on techniques.

Math 332H - Honors Introduction to Functions of a Complex Variable (3-0-3)

Prerequisite: grade of "B" or better in Math 222H or grade of "A" in Math 222. Topics enhance those of Math 332 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 333 - Probability and Statistics (3-0-3)

Prerequisite: Math 112. Descriptive statistics and statistical inference. Topics include discrete and continuous distributions of random variables, statistical inference for the mean and variance of populations, and graphical analysis of data.

Math 333H - Honors Probability and Statistics (3-0-3)

Prerequisite: grade of "B" or better in Math 112H or grade of "A" in Math 112. Topics enhance those of Math 333 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 334 - Operations Research (3-0-3)

Prerequisite: Math 244 or Math 333. Considers mathematical methods found especially in contemporary fields such as operations research and reliability engineering. Topics include linear programming, graph theory, finite mathematics, differential equations, matrices, and determinants.

Math 335 - Vector Analysis (3-0-3)

Prerequisite: Math 211 or Math 213. Algebra and calculus of vectors. Topics include the theorems of Gauss, Green, and Stokes, and curvilinear coordinates.

Math 336 - Applied Abstract Algebra (3-0-3)

Prerequisite: Math 112 or departmental approval. Classical algebra from a modern and constructive viewpoint. Emphasis is on the development of algorithmic and computational skills. Topics include rings, fields, and groups and their applications to science and engineering.

Math 337 - Linear Algebra (3-0-3)

Prerequisite: Math 112 or departmental approval. Matrices, determinants, systems of linear equations, vector spaces, linear transformations, eigenvalues, eigenvectors, and related topics.

Math 337H - Honors Linear Algebra (3-0-3)

Prerequisite: grade of "B" or better in Math 112H or grade of "A" in Math 112. Topics enhance those of Math 337 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 340 - Applied Numerical Methods (3-0-3)

Prerequisites: Math 211 or Math 213, and CIS 101 or CIS 113 or Math 240. Introduction to numerical methods with emphasis on mathematical models. Implements and investigates numerical techniques for the solution of linear and nonlinear systems of equations, eigenvalue problems, interpolation and approximation, techniques of optimization, Monte Carlo methods, and applications to ordinary differential equations and integration.

Math 340H - Honors Applied Numerical Methods (3-0-3)

Prerequisites: CIS 101 or CIS 113. Grade of "B" or better in Math 213H or grade of "A" in Math 211 or Math 213. Topics enhance those of Math 240 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 341 - Introduction to Statistics (3-0-3)

Prerequisite: Math 244 or Math 333. Covers the theory and applications of classical statistical inference. Topics include sampling distributions, point and interval estimation, criteria of good estimators, maximum likelihood estimators and their large sample properties, statistical hypotheses and tests, including most powerful and uniformly most powerful tests and likelihood ratio tests, classical tests of parametric hypotheses about means and variances of normal populations, tests for proportion, chi-square tests of homogeneity, independence, goodness-of-fit, sign test and Wilcoxon test.

Math 344 - Regression Analysis (3-0-3)

Prerequisite: Math 333 or Math 341. An introduction to statistical data analysis using regression techniques. Topics include least squares estimation, hypothesis testing, prediction, regression diagnostics, residual analysis, variance stabilizing transformations, regression using indicator variables, variable selection, and model building.

Math 346 - Mathematics of Finance I (3-0-3)

Prerequisite: Math 111 or Math 138. The main topics include basic problems in interest, annuities, certain amortization and sinking funds, bonds and related securities. **Effective From: Spring 2005**

Math 347 - Mathematics of Finance II (3-0-3)

Prerequisites: Math 346 and Math 244 or Math 333 and Math 211 or Math 213. This course introduces mathematical models of bond and stock prices, which lead to arbitrage pricing of options and other derivative securities, and portfolio management. These areas of mathematical finance have a great impact on the way financial markets function. Topics include risk-free, and risky assets, portfolio management, futures, and options. **Effective From: Spring 2005**

Math 371 - Physiology and Medicine (3-0-3)

Prerequisite: Math 211 or Math 213, or departmental approval. (No biology requirement.) Mathematical models of organs and organ systems: the heart and circulation, gas exchange in the lungs, electrical properties of excitable membranes, neuro-biological clocks, the renal countercurrent mechanism, muscle mechanics. The biology is introduced with each topic. Emphasis is on quantitative problem solving, model building, and numerical simulation.

Math 372 - Population Biology (3-0-3)

Prerequisite: Math 211 or Math 213, or departmental approval. (No biology requirement.) Introduction to the mathematics of populations: Malthus' model of geometric population growth, Euler's renewal equations, age structure in human populations, predator satiation, chaos, mathematical models of inheritance, and the theory of epidemics. The ability to weave back and forth between physical concepts and mathematical notation is emphasized as well as the relationships between random and non-random models of similar phenomena.

Math 373 - Introduction to Mathematical Biology (3-0-3)

Prerequisites: Math 211 or 213 or 213H and Math 337. This course provides an introduction to the use of mathematical techniques applied to problems in biology. Discrete and continuous models of biological phenomena will be discussed. Biological topics discussed range from the subcellular molecular systems and cellular behavior to physiological problems, population biology and developmental biology. Techniques of phase plane analysis for differential equations are introduced in the course. No prior background in biology is necessary. **Effective From: Spring 2005**

Math 388 - Introduction to Chaos Theory (3-0-3)

Prerequisite: Math 211 or Math 213. An elementary treatment of chaos theory and its applications concentrating on discrete dynamical systems. Uses theory and applications illustrated by computer experiments to develop such topics as bifurcation, attractors, the logistic map, period-doubling routes to chaos, symbolic dynamics, Sarkovskii's theorem, fractals, and Julia and Mandelbrot sets for complex dynamics.

Math 410 - Co-op Work Experience II (3 credits)

Prerequisites: Math 310, departmental approval, and permission of the Office of Cooperative Education and Internships. Provides major-related work experience. Mandatory participation in seminars and completion of requirements that include a report and/or project.

Math 426 - Advanced Discrete Analysis (3-0-3)

Prerequisite: Math 226 or Math 326. Topics include graphs, trees and their applications, grammars, finite state machines, Turing machines and Petri nets, applied combinatorics -- Stirling, Catalan, and Ramsey numbers, Polya-Burnside counting methods, finite Markov chains and coding theory.

Math 430 - Analytical and Computational Neuroscience (3-1-3)

Prerequisites: Math 211 or Math 213, Phys 121, and CIS 101 or CIS 113. A mathematical and computational introduction to the biophysical mechanisms that underlie physiological functions of single neurons and synapses. Topics include voltage-dependent channel gating mechanisms, the Hodgkin-Huxley model for membrane excitability, repetitive and burst firing, nerve impulse propagation in axons and dendrites, single- and multi-compartmental modeling, synaptic transmission, calcium handling dynamics and calcium dependent currents and processes.

Math 431 - Systems Computational Neuroscience (3-1-3)

Prerequisites: Math 211 or Math 213, and CIS 101 or CIS 113 or Math 240, or departmental approval. A mathematical and computational introduction to operations of neuronal systems and networks. Topics include central pattern generators, neuroethology of sensory systems, sensory motor transformations, models of various brain regions, models of visual processes, large network modeling, models of learning and memory, neural coding and mathematics of neural networks.

Math 440 - Advanced Applied Numerical Methods (3-0-3)

Prerequisites: Math 331 and Math 340. A survey of numerical methods for solving ordinary and partial differential equations. Includes initial-value and boundary-value problems for ordinary differential equations and for elliptic, hyperbolic, and parabolic partial differential equations.

Math 440H - Honors Advanced Applied Numerical Methods (3-0-3)

Prerequisites: grade of "B" or better in Math 331 or Math 331H and Math 340 or Math 340H. Topics enhance those of Math 440 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 441 - Actuarial Mathematics I (3-0-3)

Prerequisite: Math 346. Topics include the economics of insurance, individual risk models for a short term, survival distributions and life tables, life insurance per year, life annuities, and net premiums.

Math 442 - Actuarial Mathematics II (3-0-3)

Prerequisite: Math 441. Topics include net premium reserves, insurance models including expenses, nonforfeiture benefits, and dividends.

Math 443 - Statistical Methods (3-0-3)

Prerequisite: Math 341. Topics include complete sufficient statistics and uniformly minimum variance estimators, general linear hypotheses and related topics, nonparametric inference including rank and order statistics, permutation methods, U-statistics, and Pitman efficiency.

Math 444 - Applied Sampling Methods and Quality Control (3-0-3)

Prerequisite: Math 333, or Math 244 and Math 341. An introduction to sample survey and statistical quality control. Topics include sampling from a finite population and different sampling techniques, more detailed study of random sampling and stratification, control charts and acceptance sampling plans in statistical quality control.

Math 445 - Introduction to Experimental Design (3-0-3)

Prerequisite: Math 333, or Math 244 and Math 341. Basic concepts and principles of designs are covered. Topics include randomized blocks, Latin squares, factorial designs.

Math 446 - Topics in Applied Statistics (3-0-3)

Prerequisite: Math 341 or Math 333. Topics may include biostatistics, environmental statistics, statistical consulting.

Math 447 - Applied Time Series Analysis (3-0-3)

Prerequisite: Math 341 or Math 333. An introduction to applied univariate time series analysis. Topics include regression techniques for modeling trends, smoothing techniques (moving average smoothing, exponential smoothing), autocorrelation, partial auto-correlation, moving average, and autoregressive representation of series, Box-Jenkins models, forecasting, model selection, estimation, and diagnostic checking, Fourier analysis, and spectral theory for stationary processes.

Math 450H - Methods of Applied Mathematics I (Capstone I) (3-0-3)

Prerequisites: Math 331, Math 337, and Math 340. Combines mathematical modeling with physical and computational experiments conducted in the Undergraduate Mathematics Computing Laboratory.

Math 451H - Methods of Applied Mathematics II (Capstone II) (3-0-3)

Prerequisite: Math 450H. Small teams of students conduct research projects under the guidance of faculty members who perform applied research.

Math 460 - Differential Geometry of Curves and Surfaces (3 credits)

Prerequisites: Math 222. Curves in the plane and Euclidean space, moving frames, surfaces in Euclidean space, orientability of surfaces, Gaussian and mean curvatures, surfaces of revolution, ruled surfaces, minimal surfaces, special curves on surfaces, Theorema Egregium, the intrinsic geometry of surfaces.

Math 473 - Intermediate Differential Equations (3-0-3)

Prerequisites: Math 222 and Math 337. Topics in the qualitative behavior of solutions of ordinary differential equations with applications to engineering problems. Includes phase plane analysis, stability, dynamical systems, and chaos.

Math 475 - Intermediate Partial Differential Equations (3-0-3)

Prerequisites: Math 331 and Math 337. A survey of methods, beyond separation of variables, for analyzing and solving the fundamental partial differential equations of mathematical physics. Considers first-order equations, Laplace's equation, the wave equation, the heat equation, and linear hyperbolic systems. Emphasizes using methods of calculus to solve canonical initial- and boundary-value problems.

Math 475H - Honors Intermediate Partial Differential Equations (3-0-3)

Prerequisites: Grade of "B" or better in Math 331H and Math 337H or Grade of "A" in Math 331 and Math 337. Topics enhance those of Math 475 and concepts are studied in detail. Emphasizes science and engineering applications.

Math 477 - Stochastic Processes (3-0-3)

Prerequisites: Math 244 or Math 333. This course introduces the theory and applications of random processes needed in various disciplines such as mathematical biology, finance, and engineering. Topics include discrete and continuous Markov chains, Poisson processes, as well as topics selected from Brownian motion, renewal theory, and simulation.

Math 480 - Introductory Mathematical Analysis (3-0-3)

Prerequisite: Math 211 or Math 213. Builds on principles taught in basic calculus courses. Topics discussed include continuity, differentiation, integration, and the limit process of sequences and series.

Math 481 - Advanced Calculus (3-0-3)

Prerequisite: Math 213 and Math 480. Systematic development of partial differentiation, multiple and improper integrals, transformations, inverse and implicit function theorems, and integrals over curves and surfaces.

Math 491 - Independent Study in Mathematics (3-0-3)

Prerequisites: Senior standing and departmental approval. Each student works under the direct supervision of a member of the Department of Mathematical Sciences. The work consists primarily of a project applying the student's mathematical skills to an engineering- or science-oriented project.

Math 493 - Seminar in Actuarial Science (1-0-1)

Prerequisite: Departmental approval. A series of lectures by practicing actuaries on topics of technical and/or current practices. Subjects announced at the time of registration. Progress is evaluated through projects and term papers. A comprehensive report summarizing some aspect of special interest to the student is required.

Math 495 - Topics in Applied Mathematics (3-0-3)

Prerequisites: Math 331, Math 332, and Math 340, or departmental approval. A survey of selected areas of applied mathematics. Case histories of problems in applied mathematics from an industrial background.

ME 215 - Engineering Materials and Processes (2-2-3)

Prerequisite: Chem 126. Students also must register for the lab component. Combined lecture and laboratory relating to the study of engineering materials. Processes of formation from liquid and particle state, plastic forming, molding deformation, and metal removal. Effects of heat treatment on material properties. Laboratory exercises involve basic machine tools and computer-controlled equipment.

ME 231 - Kinematics of Machinery (3-0-3)

Prerequisites: CIS 101, Mech 234. Design, selection, and evaluation of mechanisms for various applications. Topics include planar and spatial linkages, cams, gears, planetary and non-planetary gear systems, linkage synthesis, linkage dynamics, and an introduction to robotic manipulators using vector, matrix, and complex number methods. Projects involve using mathematics software for analysis and plotting of motion and inertial forces in planar and spatial linkages.

ME 304 - Fluid Mechanics (3-0-3)

Prerequisites: Mech 236, ME 311. Introduction to the basic principles of conservation of mass, momentum, and energy as they apply to engineering systems which utilize fluids. Some of the topics are dimensional analysis, theoretical and empirical analysis of one-dimensional compressible and incompressible flow, empirical analysis of external and internal flows, and elementary boundary layer theory.

ME 305 - Introduction to System Dynamics (3-0-3)

Prerequisites: Math 222, Mech 236, ME 231. Principles of dynamic system modeling and response with emphasis on mechanical, electrical, and fluid systems. Application of computer simulation techniques.

ME 310 - Co-op Work Experience I (3 additive credits)

Prerequisites: completion of sophomore year, approval of department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated by the co-op office and approved by the department. Mandatory participation in seminars and completion of a report.

ME 311 - Thermodynamics I (3-0-3)

Prerequisites: Math 211, Phys 111. Thermodynamic fundamentals. Topics are the first and second laws of thermodynamics, physical properties of pure substances, entropy, ideal and real gases, and gaseous mixtures.

ME 312 - Thermodynamics II (3-0-3)

Prerequisite: ME 311. A continuation of ME 311 including studies of irreversibility and combustion. Thermodynamic principles are applied to the analysis of power generation, refrigeration, and air-conditioning systems. Introduction to solar energy thermal processes, nuclear power plants, and direct energy conversion.

ME 315 - Stress Analysis (3-0-3)

Prerequisites: Math 222, Mech 237, ME 215. Problems related to mechanical design. Topics include two-dimensional elasticity, transformation of stress and strain, plane stress problems, axisymmetric members, buckling criteria, and failure theories.

ME 316 - Machine Design (3-0-3)

Prerequisites: ME 231, ME 315. Aspects of the design process and design of machine elements. Mini-projects are used to introduce engineering design procedures.

ME 339 - Fundamentals of Mechanical Design (3-0-3)

Prerequisite: Mech 234. For industrial engineering majors. Topics include kinematics of mechanisms, machine components, and a brief intro-duction to mechanical vibrations. Students gain the ability to deal with design problems from the viewpoint of a non-specialist.

ME 343 - Mechanical Laboratory I (2-2-3)

Prerequisites: EE 405, Math 225, Mech 236. Corequisite: ME 304. Students also must register for the lab component. Laboratory and lecture in instrumentation and measurement for mechanical engineering students. Applications for the sensing of such variables as pressure, tem-perature, mass flow, and displacement. Particular attention to the applicability and sensitivity of instruments.

ME 403 - Mechanical Systems Design I (2-1-3)

Prerequisites: ME 304, ME 305, ME 312, ME 316. Corequisite: ME 407. Lectures and projects covering problem solving methodology in the design, analysis, and synthesis of mechanical and thermal systems. The student's academic background combines with engineering principles and topics to serve as a foundation for broad engineering projects. Emphasis on creative thinking and the engineering design process in projects involving the optimal conversion of resources.

ME 405 - Mechanical Laboratory II (1-2-2)

Prerequisite: ME 343, ME 312. Corequisite: ME 407. Laboratory emphasizing the use of fundamental principles and instrumentation systems for the analysis and evaluation of mechanical components within a system.

ME 406 - Mechanical Laboratory III (1-2-2)

Prerequisite: ME 405, ME 407. Laboratory covering the testing and evaluation of complete mechanical systems.

ME 407 - Heat Transfer (3-0-3)

Prerequisites: Math 222, ME 304, ME 311. A study of the three fundamental modes of heat transfer: conduction, convection, and radiation. A physical interpretation of the many quantities and processes in heat transfer using numerical methods. Theory is applied to the analysis and design of heat exchangers and other applications. Where appropriate, computer simulation is used.

ME 408 - Mechanical Systems Design II (1-2-2)

Prerequisite: ME 403, ME 407. A continuation of ME 403 from a more integrated viewpoint, with lectures on special topics. Concepts in optimization and computer simulation are considered in the design and synthesis of mechanical engineering systems. The projects are more comprehensive, emphasizing creative design, and requiring design decisions of a more sophisticated nature.

ME 410 - Co-op Work Experience II (3 credits)

Prerequisites: ME 310, approval of the department, and permission of the Office of Cooperative Education and Internships. Full-time work experience of approximately one semester's duration. Provides major related work experience as co-op/internship. Mandatory participation in seminars and completion of requirements that include a report and project.

ME 425 - Finite Element Method in Mechanical Engineering 3-0-3 (3-0-3)

Prerequisites: CIS 101, Math 222, and Mech 237. Introduction to central ideas underlying the finite element method in mechanical engineering and its computer implementation. Fundamental concepts such as interpolation functions for one- and two-dimensional elements, bar element method, Galerkin's method, discretization of a model, methods of assembling global matrices, and the final solution techniques for obtaining nodal values. Specific applications to mechanical engineering problems in trusses, beams, torsion, heat transfer, fluid flow, plane stress, and plane strain.

ME 430 - Introduction to Computer-Aided Design (2-2-3)

Prerequisites: CIS 101, Math 222. Introduction to basic concepts of computer-aided design as applied to mechanical engineering design problems. Topics include numerical techniques, computer graphics, geometric modeling, design optimization, and databases for design. The laboratory uses current CAD software packages for mechanical design. Projects involve applications of the basic principles using student's own as well as available software.

ME 431 - Introduction to Robotics and Automation (3-0-3)

Prerequisites: CIS 101, Mech 236. Introduction to mechanics and control of robotic manipulators. Topics include spatial transformations, kinematics, dynamics, trajectory generation, actuators and control, and relations to product design and flexible automation.

ME 432 - Principles of Air Conditioning and Refrigeration (3-0-3)

Prerequisites: ME 304, ME 312; Corequisite: ME 407. A course in the fundamentals of air conditioning and refrigeration. Topics covered are psychometrics, cooling and heat load calculations, air distribution systems, duct design, vapor compression and absorption systems, and the principles of cooling towers.

ME 433 - Vibration Analysis (3-0-3)

Prerequisites: Mech 236, Math 222. An introduction to the fundamental theory of mechanical vibrations. Undamped and damped systems with single and multiple degrees of freedom, transient vibration, vibrations of continuous media, and analog and numerical methods.

ME 435 - Thermodynamics (3-0-3)

Prerequisites: Math 211, Phys 111. Intended for non-mechanical engineering students of all disciplines. Topics include the basic laws of thermodynamics, properties of fluids and solids, analysis of open and closed systems, gas and vapor power cycles, refrigeration and air conditioning, and an introduction to heat transfer. Cannot be taken for credit by mechanical engineering students.

ME 437 - Structural Analysis (3-0-3)

Prerequisite: ME 315. Fundamentals of structural analysis. Consideration of stresses and deflections of beams as well as the design of beams, columns, trusses, and structural connections of steel, reinforced concrete, and timber structures.

ME 438 - Introduction to Physical Metallurgy (3-0-3)

Prerequisites: Chem 126, ME 215. Introduction to metallic microstructures, solid solutions and the mechanical properties of metals and alloys. Physical understanding of diffusion processes is emphasized in covering the relationship between the nature of metals and different heat treating processes.

ME 439 - Principles of Tribology (3-0-3)

Prerequisites: Chem 126, Mech 237. An introduction to the principles of wear resistance of machine parts and tribology. Physical understanding of different mechanisms of wear and friction and methods of increasing durability.

ME 441 * - Computers Simulation and Analysis in Mechanical Engineering (2-2-3)

Prerequisites: ME 425, ME 430. This course covers various topics in Computer-Aided Design (CAD) and Computer-Aided Engineering (CAE). The course provides an in-depth understanding and skill of constructing 2-D drawings using well-known commercial CAD package, and integrating 3-D solid modeling techniques into simulation, and analysis animation of new designs using commercial CAD/CAE software. The students will have hands-on experience to analyze Structure, Heat Transfer, and Computational Fluid Dynamics problems by using several different software packages. The course is also focus on CAD Product Data Exchange using both Direct Database conversion and International Standards based conversion methods between major CAD/ CAE systems. Typical industrial applications will be illustrated.

ME 451 - Introduction to Aerodynamics (3-0-3)

Prerequisites: ME 304, ME 311. Introduction to the basic principles and properties of fluid flow around immersed bodies. Topics include the kinematics and dynamics of fluid fields, the thin airfoil, finite wing theory, and one-dimensional compressible flow.

ME 452 - Dynamics of Space Flight (3-0-3)

Prerequisites: Mech 236, Math 222. An introduction to the mechanics of space flight. After a brief introduction to the physics of the solar system, the dynamics of space flight are developed from the Newtonian viewpoint. Covers the performance and propulsion methods of rocketry.

ME 454 - Compressible Flow (3-0-3)

Prerequisites: ME 304, ME 312, Math 222. Equations of one-dimensional compressible flow. Topics are flows with variable areas, friction, mass addition, heat addition, normal shocks, and combination of these effects. Special topics in two-dimensional flows such as oblique shocks.

ME 455 - Automatic Controls (3-0-3)

Prerequisite: ME 305. Introduction to the principles of automatic controls. Emphasis on systems, considering their mechanical, hydraulic, pneumatic, thermal, and displacement -aspects. First and second order linear systems. Introduction to system analysis techniques such as Nyquist and Bode diagrams and applications in system design.

ME 470 - Engineering Properties of Plastics (3-0-3)

Prerequisites: ME 215, Mech 237. A study of the physical properties of the various commerical thermosetting and thermoplastic resins. An introduction to linear viscoelastic theory and its relationship to measurable mechanical properties of plastics. Also, engineering properties such as flammability, chemical resistance, and electrical properties.

ME 471 - Introduction to Polymer Processing Techniques (3-0-3)

Prerequisites: ME 304, ME 407. A study of the various plastics processing techniques, including extrusion, injection molding, blow molding, compression molding, thermoforming, rotational molding, casting, etc. The relationship between product design and choice of process will be presented.

ME 472 - Introduction to Biomechanical Engineering (3-0-3)

Prerequisites: ME 316 or equivalent; or permission of the instructor. Introduction to biomechanical engineering integrating the principles of mechanics with the notions of physiology into simple mathematical models consisting of sets of governing equations. Topics include anatomy; basic concepts and definitions of biomechanical engineering; basic solid mechanics such as human force and motion; basic fluid mechanics such as the cardiovascular system and blood circulation; engineering design of general assistive devices.

ME 490 - Mechanical Engineering Project A (3-0-3)

Prerequisites: departmental approval required. One or more individually selected projects. Projects usually require library research, design, cost analysis, planning of testing. Also involves an engineering report and a technical presentation.

ME 490H - Honors Mechanical Engineering Project I (3-0-3)

Prerequisites: member of Honors College and departmental approval required. Similar to ME 490.

ME 491 - Mechanical Engineering Project B (3-0-3)

Prerequisite: ME 490 and departmental approval required. One or more selected projects. Projects usually require library research, design, cost analysis, planning of testing. Also involves an engineering report and a technical presentation.

ME 491H - Honors Mechanical Engineering Project II (3-0-3)

Prerequisites: member of Honors College, and departmental approval required. Similar to ME 491.

* pending approval

Mechanics: Offered by the Department of Civil and Environmental Engineering. See Civil Engineering course list for faculty.

Mech 234 - Engineering Mechanics (2-0-2)

Prerequisites: Phys 111, Math 112. A course for industrial and mechanical engineering students in which the equilibrium of particles and rigid bodies subject to concentrated and distributed forces is studied.

Mech 235 - Statics (3-0-3)

Prerequisites: Phys 111, Math 112.Provides an understanding of equilibrium of particles and rigid bodies subject to concentrated and distributed forces.

Mech 236 - Dynamics (2-0-2)

Prerequisites: Mech 235 (or Mech 234 for IE, ME majors). Provides an understanding of the mathematics of the motion of particles and rigid bodies, and of the relation of forces and motion of particles.

Mech 236H* - Honors Dynamics (2-0-2)**

Prerequisites: Mech 234 or Mech 235 and enrolled in the Honors College. Course material similar to Mech 236 except in addition, the student will be involved in a research project.

Mech 237 - Strength of Materials (3-1-3)

Prerequisites: Mech 235 (or Mech 234 for IE, ME majors) and a working knowledge of statics with emphasis on force equilibrium and free body diagrams. Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behavior of materials under various load conditions. Lab should be taken concurrently

Mech 320 - Statics and Strength of Materials (3-0-3)

Prerequisites: Phys 111, Math 112. For chemical engineering and electrical engineering majors. Statics provides an understanding of the equilibrium of particles and rigid bodies, including simple machines, trusses, and frictional forces. Mechanics of materials covers pressure vessels, thermal stresses, torsion of shafts, stresses and deflection in beams, and column action.

Mech 320H - Honors Status and Strength of Materials (3-0-3)**

Prerequisites: Phys 111, Math 112, and enrolled in the Honors College. For chemical engineering, electrical engineering, and biomedical engineering majors. Course material similar to Mech 320 except in addition, the student will design and perform several laboratory tests.

** The Senior Capstone Seminar in Humanities and Social Science, which fulfills one area of the Humanities and Social Science Electives GUR, is required for students entering NJIT in the fall of 1997 or after that date. Students entering before that date will have a different program and should consult the Department of Humanities and Social Sciences to learn which curriculum applies.

*** All students at NJIT are required to complete at least one 100-level 2-credit or 3-credit CIS course. The Department of Computer and Information Science offers a set of 100 level courses to satisfy this requirement, and the student should select one based upon his or her intended major. It is imperative that students speak with their advisors prior to enrolling to determine the appropriate CIS course.

Nursing: Offered by the College of Nursing at Rutgers-Newark

NURS 301 - Theory and Practice of Professional Nursing (3-0-3)

Building on the historical and theoretical foundations of the profession, students explore the theme of health, the continuum of health illness, the sociocultural variations that influence health and response to illness, and the many dimensions of health. Nursing interventions are explored in relation to ethical, social, legal, political, and personal issues as students clarify their own professional identity, responsibility and power.

NURS 302 - Comprehensive Health Assessment (3-0-3)

Focuses on total health assessment with differentiation between normal and abnormal findings. The total health assessment content focuses on individuals across the life span. Emphasis is placed on data collection and analysis through history and physical examination.

NURS 304 - Nursing Informatics (4-0-4)

Computer applications for nursing. Exposes students to PC-based and mainframe computer systems through computer laboratory and field experiences.

NURS 305 - Adaptations and Alterations in Body Functions (3-0-3)

Reviews and extends fundamental concepts of physiology and changes that produce signs and symptoms and the body's remarkable ability to compensate for these illness-related changes. Findings will establish the database for formulating appropriate nursing strategies.

NURS 306 - Pharmacology (2-0-2)

Prerequisite or corequisite: NURS 305. Reviews and extends students? previous knowledge of pharmacological science. Explores mechanisms of actions of drugs used to treat various health conditions at the cellular level.

NURS 307 - Epidemiology in Nursing Practice (2-0-2)

An introduction to population-based approach to health care. Incorporate information on the etiology and predictors of events in order to design health promotion and disease prevention strategies.

NURS 401 - Patterns of Community Health (3-6-6)

Prerequisites: completion of all NURS 300-level courses. Focuses on nursing knowledge and interventions directed to enhance community health for diverse populations. Clinical practicum focusing on clients with diverse needs and in a variety of settings enhances classroom learning.

NURS 402 - Environmental and Occupational Health (4-0-4)

Prerequisites: completion of all NURS 300-level courses. Prepares students to assess changes in health status related to the environment or the workplace. Students are provided with the skills needed to evaluate, and recommend control strategies for the phenomena.

NURS 403 - Nursing Care Delivery Systems (3-6-6)

Prerequisites: completion of all NURS 300-level courses. Focuses on the professional nurse's leadership and management role within health care systems. The multi-faceted aspects of the role of the nurse as a leader and manager are explored in depth, with emphasis on the role of the nurse as change agent. Includes organizational behavior, decision-making, the change process, the management of health care delivery, and nursing care within health care organizations.

NURS 404 - Research Applications in Nursing Practice (3-0-3)

Prerequisites: Completion of all NURS 300-level courses. Prepares students to critically analyze nursing issues from an applied research perspective.

Operations Management: Offered by the School of Management. See Management course list for faculty.

OM 375 - Management Science (3-0-3)

Prerequisite: Mgmt 216. Introduction to statistical and mathematical techniques used in management decision making. Develop the concepts of management science and use its techniques with unrestricted focus. Operations management applications are made in factory settings, health-care and other service industries, education and government agencies.

OM 475 - Production Planning and Control (3-0-3)

Prerequisites: OM 375, junior or senior standing. The components and functioning of in-production, planning, and control systems. Material, equipment, and labor requirements for optimizing continuous and intermittent manufacturing operations. The use of a computer to simulate such models.

OM 476 - Quality Control (3-0-3)

Prerequisites: OM 375, junior or senior standing. Deals with measuring, and improving the performance of the service and/or production processes being managed. Performance assessment is an important component of any management system's excellence. In managing a service-oriented or a manufacturing-based company, performance measurement and analysis should be built into the management processes of identifying and overcoming problems that are central to continuous improvement. The topics include cost analysis, control and improvement, continuous quality improvement, and the other assessment methods for planning and controlling production and service company-wide.

Optical Science and Engineering: Offered by the Physics Departments of NJIT and Rutgers-Newark

OPSE 301 - Introduction to Optical Science and Engineering (3-0-3)

Prerequisites: Phys 121. Laboratory and lecture introduces optics and photonics principles with their elementary applications for applied physics, engineering, computer science, or biology majors. Topics include speed at light, reflection, refraction, geometric optics, interference and interferometry, polarization, dispersion, birefringence, fiber-optics, diffraction, introduction to spectroscopy and ray tracing.

OPSE 310 - Virtual Instrumentation (2-3-3)

Prerequisites: A 3-credit 100-level CIS programming course (preferably C or C++). Intended for all engineering, computer science, and science majors. Covers the basics of virtual instrumentation including use of IEEE GPIB, RS232 interfaces, and data acquisition boards. Interface a computer to various instruments for data acquisition and instrument control using a state-of-the-art software platform such as National Instrument's LABVIEW. Emphasis is on the practical aspects of interfacing a computer to various instruments including timing issues, real-time data acquisition and instrument control, instrument status, and acquisition speed.

OPSE 402 - High Power Laser and Photonics Applications (3-0-3)

Prerequisite: Phys 121. Open to all engineering, computer science, and science majors with junior or senior standing. Advanced combined laboratory and lecture course emphasizing photonics and high power laser applications. Topics include Maxwell's equations, principles of lasers, electro-optics, non-linear optics, absorption and transmission of light, bio-optics, fiber-optic communications, chemiluminescence, scattering from periodic surfaces and colloids, sensors. Topics and experiments change on a semester basis depending on interests of enrolled students.

Philosophy: Offered by the Department of Humanities. See Humanities course list for faculty.

Phil 300 - Philosophy of Law and Social Justice (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Introduction to philosophical issues concerning law, using lectures and case studies. Topics covered will include: the interpretation of legal texts; the foundation of moral obligation to obey the law; the nature of rights; and the function of punishment

Phil 331 - Problems in Philosophy (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An examination of problems of a social, ethical, esthetic, religious, and scientific nature, and a study of the related principles and methods of philosophy. Readings are chosen from a wide range of periods and schools from the Greeks to the present, with some application of philosophical analysis to individual and societal problems.

Phil 333 - Moral Philosophy (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. A critical discussion of the history and fundamental elements of ethical thought. Examines topics such as the basic ethical theories, the nature of right and wrong, the significance of moral choice, the structure of the moral life, and the place of reason in ethics. Readings from both classical and modern philosophers.

Phil 334 - Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents.. A philosophical examination of the nature of engineering practice and applied technology. Considers such questions as: How do the societal functions of engineers and the practical application of technologies relate to basic moral and intellectual values? What moral obligations are implied by the uses of technology? What are the ethical duties of engineers in the practice of their careers? How are technological practice and engineering related to questions about knowledge and reality?

Phil 337 - World Religions (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An introduction to five world religions which make strong claims to be in some sense universal: Hinduism, Judaism, Buddhism, Christianity, and Islam, with special attention to their impact on contemporary politics, gender, economics, and culture. Study of selected scriptures, major customs, representative figures, and one or two works of art from each religious tradition.

Phil 340 - Ethical Issues in Public Policy (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Course premise is the inevitability of ethical issues in public policy decision making. Societal forces such as government, industry, economics, public interest, and science can play various roles in shaping public policy and are related to ethical concerns. Focuses on both historic and current public policy case studies.

Phil 350 - Representative Philosophies (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. The ideas of a few great thinkers, from a variety of historical periods. Shows at first hand how these philosophers accelerated intellectual progress and how their work may contribute to the solution of modern problems.

Phil 351 - Biomedical Ethics (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An examination of the ethical problems and moral foundations of medicine. Among the issues explored are the changing nature of the doctor/patient relationship, increased patient autonomy, advance directives, the rationing of care, doctor-assisted suicide, and "the right to die." Honors Note: See HSS 101.

Phil 355 - The Philosophy of Science (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An investigation into the foundations and implications of modern science, with special emphasis on the influence of philosophy on scientific thought, and on philosophic questions.

Phil 380 - Philosophy of Language (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Examines tradition, formation and change in the ways that language shapes thought. Special attention is paid to the relationships between language and religion, as well as language and science.

Physical Education: Offered by the Division of Physical Education and Athletics

PE 103 - Swim Instruction (0-1-1)

Students develop aquatic skills, including various swimming strokes and rescue techniques, according to skill level. Limited to 10 students.

PE 104 - Survival Swimming (0-1-1)

Designed for the average, weak or non-swimmer and will emphasize survival swimming, basic rescue and water safety techniques, and swimming instruction.

PE 105 - Lifesaving/Lifeguard Training (0-1-1)

An American Red Cross certification course. The purchase of textbooks is required. Laboratory hours are established at first lecture.

PE 106 - Water Safety Instructor (0-1-1)

Prerequisite: Valid Advanced Lifesaving certificate. An American Red Cross certification course. The purchase of textbooks is required. Laboratory hours are established at first lecture. Upon successful completion of this course, an individual will be able to teach swimming at all levels as well as emergency water safety.

PE 115 - Strength Training and Conditioning (0-1-1)

Covers strength and conditioning techniques and programs, goal setting, and record keeping.

PE 118 - Walking (0-1-1)

An approach to cardiovascular fitness and weight reduction. Walking tours may be offered.

PE 119 - Bicycling (0-1-1)

Emphasis on preparation for touring and recreational biking. May include some short tours. Students must have their own bikes.

PE 128 - Hydrofitness (0-1-1)

Water fitness designed to tone major muscle groups, and strengthen the cardiovascular system. Includes exercises for all parts of the body, recipes for staying in shape, and the aerobic way to a strong heart.

PE 129 - Individualized Fitness (0-1-1)

Specific training to meet the individual student's interest. Areas include techniques of strength training, goal setting and record keeping.

PE 131 - Step Aerobics (0-1-1)

A high-intensity aerobic workout designed for the moderate to advanced participant using the "Reebok Step" to increase cardiovascular strength and endurance with emphasis on target heart rates, safety, fat reduction, and achieving overall fitness and good health.

PE 132 - Aerobics (0-1-1)

Designed for cardiovascular conditioning, weight loss, and muscle toning.

PE 133 - Swim for Health (0-1-1)

Prerequisite: must be able to swim. Designed for those who want to use swimming to improve their health and fitness. Swim for Health is a concentrated program which teaches the techniques and methods used in the development of individualized ?training programs.?

PE 135 - Beginning Swimming (0-1-1)

Designed for the non-swimmer. Includes survival techniques and basic rescue.

PE 136 - Beginning Karate (0-1-1)

An introduction to shotokan karate. Includes basic self-defense. Gi (martial arts uniform) optional.

PE 137 - Intermediate Karate (0-1-1)

Prerequisite: PE 136 or permission of the instructor. A continuation of PE 136. Includes an introduction to katas, Japanese terms and complex self-defense. Gi (martial arts uniform) required.

PE 139 - Individual Fitness II (0-1-1)

Prerequisite: PE 129 or permission of the instructor. Designed to increase cardiovascular efficiency, muscular strength, and endurance through specific training that meets a student's continuing goals.

PE 140 - Circuit Training (0-1-1)

Designed as a low-impact aerobic program utilizing weights to increase flexibility, coordination, muscle tone, and cardiovascular endurance.

PE 141 - Introduction to Dance (0-1-1)

An introduction to several styles of dance, including ballet, modern, jazz, tap, folk, ethnic, and social.

PE 145 - Aerobic Instructor Certification (0-1-1)

Prerequisite: approval of the instructor. Preparation for passing the certification test to become an aerobic instructor. Includes aerobic dance and stretching techniques, class format, music, and anatomy and physiology.

PE 201 - Introduction to Lifetime Sports I (0-1-1)

Offered only in the fall semester, introduces a variety of the individual, dual, and team sports available at NJIT.

PE 202 - Lifetime Sports II (0-1-1)

A continuation of PE 101. Participate in a variety of activities or develop an area(s) of concentration.

PE 208 - Sports for Women (0-1-1)

Designed specifically for women interested in learning and competing in individual, dual and team sports.

PE 210 - Skiing (0-1-1)

Instruction and practical experience in recreational skiing designed for the novice and intermediate skier. Includes lectures on safety, equipment and clothing, first aid and injuries, tuning and repair; six sessions at Hidden Valley, and possibly one weekend trip to Vermont. Students are responsible for costs of lift tickets and any equipment rentals. Transportation may be provided.

PE 211 - Introduction to Bowling and Archery (0-1-1)

The rules, techniques and scoring of each sport. Archery equipment is provided. For bowling, students must pay a $1 per class alley fee.

PE 213 - Volleyball (0-1-1)

Learn current techniques and skills while playing triples (3 on 3) and leading up to competitive team (6 on 6) volleyball.

PE 214 - Advanced Volleyball (0-1-1)

Prerequisite: PE 113 or approval of the instructor. Advanced methods and techniques of spikes, serves, blocks, sets, team transition, strategy, tournament play, statistics, and videotape analysis.

PE 220 - Introduction to Racquet Sports (0-1-1)

An introduction to the racquet sports of badminton, paddleball, tennis, and racquetball. Includes rules of play, service, strokes, and playing strategy for singles and doubles.

PE 221 - Badminton (0-1-1)

Includes the rules, skills, strokes, and strategies of badminton, and provides an opportunity for competition.

PE 223 - Tennis for Beginners (0-1-1)

Introduces students to the rules and basic techniques and strategies of tennis.

PE 224 - Intermediate Tennis (0-1-1)

Prerequisite: PE 223 or permission of the instructor. Emphasizes correcting problem strokes, strategies, drills, and tournament play.

PE 225 - Golf (0-1-1)

Designed for the beginner. Areas covered are grip, stance, swing, strokes, and use of clubs, progressing towards actual course play. Students pay green and range fees.

PE 226 - Intermediate Golf (0-1-1)

Prerequisite:PE 225 or permission of the instructor. Designed to strengthen and advance the skills and theory learned in PE 125.

PE 227 - Sailing and Windsurfing (0-1-1)

Learn the basics of small boat sailing and windsurfing. Includes principles of sailing, rules of the road and boat maintenance with practical experience at Spruce Run Reservoir. Transportation may be provided.

PE 234 - Beginning Fencing (0-1-1)

Introduces fencing as both a lifetime and intercollegiate sport. Basic equipment is provided.

PE 242 - Introduction to Racquetball (0-1-1)

An introduction to rules, skill development, strategies and tournament play.

PE 243 - Introduction to Volleyball (0-1-1)

An introduction to rules, skill development, strategies, and tournament play.

PE 244 - Advanced Racquetball (0-1-1)

Prerequisite: PE 242 or permission of the instructor. Advanced methods and techniques of various serves; passing, and kill shots; advanced strategy; tournament play focusing on singles and doubles play.

Physics: Offered by the Physics Departments of NJIT and Rutgers-Newark

Phys 102 - General Physics (3-0-3)

Prerequisite: satisfactory completion of two high school mathematics courses and two high school science courses. Intended for students in architecture, computer science (B.A. only), STS and other disciplines requiring laboratory science electives. Elementary statics and dynamics. Subjects discussed are kinematics, Newton's laws of motion, energy, momentum, conservation principles, and mechanical properties of matter. Lab must be taken concurrently.

Phys 102A - General Physics Laboratory (0-2-1)

Prerequisite: same as Phys 102. This course is the laboratory component of Phys 102 and must be taken concurrently.

Phys 103 - General Physics (3-0-3)

Prerequisite: Phys 102. A continuation of Phys 102 for students in architecture, computer science (B.A. only), STS and other disciplines requiring laboratory science electives. Topics discussed are heat, thermodynamics, sound, wave motion, illumination, geometric and physical optics, and color. Lab must be taken concurrently.

Phys 103A - General Physics Laboratory (0-2-1)

Prerequisite: same as Phys 103. This course is the laboratory component of Phys 103 and must be taken concurrently.

Phys 105 - Physics A (3-0-3)

Corequisite: Math 103. First semester of a two-semester sequence with Phys 106. The sequence is equivalent to Phys 111. Placement is determined by performance on standardized entrance examinations. A study of elementary mechanics with emphasis on the fundamental laws of mechanics and conservation laws. Topics include scalar and vector quantities, rectilinear motion, equilibrium and Newton's laws of motion, friction, work and energy, impulse, and momentum. Lab must be taken concurrently.

Phys 105A - Physics A Laboratory (0-2-1)

Placement in this course is determined by performance on standardized entrance examinations. This course is the laboratory component of Phys 105 and must be taken concurrently.

Phys 106 - Physics B (3-0-3)

Prerequisite: Phys 105. Corequisite: Math 104. Second semester of a two-semester sequence with Phys 105. An extension of Phys 105 in the area of mechanics. Topics include rotational motion, torque, inertia and angular momentum, static equilibrium, gravity, and a full review of mechanics at the level equivalent to Phys 111. Lab must be taken concurrently.

Phys 106A - Physics B Laboratory (0-2-1)

Prerequisite: same as Phys 106. This course is the laboratory component of Phys 106 and must be taken concurrently.

Phys 111 - Physics I (3-0-3)

Corequisite: Math 111. Elementary mechanics with an emphasis on the fundamental concepts and laws of mechanics, especially the conservation laws. Topics are scalar and vector quantities of mechanics; rectilinear and circular motion; equilibrium and Newton's laws of motion; work, energy, momentum; the conservation laws. Lab must be taken concurrently. See Phys 111A.

Phys 111A - Physics I Laboratory (0-2-1)

Prerequisite: same as Phys 111. Laboratory component of Phys 111 and Phys 111H. Lab must be taken concurrently with Phys 111 or Phys 111H.

Phys 111H - Honors Physics I (3-0-3)

Corequisite: Math 111. Admission to this course is by invitation, based on class standing and standardized entrance exams. First semester of a three-semester program in Honors Physics. Covers the material in Phys 111, but topics are treated more comprehensively and in greater depth. More extensive use of mathematics. Lab must be taken concurrently. See Phys 111A.

Phys 121 - Physics II (3-0-3)

Prerequisites: Phys 111 or Phys 111H; Math 111. This course deals with an introduction to electricity and magnetism. Topics include simple dc circuits, the electric field, the magnetic field, electric potential, capacitance relationships between electric and magnetic fields, inductance, and simple ac circuits. Lab must be taken concurrently. See Phys 121A.

Phys 121A - Physics II Laboratory (0-2-1)

Prerequisite: same as Phys 121. Laboratory component of Phys 121 and Phys 121H. Lab must be taken concurrently with Phys 121 or Phys 121H.

Phys 121H - Honors Physics II (3-0-3)

Prerequisites: Phys 111 or Phys 111H; Math 111. This is the second semester of a three-semester program in Honors Physics. The course covers the material given in Phys 121. Greater use is made of vector analysis. In addition, an introduction to Maxwell's equations for the electromagnetic field and their application to physical problems is given. Lab must be taken concurrently.See Phys 121A.

Phys 202 - Introductory Astronomy and Cosmology (3-0-3)

A non-mathematical presentation of contemporary views of the origin, evolution, and structure of the solar system, stars, galaxies, and the universe. Special topics include neutron stars, black holes, gravitationally strange objects, and the ?big bang.?

Phys 202A - Astronomy and Cosmology Laboratory (0-2-1)

Corequisite: Phys 202. Includes demonstration of physical principles applicable to astronomy. Use of telescope for lunar, solar and planetary observations.

Phys 203 - The Earth in Space (3-0-3)

Introduces fundamental phenomena, such as plate tectonics, erosion, volcanism, and glaciation. Studies the interaction between the Earth's four major reservoirs?atmosphere, hydrosphere, biosphere and solid earth; investigates the dependence of the Earth on the Sun; the effect of the Moon on the Earth. Extends knowledge gained from studying the Earth to other planets in this solar system.

Phys 203A - The Earth in Space Laboratory (0-2-1)

Corequisite: Phys 203. Optional laboratory course associated with Phys 203.

Phys 231A - Physics III Laboratory (0-2-1)

Prerequisite: same as Phys 234. Laboratory component of Phys 234 and Phys 231H.

Phys 231H - Honors Physics III (4-0-4)

Prerequisites: Phys 121 or Phys 121H; Math 111. Third semester of a three-semester program in Honors Physics. Physical optics is treated in greater detail. Modern physics includes a greater number of topics, with special emphasis on the wave-particle duality in nature. Lab must be taken concurrently. See Phys 231A.

Phys 233 - Physics III (3-0-3)

Prerequisite: Phys 121. Intended for students in chemical engineering only. Topics include elements of simple harmonic motion, wave motion, interference and diffraction, quantum mechanics, semiconductor models, carrier distribution, Fermi functions, and selected topics.

Phys 234 - Physics III (3-0-3)

Prerequisite: Phys 121 or Phys 121H;. Elements of simple harmonic motion, wave motion, geometric and physical optics are considered. The wave and particle duality of nature is emphasized and made plausible by an examination of the important experiments and theories which lead to the modern concepts of matter and radiation. The conservation laws are broadened to include the equivalence of mass and energy.

Phys 235 - Physics III (4-0-4)

Prerequisites: Phys 121 and 121A. Intended for students in computer engineering. Topics include simple harmonic motion, wave motion, interference and diffraction, photons, electrons, and the wave particle duality. Thermodynamics and heat transfer are introduced.

Phys 310 - Introduction to Atomic and Nuclear Physics (3-0-3)

Prerequisites: Physics III; Math 222. Selected topics in atomic physics including the Pauli Exclusion Principle and the Atomic Shell Model. In nuclear physics, the two-body problem, nuclear models, alpha, beta, and gamma radiation, acclerators, and nuclear detectors are studied. 21&62:750:403 may be substituted for this course.

Phys 311 - Co-op Work Experience I (3 credits)

Prerequisite: acceptance into the co-op program. Students gain major-related experience and reinforcement of the academic program. Work assignments are facilitated and approved by the Office of Cooperative Education and Internships. Participation in seminars and a final report/project is mandatory.

Phys 320 - Astronomy and Astrophysics I (3-0-3)

Prerequisites: Phys 103 or Phys 121 or Phys 121H. A quantitative introduction to the astronomy of the sun, earth, and solar system, with an emphasis on the physical principles involved. Includes celestial mechanics, planetary atmospheres and the physics of comets, asteroids and meteorites.

Phys 322 - Observational Astronomy (3-0-3)

Prerequisite: Phys 320 or by permission of the instructor. Most class time is spent in an observatory performing observations of celestial objects such as the Sun, Moon, planets, stars, stellar clusters, and galaxies. Experimental projects include charting the skies, asterophotography (film and CCD), measuring masses of planets, rotational period of the Sun, topography of the Moon, H-R diagrams of stellar clusters, etc.

Phys 335 - Introductory Thermodynamics (3-0-3)

Prerequisite: Physics III. Introductory thermodynamics, kinetic theory, statistical physics. Topics include equations of state, the three laws of thermodynamics, reversible and irreversible processes. 21&62:750:315 may be substituted for this course.

Phys 390 - Selected Topics of Current Interest in Physics (1-0-1)

Prerequisite: Physics III. Seminar covering topics that are currently in the forefront of physics. The lecture series offers exposure to such topics as nuclear physics, solid state physics, plasma physics, the special and general theories of relativity, and the history and philosophy of science.

Phys 411 - Co-op Work Experience II (3 credits)

Prerequisites: Phys 311 and acceptance into the co-op program. Provides for co-op work assignments which must be approved by the Office of Cooperative Education and Internships. Participation in seminars and a final -report/project are mandatory.

Phys 430 - Classical Mechanics I (3-0-3)

Prerequisites: Phys 233 or Phys 234 or Phys 235 or 231H; Math 222. Newtonian mechanics of particles and systems. Lagrange's and Hamilton's approaches. Continuous systems. 21&62:750:361 may be substituted for this course.

Phys 431 - Classical Mechanics II (3-0-3)

Prerequisite: Phys 430. Continuation of Phys 430. Theory of small oscillations and mechanical waves. Rigid bodies. Topics include stability, linearization methods, forced vibrators and perturbation theory, fluids and mechanics of continuous media. 21&62:750:362 may be substituted for this course.

Phys 432 - Electromagnetism I (3-0-3)

Prerequisites: Physics III; Math 222. Electrostatics and magnetostatics, Maxwell's equations with applications, and electrodynamics.

Phys 433 - Electromagnetism II (3-0-3)

Prerequisite: Phys 432. Continuation of Phys 432. Maxwell's equations with applications and electrodynamics.

Phys 441 - Modern Physics (3-0-3)

Prerequisites: Physics III; Math 222.. Topics include wave-particle duality, wave mechanics, two-state quantum systems, the motion of an electron in a periodic lattice, band theory of solids, electrical, thermal and magnetic properties of solids, and plasmas and super fluid systems. 21&62:750:316 may be substituted for this course.

Phys 442 - Introduction to Quantum Mechanics (3-0-3)

Prerequisites: Physics III; Math 222. Wave-particle duality, the Schrodinger and Heisenberg formulations of quantum mechanics. The hydrogen atom, perturbation theory, and concepts of degeneracy, composite states and general properties of eigenfunctions. 21&62:750:404 may be substituted for this course.

Phys 443 - Modern Optics (3-0-3)

Prerequisites: Physics III; Math 222.. Electromagnetic theory of light, interference, diffraction, polarization, absorption, double refraction, scattering, dispersion, aberration, and an introduction to quantum optics. Other topics include holography, lasers, information retrieval, spatial filtering, and character recognition.

Phys 444 - Fluid and Plasma Dynamics (3-0-3)

Prerequisites: Physics III; Math 222. Introduces the basics of plasma physics. Covers the following plasma parameters, single particle motions, plasma as fluid, waves, diffusion and resistivity, equilibrium and instability, kinetic theory, nonlinear effects. Applications in three areas: controlled fusion, astrophysics, and interaction between light and plasma.

Phys 446 - Solid State Physics (3-0-3)

Corequisite: Phys 441 or Phys 442. An introduction to modern concepts of the solid state. Topics include crystal structure and diffraction, crystal binding and elastic properties, thermal properties, dielectric phenomena, band theory of solids and Fermi surfaces, electrical conductors, semiconductors, magnetism, and super-conductivity. 21&62:750:406 may be substituted for this course.

Phys 450 - Advanced Physics Laboratory (0-4-2)

Prerequisites: permission of the instructor. Introduction to electrical measurements; instrumentation; theoretical and applied electronics, solid state electronic devices, digital circuitry; computer design; experiments in modern physics.

Phys 461 - Mathematical Methods of Theoretical Physics (3-0-3)

Prerequisites: Phys 430, Phys 432, Phys 433. Topics include vector and tensor analysis, matrix methods, complex variables, Sturm-Liouville theory, special functions, Fourier series and integrals, integral equations, and numerical solutions of differential equations.

Phys 481 - Applied Solid State Physics: Microelectronics I (3-0-3)

Prerequisite: Phys 446 or Phys 456. Not to be taken if EE 463 has been taken. Topics include physics of bipolar and field effect devices, Phonon and optical spectra, unipolar devices, and thermal and high field properties of semiconductor devices.

Phys 482 - Applied Solid State Physics: Microelectronics II (3-0-3)

Prerequisite: Phys 446 or Phys 456. Not to be taken if EE 463 has been taken. Topics include large-scale integrated circuits, device characteristics, charge-coupled devices, LED and semiconductor lasers, photodetectors, and electrical and optical properties of materials.

Phys 485 - Computer Modeling of Applied Physics Problems (3-0-3)

Prerequisites: Physics III; Math 222. General computer programming modeling methods and techniques. Numerical solutions to integro-differential equations. Eigenvalues problems. Application of computer-aided-design and other packages. 21&62:750:461 may be substituted for this course.

Phys 490 - Independent Study (3-0-3)

Prerequisite: departmental approval. Undertake individual research or a project under the supervision of a member of the physics department. 21&62:750:485, 486 may be substituted for this course.

Phys 490H - Honors Independent Study (3-0-3)

By arrangement with a physics faculty member. Fulfills Honors College capstone course requirement.

Physics 321 - Astronomy and Astrophysics II (3-0-3)

Prerequisite: Phys 320 or by permission of the instructor. A quantitative introduction to the astronomy of the stars, the galaxy, and cosmology, with an emphasis on the physical principles involved. Includes stellar interiors, stellar evolution, galactic dynamics, large-scale structure and early history of the universe.

21&62:750:315 - Introductory Thermodynamics (3)

Prerequisites: 21&62:750:203,204 or 213,214 and one year of introductory calculus. Concludes the introductory sequence in physics. Interpretation and application of the laws of thermodynamics, kinetic theory, and statistical physics. Interchangeable with Phys 335.

21&62:750:316 - Introduction to Modern Physics (3)

Prerequisites: 21&62:750:203,204 or 213,214 Interaction of radiation with matter; elementary quantum theory; atomic and nuclear physics; relativity; solid-state physics. Interchangeable with Phys 441.

21&62:750:333 - Applications of Mathematics to Physics (3)

Prerequisites: 21&62:750:203,204 or 213,214; 21&62:640:136. Emphasis on applications of mathematic techniques to physical problems: infinite series, matrices, determinants, partial differentiation, multiple integrals, vector analysis, and Fourier series.

21&62:750:361,362 - Mechanics I, II (3,3)

Prerequisites: 21&62:640:314; 21&62:750:315, 316, 333; or permission of instructor. Dynamics of particles and systems; theory of small oscillations and mechanical waves; rigid bodies; Lagrange and Hamilton formalism. Interchangeable with Phys 430/Phys 431.

21&62:750:403 - Introduction to Atomic and Nuclear Physics (3)

Prerequisites: 21&62:750:361,385,386 or permission of instructor. Discussion of experiments that led to the quantum theory; atomic spectra; atomic structure; and nuclear physics. Interchangeable with Phys 310.

21&62:750:404 - Quantum Mechanics (3)

Prerequisites: 21&62:750:361,385,386 or permission of instructor. Schrodinger equation; operators, correspondence principle; uncertainty principle, the harmonic oscillator; the hydrogen atom; elementary scattering theory; elements of matrix mechanics; perturbation theory. Interchangeable with Phys 442.

21&62:750:406 - Introductory Solid-State Physics (3)

Prerequisites: 21&62:750:361,385,386 or permission of instructor. Crystallography and structure of crystals; bonding of atoms; structure and properties of metals, semiconductors, and insulators; luminescence and fluorescence of crystals, photoconductivity; solid-state devices. Interchangeable with Phys 446.

21&62:750:407 - Advanced Physics Laboratory I (1)

Corequisites: 21&62:750:315,316 ,333 or permission of instructor. Design of experiments and instrumentation techniques; data acquisition and analysis; graphic representation of experimental data; study of errors and reliability of results; AC and DC circuit theory.

21&62:750:408 - Advanced Physics Laboratory II (1)

Lab. 3 hrs. Corequisites: 21&62:750:315,316 or permission of instructor. Detailed examination of design concepts and measurement techniques; experiments in physical and geometric optics, coherent optics, acoustics, microwave signal propagation, and atomic and nuclear physics.

21&62:750:461 - Computational Methods in Applied Physics (3)

Prerequisite: 21&62:640:314. Pre- or corequisite: 21&62:750:404. General computer programming modeling methods and techniques; numerical solutions to integro-differential equations; eigenvalue problems; applications of computer-aided design and other packages. Interchangeable with Phys 485.

21&62:750:485, 486 - Individual Research in Physics (BA,BA)

Qualified students may undertake individual research under the supervision of a member of the department. Interchangeable with Phys 490.

21&62:750:493,494 - Readings in Physics (BA,BA)

Prerequisite: Permission of instructor. Independent study supervised by a member of the department. For qualified students who wish to investigate a specific area or topic in physics in greater depth than is normally covered elsewhere in the curriculum.

Political Science : Offered by the Department of Political Science at Rutgers-Newark. Hill Hall (973/353-5105)

20&62:790:387 - International Law (3)

Prerequisite:21&62:790:202. Basic principles and practices governing legal relations between states; relations of law to politics explored to highlight the strengths and short-comings of international law in dealing with contemporary world problems.

21&62:790:201 - American National Government (3)

Concepts and theory regarding the policy-making process in American national government. Topics include political ideas; constitutional development and law; institutions of government; political parties, elections, and voting behavior; the significance of interest groups divided along race, gender, class, or other lines; and the role of the media and public opinion. Comparisons with other political systems and generalizations are applied to several policy issues.

21&62:790:304 - Introduction to Law and Legal Research (3)

The nature and function of law, the process of legal growth, the roles of judges and lawyers, and the decision-making process; the use and retrieval of law-related materials.

21&62:790:310 - Science, Technology, and Public Policy (3)

This course fulfills the technology course requirement in the teacher certification program. Study of political issues that involve science and technology, such as arms control, energy resources, environmental pollution, public health, occupational safety, and technology transfer.

21&62:790:321 - World Politics (3)

Prerequisite: 21&62:790:202. Fundamental factors shaping international relations: the international state systems, attitudes and positions of states, elements of national power, methods of state interaction, and patterns of power; diplomacy, propaganda, war and violence, economic policy, and international law and organization in the contemporary world.

21&62:790:330 - Eastern European Governments and Politics (3)

Prerequisite: 21&62:790:203. Politics and governments of Communist East Europe, including Poland, Yugoslavia, Hungary, Czechoslovakia, Bulgaria, and East Germany; policy as the outcome of ideological and situational influences on the political needs of the regimes and the basic human needs of the people.

21&62:790:334 - International Relations of the Middle East (3)

Prerequisite: 21&62:790:202. Role of international factors in influencing the development of a critical area of the world and affecting world order and stability; the Arab-Israeli dispute, great-power politics, and the role of oil.

21&62:790:338 - Political Economy of Government-Business Relations (3)

Government-business relations within advanced market economies; focus on the U.S. Empirical and normative questions raised that range from the actual to the desirable ordering of relations between public and private authorities.

21&62:790:341,342 - Public Administration (3)

Structure and organization of administration machinery; fiscal and personnel management; methods of law enforcement; responsibility of administrators to voters, legislatures, and the courts.

21&62:790:356 - Sex, Law, and Public Policy (3)

Political issues in the U.S. related to gender differentiation; sex-based discrimination in law and public policy, differences in political participation according to gender, ideological justifications for such differences, and political movements designed to rectify discrimination.

21&62:790:360 - Urban Politics and Public Policy (3)

Analysis of urban policy issues; municipal public policy areas such as poverty, unemployment, education, housing, health, crime, transportation, and the environment; policy as an instrument of social change.

21&62:790:367 - Jurisprudence and Legal Theory (3)

Major traditions in jurisprudence-positivism, natural law, and legal realism; analysis of selected theoretical questions that arise within the framework of law and law enforcement-justice, punishment, civil disobedience, human rights, the rule of law, the enforcement of morals; definition of law and of a legal system, the relationship between law and morality, and the notion of legalism as an ideology.

21&62:790:371 - Early Political Theory (3)

Prerequisite: Junior standing or permission of instructor. Selected writers and doctrines in the tradition of Western thought on politics and society, from Greece through the Reformation.

21&62:790:372 - Modern Political Theory (3)

Prerequisite: Junior standing or permission of instructor. Selected writers and doctrines in the tradition of Western thought on politics and society, from Hobbes through Marx.

21&62:790:375,376 - American Political Theory (3,3)

Leading American political thinkers, their ideas, and their contributions to the development of the American political system. First term: political ideas from colonial times to the 1880s. Second term: political thoughts in America since the Civil War.

21&62:790:377 - Ideology and Politics (3)

Prerequisite: Junior standing or permission of instructor. Major ideologies involved in the political conflicts of the twentieth century; topics include mass movements, fascism, Marxism, nationalism, and democratic theory.

21&62:790:395 - Contemporary American Foreign Policy (3)

Prerequisite: 21&62:790:321 or permission of instructor. Analysis of the formulation and administration of American foreign policy; political, economic, and social forces influencing the decision-making process; the background, alternatives, and principal issues since World War II.

21&62:790:401,402 - American Constitutional Law and Politics (3,3)

The decision-making and policy-making roles of the Supreme Court in selected areas, including the executive and legislative branches, federal-state relations, the economy, reapportionment, welfare, civil liberties, and civil rights.

21&62:790:417 - Problems in International Relations (3)

Prerequisite: 21&62:790:321. Focus on specific issues of international relations of current interest and importance.

21&62:790:435 - The American Presidency (3)

The dynamics of the presidency: the president's powers and how they are used; the executive's relations with Congress, the court, and the public; various presidents? conceptions of their role.

21&62:790:436 - Legislatures and the Legislative Process (3)

Survey of the organization of the legislative power; working facilities; principles, procedures, and problems of statute making; the legislature as arbiter of conflicting interests; the relationship between the legislature and the executive.

21&62:790:441 - Civil Liberties (3)

Prerequisite: 21&62:790:401 or 402 or permission of instructor. Ways that the American political system balances individual liberty against the necessity to maintain a stable society; consideration of a few problems, e. g., censorship, racial equality, and church and state; role of the federal courts.

21&62:790:460,461 - Topics in Political Science (3,3)

Open only to juniors and seniors. Advanced study and research on a political problem that either is not covered in the curriculum or that deserves more in-depth treatment than is possible in a regular course.

Psychology: Offered by the Department of Psychology at Rutgers-Newark

21&62:830:301,302 - Empirical Methods in Psychology (4,4)

Prerequisite: 21&62:640:113 or equivalent. Combines a survey of statistical methods with a laboratory in research and experimental methods commonly used in psychology; procedures for conducting and analyzing research in different areas within psychology.

21&62:830:335 - Social Psychology (3)

Prerequisite: 21:62:830:103 or 21:62:830:104. Psychological study of the individual's social interaction; theories of interaction and the empirical research employed in the investigation of topics such as attitude formation and change, group structure and process, motivation, learning, and perception in a social context.

21&62:830:372 - Perception (3)

Prerequisite: 21:62:830:104. Classical problems of perception?the constancies, form perception and the illusions, the perception of movement, neutral color, direction, and orientation; important theoretical issues of perception.

21:62:830:103 - Cognitive Science I (3)

An introduction to cognitive science, the new discipline emerging from the interaction of psychology, artificial intelligence, linguistics, philosophy, neuroscience, and evolutionary biology. Examines a variety of approaches to the study of how humans and other intelligent systems represent, reason, understand, perceive, use language, learn, and plan purposeful actions. Covers foundational topics in philosophy, evolution, neuroscience and computation.

21:62:830:104 - Cognitive Science II (3)

An introduction to cognitive science, the new discipline emerging from the interaction of psychology, artificial intelligence, linguistics, philosophy, neuroscience, and evolutionary biology. Examines a variety of approaches to the study of how humans and other intelligent systems represent, reason, understand, perceive, use language, learn, and plan purposeful actions. Covers learning and connectionism, action, cognitive development, cognitive neuro-science and language.

Science, Technology and Society: Offered by the Department of Humanities. See Humanities course list for faculty.

STS 257 - Technology, Society and Culture: An American View (3-0-3)

Prerequisites: HSS 101 or equivalent; 3 credits of basic social science. Examines the nature, functioning, and evolution of manufacturing, communications and other technologies in a socio-ecological world. The first semester uses case studies and visits to engineering laboratories and other plant sites to focus on scientific and technological forces that are reshaping our domestic economy.

STS 258 - Technology, Society and Culture: A Global View (3-0-3)

Prerequisites: HSS101 or equivalent; 3 credits of basic social science. Examines the nature, functioning, and evolution of manufacturing, communications, and other technologies in a global environment. The second semester uses case studies and engineering site visits to focus on scientific and technological forces that are transforming our global political economy.

STS 300 - Legal Reasoning, Writing, and Technology (3-0-3)

Prerequisite: HSS 101. Integrates the process of legal research and fundamentals of legal writing with analysis of law. Focuses upon legal reasoning through analysis of fact and upon the logic of law in judicial opinions, statutory construction, and constitutional interpretation as contemporary issues are analyzed.

STS 301 - Independent Study (1 credit)

Prerequisites: junior standing in the STS program and written approval of the program director. Consists of self-paced study on an individual or small group basis in a specific area integral to a student's STS concentration but not available on a regular course basis.

STS 302 - Independent Study (2 credits)

See STS 301.

STS 303 - Independent Study (3 credits)

See STS 301

STS 304 - Writing about Science, Technology and Society (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Develop abilities to write lucidly and speak forcefully about the interrelationship of science, technology and society. Learn to articulate a sense of purpose in order to choose the appropriate methods for reporting issues in a technological society. Effective development and transfer of technical knowledge in a complex world.

STS 305 - Engineers in Society (2-1-2)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents Corequisite: CoE 394. For students majoring in computer engineering. The professional aspects of an engineering career. Topics include ethics and responsibility, the role of the professional society, the importance of communication, and the realities of the workplace. Certain writing projects are correlated with the linked lab CoE 394. Field studies of working engineers are conducted by student teams. Co-listed as CoE 301.

STS 306 - American Mosaic: Understanding Cultural Diversity (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An examination of multiculturalism in the United States. The course provides students with a methodological framework for understanding cultural diversity in the United States and around the world.

STS 307 - Fundamentals of Research in STS (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Focuses on research methods in the field of science, technology and society. Focuses on the following methods: problem statement and hypothesis formulation; research design in science, technology and society; data sources; and data acquisition and analysis.

STS 308**** - Technology and Global Development: Introduction to STS (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Introduces the important public issues that technology brings to the modern world, such as energy development and environmental pollution. Emphasizes the close connections between science and technology, social institutions, and cultural values. Also analyzes today's "global village", the changing relations between East and West and the Third World, and worldwide development and environmental issues. Honors Note: See HSS 101.

STS 309 - Advocacy and the Law (3-0-3)

Prerequisite: Eng 300, SS 300. Offers opportunities to explore the retrieval and use of legal and law-related materials while developing skills in oral advocacy and in writing persuasive legal documents, such as motion memoranda and briefs. Includes learning to listen to participants in the legal process as well as developing effective styles and forms of speech in the classroom. **Effective From: Spring 2005**

STS 310**** - Technology and Human Values (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Examines the interactions between science, technology and human values. Specifically, explores psychological, moral, and philosophical consequences of, and humanistic responses to, technological change. Readings, essays, fiction, and research articles treat such topics as the philosophical foundations of modern science, scientism, technicism; the impact of technology on images of man found in modern literature; and the moral implications of various kinds of recent technology. Honors Note: See HSS 101.

STS 311 - Co-op Work Experience I (3 credits)

Prerequisites: completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the Co-op Office. Mandatory participation in seminars and completion of a -report.

STS 312**** - Technology and Policy in Contemporary America (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. A study of technology and politics in recent America. Focuses on the role of the federal government in shaping technology, especially through funding technological innovations and applications. Topics will include the origins of technology policy in World War II, the influence of the Cold War, the science and technology policy advisory system, and political and cultural influences on technology policy. Honors Note: See HSS 101.

STS 313**** - Environmental History and Policy (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Covers the rise of the modern environmental debate, and examines its current priorities and values, politics and economics, and impacts on industry and society. Students review the role of regulatory agencies, private industry, public interest groups, and the media. Current major issues in New Jersey are considered, as well as environmental debate on a national and global level. Honors Note: See HSS 101.

STS 316 - Mass Communications, Technology and Culture (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Uses the tools of the humanities and social sciences to study the interplay between technology and mass culture. Focuses on motion pictures, electronic music, and television as both technologies and as forms of art. Devotes special attention to the portrayal of science and technology in the media.

STS 320 - Global Evolution of Scientific Thought I: Case Studies from Antiquity through the 19th Century (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Traces the global development of scientific ways of thinking and demonstrates how scientific ideas, methods, and theories both reflect and influence thought in other areas. Special emphasis is on the biographical approach to scientific innovation through analysis of key figures in relation to the societies in which they lived. Attention is paid to the roles of class and gender in scientific practice. Begins with the study of science in the ancient nations of Babylonia, China, and India and ends with an examination of the rise of scientific approaches to social problems in the nineteenth century.

STS 321 - Global Evolution of Scientific Thought II: 20th-Century Case Studies (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. A continuation of STS 320, traces the global development of scientific ways of thinking and demonstrates how scientific ideas, methods, and theories both reflect and influence thought in other areas. Begins with the study of Einstein, continues with an analysis of United States and Soviet relations during the Cold War, and concludes with an examination of trends in today's global scientific community.

STS 325-329 - Special Topics in Science, Technology and Society (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An in-depth examination of a current STS issue. A new topic is addressed each time the course is offered. Honors Note: See HSS 101.

STS 330 - The Professional Engineer: History and Context (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An examination of the origins of modern engineering and the context in which engineering has developed. The course includes an analysis of the contemporary engineering culture?its structure and the values which drive it. The student will be expected to confront both the constraints and opportunities presented by the professional world of engineering.

STS 340 - Multiculturalism in a Technological Society (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Explores the roles of culture and ethnicity in our increasingly technological and global society. The interplay between scientific developments and the specific sociocultural contexts is addressed. Specific case studies from various countries are explored, covering differing levels of technological achievement. Upon completion of the course, students will be able to competently analyze the interaction between a country's scientific development and its political and sociological climate. Special topics are negotiated with students at the start of each class, with the goal of covering all continents and a variety of scientific fields. At least one case study each semester carefully reviews multiculturalism in the American technological culture. Emphasis also is given to the particular roles and responsibilities of the United States as a technological and political leader.

STS 342 - Women in Technological Culture (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Takes an interdisciplinary and multicultural approach to issues of gender in science and technology. The issues include the current status and problems of women in non-traditional professions; the historical contributions of women in science and technology; images of women in Western and non-Western cultures; theories of gender difference, past and present; the impact of cultural gender coding on the epistemologies of science and technology; women and Third World development. Course materials include case studies and autobiographical narratives, films, and science fiction as well as historical and sociological analyses. Expressive student writing and group projects are encouraged.

STS 344 - Communications Policy (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Study of communication environments and developing communications technologies as central elements of evolving political and social systems. Analysis of philosophical, military, economic, and technical premises for communications policy and the process of regulation.

STS 346 - Pragmatism and Technology (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Examines the relationship between the American philosophy of pragmatism and the role of technology in the contemporary world. How do philosophical ideas affect the development of technology and science? How has pragmatism shaped the current view of the meaning and value of technological progress? Readings from both the traditional authors of American pragmatism?Peirce, James, and Dewey?and contemporary texts.

STS 347 - Music and Technology ((3-0-3))

This course examines the ways music has been affected by technolgoy from the nineteenth to twenty-first centuries. How has recording technology changed the way we listen to, create, and experience music? How does electronic and computer music relate to the rest of music? Is a recording the record of an event or a whole new art form in itself? Do machines encourage a kind of music-making radically different from previous live music? Now that nearly every recording is done digitally, does that make all recorded music computer music? This course has both a theoretical and a practical component: in addition to the history of technology's transformation of music, the course examines the basics of digital sampling, recording, sequencing, and mastering software. **Effective From: Spring 2002**

STS 348 - Esthetics and Modern Technology (3-0-3)

Prerequisites:HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. The central focus of this course is on the changing conception of beauty as influenced by technological development, especially in twentieth-century United States society. The course examines how technology is echoed in art and philosophy, and how they, in turn, influence future technological considerations.

STS 350 - Computers and Society (3-0-3)

Prerequisites: HSS 101, one SS course, completion of a 100-level GUR course in CIS. Examines the historical evolution of computer and information systems and explores their implications in the home, business, government, medicine, and education. Topics include auto-mation and job impact, privacy, and legal and ethical issues.

STS 360**** - Ethics and the Environment (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An examination of contemporary environmental problems from the perspective of ethics or moral philosophy. An analysis of the ethical presuppositions and value principles underlying environmental policy. The study of ethical theories and their application to the environmental crisis. Honors Note: See HSS 101.

STS 362**** - Environmental Economics (3-0-3)

Prerequisites: HSS 101, HSS 202, SS 201 or their equivalents. Presents a detailed overview of the relationship between political economy and the environment. Draws on diverse case studies including global warming, harvesting of minerals on the ocean's floor, destruction of old growth forests, and contamination of the -nation's water, air, and soils. Explores the economic remedies to the fast-changing relationship between society and nature. Honors Note: See HSS 101.

STS 378 - Literature and Nature (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Literature reveals and interprets the natural world. Students examine the ways that nature has been used in non-fiction and fiction. Students also learn the challenge of describing the natural world in their own words. Representative writers include Percy Shelley, Henry David Thoreau, Octavio Paz, Denise Levertov, Gary Snyder, Joyce Carol Oates, and Annie Dillard. Co-listed as Lit 378.

STS 380 - Policy Issues in the Coastal Environment (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. An examination of coastal environments from the standpoint of the scientist, the engineer, and the resource manager. Topics include beach and shoreline characteristics, technological innovations to address coastal erosion problems, and current debates in coastal policy and resource management. Case studies are used to illustrate coastal management practices and the scientific, technical, and social constraint to policy formulation.

STS 381 - Field Techniques and Research Methods (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents.; STS 307. An introduction to research methods. The objectives of the course are to provide opportunity to pursue specialized, in-depth research in a subfield of science, technology and society of the student's choice; to develop skills in problem identification, research design and problem solving; to increase familiarity with methods of data analysis; to strengthen library research skills; to provide an opportunity to gather original field data in a team-oriented environment; and to improve oral and written communication skills.

STS 382 - Geographical Perspectives on the Environment (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Designed to introduce students to the field of geography. Focuses on the natural processes that sculpt the physical and biological terrain, and the environmental interrelationships between human societies and nature. Combining physical, human and environmental perspectives on the earth's surface, explores, in depth, topics such as famine, societal response to natural and technological hazards, and water issues in the United States.

STS 411 - Co-op Work Experience II (3 credits)

Prerequisites: STS 311 or its equivalent; approval of the department, and permission of the Office of ve Education and Internships. Provides major-related work experience. Mandatory participation in seminars and completion of requirements that include a report and/or project.

STS 490**** - Project and Seminar I (3 credits)

Prerequisite: senior standing in the STS program. Each student undertakes a comprehensive study of an issue in science technology and human affairs. The solution requires application of knowledge and skills acquired in course work, self-study, and library research as well as consultation with persons in the academic community, industry, and government. The completed study is submitted as a detailed written report. The seminar meets weekly. Speakers from education, government, and industry address themselves in topics of current interest to STS students. Honors Note: See HSS 101.

STS 491**** - Project and Seminar II (3 credits)

A continuation of STS 490.

**** Special Honors sections are available; permission of Honors College or Humanities Department required.

Social Science and Policy Studies: Offered by the Department of Chemistry and Environmental Science. See Humanities and Social Sciences course list for faculty.

SS 201 - Economics (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents. The nature of a market economy. Microeconomics? demand theory, production possibilities, cost and price, equilibrium anal-ysis, and applications to decision making in the firm. Macroeconomics?national income accounts, consumption, investment, government monetary and fiscal policy, and problems of employment and price levels. Economic analysis leading to an understanding of current developments in the United States economy and international trade and currency problems. Students who have received credit for Econ 265 or Econ 266 may not subsequently receive credit for SS 201.

SS 201H - Honors Economics (3-0-3)

Prerequisite: enrolled in the Honors College or permission of the instructor. Covers the material in SS 201, but topics are treated more comprehensively and in greater depth.

SS 300 - Basic Principles of Law and the Judicial System (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents, two from HSS 211, HSS 212, HSS 213 or their equivalents. Explores controversial legal issues focusing upon fundamental principles of law that have evolved in such bodies of law as contract, tort, criminal real and intellectual property, and in specialized areas such as environmental and labor/business law. Covers implementation of law in the judicial system, which includes examination of administrative regulations and due process.

SS 318 - International Economic Policy (3-0-3)

Prerequisites: HSS 101, HSS 202, SS 201 or their equivalents. Examines the increasing effects international economic affairs have on our lives; the choices economic policy analysts must make; the economic policies that promote or restrain trade; and causes of economic growth or decline.

SS 338 - Issues in Public Policy (3-0-3)

Prerequisites: HSS 101, HSS 202, SS 201 or equivalents. A survey of key social and political issues within a public policy perspective. Topics covered include policy problems with an emphasis on economics, urban and regional planning, sociology-psychology, natural science or engineering, and problems with a political science emphasis.

SS 343 - Rise of Modern Diplomacy (3-0-3)

Examines the origins and mechanisms of modern diplomacy and their historic connection with the state. Topics include resident embassies, the development of diplomatic procedures and conventions, international law, diplomatic theory, and the relationship between diplomacy and war.

SS 351 - International Relations (3-0-3)

Prerequisites: HSS 101, HSS 202, SS 201 or equivalents. Analysis of the factors affecting relations among nations. Emphasis on the growing interdependence of the world system. Examination of international agencies, such as the United Nations, the World Bank, and the International Monetary Fund. International political and economic conflict. Patterns of power, and the roles of diplomacy, war, and international terror. Attempts to ameliorate conflicts among nations.

SS 352 - Race and Ethnicity: Contemporary Issues (3-0-3)

Prerequisites: HSS 101, HSS 202, SS 201 or their equivalents. Explores the concepts of race and ethnicity in both national and international arenas. Scientific, sociological, political, and global implications are addressed. Upon completion of this course, students will be able to competently address the impact of race on micro and macro levels, from both individual and policy perspectives. Special topics are negotiated with students at the start of each class. Such topics can include immigration, affirmative action, educational curricula, institutional racism, or the impact of multiculturalism on families. Emphasis is on the interaction between race and technology.

SS 362 - Environmental Economics (3-0-3)

Prerequisites: HSS 101, HSS 202, SS 201 or their equivalents. Presents a detailed overview of the relationship between political economy and the environment. Draws on diverse case studies including global warming, harvesting of minerals on the ocean's floor, destruction of old growth forests, and contamination of the nation's water, air, and soils. Explores the economic remedies to the fast changing relationship between society and nature. Co-listed as STS 362.

SS 362H - Honors Environmental Economics (3-0-3)

Prerequisites: admission to the Honors College or permission of the instructor. An honors course parallel to SS 362. Co-listed as STS 362H.

SS 363 - Natural Resources Economics (3-0-3)

Prerequisites: HSS 101, HSS 202, SS 201 or equivalents. Natural resource economics is concerned with supply and demand, theory, pricing under various market conditions, the commodity aspects of exchange and the effects of government intervention on depletion and profits. Case studies and examples of natural resource usage will be demonstrated; also substitution and recycling strategies will be examined

Sociology: Offered by the Department of Sociology and Anthropology at Rutgers-Newark. See Anthropology course list for faculty.

21&62:920:201 - Sociology I: Contemporary Society (3)

Study of society: social structure, culture, and social interaction; the nature and historical developments of modern forms of social organization and social relationships.

21&62:920:208 - Social Problems (3)

Social problems facing Americans today; causes and processes underlying these problems; evaluation of proposed solutions.

21&62:920:301-302 - Introduction to Social Research I, II (4,4)

Lec. 3 hrs., lab. 3 hrs. Prerequisites: 21&62:920:201, 202, or equivalent. The art and the science of doing research; how to develop a researchable question (hypothesis construction and causal modeling); how to collect (observation, surveys, experiments, and secondary analysis) and analyze data (statistics); and how to write a scientific report. Independent research project required.

21&62:920:306 - Marriage and the Family (3)

The institution of the family; emphasis on the modern American family and the current search for alternatives to the traditional monogamous family.

21&62:920:308 - Social Movements (3)

The manifestations of social change as they appear in diffuse collective behavior and subsequent reintegrative social movements.

21&62:920:314 - Sociology of Organizations (3)

Causes and consequences of organizations; internal arrangements; effects of environment; organizational performances and effects on people.

21&62:920:315 - Self and Society (3)

The interaction between the development of the self and the social environment in which it occurs

21&62:920:332 - Social Stratification (3)

Theories of inequality, social ranking, and the distribution of resources and opportunity as they affect individuals and groups in terms of crime, health, family life, and value systems.

21&62:920:337 - Sociology of Sex and Roles (3)

Relative statuses and roles of men and women in American society, including socialization; historical overview of sex statuses; differentials between males and females in educational and occupational sectors; personal relationships; sexuality.

21&62:920:345 - Sociology of Education (3)

The interaction between schools and society; basic social concepts such as stratification, social role, and bureaucratic organization as they relate to the educational system; the system in relation to the larger institutions in the society, with emphasis on both stated objectives and actual social functions.

21&62:920:375 - Sociology of Development (3)

Comparative study of the developed and the less-developed nations, and of what separates the two; the growth of nationalism; the emergence of new elites; the roles of higher education and the military in development; the sociological determinants of economic growth; modernity as individual and societal characteristic.

21&62:920:386 - Sociology of Science (3)

Social organization of scientific knowledge; organization of scientific communities; inequalities among scientists; effects of scientific knowledge on modern ways of life.

21&62:920:409 - Classical Sociological Theory (3)

Foundations of social theory; Comte, Durkheim, Marx, Weber, and other contributors to major orientations in the nature and historical development of modern society in the Western world.

21&62:920:415 - Contemporary Sociological Theory (3)

Prerequisite: 21&62:920:409 or permission of instructor. Current modes of theoretical analysis, and contemporary perspectives on the nature and historical development of modern forms of social organization and social relationships.

Spanish: Offered by the Department of Classical and Modern Languages and Literatures at Rutgers-Newark. See Classics course list for faculty.

21:940:311,312 - Spanish Literature in English Translation (3,3)

Not open to Spanish majors. A chronological survey of Spanish literature from the Middle Ages to the twentieth century, with emphasis on literary traditions and culture.

21:940:341,342 - Hispanic Civilization (3,3)

Historical and cultural development of Spain and of Latin America.

21:940:343,344 - Latin American Literature in English Translation (3,3)

Not open to Spanish majors. A chronological survey of Latin American literature from the period of the Conquest to the 20th century, with emphasis on literary traditions and cultures.

21:940:383 - Ibero-American Thought in English Translation (3,3)

Prerequisite: 21:350:102. Not open to Spanish majors. Development and reception of philosophical trends and ideas in Spain and Latin America extending from the 16th to the 20th centuries, especially in the context of the essay as genre; conducted in English with English texts.

21:940:417,418 - Seminar in Spanish and Latin American Literatures (3,3)

Explores significant themes and concepts as reflected in diverse genres of Spanish and Latin American literatures. Content varies according to the individual professor's specialization and the students? interests; conducted in Spanish.

21:940:421 - Spanish Theater of the Golden Age (3)

Significance of the Golden Age in relation to the life and thought of the period; reading of works by Lope de Vega, Tirso de Molina, Calderon de la Barca, Juan Ruiz de Alarcon, and others; conducted in Spanish.

21:940:452 - Twentieth-Century Spanish Literature: Contemporary Spanish Poetry and Prose (3)

Prominent literary movements in Spain from Postmodernismo to the present; representative works by Garcia Lorca, Guillen, Miguel Hernandez, Cela, Laforet, Buero Vallejo, and others; conducted in Spanish.

21:940:462 - Spanish-American Literature: Twentieth-Century Poetry and Prose (3)

Development of Spanish-American literature in the 20th century stressing literary trends, historical background, and contemporary problems as reflected in the works of representative authors; conducted in Spanish.

Support Courses: Offered by the Office of the Dean, Freshman Studies

Tutr 089 - Freshman Tutorial I (1-0-0)

Prerequisite: special permission. For first-semester freshmen. Develop appropriate study skills that will lead to success at NJIT. Pays particular attention to problem solving, study skills, abstract and cognitive skills development, using a collaborative learning approach.

Tutr 090 - Freshman Tutorial II (1-0-0)

Prerequisite: Tutr 089. A continuation of Tutr 089. Further enhances student's skills through evaluation of current study habits and reinforcement of collaborative learning techniques that prepare students for successful completion of coursework.

Theatre Arts: Offered by the Department of Visual and Performing Arts at Rutgers-Newark and the Department of Humanities. See Art course list for Rutgers-Newark faculty. See Humanities course list for Rutgers-Newark faculty.

21&62:950:271,272 - Voice and Articulation (3,3)

The effective use of the voice and speech mechanism; guided ear training; use of the International Phonetic Alphabet.

21&62:950:289,290 - Principles of Oral Interpretation (3,3)

Analysis and oral presentation of types of literature; development of vocal techniques and their use in conveying meaning; analysis of sound values, vocal emphasis, rhythm, poetic diction, prosody, and imagery in relation to oral reading.

21&62:965:202 - Journalism and Communications Media (3)

The second semester of a two-semester sequence. The first semester is 21&62:570:201. Analysis and evaluation of the distinctions between print and electronic journalism and between commercial and noncommercial communications. Emphasis on social impact, regulatory policy, and ethical and aesthetic issues related to broadcast and cable television, radio, computer-based information delivery systems, and the ? information superhighway.?

21&62:965:211,212 - The Living Theater (3,3)

Introduction to the basic elements of theater with an emphasis on how a play is written and produced for the stage. Roles of the playwright, actor, director, and designer in creating a production. Relationship between play scripts and how they are produced for the stage. Attend select current plays.

21&62:965:256,257 - The Art and History of the Film (3,3)

Development of the film as an art form; its origins in stage techniques; the emergence of a film aesthetic through the contributions of various international artists.

21&62:965:261 - Fundamentals of Speech (3)

Effective oral communication and effective listening; practice in speech situations; oral organization and logic.

21&62:965:261,262 - Dramatic Invention (3,3)

Recommended: 21&62:965:211, 212, 271. Lecture/workshop combining class work with production. Different style or genre studied each term.

21&62:965:263,264 - Modern Film (3,3)

Selected examples of modern filmmaking, with emphasis on the changes and developments following World War II; examples of verisimo, imagination, and the relationship of film to other narrative art forms.

21&62:965:271 - Acting Fundamentals (3)

Fundamental principles of acting; theory and practice in improvisation emphasizing imagination, movements, rhythm, and group ensemble; basic techniques and exercises.

21&62:965:305,306 - Dramatic Art (Summer Theater) (3,3)

Prerequisite: Permission of instructor. Offered only in summer session. An in-depth experience in the theories and practices of summer touring, repertory, and children's theater; practical involvement in the production and performance of the department's summer theater program and in the study of dramatic art video.

21&62:965:311,312 - Theater History (3,3)

Recommended: 21&62:965:211 or 212. A study of Euro-American theater history with an emphasis on production rather than dramatic literature. First term: Ancient Greece and Rome through early post-Renaissance Europe. Second term: Post-Renaissance Europe to present.

21&62:965:313 - Theater Technology I (3)

Prerequisite: 21&62:965:211 or 212. Materials, equipment, and methods basic to construction of scenery for stage and/or television; properties, lighting, costumes, and makeup; laboratory work in the theater required.

21&62:965:314 - Scenic Art for Theater and Television (3)

Prerequisite: 21&62:965:212. Consideration and practical application of visual arts principles as they affect designing for the theater and/or television; emphasis upon integration of settings, lights, and costumes; laboratory work in the theater required.

21&62:965:315 - Intermediate Acting (3)

Prerequisite: 21&62:965:271. Interpretation of scenes from selected dramas for stage performance; evaluation of practiced techniques in character portrayal through dialogue and action.

21&62:965:331,332 - Production Laboratory I (3,3)

Recommended: 21&62:965:271,313. Consult with adviser prior to registration. Experience in the process of production. Credit may be acquired for acting in department productions under special circumstances.

21&62:965:394 - Internship?Television (3)

Open to theater arts majors in junior or senior year. Prerequisites: Permission of department chairperson and instructor directing the study.

21&62:965:395 - Internship: Radio (3)

Open to theater arts majors in junior or senior year. Prerequisites: Permission of department chairperson and instructor directing the study.

21&62:965:396 - Internship: Theater (3)

Open to theater arts majors in junior or senior year. Prerequisites: Permission of department chairperson and instructor directing the study.

21&62:965:397 - Internship: Film (3)

Open to theater arts majors in junior or senior year. Prerequisites: Permission of department chairperson and instructor directing the study.

21&62:965:410 - Theory and Practice of Video Art (3)

Open to non-majors with permission of instructor. Prerequisites: 21&62:080:231 or 261 or 245 or 21&62:965:313 or 319. Introduction to contemporary theory and practice of video as an art form. Emphasis on the production of individual art works incorporating video technology and critical literature about video.

21&62:965:413,414 - Directing (3,3)

Prerequisites: 21&62:965:212, 271, 313. Enrollment limited by laboratory space. Production of short plays or other workshop scenarios; emphasis on the process of synthesizing all theatrical elements toward a structured performance.

21&62:965:415 - Problems in Performance Styles (3)

Prerequisite: 21&62:965:315. Continuing examination of patterns of visual and auditory stimuli, as they affect the problems of the performer.

21&62:965:417,418 - Problems in Theatrical Design (3,3)

Prerequisite: 21:965:313. Continuing examination of the temporal-spatial composition through problems and responsibilities in setting, lighting, or costuming.

21&62:965:419,420 - Production Laboratory (3,3)

Advanced courses that provide major experience in the process of production.

21&62:965:433 - Advanced Television Production (4)

Prerequisites: 21&62:965:319,320. Technical and creative experience in the production of advanced television programming: practical experience in such formats as news, public affairs, drama, and commercials; technical aspects of advanced color television.

21&62:965:434 - Advanced Television Production (3)

Prerequisite: 21&62:965:433. Advanced course in the theory and practice of television production; special problems in production, direction, and performance.

21&62:965:440,441 - Topics in Television (3,3)

Open to non-majors. Prerequisite: 21:965:254 or permission of instructor. Contemporary issues concerning the functions and impact of television in the United States and related public policies, including the latest developments in programming, news, politics, advertising, and relationship of television to the ?information superhighway.?

21&62:965:442 - Corporate and Instructional Television (3)

Prerequisite: 21&62:965:433. Use of electronic communication in business and educational settings and by grass-roots organizations; training, employer-employee communications, and recruitment; topics for the corporate setting.

21&62:965:451 - American Theater (3)

Theater in the United States from its beginnings to the present day. Areas covered include the beginnings in the colonies, the gradual shift in the early years from touring to the emergence of the theater centers of Philadelphia, Boston, and New York; major movements and figures; and the contribution of regional theaters.

21&62:965:453 - Traditional Theaters of Asia (3)

Asian theater forms from India, Japan, China, and Bali. Consideration of the theories underlying the forms as well as a discussion of their influence on the works of several leading contemporary theater artists.

21&62:965:481,482 - Seminar in Theater Art and History (3,3)

Research in theater (stage, film, television); may be arranged upon consultation with department chairperson.

21&62:965:483,484 - Individual Study in Theater (1-3,1-3)

Prerequisite: Permission of instructor. Problems in the theory and/or practice of theater; may be arranged upon consultation with department chairperson.

21&62:965:487,488 - Individual Study in Broadcasting (1-3,1-3)

Prerequisite: Permission of instructor. Special problems in the theory and/or practice of broadcasting; may be arranged upon consultation with department chairperson.

Theatre: Offered by the Department of Humanities and the Department of Visual and Performing Arts at Rutgers-Newark. See Humanities course list for NJIT faculty. See Art course list for Rutgers-Newark faculty.

Thtr 311 - Living Theater (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Elements of stage presentation: acting, design, theater history, and lighting and other technologies using the resources of the NJIT and Rutgers-Newark theaters.

Thtr 344 - American Musical Theater (3-0-3)

Prerequisites: HSS 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents. Course covers the development of American Musical Theatre decade by decade, starting with the turn of the 20th century until the present day. Examples of music and lyrics are demonstrated in class and students attend contemporary and revival Broadway musicals.

2003-2004 Undergraduate Catalog

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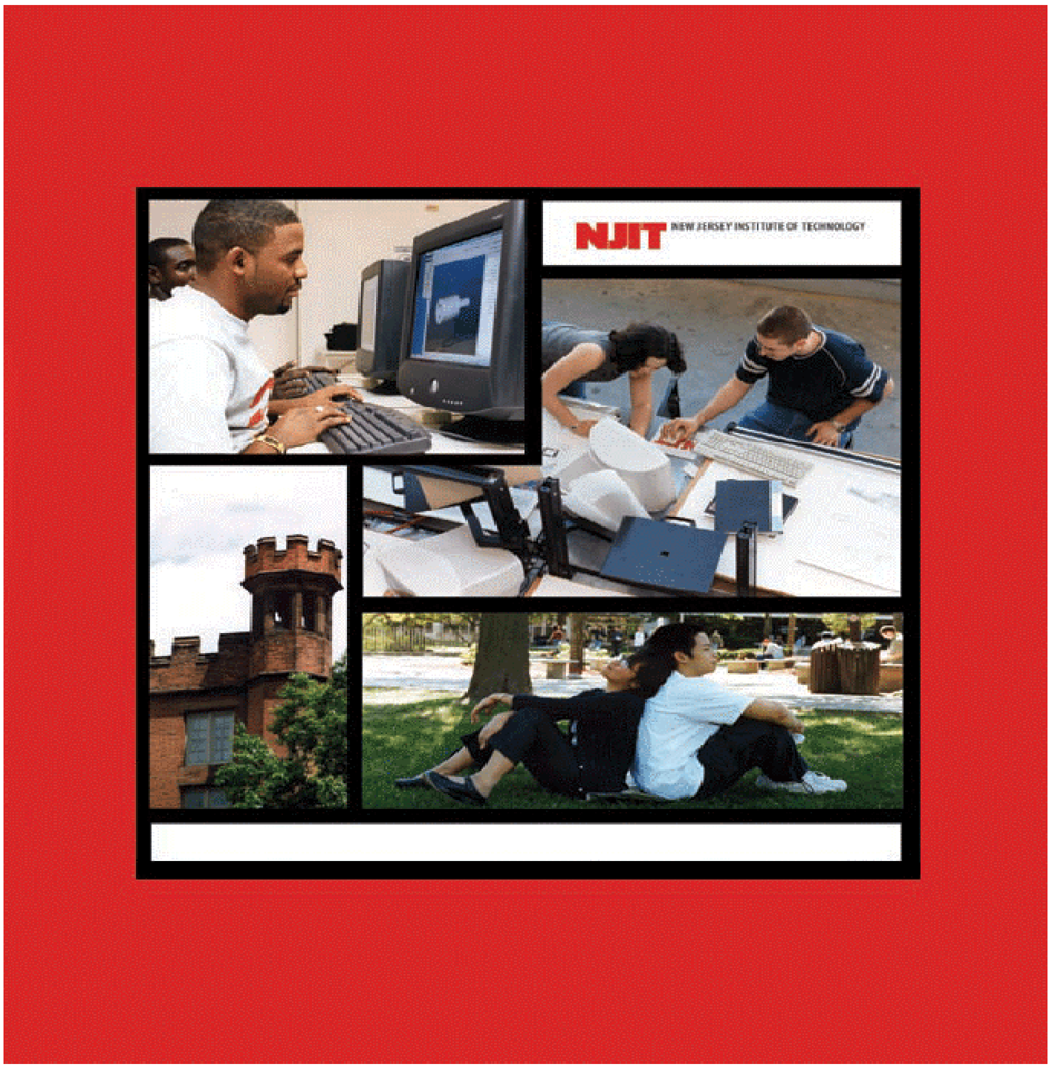

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West Virginia University, B.A., 1927;
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University of Michigan, B.S., 1949;
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DePauw University, B.A., 1956;
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P.E., PROFESSOR OF MATHEMATICS, AND ASSOCIATE CHAIR OF THE DEPARTMENT (1935), POMPEY

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New York University, A.B., 1948;
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Rutgers, The State University of New Jersey, B.S., 1928;
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Tientsin University, B.S., 1944;
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Brooklyn College, B.S., 1954;
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ZATZKIS, HENRY
Distinguished Professor of Mathematics (1953)
Ohio State University, B.S., 1942;
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Syracuse University, Ph.D., 1950.

Adjunct Faculty, Visiting Professors, Special Lecturers, University Lecturers

(Partial Listing)

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Electrical Engineering (1986)
New Jersey Institute of Technology, B.S.E.E., 1983;
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Architecture (1997)
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Cornell University, Ph.D., 1995.

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University of South Carolina, B.S., 1957;
Bradley University, M.S., 1962;
University of Illinois, Ph.D., 1967.

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Chemistry (1993)
City College of New York, B.S., 1956;
Florida State University, M.S., 1960;
Rutgers, The State University of New Jersey, Ph.D., 1968.

BAR-NESS, YEHESKEL , Ph.D.
Executive, Center for Communications and Signal Processing Research.

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R.a., Architecture (1997)
University of Pennsylvania, B.A., 1967;
Columbia University, M.Arch., 1975.

BARR, DAVID
Electrical And Computer Engineering Technology (1997)
Southern Illinois University, B.S., 1979;
Stevens Institute of Technology, M.S., 1994;
Ph.D., 1996.

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Visiting Professor of Management (1999)
Coventry University, B.Eng., 1993;
Cronfield University, M.Sc., 1994;
Manchester Business School, Ph.D., 1998.

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Architecture (1991)
Bennington College, B.A.;
Princeton University, M.Arch., 1980.

BASAVIAH, MATT
Electrical Engineering (1988)
Annamalai University (India), B.S.E.E., 1969;
Polytechnic Institute of Brooklyn, M.S.E.E., 1970;
Fairleigh Dickinson University, M.B.A., 1979.

BASU, SANAT
Computer And Information Science (1999)
Banaras Hindu University, M.S., 1959;
Tata Institute of Fundamental Research, Ph.D., 1972.

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Computer Science (2001) , NJIT.

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City College of New York, B.S., 1963;
Stevens Institute of Technology, M.S., 1966.

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Chemistry (1998)
University of Manitoba, B.S., 1986;
Rutgers, The State University of New Jersey, Ed.M., 1993.

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Chemical Engineering, Chemistry And Environmental Science (1998)
Slippery Rock University, B.S., 1992;
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Electrical Engineering (1985)
Rose Polytechnic Institute, B.S.E.E., 1966;
Rose-Hulman Institute of Technology, N.S.B.E., 1970.

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United States Military Academy at West Point, B.S., 1968;
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Biomedical Engineering (1985)
Seton Hall University, B.A., 1967;
New Jersey Medical School, M.D., 1971.

CAMPELL, CATHERINE
Computer And Information Science (1999)

CANCRO, LORRAINE
Environmental Science (1997)

Assistant Chairperson, Mount Laurel Programs.
Temple University, B.S, 1979;
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Rutgers, The State University of New Jersey, B.S., 1992;
New Jersey Institute of Technology, M.S., 1997.

CASTRONOVA, LOUISE
Humanities And Social Sciences (1983)
Upsala College, B.A., 1973;
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Mathematics (1991) And Biomedical Engineering (2000)
Punjab University (India), B.A., 1952;
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Indian Institute of Technology, Kharagpur, Ph.D., 1967.

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Electrical Engineering (1993)
National Tsing-Hua University, B.S.E.E., 1984;
Michigan Technological University, M.S.E.E., 1986;
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New Jersey Institute of Technology, Ph.D., 1993.

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P.e., Engineering Technology (1990)
Kansas State University, M.S.C.E., 1970;
Taipei Institute of Technology, Diploma C.E., 1965.

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Electrical Engineering (1959)
Newark College of Engineering, B.S.E.E., 1956;
Yale University, M.S., 1958.

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University of Michigan, B.A., 1977;
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Towson State College, B.S., 1963;
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Ecole Superieure d'Electricite (France), Engrg. Diploma, 1969;
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Chemical Engineering (1989)
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Physics (1999)
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Brooklyn College, B.A., 1958;
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