School of **Engineering and Computing Sciences**

Heskia Heskiaoff, Eng.Sc.D., *Dean*

Computer Science

Electrical and Computer Engineering

Information Technology

Mechanical Engineering

Engineering Management

Electrical and Computer Engineering Technology

Telecommunications Network Management

Telecommunications Technology

School of Engineering and Computing Sciences

The School of Engineering and Computing Sciences offers baccalaureate degrees in Computer Science, Electrical and Computer Engineering, Electronics and Information Security, Information Technology, Mechanical Engineering, Engineering Management, Electrical Engineering Technology, Mechanical Engineering Technology, and Telecommunications Management. Associate degrees in Electrical, Mechanical, and Telecommunications Technologies are also offered. The school also offers Master's degrees in Computer Science, Environmental Technology, Electrical and Computer Engineering, and Energy Management.

Computer Requirements

Computers are indispensable in virtually all fields of human endeavor today. Few engineers or technologists can get along without them. The ability to use computers with skill and intelligence is essential for graduates of engineering schools. At NYIT, the use of computers has been integrated into almost all courses in the School of Engineering and Computing Sciences. This process continues to include computer applications in all courses so that students will have the pervasive experience that produces understanding of the tool and the possibilities it presents. To achieve program goals, students must have unrestricted access to computers at all times. The only way this is possible is for all students to purchase their own computers. Therefore, all students are required to obtain a computer compatible with specifications available at the school.

A brochure containing specifications and possible suppliers may be available in departmental offices of the School. This information is provided purely as a service to students; NYIT does not recommend any suppliers nor does it imply any warranty or benefit in dealing with them.

Computer Science

Faculty: S. Barone, S. Billis, M. Colef, M. Drossman, H. Heskiaoff, A. Jafari, E. Kafrissen, K. Kaplan, F. Li, R. Mihajlovic, Y. Saito, S.L. Wang, J. Wu, Tao Zhang.

Adjunct Faculty: H. Chin, S., Homem de Mello, A. Lee, C. Liou, P. Stirpe, H. Taylor.

The college offers courses leading to both Bachelor of Science and Master of Science degrees in Computer Science.

The electronic digital computer has contributed to revolutionary changes in the methodologies of business and governmental data processing, the control of manufacturing operations, and the scope and nature of research in scientific and technological areas. Present trends leave little doubt that increasing computer capabilities will exert a profound influence on the nature of world culture.

At NYIT, courses pursued by computer science majors may be classified as (a) courses in the hardware and software aspects of computer science; (b) humanities courses; (c) groups of courses termed options which provide a solid background in the field in which the student will apply a knowledge of computing. Present options include Internet Engineering and Distributed Information Systems with minor concentrations in Management, Fine Arts or Engineering.

Entering students should be prepared to begin calculus and have a working knowledge of computer programming. Transfer students from recognized community colleges, technical institutes, or undergraduate colleges will receive the maximum allowable transferrable credit toward programs at NYIT. All students have access to sophisticated computer equipment and up-to-date laboratory facilities.

By the end of the second term, each computer major must select, in consultation with an adviser, an area of computer application in which to specialize. A minimum of 12 elective credits, approved by the department, must be selected in this area. Courses are designed to produce a versatile individual capable of graduate study or employment in expanding computer-based industries.

Those seeking graduate studies in computer science will find new avenues of knowledge and many job opportunities. The Master of Science degree in computer science is designed to serve a wide range of professional interests and includes a broad-based approach to practical, computer-related applications.

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Curriculum requirements for the Bachelor of Science in Computer Science with options in Internet Engineering and Distributed Information Systems

ETCS 105 Career Discovery[1] **2 credits**

Computer Science

Required courses:

CSCI 120	Programming I	3
CSCI 130	Computer Organization	3
CSCI 170	Computer Architecture	3
CSCI 180	Programming II	3
CSCI 230	Discrete Structures	3
CSCI 260	Data Structures	3
CSCI 312	Theory of Computation	3
CSCI 318	Programming Language Concepts	3
CSCI 330	Operating Systems	3
CSCI 335	Design and Analysis of Algorithms	3
CSCI 370	Intro. To Computer Networks	3
CSCI 380	Introduction to Software Engineering	3
CSCI 450	Seminar Project	3
CSCI Electives[2]		6

45 credits

Internet Engineering Option:

ITEC 305	Internet Programming I	3
ITEC 320	Web-based Mult-Med I	3
CSCI 405	Distributed Database Systems	3

9 credits

or

Distributed Information Systems Option:

ITEC 290	Appl Database Systems	3
CSCI 401	Database Interfaces and Programming	3
CSCI 405	Distributed Database Systems	3

9 credits

or

9 credits of 300 or 400 level courses from CS and/or ITEC with department approval 9

9 credits

Engineering Management

IENG 245	Statistical Design I	3
IENG 345	Statistical Design II	3
IENG 400	Technology and Global Issues	3

9 credits

Behavioral Sciences **3 credits**

Mathematics

MATH170	Calculus I	4
MATH180	Calculus II	4
MATH310	Linear Algebra	3

11 credits

Science Requirements

PHYS170 General Physics I	4
PHYS180 General Physics II	4
Life Science/Biology Elective	3

11 credits

or

CHEM 110 General Chemistry I	4
CHEM150 General Chemistry II	4
Physics Elective	3

11 credits

or

BIOL 110 General Biology I	4
BIOL 150 General Biology II	4
Physics Elective	3

11 credits

Social Sciences

Economics	3
History or Political Science	3
Philosophy	3

9 credits

English[3]

Composition	6
Speech	3
One Group A course[4]	3
WRIT 316 Writing for the Technical Professions	3

15 credits

Minor Concentration[5] **12 credits**

Liberal Arts **3 credits**

General Electives **3 credits**

Total credits required **130–132**

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) All electives must be approved by the department.

(3) Intensive English as a second language is not acceptable as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

(4) Group A courses are LITR 210, 220, 230 and 240.

(5) In consultation, with an advisor, the student can select a minor area of concentration. Areas of specialization may include: Computer Engineering, Mathematics, Management, Fine Arts, Computer Graphics, and Telecommunications. Students with a Minor concentration in one of the Engineering disciplines are required to take Mathematics 260, 320.

ETCS 102
Computers and Society
3-0-3

A course designed to provide an understanding of what the computer can do and how it does it for the nontechnically oriented student. This course covers the basic concepts of computer operation and programming, applications of computers, and the effects of computers on society. This course replaces College Success Seminar for students in the School of Engineering & Computing Sciences.

ETCS 105
Career Discovery 2-0-2

The course experience provides the skills and tools necessary for a technical career while enabling students to develop confidence in their academic endeavors. The creative role in the multi-disciplinary design and development process is emphasized in addition to communication skills, ethical, legal, and professional responsibilities. This course may be waived for students with sophomore or higher status. This course replaces College Success Seminar for students in the School of Engineering & Computing Sciences.

ETCS 365
Externship for the Technical Professions
1-0-1

This course provides students with an opportunity to work in a professional environment in areas appropriate to their field of study. To be eligible, students must have junior or senior status, a GPA of 3.0 or better, and the permission of his/her chairperson. The grade is on a Pass/Fail basis and is to be determined by the faculty advisor in consultation with the student's supervisor. A term paper, with presentation, is required. This course will be in addition to the required courses for the degree and may be repeated.

CSCI 105
Introduction to Computational Tools
1-2-2

In this course students will learn how to use the computer as a tool to solve problems in engineering, computer science, and related area. Packages such as MathCAD or MATLAB will be used to illustrate the solution to new and familiar problems in physics, mathematics, engineering and computer science.

CSCI 110
Introduction to Computer Science
3-0-3

This course is designed to provide students with an overview of the basic hardware and software organization of computer systems. Students get hands-on experience with the DOS and Windows operating systems environments. Computer Programming Skills are taught using the Visual Basic programming language. *Prerequisite:* MATH 141 or TMAT 155

CSCI 120
Programming I
3-0-3

This course provides basic skills in problem solving and programming. Topics covered include simple data types, expressions and statements, program flow control structures, exception handling and functions. Elements of object oriented programming techniques are also introduced. Prerequisite: Knowledge of Algebra.

CSCI 130
Computer Organization
3-0-3

The course covers the basics of combinatorial and sequential digital circuits. Representative digital circuits are multiplexers, demuliplexers, decoders, counters, registers, memory and ALUs. The use of programmable logic devices in digital circuitry is also covered. The course culminates with the design of a simple computer to specifications, both hardware description language and a graphical editor to design and implement digital circuits throughout the course. Equivalent to EENG 130. *Prerequisite:* MATH 141 or equivalent.

CSCI 170
Computer Architecture
3-0-3

A detailed discussion of computer hardware organization and design. Topics included are: processor bus organization, the arithmetic unit, micro-instructions, micro-programming, memory subsystem design, memory organization, I/O interface, asynchronous data transfer, interrupt and direct memory access. *Prerequisite:* CSCI 130 or EENG 130.

CSCI 180
Programming II
3-0-3

Object oriented design concepts and techniques are explored. Topics covered include classes, objects, function overloading and inheritance, to name a few. Students are introduced to object oriented design, code reusability and encapsulation. The techniques learned are applied in solving practical problems using a modern software development environment. Prerequisite: CSCI 120.

CSCI 220
Computer Laboratory
1-2-1

This course is intended to strengthen the student's programming skills in a high level language such as JAVA, through numerous programming assignments. Students who do not receive a grade of "B" or better in CSCI 120 may be required to take this course. *Corequisite:* CSCI 180.

CSCI 225
Introduction to Hardware Description Language
3-0-3

An introduction to the programming techniques used to design electronic circuits. The structure of the language, the method of specifying signals, digital logic and components will be developed using object-oriented programming algorithms and constructs. Circuit design software and languages such as ABEL, VERILOG, and VHDL will be reviewed. Equivalent to EENG 225. *Prerequisites:* CSCI 130/EENG 130, CSCI 180.

CSCI 230
Discrete Structures
3-0-3

A review of sets, functions, relations, mathematical induction and algorithmic analysis as applied to Computer Science. Graph theory, including minimal and maximal algorithms and the critical path method, is studied as well as automata theory and formal languages. *Prerequisite:* MATH 170 or MATH 161, CSCI 180.

CSCI 260
Data Structures
3-0-3
The classic data structures, such as stacks, queues, linked lists, binary trees, etc. are studied. Sorting and searching are stressed. Computational analysis is also studied. *Prerequisites:* CSCI 180, MATH 170 or MATH 161.

CSCI 280
COBOL
3-0-3
For computer majors. A detailed study of the COBOL languages with application to business problems: identification, environment, data and procedure divisions, syntax structure. File organization is discussed in connection with the data processing system. *Prerequisite:* CSCI 180. (Offered regularly, but not every semester.)

CSCI 305
Introduction to Automata Theory
3-0-3
Synchronous sequential circuits, interactive networks, transformation of sequential machines. Asynchronous sequential circuits, the structure of sequential machines, state identification, finite state recognizers. *Prerequisite:* CSCI 130 or equivalent. (Offered regularly, but not every semester.)

CSCI 310
C and UNIX
3-0-3
A study of the ANSI Standard C programming language and the UNIX programming environment. Topics covered include the syntax of C, basic UNIX commands, the UNIX file system, filters and pipes, shell programming and using UNIX system calls in C. C++, the object-oriented extension of C, will also be introduced. *Prerequisite:* CSCI 260.

CSCI 312
Theory of Computation
3-0-3
The basic concepts of the theory of computation are studied including set theory, finite automata, context free and context sensitive languages, Turing machines, Church's thesis and uncomputability. The classes of computation complexity and their practical limitations are studied. *Prerequisite: CSCI 230*

CSCI 318
Programming Language Concepts
3-0-3
Formal definition of programming languages including specification of syntax and semantics. A comparative analysis of various high-level programming languages with emphasis on the appropriateness of languages for certain applications. *Prerequisite: CSCI 260*

CSCI 320
Computer Graphics I
3-0-3
Introduction to the principles of interactive computer graphics, including input techniques and devices, display devices, display files, interactive graphic techniques, two- and three-dimensional computer graphics, and transformations. Graphic oriented languages are also discussed. *Prerequisites:* MATH 310, and CSCI 260 or equivalent. (Offered regularly, but not every semester.)

CSCI 325
Compiler Design
3-0-3
The design and implementation of a compiler is studied, including compiler organization, lexical analysis, searching methods and symbol tables, formal languages and grammar, parser construction, code syntax and code generation. *Prerequisites:* CSCI 260, CSCI 170.

CSCI 330
Operating Systems
3-0-3
The design and implementation of an operating system is studied, including process states and synchronization, memory management strategies, processor scheduling, multiprocessing, parallel processing, hardware organization, disk scheduling and file management. *Prerequisites:* CSCI 260, CSCI 170.

CSCI 335
Design and Analysis of Algorithms
3-0-3
The fundamentals of designing computer algorithms are introduced. An overview of advanced data structures such as balanced trees, heaps and hash tables is presented. A discussion of algorithm design techniques will include, but not be limited to, sorting and ordering, divide and conquer, shortest path and dynamic programming. The complexity of each class of algorithms is analyzed and the efficient use of algorithms to various applications is discussed. *Prerequisite: CSCI 260*

CSCI 340
Numerical Methods
3-0-3
A thorough treatment of problems requiring interpolation, numerical integration, relaxation and iterative processes. Truncation and roundoff errors. Error estimate and curve fitting. Runge-Kutta methods. The solutions will be implemented in a scientific language such as FORTRAN which will be studied in some detail. *Prerequisites:* CSCI 120, MATH 320. *Corequisite:* MATH 310.

CSCI 355
Artificial Intelligence I
3-0-3
Introduction to artificial intelligence programming languages LISP, PROLOG, and object- oriented programming. Basic problem representation and heuristic searching techniques will be discussed. Concept of knowledge engineering and various application of knowledge representation schemes will be studied. *Prerequisite:* CSCI 260.

CSCI 370
Introduction to Computer Networks
3-0-3
An introduction to the fundamentals and the applications of data communications. Network architectures, topology and the ISO model will be discussed. Novell's LAN or equipment will be used for practical hands-on experience. *Prerequisite:* CSCI 330.

CSCI 375
Systems Design
3-0-3
Structured systems design including flow charts, structure charts, module coupling and cohesion, and composite design. The use of simulation in systems design is discussed and various simulation techniques are covered. *Prerequisite:* CS 335. (Offered regularly, but not every semester.)

CSCI 380
Introduction to Software Engineering
3-0-3
Formal approach to techniques of software design, development, testing and management. Design techniques considered include formal models of structured programming, stepwise refinement, segmentation, top-down design, data abstraction, information hiding and object oriented development. A modern programming language will be used. *Prerequisites:* CSCI 260.

CSCI 385
Network and Internet Security
3-0-3
In this course we provide students with a firm understanding of the major aspects of network and Internet security. A hands-on project in a laboratory setting to emphasize some aspect of network or Internet security will be studied. *Prerequisites:* CSCI 370.

CSCI 401
Database Interfaces and Programming
3-0-3
An advanced course in static and dynamic programming, embedded SQL using C. Open Database Connectivity (ODBC), interface to access data from various database management systems with Structured Query Language (SQL). *Prerequisite:* CSCI 300 (offered regularly, but not every semester).

CSCI 405
Distributed Database Systems
3-0-3
Concepts underlying distributed systems: synchronization, communication, fault tolerance. Concepts and architecture of distributed database systems. Distributed concurrency control and recovery. Replicated databases. Distributed Query Processing. Examples of commercial relational distributed DBMS. *Prerequisite:* CSCI 300.

CSCI 410
Artificial Intelligence II
3-0-3
Principal artificial intelligence application areas such as Natural Language Processing (NLP), Computer Vision, speech recognition and understanding, problem solving and planning and machine learning systems will be studied. Current state-of-the-art Expert Systems and Expert System Tools will be introduced. *Prerequisite:* CSCI 355.

CSCI 420
Computer Graphics II
3-0-3
Advanced work in computer graphics, including surface description methods, color perception and images synthesis. Dynamic Vectors, Raster displays. Applications such as CAD/CAM will be discussed. *Prerequisite:* CSCI 320. (Offered regularly, but not every semester.)

CSCI 450
Seminar Project
3-0-3
The student will undertake a project under the guidance of an instructor. Each student will present oral reports before the group in a seminar situation. The project will be concerned with some aspect of computer science and results will be presented in a final written report. *Prerequisite:* Approval of chairman.

CSCI 460
Special Topics I
3-0-3
Critical study of theory and research related to advanced topics in computer science such as computer graphics, artificial intelligence, performance evaluation, advanced systems programming or topics in computability, automata theory, etc. The specific topics of the seminar will be determined by the interest of both the students and the instructor. *Prerequisite:* Approval of chairperson.

CSCI 470
Special Topics II
3-0-3
Advanced topics in computer science which are of interest to both students and faculty will be covered. *Prerequisite:* Approval of chairperson. (Offered regularly, but not every semester.)

Electrical and Computer Engineering

Faculty: S. Barone, S. Billis, S. Blank, J. Cheung, M. Colef, M. Drossman, R. Dua, A. Jafari, E. Kafrissen, W. Mesa, Y. Saito, S. Wadoo, M. Wernicki, Tao Zhang.

Adjunct Faculty: A. Gelman, D. Hoitsma, K. Kazi, M. Khoshsima, W. Vojir

Currently, NYIT offers courses leading to a Bachelor of Science degree in Electrical and Computer Engineering at the Manhattan and Old Westbury campuses.

The primary educational objectives of the Electrical and Computer Engineering program at NYIT are to produce well-rounded graduates who have a broad range of skills, aptitudes, and interests, and are prepared for successful careers in industry, government, or their pursuit of graduate studies.

These objectives are consistent with the overall mission of the college: to provide its students with a career-oriented education and access to opportunity, to conduct applications-oriented research, and to render service in the public interest.

The objectives of the electrical and computer engineering program are satisfied by the required and elective courses in liberal arts, humanities, science, mathematics, computer science, and electrical engineering with an increasing emphasis on design. The sequences established are meant to provide both depth and breadth in the major areas of study while also providing a degree of flexibility, through a choice of elective courses, that allows the students to specialize in areas of particular interest.

The college's liberal arts and humanities core curriculum is designed to provide the student with skills related to career and graduate school success. It is concerned with preparing the student to be a responsible citizen and engineer. To achieve this goal, it offers a broad perspective of advanced courses in social science, philosophy, and literature. Written and oral presentation skills are intended to carry over into their major areas of study.

Today's engineering student must understand both digital and electronic systems. The electrical and computer engineering program addresses this need through its sequence of course requirements. This includes the skills necessary to design and analyze the hardware and software aspects of the computer systems.

The use of modern engineering tools and computers are integrated into nearly all engineering courses. This includes lab work where software is used for the analysis and presentation of data.

As students progress through the curriculum, increasing emphasis is focused on analog and digital electronics as well as software design. Each student takes two Capstone design classes in both digital and electronic system design. The design projects are intended to utilize the full extent of the technical skills and knowledge the students gain throughout the curriculum as well as an understanding of the relevant economic, societal, and ethical issues appropriate for effective engineering practice. Teamwork, when appropriate, is emphasized and effective presentation of ideas, whether written or oral, is stressed.

Within this general direction and the mission of the college as well, the faculty have determined Program Educational Objectives (PEOs) that intend to create versatile engineers who will:

- be successful in their engineering or chosen career path.
- engage in life-long learning and professional development through graduate studies and active participation in professional organizations.
- be able to interact effectively with others in a collaborative team-oriented manner in the management and execution of a project
- function as a responsible member of society with a willingness to act as a mentor to fellow employees and in the community with an understanding of the social, ethical and economic impact of his/her work at the local and global level.

To support these objectives, the curriculum has been developed to provide program outcomes which describe what students are expected to know and be able to do by the time of graduation.

Upon graduation students are expected to have:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function on multi-disciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- a recognition of the need for, and an ability to engage in life-long learning
- a knowledge of contemporary issues
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The program in Electrical and Computer Engineering is accredited by the Accreditation Board for Engineering and Technology.

Curriculum requirements for the Bachelor of Science in Electrical and Computer Engineering

ETCS 105 Career Discovery[1] 2 credits

Electrical Engineering

EENG 130	Intro. to Computer Hardware	3
EENG 212	Electrical Circuits I and Eng. Tools	4
EENG 270	Introduction to Electronic Circuits	3
EENG 275	Electronics Laboratory I	1
EENG 281	Electrical Circuits II	3
EENG 310	Electronic Circuit Applications	3
EENG 315	Electronics Laboratory II	1
EENG 320	Control Systems	3
EENG 330	Electromagnetic Theory I	3
EENG 341	Signal and Systems	3
EENG 360	Electronics Laboratory III	1
EENG 370	Microprocessors	3
EENG 382	Random Signals and Statistics	3
EENG 401	Communication Theory	3
EENG 403	Electronics Laboratory IV	1
EENG 491	Senior Design Project	2
Design Elective		2
EE/CS Electives		6

48 credits

Computer Science

CSCI 120	Programming I	3
CSCI 170	Computer Architecture	3
CSCI 180	Programming II	3
CSCI 230	Discrete Structures	3
CSCI 260	Data Structures	3
CSCI 330	Operating Systems	3

18 credits

Behavioral Sciences 3 credits

English [3]

Composition		6
Speech		3
One Group A course [4]		3
WRIT 316	Writing for Technical Professions	3

15 credits

Liberal Arts 3 credits

Life Sciences

CHEM 107	Engineering Chemistry	4 credits

Mathematics

MATH 170	Calculus I	4
MATH 180	Calculus II	4
MATH 260	Calculus III	4
MATH 310	Linear Algebra	3
MATH 320	Differential Equations	3

18 credits

Mechanical Engineering

MENG 211	Engineering Mechanics I	3 credits

Physics

PHYS 170	General Physics I	4
PHYS 180	General Physics II	4
PHYS 225	Intro to Modern Physics	3

11 credits

Social Sciences

Economics		3
PHIL 230	Tech, Soc, & Val	3
OR		
IENG 400	Tech & Global Issues	3
Philosophy		3

9 credits

General Electives 3 credits

Total credits required—135-137

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Students should choose one from each of the following 2 groups of courses. Group 1: EENG 410, 415, 420, 430, 450, 465, 470, 488, 492. Group 2: EENG 435, 440, 483, 488.

(3) Intensive English as a second language is not acceptable as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

(4) Group A courses are LITR 210, 220, 230 and 240.

EENG 130
Introduction to Computer Hardware
3-0-3

The course covers the basics of combinatorial and sequential digital circuits. Representative digital circuits are multiplexers, demuliplexers, decoders, counters, registers, memory and ALUs. The use of programmable logic devices in digital circuitry is also covered. The course culminates with the design of a simple computer to specifications, both hardware description language and a graphical editor to design and implement digital circuits throughout the course. Equivalent to EENG 130. *Prerequisite:* MATH 141 or equivalent.

EENG 201
Introduction to Electrical Engineering
3-3-4

A lecture and laboratory course in the elements of electrical engineering. Brief review of topics covered in elementary physics such as Ohm's and Kirchhoff's Laws. Elementary dc and ac circuit analysis and basic electronic devices. *Prerequisites:* MATH 170, PHYS 170. (Not for electrical engineering majors.)

EENG 211
Electrical Circuits I
3-0-3

Properties of linear networks, mesh and nodal analysis, network theorems, solution of first order and second order circuits in the time domain are studied. *Prerequisites:* MATH 170, PHYS 170. *Corequisites:* MATH 180, PHYS 180.

EENG 212
Electrical Circuits I and Engineering Tools
3-1-4

Properties of linear networks, mesh and nodal analysis, network theorems, solution of first order and second order circuits in the time domain are studied. A software package, such as PSPICE, MATLAB and MATHCAD will be introduced. *Prerequisites*: MATH 170, PHYS 170. *Corequisites:* MATH 180, PHYS 180.

EENG 221
Computational and Engineering Tools
1-0-1

An introduction to the problem solving process using software packages, such as MATLAB. *Corequisite:* MATH 170.

EENG 225
Introduction to Hardware Description Language
3-0-3

An introduction to the programming techniques used to design electronic circuits. The structure of the language, the method of specifying signals, digital logic and components will be developed using object-oriented programming algorithms and constucts. Circuit design software and languages such as ABEL, VERILOG, and VHDL will be reviewed. Equivalent to CSCI 225. *Prerequisites:* CSCI 130/EENG 130, CSCI 180.

EENG 260
Electrical Engineering II
3-0-3

Direct current and alternating current motors and generators. LaPlace transform and basics of control theory and digital logic. Sampling, quantization and encodings of analog signals. Not for electrical engineering majors. (Offered regularly, but not every semester.) *Prerequisite:* EENG 201.

EENG 270
Introduction to Electronics Circuits
3-0-3

Characterization of semiconductor diodes, Zener diodes, transistors and field effect transistors (FET). Effect of temperature variation. Amplifier bias analysis and large signal analysis. Power amplifiers. Small signal models and small signal amplifier analysis. *Prerequisite:* EENG 212.

EENG 271
Introduction to Engineering Design
3-0-3

This course provides theoretical as well as practical insights into fundamental concepts of design in modern engineering. Emphasis on the creative role of the engineer, model utilization, problem formulation and analysis, optimization techniques and the search for alternative solutions leading to a functional and economical design are studied. Tools for effective engineering communication as well as the ethical, legal and professional responsibilities of the engineer in the design process are presented. *Prerequisite:* EENG 212.

EENG 275
Electronics Laboratory I
0-3-1

Laboratory work to complement lecture courses. *Prerequisites:* Engl WRIT 101 or WRIT 111, EENG 212.

EENG 281
Electrical Circuits II
3-0-3

Topics covered in this course include: phasors, AC steady-state analysis, transfer functions, frequency response, Laplace transform two-port networks. *Prerequisites:* EENG 211, CSCI 180. *Corequisite:* MATH 320.

EENG 301
Energy Conversion
3-0-3

This course covers methods for converting energy between electrical and other forms. Electromechanical, electrochemical, photoelectric, thermoelectric, and other methods of conversion are studied. The transduction of low energy signals as well as the conversion of large quantities of energy is discussed. The transmission of electrical power is also covered in this course. *Prerequisites:* EENG 270, PHYS 220.

EENG 310
Electronic Circuit Applications
3-0-3

Difference amplifiers, Darlington configuration, low and high frequency analysis, op-amps, gates: TTL, ECL, CMOS, comparators and Schmitt trigger, flip-flops with level and edge triggering, monostable and astable timing circuits. *Prerequisites:* EENG 270. *Corequisites:* EENG 281.

EENG 315
Electronics Laboratory II
0-3-1

Laboratory work to complement lecture courses. *Prerequisite:* EENG 270, 275.

EENG 320
Control Systems
3-0-3
Control systems analysis. Differential equations of motion of mass-spring and RLC systems. Differential equations of motion of servomechanism. Response to step, ramp and sinusoidal forcing command. Servomechanism transfer functions, signal-flow diagrams. State- space description; transition matrix, sensitivity analysis and error analysis. Stability analysis using the Bode diagram and the root locus methods. *Prerequisites:* EENG 281 or EENG 260.

EENG 330
Electromagnetic Theory I
3-0-3
Review of vector calculus, static electric and magnetic fields. Maxwell equations in integral form, Maxwell's equations in differential forms. Dielectrics, conductors, magnetic materials. Energy storage, Poynting's vector, dispersion and group velocity. *Prerequisites:* MATH 320, PHYS 180.

EENG 341
Signals and Systems
3-0-3
Topics covered in this course are: discrete networks, difference equations, discrete continuous convolution, Z transforms and Fourier series and transforms. *Prerequisite:* EENG 281.

EENG 360
Electronics Laboratory III
0-3-1
Laboratory work to complement lecture courses. *Prerequisites*: EENG 310, 315, WRIT 316.

EENG 370
Microprocessors
3-0-3
Microprocessor architecture, memory, I/O ports, interrupts, DMA and A/D-D/A converters are discussed along with interfacing and programming techniques. *Prerequisites:* EENG 310, EENG 130 or EENG 260.

EENG-382
Random Signals and Statistics
3-0-3
This course covers basic probability concepts, discrete and continuous random variables, distribution and density functions, and stochastic processes. Principles of statistical inference with applications in basic engineering design are discussed. *Prerequisite:* EENG 341

EENG 390
Electromagnetic Theory II
3-0-3
Topics include: wave propagation in unbounded media; Transmission lines, closed and open wavequides, discontinuities, Smith chart, optical waveguides and resonators; antennas and antenna arrays. *Prerequisite:* EENG 330.

EENG 401
Communication Theory
3-0-3
Review of Fourier transform and series, correlation and spectral densities of deterministic signals, baseband and bandpass linear systems, AM and FM modulation/demodulation schemes, elements of PCM, introduction to information theory and coding, and introduction to communication networks. *Prerequisite:* EENG 341, *Corequisite:* EENG 382.

EENG 403
Electronics Laboratory IV
0-3-1
Laboratory work to complement lecture courses. *Prerequisite:* EENG 360, 370. *Corequisite*: EENG 401.

EENG 410
Control Systems Design
3-0-3
Design of linear feedback systems using the Bode diagram and root locus method. System compensation using cascade and minor-loop feedback techniques. Design of non-linear feedback systems using the describing function, phase-plane method, Liapunov's method, and Popov's method. Introduction to optimal control theory using dynamic programming and the maximum principle. (Offered regularly, but not every semester.) *Prerequisite:* EENG 320.

EENG 415
Digital Control Systems
3-0-3
Linear discrete dynamic system analysis using the z-transform. Properties of the z-transform. Discrete equivalents to continuous transfer functions: the digital filter. Analysis of sampling, data extrapolations, and block diagram reduction techniques. Stability analysis of digital control systems using frequency response methods (the w-transform), the root locus method and Ragazzini's method. Design of digital control system using state-space methods. The development of theoretical topics is coupled with application of the theory to practical control system problems. (Offered regularly, but not every semester.) *Prerequisite:* EENG 320. *Corequisite:* EENG 341.

EENG 420
Digital Filter Design
3-0-3
This course provides step-by-step procedures for the design and implementation of digital filters. Discrete Fourier transforms and Z-transforms, recursive digital filter design satisfying prescribed specifications, non-recursive digital filters, quantization and practical implementations. (Offered regularly, but not every semester.) *Prerequisite:* EENG 341.

EENG 430
Operational Amplifier Design
3-0-3
The theory and design of a medium scale integrated (MSI) circuits are discussed. Criteria for a single stage BJT and FET amplifier design, multi-stage cascode hybrid design, active current source and active current load design, output stage design, and DC level shift design are covered. Multi-stage operational amplifier design with differential and Darlington stages, frequency response of an operational amplifier, and the negative feedback design are also presented. *Prerequisite:* EENG 310

EENG 435
Robotics and Flexible Automation
3-0-3
Robot classification, robot subsystems; electrical, computer, mechanical drives and links. Programming methods, work cells, and safety procedures. (Offered regularly, but not every semester.) *Prerequisite:* EENG 320. *Corequisite:* EENG 370.

EENG 440
Microcomputer-Based Design
3-0-3

Development of the ability to define and design "smart" microcomputer-based instruments. Digital circuitry which augments the capabilities of a microcomputer is discussed. Designing for maintainability is emphasized. *Prerequisite:* EENG 370. (Offered regularly, but not every semester.)

EENG 450
Optical Engineering
3-0-3

Introduction to optics and optical systems as applied to modern engineering problems. Fiber optics design consideration. Fiber materials and characterization. Lasers and LED's. Avalanche and PIN detectors, noise analysis. Receiver-transmitter design and performance. Transmission system budget analysis. State-of- the-art design for space satellite communication. *Prerequisites:* EENG 310, EENG 382, EENG 390.

EENG 455
Quantum Electronics
3-0-3

Optical fibers, rays and beams, optical resonators. Interaction of radiation and molecular systems, laser amplification and oscillation. Harmonic generation, modulation noise, detection. Laser applications. (Offered regularly, but not every semester.) *Prerequisite:* EENG 390.

EENG 460
Fiber Optics Concepts I
3-0-3

Introductory topics in fiber optics communication. Evolution of fiber types. Guiding, dispersive and nonlinear properties of fibers; numerical aperture, attenuation, modal properties for multi- and single-mode fibers and bandwidth characteristics. Fiber design considerations. Optical sources—laser and LED's, optical detectors—PIN and avalanche diodes. Transmitter system configuration, analysis and design. Receiver analysis and design, receiver performance. A total optical communication link design. Concepts and designs are reinforced through laboratory experiments. *Prerequisites:* EENG 390 or equivalent; *Corequisite:* EENG 450.

EENG 465
Microwave Engineering
3-0-3

Transmission lines, closed microwave wave- guides, passive components, s parameters. Microwave tubes and solid state devices. Microstrip and microwave integrated circuits. (Offered regularly, but not every semester.) *Prerequisite:* EENG 390.

EENG 470
Antennas and Propagation
3-0-3

Radiation resistance, power density, radiated power. Input impedance of antennas and antenna current. Dipole antennas and vertical wires. Quarter-wavelength and half-wavelength antennas. Arrays of radiators. Parabolic reflectors and horns. (Offered regularly, but not every semester.) *Prerequisite:* EENG 390.

EENG 480
Communication Network Design
3-0-3

Introduction to communication networks, layered network architecture models (OSI, SNA), Datalink, network and transport layers. Routing and flow control. LANs and ISDN. *Prerequisite:* EENG 382.

EENG 482
Advanced Communication Systems
3-0-3

Introduction to stochastic processes, narrowband noise, AM, coherent DSB and SSB, FM superheterodyne receiver, and their performance in noise. *Prerequisite:* EENG 382 and EENG 401.

EENG 483
Introduction to VLSI Design
3-0-3

Circuit design using VLSIs will be covered using basic CMOS and NMOS circuit structures, design rules, and speed-time tradeoffs. Introduction to computer-aided design tools and design projects using top-down design methods and bottom-up circuit construction design. The testability of design is emphasized. *Prerequisite:* EENG 310.

EENG 484
Digital Communications
3-0-3

Models of digital communication systems, concepts of mutual information and channel capacity, PCM, simple digital modulation techniques (ASK, FSK, PSK, DPSK), coherent detection of binary signals in noise and the matched filter. *Prerequisite:* EENG 382 and EENG 401.

EENG 486
Information Theory and Coding
3-0-3

Source and channel models, mutual information and entropy, channel capacity, fixed and variable codes for discrete sources, discrete memoryless channels, parity check codes (generating matrix and parity check matrix), cyclic codes and convolutional codes. *Prerequisite:* EENG 401.

EENG 488
Telecommunication System Design
3-0-3

Various telecommunication network design issues will be addressed in this course; examples of topics will include the design of network architectures, protocols, and routing algorithms. *Prerequisites:* EENG 401 and EENG 480.

EENG 489 Design Project
1-3-2

The course provides students with a design experience, under the guidance of a faculty advisor that draws significantly on knowledge and skills acquired in previous coursework, in areas such as digital control, microcomputers, VLSI, etc. While the projects may be self contained they will incorporate engineering standards, and realistic constraints. *Prerequisite:* One advanced EENG/CSCI elective and approval of the Chair

EENG 490
Fiber Optics Concepts II
3-0-3

Advanced topics in fiber engineering. Analysis and design of optical communication systems; coherent communication design. Digital communication links, including LAN's, MAN's, WAN's, and FDDI networks-analysis and design. Multi-mode and single-mode interferometric sensors analysis and design. ERBIUM doped amplifiers, optical time domain reflectometer design and implementation. Concepts and designs are reinforced through laboratory experiments. *Prerequisite:* EENG 460.

EENG 491 Senior Design Project
1-3-2

This is a course open to seniors which provides the major design experience as required by ABET. Students will work in teams to design a system or component of a system. This will be a comprehensive design that draws primarily on skills and knowledge acquired in previous coursework. The teams will work on an independent basis with the primary function of the instructor being that of a mentor to the students. The design will incorporate engineering standards and multiple realistic constraints such as its impact on society, health and environmental considerations, literature and patent search, and project management. Weekly progress reports as well as a final oral and written presentation will be required. EENG 320, EENG 330, EENG 370, EENG 401 and approval of the Chair

EENG 492
Senior Project
3-0-3

Advanced work in electrical engineering or applied science carried out under the supervision of a faculty adviser. A comprehensive, written final report is required. *Prerequisite:* Approval of the chairperson.

EENG 494
Special Topics I
3-0-3

The course covers topics of current interest in electrical engineering with emphasis on design. (Offered regularly, but not every semester.) *Prerequisite:* Approval of the chairperson.

EENG 496
Special Topics II
3-0-3

The course covers topics of current interest in electrical engineering with emphasis on design. (Offered regularly, but not every semester.) *Prerequisite:* EENG 494.

EENG 497
Wireless Communications I
3-0-3

The definition of Wireless Communication Systems (WCS) and their inherent technical difficulties are discussed. The information services delivered by WCS, their performance metrics, and their associated network control operations are considered. Various architectures such as FDMA, TDMA, and CDMA, the call management and network management procedures for these systems are discussed. The role IS-41 plays in the delivery of WCS services to subscribers, and concepts such as frames, time slots, physical and logical channels, power control, signaling protocols, and authentication are reviewed. *Prerequisite:* EENG 401, *Corequisite:* EENG 482

EENG 498
Wireless Communications II
3-0-3

Modulation and demodulation techniques used in FDMA, TDMA and CDMA systems are discussed. Topics in spread spectrum signals such as direct sequence and frequency hopping, error rate performance, processing gain and jamming margin, low detectability to unauthorized receivers, and interference estimation and suppression are presented. Spectrum efficiency, channel coding, interleaving, adaptive equalization, linear prediction coding, ISDN, and SS7 are studied. Propagation impairments and methods to overcome these difficulties are considered. *Prerequisite:* EENG 497

Information Technology with concentrations in Computer Security

Faculty: S. Billis, M. Colef, A. Jafari, E. Kafrissen, F. Lee, Y.Saito, S.L. Wang, J. Wu

Adjunct Faculty: H. Chin, A. Lee

Today, computers are applied to every industry and every level of human interaction. IT professionals, often working with people in every walk of life, design systems, create computer- based solutions, introduce computer human interfaces, configure and manage networks, and serve as technical consultants in technical as well as non-technical fields.

The primary educational objective of the Information Technology program at NYIT is to produce well-rounded graduates that have a wide range of skills, aptitudes, and interests, and who are prepared for successful careers in industry and government and/or graduate studies. This is accomplished through courses in Information Technology, Computer Science, liberal arts, humanities, and science. The sequences established are meant to provide both depth and breadth in the major areas of study, while also providing a degree of flexibility through a choice of elective courses that allow the students to specialize in areas of particular interest. The students can select a minor concentration in their area of interest such as communication arts, business, architecture, and others. The minor concentration provides the students with an opportunity to focus in an area of application and interest. In addition to our extensive computer facilities, the students have access to state-of-the-art laboratories in computer and network security, electronics, telecommunications and others.

Graduates find employment in a wide variety of technical careers such as: Software Engineer, Network Administrator, Systems Analyst, Computer Programmers, Sales Engineers, Technical Consultants, and others.

Curriculum requirements for the Bachelor of Science in Information Technology with concentrations in Computer Security

ETCS 105	**Career Discovery**	**2 Credits**
Computer Science		**24 Credits**
CSCI 120	Programming I	3
CSCI 130	Computer Organization	3
CSCI 170	Computer Architecture	3
CSCI 180	Programming II	3
CSCI 230	Disc Structure	3
CSCI 260	Data Structures	3
CSCI 330	Operating Systems	3
CSCI 370	Introduction to Computer Networks	3
Information Technology		**13 Credits**
ITEC 251	Applied Discrete Structures I	3
ITEC 290	Applied Database Systems	3
ITEC 305	Internet Programming I	3
ITEC 320	Web-based Multimedia Development 1	3
ITEC 410	Internetworking Lab	1
Professional Concentration		**9 Credits**
Information and Network Security Option		
Choose 3 courses:		
ITEC 365	Secure Programming	3
ITEC 385	Intro to Comp & Network Sec	3
ITEC 440	Network Security and Perimeter Protection	3
ITEC 445	Operating System Security	3
ITEC 450	Seminar Project	3
ITEC 460	Topics in Information Technology	3
ITEC Elective		3
or		
General Option		
CSCI/ITEC Electives		9 Credits
Engineering Management		**9 Credits**
IENG 251	Project Engineering	3
IENG 400	Technology & Global Issues	3
Management		**3 Credits**
MGMT421	Cyber Law, Policy and Ethics	3
Mathematics		**6 Credits**
MATH161	Basic Applied Calculus	3
Math Elective		3
Physics		**3 Credits**

Life Science	**3 Credits**
English[2]	**15 Credits**
Composition	6
Speech	3
One Group A course[3]	3
WRIT 316 Writing for the Tech. Professions	3
Social Sciences	**9 Credits**
Economics	3
History or Political Science	3
Philosophy	3
Behavioral Science	**3 Credits**
Minor Concentration	**15 Credits**
Science and Technology Electives	**6 Credits**
Liberal Arts Elective	**6 Credits**
Total credits required	**121-123**

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Intensive English as a second language is not acceptable as a substitution for any of these requirements. The only permissible substitution is WRIT 111and WRIT 161 in place of WRIT 101 and WRIT 151.

(3) LITR 210, 220, 230 and 240 may be selected.

ITEC 251
Applied Discrete Structures I
3-0-3

A review of sets, functions, relations and mathematical induction as applied to information technology will be given. Graph theory, recursion, and sorting algorithmic analysis will be studied. *Prerequisite:* CSCI 120, MATH 161.

ITEC 290
Database Systems
3-0-3

This course introduces students to the database design, implementation and administration. The students will also learn how to develop database applications using SQL. Additionally other topics such as XML and data mining will be discussed. *Prerequisite* CSCI 260.

ITEC 305
Internet Programming I
3-0-3

This course provides students with an understanding of various Internet programming languages including HTML, Javascript, and Java server side languages, including Java Server Pages and Java Servlets. Furthermore, fundamental web site design issues will be discussed including page navigation, user interface, and web page layout. *Prerequisite* CSCI 260.

ITEC 320
Web-based Multimedia Development I

Introduction to web-based multimedia systems, digital video compression techniques, operating system support for streaming audio and video, as well as network protocols for multimedia. Emphasis will be placed on the efficient use of resources and proper design choices to achieve the required quality of service for web-based multimedia intensive content. *Corequisite*: ITEC 305 *Prerequisite:* CSCI 260.

ITEC 365
Secure Programming
3-0-3

Secure programming involves the use of new methodologies in software engineering. This course provides an introduction to secure software design, development, testing and deployment. Practical approaches to secure software development are introduced. Topics related to the development of enterprise and web-based software are investigated. Secure programming for operating systems, databases, web servers, web services and their frameworks are addressed. *Prerequisite:* ITEC 305 or equivalent.

ITEC 380
Web-based Multimedia Development II
3-0-3

In this course, the students will learn how to write simple navigational scripts used in interactive object-oriented solutions to problems from domains such as simulations, gaming, instruction and artificial life. Students will develop data structures and classes in order to navigate through screens. They will learn to implement interfaces and control media. *Prerequisite:* ITEC 320

ITEC 385
Introduction to Computer & Network Security
3-0-3

In this course we introduce various to aspects of computer and network security. Security concepts including but not limited to public and private cryptography, authentication, digital signatures, email system security, IP security, web security technologies, firewalls and viruses are introduced. The fundamentals of computer and networks security concepts are provided in the context of modern computer systems and services. *Prerequisite:* CSCI 370.

ITEC 410
Internetworking Lab
0-3-1

This lab provides students with practical experience in the design, construction and maintenance of computer communication networks. Students utilize the laboratory to gain hands-on experience by applying concepts in Information Technology. *Prerequisite:* CSCI 370.

ITEC 420
Internet Programming II
3-0-3

This course provides students with an understanding of advanced techniques in World Wide Web programming. Students are introduced to the C# programming language for use in programming sophisticated web sites and services. Topics covered include XML, Web Services, database interactions, and web site design patterns. Students will implement a significant project using the Microsoft .Net framework. *Prerequisite:* CSCI 305

ITEC 440
Network Security and Perimeter Protection
3-0-3

This course will cover infrastructure security issues. Network operating systems and network architectures will be discussed together with the respective security related issues. The students will learn about the threats to computer networks through exploitation of weaknesses in the design of network infrastructure and security flaws in the network infrastructure protocols. Issues related to the security of content and applications such as email, DNS, web servers will be discussed. Security techniques including intrusion detection, forensics, cryptography, authentication and access control are analyzed. Developments in IPSEC, transport protocols, secure mail, directory services, and multimedia services are discussed. Equivalent to INCS 615. P*rerequisites:* CSCI 370, *Corequisite*: CSCI 385 or equivalent.

ITEC 445
Operating System Security
3-0-3

In this course students are introduced to advanced concepts in operating systems with emphasis on security. Students will study contemporary operating systems including UNIX and Windows. Topics include the application of policies for security administration, directory services, file system security, audit and logging, cryptographic enabled applications, cryptographic programming interfaces, and operating system integrity verification techniques. Equivalent to CSCI 620. *Prerequisite:* CSCI 370, ITEC 385 or equivalents.

ITEC 450
Seminar Project
3-0-3

The student will undertake a project under the guidance of an instructor. Each student will present oral reports before the group in a seminar situation. The project will be concerned with some aspects of computer science and results will be presented in a final written report. *Prerequisite:* Approval of chairperson.

ITEC 460
Topics in Information Technology
3-0-3

Critical study of recent developments in information, network and computer security. *Prerequisite:* ITEC 385.

Mechanical Engineering

Faculty: H. Fox, J.B. Lee, J. Ma, S. Lu, R. Tabi.

Adjunct Faculty: S. Berri, R. Phillips, R. Gilkes, R. H. Rahemi, Saporita.

The college offers courses leading to the Bachelor of Science degree in Mechanical Engineering at the Old Westbury Campus in both day and evening sessions. The day and evening offerings are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. Students have the option of selecting a concentration of courses in aerospace engineering in the Mechanical Engineering option.

Mechanical engineers specialize in the design and development of mechanical systems, structures, and energy conversion devices. The engineer can work in a variety of fields including aerospace, energy conversion, product design and development, manufacturing, construction, and research. With changing priorities in the energy field and the introduction of CAD/CAM processes, the mechanical engineer is at the cutting edge of new technologies that can enhance career choices and rewards.

The student will take courses in mechanical engineering, science and design with an increasing emphasis on the computer as a tool to assist in homework and laboratory assignments. Laboratory activity will provide hands-on experience with instrumentation used in the measurement of physical phenomena. Courses are designed to produce a versatile engineer capable of subsequent growth within industry or prepared to pursue graduate education.

The primary objectives of the Mechanical Engineering curriculum are to produce a versatile engineering graduate capable of growth within industry or prepared to pursue advanced education. The objectives which follow below are reflective of the overall mission of the college: career-oriented education to prepare students for successful careers in an information-age society; and applications-oriented research which not only expands the knowledge base of our society but also contributes to the economic development of the region, state and nation.

The important mission element to emphasize is the applied orientation of the college in general, and the engineering programs in particular. Our stress is on the design/computer/applications components in the spectrum of mechanical engineering programs.

Our objectives are fulfilled by courses in the sciences, in the humanities and in mechanical engineering with increasing emphasis on design. The sequences established for the students provide them with a broad education but also the flexibility to allow some specialization in an area of particular interest to them.

Providing the backbone of the curriculum, the sciences, mathematics and basic levels, mechanical engineering courses develop the fundamental knowledge needed by the student for the array of advanced courses. The college's liberal arts and humanities core curriculum is designed to provide the student with skills related to job and graduate school success. It is concerned with the student as future voter and community leader; to that end it provides a broad perspective of history, philosophy and literature. One of the major features of these courses is their emphasis on learning through written, oral and electronic presentations. These writing skills carry over effectively into the advanced mechanical engineering courses.

In the mechanical engineering major students take courses in both the thermal/fluids and solid mechanics tracks. In both stems of the curriculum, the sequence of courses

have increasing emphasis on computer usage and on design. To this end students are required to take twelve (12) credits of specifically designated design courses. These design courses include both a capstone course and electives, the latter chosen depending on the student's interest. The design projects encompass engineering components using the skills developed throughout the curriculum, economic issues appropriate to the effective practice of engineering, language and oral communication skills.

Based on this overall direction, and consistent with the mission of the college, the Department of Mechanical Engineering has set program goals and outcomes for its students. These have been developed to be comparable to the Accreditation Board of Engineering and Technology Engineering Criteria 2000 (EC2000) and the Program Criteria established by the American Society of Mechanical Engineering (ASME).

Within this general direction and the mission of the college as well, the faculty have determined Program Educational Objectives (PEOs) that intend to create versatile engineers who will:

- be successful in their engineering technology or chosen career path.
- engage in life-long learning and professional development through continued studies, professional experience, and active participation in professional organizations.
- be able to interact effectively with others in a collaborative team-oriented manner in the development and execution of a project.
- function as a responsible member of society with a willingness to act as a mentor to fellow employees and in the community with an understanding of the social, ethical and economic impact of his/her work at the local and global level.

To support these objectives, the curriculum has been developed to provide program outcomes which describe what students are expected to know and be able to do by the time of graduation.

Upon graduation students are expected to have:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.

- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- A recognition of the need for, and an ability to engage in life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Five-Year Combined Program—B.S. in Mechanical Engineering and M.S. in Energy Management

The college offers a five-year combined program leading to the Bachelor of Science in Mechanical Engineering and a Master of Science in Energy Management. As an interdisciplinary program, the curriculum is designed to train students who intend to function in engineering and leadership roles in various energy related industries.

For program details, please contact the Chairperson, Department of Mechanical Engineering.

Aerospace Engineering Concentration

The concentration in Aerospace Engineering is designed to allow mechanical engineers the opportunity to focus on aircraft and space vehicle design. Material capabilities, production, and propulsion are emphasized to enable the engineer to meet the changing priorities of the Aerospace industry.

Engineering Management

The department offers courses leading to the Bachelor of Science degree in engineering management. As an interdisciplinary program, the curriculum is designed to train students who intend to function in leadership roles in various manufacturing or service environments. Students take courses in industrial engineering as well as management and other technical and liberal arts disciplines.

Curriculum requirements for the Bachelor of Science in Mechanical Engineering

ETCS 105 Career Discovery — 2 Credits

Mechanical Engineering

MENG 105	Engineering Graphics	2
MENG 211	Engineering Mechanics I	3
MENG 212	Engineering Mechanics II	3
MENG 221	Strength of Materials	4
MENG 240	Thermodynamics	3
MENG 270	Instrumentation & Measurement	1
MENG 310	Introduction to Material Science	3
MENG 320	Materials Mechanics Laboratory	1
	or	
MENG321	Intro to CAD	3
MENG324	Vibrations & System Dynamics	3
MENG 340	Fluid Mechanics	3
MENG 343	Thermofluids Lab	1
MENG 346	Energy Conversion	4
MENG 349	Heat Transfer	3
MENG 370	Machine Design	4
MENG 373	Engineering Analysis	3
MENG 470	Senior Mechanical Engineering Design	4

47 credits

Design Elective Options
Select 8 credits from the following:
AENG 490, MENG 486, 446, 443. **8 credits**

Elective Options
Select 3 credits from non-required AENG, IENG, MENG, or graduate MENG courses with Chairperson approval. **3 credits**

Computer Science
CSCI 120 Programming I **3 credits**

Electrical Engineering
EENG 201 Introduction to Electrical Engineering **4 credits**

Engineering Management

IENG 240	Engineering Economics	3
IENG 245	Statistical Design I	3

6 credits

Behavioral Sciences **3 credits**

English [2]

Composition		6
Speech		3
One Group A course [3]		3
WRIT 316	Writing for Technical Professions	3

15 credits

Liberal Arts **3 credits**

Life Sciences
CHEM 107 Engineering Chemistry I 4 credits

Mathematics
All students are required to take a mathematics placement examination prior to registration, and may have to take a developmental mathematics course (MATH 096-MATH 097, or MATH 098) before taking required mathematics courses.

MATH 170	Calculus I [4]	4
MATH 180	Calculus II [4]	4
MATH 260	Calculus III	4
MATH 320	Differential Equations	3

15 credits

Physics

PHYS 170	General Physics I [4]	4
PHYS 180	General Physics II [4]	4
PHYS 225	Introduction to Modern Physics	3

11 credits

Social Sciences

Economics		3
PHIL 230	Technology, Society, and Values	
	or	
IENG 400	Technology and Global Issues	3
PHIL		3

9 credits

Electives **3 credits**

Total credits required—134-136

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Intensive English as a second language is not acceptable as a permissible substitution for WRIT 111 and WRIT 161 in place of WRIT 101 as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

(3) LITR 210, 220, 230 or 240 may be elected.

(4) M.E. students are permitted to register concurrently for Calculus I and Physics I and Calculus II and Physics II.

MENG 105
Engineering Graphics
1-2-2

An introduction to current graphic representations. Problems chosen to develop recognition and development skills in such areas as orthographics, pictorials, auxiliaries, sections, intersections and developments. Practical applications in screws and fasteners, welds, gears, cams, pipes, and electrical conventions. AUTOCAD applications.

MENG 115
Mechanical Engineering Tools
2-1-3

Introduction to fundamentals of computer tool use and machine tool use: Pro/Engineer, a 3D parametric, feature based, solid modeling package with fully detailed representation of design concepts, and Autocad with lab applications; bandsaw, milling machine, and lathe. *Prerequisite:* MENG 105.

MENG 211
Engineering Mechanics I (Statics)
3-0-3

Statics of particles; force in plane and space; equivalent systems of forces; equilibrium of rigid bodies in two and three dimensions; analysis of structures, friction; distributed forces; centroids, centers of gravity and moment of inertia; method of virtual work. *Prerequisites:* PHYS 170, MATH 180.

MENG 212
Engineering Mechanics II (Dynamics)
3-0-3

Basic concepts, fundamental laws: absolute and relative motion, work, energy, impulse, momentum. Kinematic and kinetics of a particle, or rigid bodies. Central force motion. Impact. Advanced topics. *Prerequisites:* MENG 211, MATH 260.

MENG 221
Strength of Materials
4-0-4

Stresses and strains in members under the actions of axial and shearing forces, bending and twisting moments. Transformations of stress and strain; principal stresses. Combined stresses; pressure vessels. Deflection of beams. Statically indeterminate problems. Columns. *Prerequisites:* MENG 211, MATH 180.

MENG 240
Thermodynamics
3-0-3

Review of dimensions, units, and fundamental concepts. Study of First and Second Laws of Thermodynamics. Application to fluid dynamic processes. Energy conversion cycles. Reversed cycles. Concept of exergetic analysis. *Prerequisites:* PHYS 180, CHEM 107, *Co-requisites:* MATH 260.

MENG 270
Instrumentation and Measurement
0-3-1

Introduction to measuring techniques in mechanical engineering. Analysis of experimental data with emphasis on accuracy, errors, and uncertainty. Mechanical, electrical, electronic, pneumatic, hydraulic and optical instruments are used in the experiments performed, and their design, function, and limitations are studied. *Prerequisite:* PHYS 170.

MENG 310
Introduction to Materials Science
3-0-3

Introductory course to the science of materials. Review of atomic theory and atomic bonding. Structure of crystals and nature of crystal imperfections and atom movements. Discussion of phase diagrams, multiphase materials and equilibrium relationships. *Prerequisite:* CHEM 107.

MENG 320
Materials Mechanics Laboratory
0-3-1

This laboratory course should be regarded as a supplement to the theoretical studies of materials and mechanical properties of engineering materials. Important mechanical properties are defined and discussed. The operation and use of the testing equipment described, i.e., universal testing machines, hardness tester, torsion, impact and cyclic load tester. Deflection, deformation, and strain gauges. Low and high temperature testings. Metallographic laboratory techniques and nondestructive testing methods introduced. (Offered regularly, but not every semester.) *Prerequisites:* MENG 310, MENG 221.

MENG 321 Introduction to
Computer Aided Design
3-0-3

General overview of how CAD operates in a modern mechanical engineering design environment. Introduction to major commercial CAD software (CATIA, Pro/E, Solidworks, NX, etc.) in relation to the production of two and three dimensional images of design concepts for machinery components. Introduction to finite element techniques for structural analysis. Includes hands-on experience in the use of CAD software packages for designing and analyzing mechanical components. *Prerequisites:* MENG-105, MENG-221, MENG 212

MENG-324
Vibrations and System Dynamics
3-0-3

Mathematical modeling and analysis of lumped dynamic systems with mechanical elements. Topics: time domain solutions (with emphasis on one- and multi-degree-of-freedom vibration problems including free and forced vibrations), computer simulation, block diagram representation, numerical methods and frequency domain solutions. *Prerequisite:* MENG 212, MATH 320

MENG 340
Fluid Mechanics
3-0-3

Fundamental fluid statics: manometry, forces on submerged surfaces, Archimedes' principle. Details of one-dimensional incompressible flow; conservation laws and application to flowing systems, cavitation, impulse-momentum problems, vanes. Pipe flows: laminar analyses, turbulent flows with emphasis on calculation of fluid properties. One-dimensional compressible flow; conservation laws, specialization to isentropic situations, nature of speed of sound. Applications including effects of area change, converging and diverging nozzles, choking phenomena, normal shock waves. *Prerequisite:* MENG 240.

MENG 343
Thermofluids Laboratory
0-3-1

Introduction to basic instrumentation. Experiments involving pressure, velocity, temperature and viscosity measurements, determination of thermal properties of solids, liquids and gases. Calorimetry. Steam turbogenerator, reversed refrigeration cycles. Tests involving internal combustion engines, wind tunnel testing. Basic experiments in hydraulics. (Offered regularly, but not every semester.) *Prerequisites:* MENG 340, MENG 240.

MENG 346
Energy Conversion
3-3-4

Starting with basic principles of energy conversion, the vast area of modern energy technology is covered. Fossil, nuclear, solar, and geothermal energy resources and current and future methods of energy conversion are analyzed. State of the art and present research areas reviewed. Technical and economic feasibility of processes, equipment, and plants is analyzed. *Prerequisite:* MENG 240.

MENG 349
Heat Transfer
3-0-3

Basic concepts. Steady-state conduction; unsteady-state heat conduction; mathematical, graphical empirical and numerical methods of analysis. Principles of convection, dimensionless numbers. Forced convection. Natural convection. Radiation heat transfer. Heat exchangers. *Prerequisites:* MENG 240, MATH 320.

MENG 370
Machine Design
4-0-4

General concepts of machine design, such as stress and strength, stress concentration fatigue, theories of failure, deflection in machine parts. Applications of the design process, including design of shafts, fasteners, couplings, gears, bearings, springs, screws, and other machine elements. *Prerequisite:* MENG 221.

MENG 373
Engineering Analysis
3-0-3

Numerical and analytical methods for the solution of engineering problems will be covered. In particular, applications to problems in heat transfer, fluid mechanics, flight vehicle design, and vibration theory will be discussed. *Prerequisites:* MATH 320, MENG 221.

MENG 410
Fundamentals of Stress Analysis
2-2-3

Two-dimensional state of stress and strain. Stress equations of equilibrium. Stress and strain transformation equations. Compatibility. Three-dimensional stress-strain relations. Plane elasticity theory; plane-strain and plane-stress problems in cartesian and polar coordinates. Airy's stress function. Verification of theoretical solutions by experimental methods using strain-gages. Photoelasticity. Birefringent coatings. (Offered regularly, but not every semester.) *Prerequisites:* MENG 423.

MENG 413
Mechatronics
3-0-3

Review of classical mechanics and electromagnetics. Analysis of electric and electromechanical components and systems. Principles and fabrication of Microsystems including microsensors and actuators. Control of mechatronic systems. Passive and active vibration compensation. Integration of microprocessors for embedded application. *Prerequisite:* MENG-324

MENG 420
Mechanical Metallurgy
3-0-3

Quantitative prediction of mechanical behavior of materials: plastic, viscous, plastic deformations, crack formation, and growth under monotonic and repeated loading. Deformation, viscous creep. Types of fracture and theories of fracture; fatigue. Elective for MENG students. (Offered regularly, but not every semester.) *Prerequisites:* MENG 310, MENG 221.

MENG 423
Advanced Strength of Materials
3-0-3

Theories of stress and strain. Energy methods. Deflections of structures using the method virtual work and Castigliano's theorem. Analysis of statically indeterminate structures. Classical and modern theories of curved beams subjected to general loading. Determination of stresses and deformations of curved beams with various boundary conditions. Thick-walled cylinders; shrink fits. Flat plates. Beams on continuous elastic support. *Prerequisites:* MENG 310, MENG 221, MATH 320. (Elective for MENG or AENG students.)

MENG 440
Advanced Fluid Mechanics
3-0-3

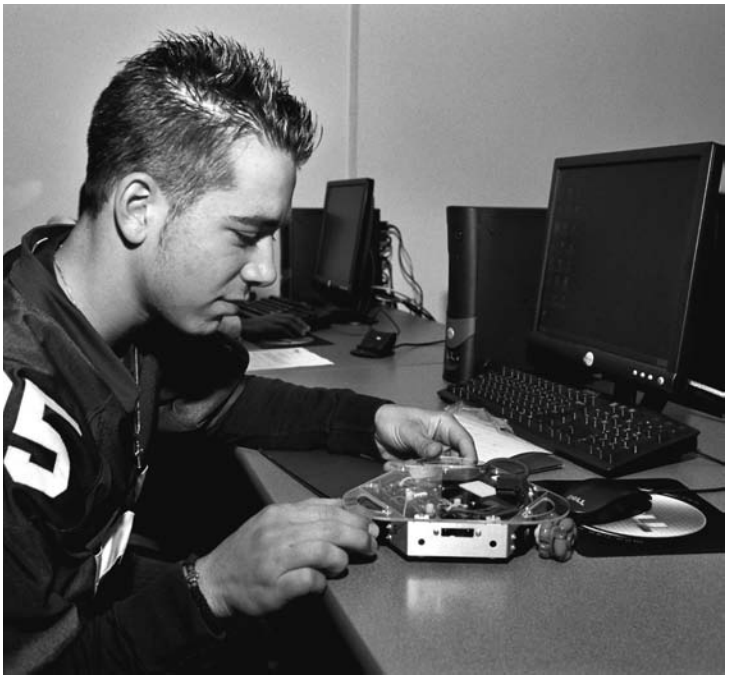
Conservation laws, viscous flow in ducts, fully developed flow, turbulent flow, pipe networks, general theory of turbomachines including pump performance and characteristics, pump cavitation and hydraulic turbines. Laminar and turbulent boundary layer flow. *Prerequisites:* MENG 340, MATH 320.

MENG 443
Energy System Analysis and Design
3-3-4

Fundamentals of planning and design of thermal power plants. Detailed design and performance characteristics of power plant subsystems, i.e., turbines, steam condensers, feedwater heaters, boiler plant pumps, steam generators, boiler fans, piping design, cooling water systems, water treatment. System analysis based on First and Second Laws of Thermodynamics toward optimization of power generation. Advanced (optimized) energy conversion cycles with energy/energy flows. Students are required to complete a design project of a thermal power plant and submit a report with complete system analysis, heat balance diagrams, major system/subsystem and piping drawings. *Prerequisites:* MENG 240.

MENG 446
Heating, Ventilation, and Air Conditioning
3-3-4

Analysis and design procedures of HVAC systems, accompanied by a design project. *Prerequisites:* MENG 340, MENG 240; *Pre- or corequisite*: MENG 349.



MENG 470
Senior Mechanical Engineering Design
3-3-4
The course will deal with open-ended design investigations which allow the application of advanced engineering techniques to the analysis and synthesis of engineering systems or devices. Topics such as manufacturing processes, DFM, modern engineering materials reliability and liability, environmental friendliness, thermo-fluid machines and devices will be covered. *Prerequisite:* Approval of chairperson.

MENG 473
Kinematics
3-0-3
Kinematics of machines, velocity and acceleration, analysis of mechanisms using graphical, analytical, and computer methods. Synthesis of planar linkages. Study of cams and gear trains. Introduction of spatial linkages. (Offered regularly, but not every semester.) *Prerequisite:* MENG 212

MENG 474
Special Topics I
3-0-3
Topics of current interest in mechanical engineering involving project analysis and design are covered in the course. *Prerequisite:* Approval of the Chair.

MENG 478
Special Topics II
3-0-3
Topics of current interest in mechanical engineering involving project analysis and design are covered. This course may serve as continuation of, MENG 474. *Prerequisite:* MENG 474 or approval of the chair.

MENG 483
Mechanical Engineering Workshop
0-3-1
A workshop designed to address deficiencies in transfer credit evaluation in areas such as design and computer applications in engineering and related courses. The course may be repeated. *Prerequisite:* Approval of the chairperson.

MENG 486
Advanced Machine Design
3-3-4
Review of basic concepts, plus such considerations as impact loads, cumulative damage, reliability as a statistical concept, optimization, cost standardization, computer usage. In-depth treatment of such machine elements as clutches and brakes, special springs, roller bearings, gearing systems. Two open-end design projects, each combining various machine elements: conceptual design, feasibility, calculations, assembly drawing, detail drawings including dimensioning, fits and tolerance and parts lists. *Prerequisites:* MENG 370, MENG 212 (ME design elective.)

Curriculum requirements for the Bachelor of Science, Mechanical Engineering—Aerospace Concentration.

ETCS 105 Career Discovery [1] **2 credits**

Mechanical Engineering

MENG 105	Engineering Graphics	2
MENG 211	Engineering Mechanics I	3
MENG 212	Engineering Mechanics II	3
MENG 221	Strength of Materials	4
MENG 240	Thermodynamics	3
MENG 270	Instrumentation & Measurement	1
MENG 310	Introduction to Material Science	3
MENG321	Intro to CAD	3
MENG 324	Vibrations & System Dynamics	3
MENG 340	Fluid Mechanics	3
MENG 346	Energy Conversion	4
MENG 349	Heat Transfer	3
MENG 370	Machine Design	4
MENG 373	Engineering Analysis	3

42 credits

Aerospace Engineering

AENG 360	Aerodynamics	3
MENG 343	Thermofluids Laboratory	1
or		
AENG 466	Aerospace Laboratory	1
AENG 463	Propulsion	3
AENG 490	Flight Vehicle Design	4
AENG 492	Senior Aerospace Design	4

15 credits

Computer Science

CSCI 120 Programming I **3 credits**

Electrical Engineering

EENG 201 Intro. Electrical Engineer. **4 credits**

Engineering Management

IENG 240	Engineering Economics	3
IENG 245	Statistical Design I	3

6 credits

Behavioral Sciences **3 credits**

English [2]

Composition	6
Speech	3
One Group A course [3]	3
WRIT 316 Writing for Technical Professions	3

15 credits

Liberal Arts **3 credits**

Life Sciences

CHEM 107 Engineering Chemistry **4 credits**

Mathematics

All students are required to take a mathematics placement examination prior to registration, and may have to take a developmental mathematics course (MATH 096-MATH 097, or MATH 098) before taking required mathematics courses.

MATH 170	Calculus I [4]	4
MATH 180	Calculus II [4]	4
MATH 260	Calculus III	4
MATH 320	Differential Equations	3

15 credits

Physics

PHYS 170	General Physics I [4]	4
PHYS 180	General Physics II [4]	4
PHYS 225	Introduction to Modern Physics	3

11 credits

Social Sciences

Economics	3
PHIL	3
Phil 230 Tech, Soc. Val	
or	
IENG 400 Tech & Global Issues	3

9 credits

Electives **3 credits**

Total credits required—133-135

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Intensive English as a second language is not acceptable as a permissible substitution for WRIT 111 and WRIT 161 in place of WRIT 101 as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

(3) LITR 210, 220, 230 or 240 may be elected.

(4) M.E. students are permitted to register concurrently for Calculus I and Physics I and Calculus II and Physics II.

AENG 360
Aerodynamics
3-0-3

Review of basic incompressible and compressible flows, introduction to oblique shock waves, Prandtl Meyer flows. Detailed airfoil analyses including effects on lift and drag of angle of attack, Reynolds number, compressibility. Three-dimensional considerations: qualitative discussion of downwash and circulation, quantitative aspects of this type of flow. Boundary layer theory: simple ideas, flat plate flows, calculation formulae. (Offered regularly, but not every semester.) *Prerequisites:* MATH 320 and MENG 340.

AENG 430
Aero Structures
3-0-3

Analysis of flight structures; compound and complex trusses. Torsion of space frameworks and box sections. Shear flow distribution in box beams; tapered beams and unsymmetrical beams. Analysis of semimonocoque structures; fuselage bulkheads and wing ribs. Multi-cell box beams. Indeterminate rigid frames. (Offered regularly, but not every semester.) *Prerequisites:* MATH 320, MENG 221.

AENG 433
Structural Dynamics
3-0-3

Natural frequency of vibrating beams by Newmark's method. Numerical and rigorous dynamic response of one-degree of freedom systems. Dynamic response analysis of lumped-mass systems. Response of damped systems by Duhamel's integral. Analysis of nonlinear structural response. Formulation of MDOF equations of motion; Rayleigh's method. Normal coordinates; uncoupled equations of motion; conditions of orthogonality; mode super- position. Response spectra for earthquakes. (Offered regularly, but not every semester.) *Prerequisites:* MENG 212, MENG 323, MATH 320.

AENG 436
Aerospace Mechanics
3-0-3

Elements of spherical trigonometry and navigation. Determination of position, velocity, and acceleration on earth, in the air, and in space, celestial motion, theory of orbits. Rocket equation and elements of astronomy and guidance included. (Offered regularly, but not every semester.) *Prerequisites:* MATH 260 and MENG 212.

AENG 439
Dynamics of Flight
3-0-3

Dynamic problems of the airplane in motion. Fixed and free controls, transient motion and dynamic loads on the airplane in maneuvering flight. Design of aerodynamic characteristics, automatic control, transfer function, stability criterion of automatic control systems. (Offered regularly, but not every semester.) *Prerequisites:* MENG 212, AENG 490.

AENG 463
Propulsion
3-0-3

Review of fluid mechanics principles including shock wave. Details of air-breathing propulsion including analysis of diffusers and nozzles, compressors and turbines, and combustion processes. Matching of components is treated in depth. Over-all vehicle analysis treating turbojet, turbofans, turboprops, ram-jets. (Offered regularly, but not every semester.) *Prerequisite:* MENG 340.

AENG 466
Aerospace Laboratory
0-3-1

Experiments involve aerospace concepts and are geared to simulate operations in a typical industrial aerospace lab. Wind tunnel testing, flow visualization, model forces, pressure measurements; boundary layers, nozzles and jets. Error analysis. (Offered regularly, but not every semester.) *Corequisite:* AENG 360.

AENG 490
Flight Vehicle Design
2-4-4

Actual optimum design of an airplane meeting the specifications of load (number of passengers and/or weight of cargo), range, field length, and cruising speed. The course proceeds step by step to calculate all the design characteristics: wing sweepback, thickness ratio, wing loading, thrust loading, takeoff weight, drag, range, direct operating cost. Many of these factors are varied in order to optimize the cost. (Offered regularly, but not every semester.) *Corequisite:* MENG 340.

AENG 492
Senior Aerospace Design
4-0-4

A specific field of design will be selected. The design will be open-ended and proceed from specifications using all the pertinent fields of science and engineering as well as empirical formulations. Some topics which may be selected are Supersonic Aircraft, Rocket Technology and Helicopter Design. *Prerequisite:* AENG 490 and approval of chairperson.

AENG 494
Guidance and Control
3-0-3

The high-speed motion of modern aerospace vehicles requires extremely accurate measurements of the parameters of motion as well as the means of correcting such motion. These techniques of guidance and control are offered from first principles. Different guidance systems (gyroscopes, accelerometers, and other sensors are evaluated). (Offered regularly, but not every semester.) *Prerequisite:* AENG 436.

Curriculum requirements for the Bachelor of Science in Engineering Management

ETCS 105 Career Discovery [1] **2 credits**

Industrial Engineering

IENG 240	Engineering Economics	3
IENG 245	Statistical Design I	3
IENG 251	Project Engineering	3
IENG 345	Statistical Design II	3
IENG 355	Quality Control & Reliability	3
IENG 380	Operations Research I	3
IENG 400	Technology & Global Issues	3
IENG 425	Systems Simulation	3
IENG 475	Industrial Engineering Design I	3
IENG 476	Industrial Engineering Design I	3
IE Electives		6
		36 credits

Management

ACCT 101	Accounting I	3
ACCT 306	Cost Accounting	3
FINC 201	Corporation Finance	3
MGMT 205	Organizational Behavior	3
MGMT 405	Business Policy Seminar	3
Electives in Management [2]		6
		21 credits

Computer Science

CSCI 120 Programming I **3 credits**

Mechanical Engineering

MENG373 Engineering Analysis **3 credits**

English [3]

Composition		6
Speech		3
One Group A course [4]		3
WRIT 316	Writing for Technical Professions	3
		15 credits

Social Sciences

Economics	3
History or Political Science	3
Philosophy	3
	9 credits

Behavioral Sciences **3 credits**

Liberal Arts **3 credits**

Life Sciences

CHEM 107 Engineering Chemistry **4 credits**

Physics

PHYS 170	General Physics I	4
PHYS 180	General Physics II	4
		8 credits

Mathematics

MATH 170	Calculus I	4
MATH 180	Calculus II	4
MATH 310	Linear Algebra	3
		11 credits

Technical Electives [5] **6 credits**

General Electives **6 credits**

Total credits required—128-130

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) All management electives and substitutions for any required management courses must be approved by the departmental chairperson.

(3) International students may be required to take Intensive credits in English (X503, 6 credits; and 098, 5 credits) prior to taking these courses. Intensive English as a second language is not accepted as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and 161 in place of 101 and 151.

(4) LITR 210, 220, 230 or 240 may be selected.

(5) Electives may be advanced level mathematic such as MATH 260, 320 or advanced level computer science or industrial engineering courses, or other approved electives.

IENG 240
Engineering Economics
3-0-3

Economic problems relevant to the management-engineering decision-making environment, managerial costs, interest, depreciation, break-even analysis, capital budgeting, replacement decisions. *Prerequisite:* MATH 141. or TMAT 155, or equivalent.

IENG 245
Statistical Design I
3-0-3

Fundamentals of engineering probability and statistical analysis as applied to industrial problems: sample spaces, random variables, discrete and continuous distributions, sampling techniques and design of statistical investigations, Bayesian decision making. Emphasis is on the application of these ideas to the decision-making process, rather than pure theory. *Prerequisite:* MATH 170 or TMAT 235.

IENG 251
Project Engineering
3-0-3

In this course, we discuss development and management of engineering and technology projects. Project proposal preparation, resources and cost estimating, project planning, organizing, and controlling, network diagrams and the techniques are covered. *Prerequisite:* MATH 170 or MATH 161

IENG 255
Computer Aided Design (CAD)
3-0-3

General introduction to computer graphics and its application in design of physical plant layouts and the graphic arts. Practical assignments provide experience in the use of 2-D and 3-D graphics. *Prerequisites:* TMAT 255 and CSCI 160.

IENG 260
Facilities Design and Materials Handling
3-0-3

The main objective of the facilities layout function is to increase operational efficiency of the plant through effective integration of manufacturing equipment, materials handling systems, plant facilities and labor requirements. This course will provide a thorough analysis of the various quantitative and computerized models that have been developed to cope with the increasing complexity of layout problems. *Prerequisites:* MENG 105 and IENG 250 or IENG 360 and IENG 255.

IENG 265
Industrial Safety
2-0-2

Evaluates the fundamentals of safety engineering and accident prevention, including the industrial causes and impact of accidents and the production values of attaining an accident-free goal. Attention is paid to the meaning and interpretation of the Occupational Safety and Health Act. (Offered regularly, but not every semester.)

IENG 270
Work Measurement and Analysis
3-0-3

Work measurements techniques based on simplification of design, process, sequence, and workplace. Micromotion and memomotion evaluation of work content for improvement and training. Time study via stop watch observation, statistical sampling and synthetic time systems. Worker ratings and allowances. Job evaluation and wage determination. Laboratory work in motion and time. *Prerequisite:* IENG 250 or IENG 360.

IENG 275
Engineering Ethics—Law and Sales
2-0-2

Philosophy of engineering; methodology of ethics; the engineer and society; communications between engineers and laypersons; continuing education and upgrading of the engineer in practice; selling engineering services; moral and statutory laws. (Offered regularly, but not every semester.)

IENG 280
Technology & Labor Issues
3-0-3

In this course students discuss the changing nature of work and its impact on workers and labor management relations. Also covered are the history and development of the labor movement, including current issues and perspectives, the impact of social and technical factors on the evolution of business organizations, and the theory and function of workplace skills, i.e. customer focus, quality, team work, leadership, and problem solving.

IENG 340
Design for Manufacturability
2-3-3

A lecture/laboratory course designed to provide insight into manufacturing requirements. Students will analyze component/part design with a view towards improving their manufacturability. Team and individual prospects will be required. *Prerequisites:* IENG 445, IENG 240.

IENG 345
Statistical Design II
3-0-3

Principles of modern statistical experimentation and practice in basic engineering design: statistical inference and decision problems, estimation, tests of hypothesis, regression, correlation, one-way and two-way analysis of variance, application to engineering and management data, time-series analysis. *Prerequisite:* IENG 245.

IENG 350
Quality Control
3-0-3

The applied techniques for determining the quality of mass-produced items by means of statistical analysis. The use of control charts for detecting changes in a process. Setting control limits and lot sizes for sampling inspection plans. Sampling by variables and attributes. Prediction of the probable percentage defective in a monitored process. (Offered regularly, but not every semester.) *Prerequisite:* TMAT 135.

IENG 355
Quality Control and Reliability
3-0-3

Economic aspects of statistical quality control. Control charts for variables and attributes, acceptance sampling, operating characteristics curves, fundamentals of reliability, failure prediction. *Prerequisite:* IENG 245.

IENG 360
Quantitative Methods in Industrial Operations
3-0-3

Linear optimization models, simplex methods and solutions, networks and applications, assembly line balancing, queueing theory with applications in production and computer simulation. *Corequisite:* IENG 345.

IENG 365
Industrial Engineering Laboratory
1-2-2

Laboratory work using timing devices, work simplification techniques, and statistical sampling simulators. Data gathering and analyses methods are demonstrated. *Prerequisite:* IENG 245.

IENG 370
Industrial Plant Operations
2-3-3

A study of current industrial engineering practices: production, layout, safety, planning, personnel management, through plant visits and class discussions. Term report. (Offered regularly, but not every semester.) *Prerequisite:* IENG 260.

IENG 375
Production Planning and Control
3-0-3

Forecasting methods for production planning, exponential smoothing, scheduling techniques, inventory planning and control, networks, line balancing, application of various mathematical models. *Prerequisites:* IENG 250 and IENG 245.

IENG 380
Operations Research I
3-0-3

Linear programming solution; simplex method; dual problem—its solution and economical meaning; sensitivity analysis; transportation problems and solutions. Transshipment and assignment problems, traveling salesman problems, network optimization problems, CPM and critical path, and the use of computers for problem solutions. *Prerequisites:* CSCI 160, IENG 375. *Corequisite:* MATH 310.

IENG 400
Technology and Global Issues
3-0-3

In this course the relationships between technology and global concerns are explored. Topics such as sustainable development, standards, ethics, environmental concerns and public policies related to design and development, energy, transportation, air, and water facing both developed and developing nations will be discussed. *Prerequisite:* Senior status or approval of the Chair.

IENG 420
Operations Research II
3-0-3

Introduction to nonlinear programming, dynamic programming and its applications, the branch and bound algorithm, integer linear programming, zero-one programming, applications of zero-one programming, introduction to game theory. *Prerequisite:* IENG 380.

IENG 425
Systems Simulations
3-0-3

The use of simulation methods for the analysis and design of various types of systems. Queueing theory, queueing problems and stochastic systems are simulated using GPSS. Continuous and other discrete simulation languages will be discussed. *Prerequisites:* IENG 380, IENG 345.

IENG 430
Nondestructive Test Engineering
3-0-3

Fundamentals of nondestructive testing techniques, including X-ray, ultrasonic, eddy current and other methods. Characterization of flaws and effects of flaws on design parameters. Applications to pressure vessels, construction and other industrial processes.

IENG 435
Industrial Reliability Engineering
3-0-3

Fundamentals of reliability mathematics as applied to survival or failure of mechanical and electrical subsystems and components. Application of statistical and probability theories to predict failure rates under operational conditions. (Offered regularly, but not every semester.) *Prerequisites:* MENG 310, IENG 345.

IENG 440
Production Process Design
3-0-3

Investigation of manufacturing processes in the metal and plastics working areas. Processes include casting, forming, joining, treatment, and material removal. Manual, semiautomatic, and automatic machine selection for process work. The plant equipment and process requirements to meet the design and manufacture of a given product will be emphasized. Plant visits may be arranged. *Prerequisite:* MENG 310.

IENG 445
Production Process Design II
3-0-3

A continuation of IENG 440. Detailed analysis of how materials behave during production. Theories of plastic flow and plasticity of materials will be discussed, with application to a variety of production processes. A term project, requiring a detailed analysis of a particular process, will be required. *Prerequisites:* IENG 440; *Corequisite:* IENG 450.

IENG 450
Production Process Laboratory
0-3-1

A laboratory course to complement the theory in IENG 440 and IENG 445. Students will perform experiments in metal working and manufacturing techniques including forming, plating, machine turning and drilling, grinding, welding and allied process. *Prerequisite:* IENG 440.

IENG 455
Design of Man-Machine Systems
3-0-3

This course integrates concepts developed in psychology, physiology, and industrial and mechanical engineering and provides the necessary background for an optional design of the workplace. Topics to be included: systems analysis of man-machine systems, design of visual and auditory displays, design of controls, layout of workplaces, and environmental effects of human performance. (Offered regularly, but not every semester.) *Prerequisites:* IENG 260 and PSYC 101.

IENG 460
Design of Industrial Enterprise
3-0-3

Focuses on a detailed design of an industrial enterprise from the concepts of a manufacturing idea, through resource allocation, to methods of distribution. Topics will include product specification, market research, equipment and process determination, plant layout, financial requirements, labor requirements, capacity planning, and organizational structure. Term project. (Offered regularly, but not every semester.) *Prerequisites:* IENG 375, IENG 355, IENG 260.

IENG-475
Industrial Engineering Design I
3-0-3

A senior design course encompassing various phases of systems design including problem definition and analysis, synthesis, specification and implementation. The project, under the supervision of an advisor, may be conducted in an off-campus enterprise environment. Students will work in teams and be expected to present their work orally and in a written report. *Prerequisite:* Senior status.

IENG 476
Industrial Engineering Design II
3-0-3

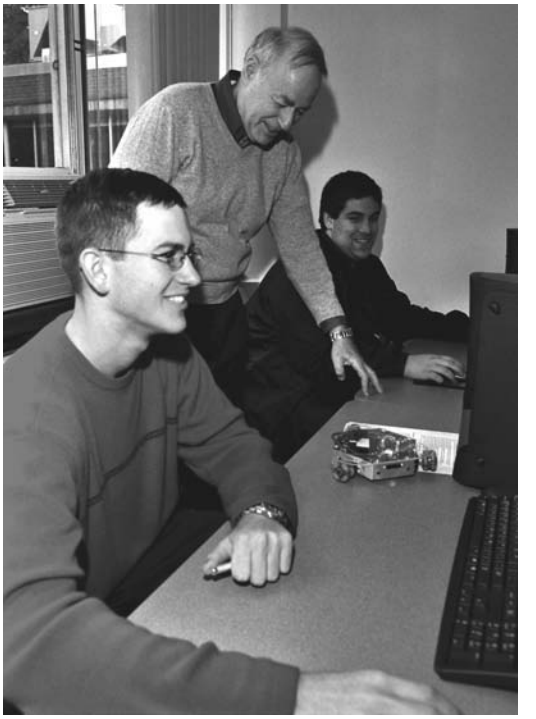
A senior design course encompassing where students continue projects from IENG 475 or work individually under the same format on a design project. *Prerequisite:* IENG-475.

IENG 485
Seminar Project
2-0-2

Term project: (May be combined with IENG 490, Advanced Seminar Project, as a two-semester project if approved by the dean after selection of the project.) Student may select the design of an industrial enterprise (product and market research, production processes, plant layout, cost and profit predictions, or research into a pollution control field, magnitude and composition of the pollutant economic and physiological effects, state-of-the-science for reduction, cost effectiveness of the reduction process). *Prerequisite:* Approval of department chairperson.

IENG 490
Advanced Seminar Project
2-0-2

Continuation of IENG 485 for project which cannot be completed in one semester. *Prerequisite:* IENG 485 and approval of department chairperson.



Pre-Engineering

Students who have not chosen a specific branch of engineering as a major or who do not fully satisfy the entrance requirements for engineering, may be classified as Undeclared status in the School of Engineering and Computing Sciences up to the end of their second year. Transfer students and students who have completed more than two years of course work should check with both their academic and financial aid advisors regarding their status as majors.

Electrical and Computer Engineering Technology

Faculty: L. Amani, L. Amara, B. Beheshti, A. Kashani, R. Meyers, T. Moroney, E. Nelson, L. Pavlidis, Y. Saito, G. Salayka.

Adjunct Faculty: T. Decanio, S. Fall, J. Fiorillo, F. Fischman, A. Golubev, M. Hoffman, J. Rogers.

The college offers courses leading to the Bachelor of Technology degree in Electrical and Computer Engineering Technology. In addition, courses lead to the A.A.S. degree in Electrical Technology. Engineering technology is the nationally accepted terminology for education programs designed to prepare engineering technologists and engineering technicians. Engineering technology is that part of the technological field which requires application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies within the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer.

Entering students normally enroll directly in the program areas leading to the Bachelor of Technology degree. However, they may also enroll in the corresponding program area leading to the A.A.S. degree and upon graduation transfer to the upper two years of the four-year Bachelor of Technology program. Graduates from community colleges and technical institutes with A.A.S. degrees in engineering technology may transfer into the upper two years of the corresponding program leading to the Bachelor of Technology.

Graduates of electrical and computer engineering technology programs often hold positions as electrical, computer, and electronics technologists in the area of testing, service, maintenance, sales and marketing, and research assistant.

According to this general direction and mission of the college, the primary objectives of the Electrical and Computer Engineering Technology have been developed to create versatile engineering technologists who:

- be successful in their engineering or chosen career path.
- engage in life-long learning and professional development through graduate studies and active participation in professional organizations.
- be able to interact effectively with others in a collaborative team-oriented manner in the management and execution of a project
- function as a responsible member of society with a willingness to act as a mentor to fellow employees and in the community with an understanding of the social, ethical and economic impact of his/her work at the local and global level.

To support these objectives, the curriculum has been developed to provide program outcomes which describe what students are expected to know and be able to do by the time of graduation.

Upon graduation students are expected to have:

- an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines
- an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology
- an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes
- an ability to apply creativity in the design of systems, components or processes appropriate to program objectives
- an ability to function effectively on teams
- an ability to identify, analyze and solve technical problems
- an ability to communicate effectively
- a recognition of the need for, and an ability to engage in life-long learning
- an ability to understand professional, ethical and social responsibilities
- a respect for diversity and a knowledge of contemporary professional, societal and global issues
- a commitment to quality, timeliness, and continuous improvement

The program in electrical and computer engineering technology leading to the Bachelor of Technology, is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, III Market Place, Suite 1050, Baltimore, Maryland 21202 – Telephone: (410) 347.7700.

*Curriculum requirements for the Bachelor of Technology in Electrical and Computer Engineering Technology**

ETCS 105 Career Discovery [1]		**2 credits**
Electrical Technology		
ETEC 110	Electrical Technology I	4
ETEC 120	Electrical Technology II	4
ETEC 131	Electronics Technology I	4
ETEC 231	Electronics Technology II	4
ETEC 310	Communication Circuits	4
ETEC 410	Control System Technology	4
ETEC 495	or CTEC 495 Seminar Project	3
		27 credits
Computer Technology		
CTEC 204	Programming Techniques I	3
CTEC 206	Programming Techniques II	3
CTEC 216	Digital Electronics	4
CTEC 235	Microcomputers I	4
CTEC 241	Circuit Design and Fabrication	4
CTEC 247	Applied Computational Analysis	3
CTEC 335	Microcomputers II	4
CTEC 350	Microcontroller Based Systems	3
		28 credits
Electrical and Computer Technology Electives [2] **(Choose 9 elective credits from the following)**		
CTEC 430	Digital Signal Processing	3
CTEC 460	Computer Networking Technology	3
CTEC 471	Internet Development	3
ETEC 240	Energy Technology	3
ETEC 420	Communication Circuits II	3
ETEC 470	Fiber-Optic Communication Technology	3
ETEC 490	Special Topics	3
ETEC 491	Special Topics II	3
MTEC 210	Intro. to Computer Aided Design	3
		9 credits
Engineering Management		
IENG 240	Engineering Economics	3
IENG 251	Project Engineering	3
IENG 350	Quality Control	3
IENG 400	Technology and Global Issues	3
		12 credits

Behavioral Sciences		**3 credits**
English [3]		
Composition		6
Speech		3
One Group A course [4]		3
WRIT 316 Writing for the Technical Professions		3
		15 credits
Liberal Arts		**3 credits**
Life Science		
CHEM 107	Engineering Chemistry	4
		4 credits
Mathematics		
TMAT 135	Technical Mathematics I	4
TMAT 155	Technical Mathematics II	4
MATH 161	Basic Applied Calculus	3
		11 credits
Physics		
PHYS 130	Introductory Physics	3
PHYS 150	Introductory Physics II	3
		6 credits
Social Sciences		
Economics		3
History or Political Science		3
Philosophy		3
		9 credits
Electives		**3 credits**
Total credits required		**130–132**

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Other advanced ETEC/CTEC electives with the approval of the Chairperson.

(3) Intensive English as a second language is not acceptable as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

CTEC 130
Computer Hardware
3-0-3

Number systems, binary data representations, digital circuits. Boolean algebra, and minimization of combinatorial circuits are presented. Flip flops, synthesis of synchronous sequential machines, PLAs and PAL, RAM and ROMs, basic computer organizations, and assembly language programming are also discussed. Equivalent to CSCI 130. *Prerequisite:* MATH 141 or equivalent.

CTEC 201
Computer Applications in Telecommunications
3-0-3

This course is an introductory course for students in the Verizon Next Step program. It provides a basic computer orientation to hardware and implementation of software applications in Telecommunications. Students will use various software packages to create documents, spreadsheets, graphs, databases, and presentations. The student will utilize this knowledge to solve problems and transfer information via electronic media. Lectures, interactive learning, and demonstrations will be employed. Laboratory exercises will be required.

CTEC 204
Programming Techniques I
3-0-3

The course covers structured programming in a high level language such as C/C++. Topics include simple data types, expressions, statements, control statements and looping techniques. Elements of object oriented programming will be introduced by use of predefined objects. *Prerequisite:* TMAT-135.

CTEC 206
Programming Techniques II
3-0-3

Programming techniques are expanded using an object oriented language such as C/C++ or JAVA. Fundamental data structures will be introduced. Issues such as graphic user interface design, implementation, code maintenance and reusability are also discussed. *Prerequisite:* CTEC-204.

CTEC 216
Digital Electronics
3-3-4

This course is a study of the fundamental concepts of digital electronics. Covered topics include numbering systems, Boolean algebra and reduction techniques, logic gates, arithmetic operations and circuits, multiplexers and demultiplexers, flip-flops, counters, registers, memory circuits and programmable arrays, analog to digital and digital to analog conversion techniques and circuits. The focus of the course is SSI/MSI IC digital design and the architecture of microprocessors is introduced. A software simulation tool for digital electronics such as will be used. Laboratory work is coordinated with the lectures.*Prerequisite*: ETEC-131.

CTEC 235
Microcomputers I
3-3-4

Building blocks of a microcomputer system: addressing, machine code formats, assembly language programming. Weekly laboratory work on the microcomputer supplements lecture material. *Prerequisites:* ETEC 231, *Corequisite:* CTEC 225.

CTEC 241
Circuit Design and Fabrication
3-3-4

Students are introduced to CAD tools for schematic and PCB layout. Techniques and principles for schematic drawing and PCB artwork will be covered. Additional topics include design methodologies for multilayer boards, and effects of crosstalk and noise on PCB performance. VHDL logic synthesis is introduced with a top-down approach to design and simulate circuits. Laboratory experiments emphasize all the above techniques. *Prerequisites:* CTEC 216, ETEC 131.

CTEC 247
Applied Computational Analysis
2-1-3

An introduction to numerical computation and visualization for the solving of problems encountered in computer and electrical technology. Topics will include applied differential equations, transform methods and discrete mathematics, as applied to electrical/computer systems in a laboratory setting A software package such as MATLAB will be used. *Prerequisite:* MAT 160.

CTEC 305
Numerical Methods for Technology
3-0-3

A study of some of the computational problems encountered in technological practices and analysis. Topics covered include curve fitting, interpolation, solution of algebraic equations, and numerical differentiation and integration. A high level programming language will be used. *Prerequisite:* MAT 161, CTEC 204.

CTEC 311
Introduction to Operating Systems
2-2-3

The principles of Operating Systems such as UNIX, Linux, and Windows are introduced. Access and privacy, process management in a multi processing environment, memory management and input/output (I/O) devices. Basic Operating Systems commands, tools and utilities, system operations and administration are presented. Shell programming and Operating System service calls are presented. Lectures are followed by laboratory experiments. *Prerequisite:* CTEC-204

CTEC 335
Microcomputers II
3-3-4

Memory subsystems, I/O methods for a microcomputer, address decoding, interrupt techniques, timing, LSI controllers such as DMA's, UART's, and CRT's, analog interface, demonstration of computer graphic techniques. Weekly laboratory work is integrated to lectures. *Prerequisite:* CTEC 235.

CTEC 345
Robotics Technology
3-3-4

An introduction to robotics and the current state-of-the-art science. Analysis of robotic control systems, mechanical drives, sensor and vision systems, robotic work cells. Laboratory demonstrations supplement lectures. (Offered regularly, but not every semester). *Prerequisites:* CTEC 235, ETEC 231, ETEC 410, approval of chairperson and completion of junior year.

CTEC 350
Microcontroller Based Systems
3-0-3

In this course, we concentrate on selection criteria and hardware and software considerations for imbedded microcontroller based systems. Topics such as microcontroller resources, real time control, development tools, state machine and standard programming types, high level language cross compilers, design for manufacturability, testability, packaging and aesthetics consideration for consumer oriented products will be covered in conjunction with design examples from real life applications. Students will build their own microcontroller based system in parallel with the course lectures. *Prerequisite:* CTEC 235.

CTEC 430
Digital Signal Processing
3-0-3

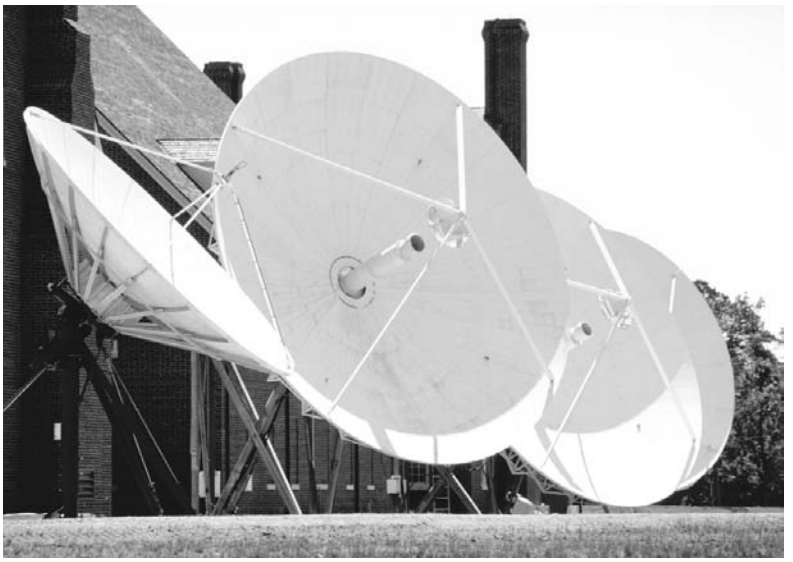
In this course, we analyze discrete time signals and systems, z-transforms, discrete Fourier transforms, digital filter design, structures for digital networks, FFT algorithms, quantization and round-off errors. (Offered regularly, but not every semester.) *Prerequisites:* Approval of chairman and completion of junior year.

CTEC 460
Computer Networking Technology
3-0-3

In this course, we present the fundamental knowledge on the building blocks of data communications systems. Topics include characteristics of analog and digital transmission, networking protocols, network data flow as presented by OSI reference model, Ethernet, switching and routing technologies. Structure of the Internet and intranets, network management and security are also discussed. *Prerequisite:* CTEC 235.

CTEC 471
Internet Development
3-0-3

Topics included are Web technologies and strategies for web site development, including architecture, web life cycle, tool and technologies, and the approach to security planning. Also covered are elements of a simple web site using HTML and XHTML, multimedia on the web, design of a user interface, server-side scripting languages, dynamic web pages, cascading style sheets (CSS), elements of JavaScript, Java applets integration and basic web security issues. *Prerequisite:* CTEC 204.



Electrical Technology

The program in electrical technology leading to the Associate in Applied Science is for those individuals interested in preparing for careers as technicians in the growing fields of electronics and microcomputer repairs. Students develop a thorough foundation in electrical, electronic, and solid-state principles and may choose coursework in the rapidly expanding fields of microcomputers.

Graduates of these programs can find employment as high-level technicians, often working directly with engineers or scientists. Employment opportunities include the repair and maintenance of microcomputers, and word processors. Microelectronic circuit design, analysis, testing, field service and sales are some of the additional employment areas available to graduates.

Curriculum requirements for Associate in Applied Science, Electrical Technology

ETCS 105 Career Discovery [1]		**2 credits**
Electrical Technology		
ETEC 110	Electrical Technology I	4
ETEC 120	Electrical Technology II	4
ETEC 131	Electronics Technology I	4
ETEC 231	Electronics Technology II	4
		16 credits
Computer Technology		
CTEC 204	Programming Techniques I	3
CTEC 206	Programming Techniques II	3
CTEC 216	Digital Electronics	4
CTEC 235	Microcomputers I	4
CTEC 241	Circuit Design and Fabrication	4
CTEC 247	Applied Computational Analysis	3
		21 credits
Behavioral Sciences		**3 credits**
English[2]		
Composition		6
Speech		3
		9 credits
Mathematics		
TMAT 135	Technical Mathematics I	4
TMAT 155	Technical Mathematics II	4
MATH161	Basic Applied Calculus	3
		11 credits
Physics		
PHYS 130	Introductory Physics	3
		3 credits
		Total credits required—63 - 65

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Intensive English as a second language is not acceptable as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

ETEC 110
Electrical Technology I
3-3-4

Fundamental units, electrical components, wire calculations, work power, efficiency, Ohm's law series and parallel resistive circuits, Kirchhoff's laws. Introduction to electric and magnetic energy storage, capacitance, inductance, RC and RL time constants, meters, fundamentals of dc motors and generators. Lectures are followed by laboratory experiments. *Corequisite:* TMAT 135.

ETEC 111
Electrical I
3-0-3

Fundamental units, electrical components, wire calculations, work, power, efficiency, Ohm's law, series and parallel resistive circuits, and Kirchhoff's laws are covered. Electric and magnetic energy storage, capacitance, inductance, RC and RL time constants, and meters are also discussed. *Corequisite:* TMAT-135.

ETEC 120
Electrical Technology II
3-3-4

Alternating-current concepts. Reactance circuits, series and parallel, power factor, complex algebra, and phasor notation. Resonance phenomena, coupled circuits and transformers. Lectures are followed by laboratory experiments. *Prerequisite:* ETEC 110. *Corequisite:* TMAT 155.

ETEC 131
Electronics Technology I
3-3-4

In this course, we cover semiconductor theory, diodes, Zener diodes, rectifier circuits, filters, voltage regulators, special purpose diodes, Bipolar Junction Transistor (BJT) and Junction Field Effect Transistor (FET) fundamentals. BJT and FET configurations, biasing, AC models and voltage amplifiers, and small signal analysis. BJT power amplifier classification and analysis are also discussed. Laboratory work is correlated with the lectures. *Prerequisite:* ETEC 110. *Corequisite:* ETEC 120.

ETEC 150
Electrical II
3-0-3

This course discusses alternating-current concepts. Reactance circuits, series and parallel, power factor, complex algebra, phasor notation, resonance phenomena, coupled circuits and transformers are discussed. *Prerequisite:* ETEC-111, *Corequisite:* TMAT-155.

ETEC 160
Electronics I
3-0-3

In this course we cover semiconductor theory, diodes, Zener diodes, rectifier circuits, filters, voltage regulators, special purpose diodes, Bipolar Junction Transistor (BJT) and Junction Field Effect Transistor (FET) fundamentals. BJT and FET configurations, biasing, AC models and voltage amplifiers, and small signal analysis. BJT power amplifier classification and analysis are also discussed. *Prerequisite:* ETEC 111. *Corequisite:* ETEC 150.

ETEC 231
Electronics Technology II
3-3-4

In this course, we cover Metal Oxide Semiconductor Field Effect Transistor (MOSFET) fundamentals, configurations, biasing and small signal analysis. Frequency response of BJT and FET circuits, Bode plots, and Oscillators are discussed. Other topics covered include Differential Amplifiers, Operational Amplifiers (op-amps) fundamentals and applications including linear and non-linear op-amp circuits. Regulated Power supplies and Thyristor devices are also considered. Laboratory work is correlated with the lectures. *Prerequisite:* ETEC 131.

ETEC 232
Electronics II
3-0-3

In this course we cover Metal Oxide Semiconductor Field Effect Transistor (MOSFET) fundamentals, configurations, biasing and small signal analysis. Frequency response of BJT and FET circuits, Bode plots, and Oscillators are discussed. Other topics covered include Differential Amplifiers, Operational amplifiers (op-amps) fundamentals and applications including linear and non-linear op-amp circuits. Regulated Power supplies and Thyristor devices are also considered. *Prerequisite:* ETEC 160.

ETEC 235
Electrical Simulation Lab
2-0-2

Laboratory experiments to complement courses covering dc circuits, ac circuits, as well as basic digital circuitry will be performed using a currently available software package. Lab reports are to be submitted for each experiment performed using word processing and circuit simulation software. *Prerequisite:* ETEC-150. *Corequisite:* CTEC-217

ETEC 236
Electronics Simulation Lab
2-0-2

Laboratory experiments to complement courses covering electronic circuits and advanced digital circuitry will be performed using a currently available software package. Lab reports are to be submitted for each experiment performed using word processing and circuit simulation software. *Prerequisite:* CTEC-217, ETEC-232, ETEC-235.

ETEC 240
Energy Technology
2-3-3

Principles of electromechanical energy conversion, structure of typical dc and ac motors and generators, analysis of motor and generator performance characteristics, motor starting, single phase and polyphase transformers. Laboratory experiments using ac and dc rotating machines. *Prerequisite:* ETEC 120.

ETEC 310
Communication Circuits
3-3-4

Transmission of information by wire and radiated electromagnetic waves, RF oscillators, AM and FM transmission and reception, SSB are introduced. Digital modulation, digital transmission and digital reception concepts, as well as multiplexing using FDM and TDM are presented. Typical circuits are analyzed in the laboratory. *Prerequisites:* ETEC 231, MATH 161.

ETEC 410
Control Systems Technology
3-3-4

Open and closed loop control systems. Principles of feedback control: transducers, transfer functions, block diagrams. System response. Introduction to stability criteria, analysis, and digital control systems. *Prerequisites:* ETEC 231, CTEC 246, 216

ETEC 420
Communication Circuits II
3-0-3

Digital communication systems, advanced digital modulation concepts, data communications, advanced multiplexing concepts. Transmission lines, antennas and waveguides. Space communication is discussed. *Prerequisites:* ETEC 310.

ETEC 470
Fiber-Optic Communication Technology
3-0-3

This course covers the basic topics related to optical fiber components used in telecommunication systems. It covers the bandwidth and rate capabilities of optical fibers, their properties and characteristics. Topics include light sources, lasers, semiconductors, optical detectors and their applications, principles of fiber-optic communications, modulation and multiplexing, short-haul and long-haul communication links, asynchronous transfer mode (ATM) and synchronous transfer mode (SONET) based networks. A term paper is required in this course. *Prerequisite:* ETEC 231, PHYS 150.

ETEC 490
Special Topics
3-0-3

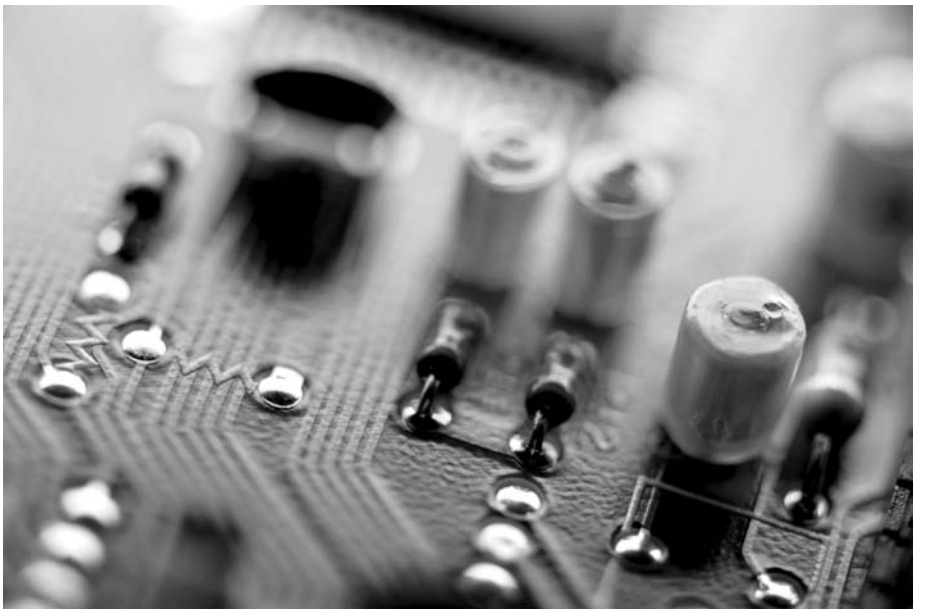
Advanced topics in electrical engineering technology and computer technology. (Offered regularly, but not every semester.) *Prerequisite:* Approval of chairperson.

ETEC 491
Special Topics II
3-0-3

Advanced topics in Electrical and Computer Engineering and technology. Prerequisite: Approval of chairperson.

ETEC 495
Seminar Project
3-0-3

In this course we focus on a design project in an area such as fabrication, computerized control, or Internet Technology. The work will require a written and oral proposal, followed by periodic progress reports (oral and written), and culminate in a completed product and report. *Prerequisites:* Approval of chairperson and completion of junior year.



Telecommunications Network Management

Faculty: L. Amani, L. Amara, B. Beheshti, M. Colef, A. Kashani, R. Meyers, T. Moroney, E. Nelson

Adjunct Faculty: T. Decanio, F. Fishman, M. Hoffman

The college offers courses leading to the Bachelor of Science in Telecommunications Network Management. In addition, courses lead to the A.A.S. degree in Telecommunications Technology.

The Bachelor of Science degree in Telecommunications Network Management meets the increasing need of the telecommunications industry for current principles, applications, technology, and regulatory policies. The telecommunications industry needs graduates who are capable of utilizing equipment to its maximum performance with a focus in network management, planning and analysis.

The curriculum discusses the applications and equipment used in the industry. This includes courses in the areas of telecommunications as well as electrical and computer technology, including Internet application development. A business perspective is provided with courses in accounting, finance and law.

Entering students normally enroll directly in the program leading to the Bachelor of Science degree in Telecommunications Network Management. However, they may also enroll in the A.A.S. degree in Telecommunications Technology and upon graduation transfer to the upper two years of the four-year Bachelor of Science degree program in Telecommunications Network Management. Graduates from community colleges with A.A.S. degrees in Telecommunications Technology may transfer into the upper two years of the Bachelor of Science degree program in Telecommunications Management.

Curriculum requirements for the Bachelor of Science in Telecommunications Network Management

ETCS 105 Career Discovery[1] — 2 credits

Telecommunications

TELE 110	Telecomm. Fundamentals	3
TELE 210	Data Networking Fundamentals	3
TELE 220	Applied Telecommunications	3
TELE 310	Telecomm. Law and Policy	3
TELE 321	Cellular and Wireless Technologies	3
TELE 420	Internetworking Technology I	3
TELE 431	Internetworking Technology 2	4

22 credits

Telecommunications Networks

(Choose 6 elective credits from the following)

TELE 330	High Speed Information Networks	3
TELE 340	Advanced Topics in Telecomm.	3
TELE 345	LAN and Internetworking	3
ETEC 470	Fiber-Optic Communication Technology	3
ETEC 490	Special Topics	3
Electives[2]		3

6 credits

Computer Technology

CTEC 204	Programming Techniques I	3
CTEC 206	Programming Techniques II	3
CTEC 216	Digital Electronics	4
CTEC 311	Introduction to OS	3
CTEC 471	Internet Development	3

16 credits

Electrical Technology

ETEC 110	Electrical Technology I	4
ETEC 120	Electrical Technology II	4
ETEC 131	Electronics Technology I	4

12 credits

Tech Electives

(CS, IT, ET, CT, Tele, etc.)		3

3 credits

Engineering Management

IENG 400	Technology and Global Issues	3

Behavioral Sciences — 3 credits

Management

ECON 201	Money and Banking	3
ACCT 101	Accounting I	3
QANT 301	Statistical Sampling Theory	3
QANT 305	Quantitative Applications to Making Managerial Decisions	3

12 credits

Mathematics

MATH 151	Fundamentals of Calculus	3
TMAT 135	Technical Mathematics I	4
TMAT 155	Technical Mathematics II	4

11 credits

English[3]		
Composition		6
Speech		3
One Group A course[4]		3
WRIT 316	Writing for the Technical Professions	3

15 credits

Liberal Arts Electives — 3 credits

Physics

PHYS 130	Introductory Physics	3

3 credits

Life Sciences

CHEM 107	Engineering Chemistry	4

4 credits

Social Sciences

Economics	3
History or Political Science	3
Philosophy	3

9 credits

General Electives — 3 credits

Total credits required — 125–127

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Electives must be approved by the department chairperson.

(3) Intensive English as a second language is not accepted as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

(4) LITR 210, LITR 220, LITR 230, or LITR 210 may be selected.

Telecommunications Technology

Faculty: L. Amani, L. Amara, B. Beheshti, A. Kashani, R. Meyers, T. Moroney, E. Nelson

Adjunct Faculty: T. Decanio, F. Fishman, M. Hoffman, K. Ryan

The college offers courses leading to the Associate in Applied Science degree in Telecommunications Technology. Currently, the Associate in Applied Science program is offered as a general option and a corporate-specific option for Verizon.

The Associate in Applied Science degree in Telecommunications Technology meets the increasing need of the telecommunications industry by preparing students for careers as telecommunications technologists. The curriculum discusses the applications and equipment used in the telecommunications industry. This includes courses in the areas of telecommunications as well as electrical and computer technologies.

Graduates with the Associate's degree may choose to work immediately in industry or continue their academic studies in a Bachelor of Technology program or a Bachelor of Science program in Telecommunications Network Management. The credits earned in both the general and the Verizon options can be transferred to the Bachelor of Science degree program in Telecommunications Network Management at NYIT.

Curriculum requirements for Associate in Applied Science, Telecommunications Technology

ETCS 105 Career Discovery [1] — 2 credits

Telecommunications

TELE 110	Telecomm. Fundamentals	3
TELE 210	Data Networking Fundamentals	3
TELE 220	Applied Telecommunications	3
Elective[2]		3

12 credits

Computer Technology

CTEC 204	Programming Techniques I	3
CTEC 206	Programming Techniques II	3
CTEC 216	Digital Electronics	
or		
CTEC 217	Digital Electronic Applications	4

10 credits

Electrical Technology

ETEC 110	Electrical Technology I	4
ETEC 120	Electrical Technology II	4
ETEC 131	Electronics Technology I	4

12 credits

or

ETEC 111	Electrical I	3
ETEC 150	Electrical II	3
ETEC 160	Electronics I	3
ETEC 232	Electronics II	3
ETEC 235	Electrical Simulation Lab	2
ETEC 236	Electronics Simulation Lab	2

16 credits

Mathematics

TMAT 135	Technical Mathematics I	4
TMAT 155	Technical Mathematics II	4

8 credits

Physics

PHYS 130	Introductory Physics	3

3 credits

Social Sciences

Economics	3

3 credits

Management

QANT 301	Statistical Sampling Theory	3

3 credits

English [3]

Composition	6
Speech	3

9 credits

Total credits required — 60 - 62

(1) This course may be waived for students and transfers with sophomore or higher status. For course description, see computer science course listing. All course substitutions must be approved by the department chairperson.

(2) Electives must be approved by the department chairperson.

(3) Intensive English as a second language is not accepted as a substitution for any of these requirements. The only permissible substitution is WRIT 111 and WRIT 161 in place of WRIT 101 and WRIT 151.

Curriculum requirements for the Associate in Applied Science, Telecommunications Technology Verizon Next Step Program

The A.A.S. degree program in Telecommunications Technology: Verizon option, an eight semester day sequence, is offered exclusively for selected employees at Verizon. All credits earned toward the A.A.S. degree program can be transferred to New York Institute of Technology's Bachelor of Science degree program in Telecommunications Management.

Telecommunications

TELE 181	Telecommunications I - Voice	4
TELE 286	Telecommunications II - Data	4
TELE 291	Telecommunications III - LANs	4
TELE 296	Telecommunications IV	4
		16 credits

Electrical Technology

TELE 165	Telecomm. Electrical Circuits	4
TELE 171	Intro to Electronics I	4
TELE 271	Intro to Electronic Comm.	4
TELE 276	Digital Systems for Telecomm I	4
TELE 281	Digital Systems for Telecomm II	4
		20 credits

Computer Technology

CTEC 201	Computer Applications in Telecommunications	**3 credits**

Mathematics

TMAT 135	Technical Mathematics I	4
TMAT 155	Technical Mathematics II	4
		8 credits

Physics

PHYS 165	Physics for Telecomm.	**4 credits**

Industrial Engineering

IENG 280	Technology and Labor Issues	**3 credits**

English

WRIT 101	College Composition I	3
WRIT 151	College Composition II	3
		6 credits

Total credits required—60

TELE 110
Telecommunications Fundamentals
3-0-3

A broad examination of fundamental concepts in telecommunications. Topics include a discussion on signal and channel bandwidth, digitization of voice (with emphasis on PCM), data transmission, analog and digital modulation techniques (AM, FM, PSK, FSK, etc.), multiplexing (FDM, TDM, T1 multiplexing, SONET and SDH), and switching (circuit, packet, and cell). The role of the Public Switched Telephone Network is also examined. An introduction to data networking is presented. *Prerequisite:* TMAT 135 or equivalent.

TELE 165
Telecommunications Electrical Circuits
3-3-4

In this course the Verizon Next Step students learn to analyze DC and AC passive circuits using the Ohm's Law, Kirchhoff's laws, and Superposition. RC and RL circuits are analyzed for impedance and phase angles. Troubleshooting, analysis by computer simulation using simulation software, and telecommunication applications are stressed throughout. *Prerequisite:* TMAT-155, CTEC-201.

TELE 171
Introduction to Electronics
3-3-4

In this course the Verizon Next Step students are taught the characteristics of amplifiers using opamps with respect to amplification, dB, frequency response, and input and output impedance. Opamp applications such as inverting and noninverting amps, summing amps, and comparators are introduced with emphasis on the uses of these devices in the telecom industry. Electro-optical devices, such as LEDs, laser diodes, and photodiodes, are studied including their use by the telecom industry. Diodes and transistors are conceptually introduced. Transformers are introduced in connection with power supplies. Diodes are applied as switches in linear and switching power supplies. The frequency response of passive networks and amplifiers is measured. Cutoff frequencies, rolloff, bandwidth, and magnitude and phase are discussed and visualized via Bode plots. Troubleshooting and analysis by computer simulation software is stressed throughout. *Prerequisite:* TELE 165, PHYS 165.

TELE 181
Telecommunications I
3-3-4

The Verizon Next Step students will be introduced to the techniques, principles, and terminology of voice telecommunications. Public and private telecommunication networks will be examined. Telecommunication equipment, switching and transmission technology will be demonstrated. The frequency spectrum, modulation schemes and multiplexing techniques will be explored. Lectures and demonstrations will be employed. Laboratory exercises will be required. *Prerequisite:* TELE 165. *Corequisite:* TELE 171

TELE 201
Traffic Data Management and Call Analysis
3-0-3

Business analysis of data provided by modern computer-based switches. Interpretation and validity analysis of call and traffic management data. Call and traffic data analysis. *Prerequisites:* QANT 301.

TELE 210
Data Networking Fundamentals
3-0-3

Topics discussed include the DTE to DCE physical connection (with emphasis on EIA-232), data link protocols (BISYNC, DDCMP, HDLC), the OSI reference model, LANs, MANs, LAN interconnection and the role of bridges and routers, X.25, TCP/IP, Frame Relay, SMDS, SNA, ISDN, SS7, BISDN, and enterprise networks. An introduction to traffic engineering is also provided. *Prerequisite:* TELE 110, TMAT 155, QANT 301 or equivalent.

TELE 220
Applied Telecommunications
3-0-3

An overview of the fundamentals of the Integrated Services Digital Network (ISDN) and broadband ISDN architecture and protocols is presented. The Signaling System 7 (SS7) network structure and architecture is described. Packet switching, Frame Relay and the Asynchronous Transfer Mode (ATM) are introduced and compared. Network Management, an introduction to the Internet and traffic engineering are also covered. *Corequisite:* TELE 210

TELE 265
Telecommunications Workshop
0-3-1

This course is a project course to supplement the Telecommunications and Electrical Technology courses in the Verizon Next Step program. The course can be repeated.

TELE 271
Electronic Communication
3-3-4

The Verizon Next Step students will be introduced to the analysis and application of advanced electronic circuits as applied to the telecommunications industry. Topics include frequency response of active filters, oscillators, amplitude modulation, frequency modulation, phase locked loops, pulse modulation concepts, and introduction to television. Theoretical and hands-on troubleshooting of test circuits, and analysis by computer simulation is also covered. *Prerequisite:* TELE 171.

TELE 276
Digital Systems for Telecommunications I
3-3-4

In this course the Verizon Next Step students are introduced to topics in hardware and systems as used in the telecommunications industry. Digital and electrical circuits are explored. Binary numbers systems as applied to telecommunications equipment are discussed. Students will explore hardware to the modular level. Students will demonstrate and simulate digital circuits. *Prerequisite:* TMAT-135, CTEC-201.

TELE 281
Digital Systems for Telecommunications II
3-3-4

In this course the Verizon Next Step students will be introduced to the hardware and software of the personal computer. The course will cover managing and supporting Windows, Configuration, customization, maintenance and troubleshooting. Students will connect a personal computer to a network and install and setup a printer. An optional topic would cover Home Technology Integration including surveillance and home automation. The course is composed of lecture and in-class demonstrations. *Prerequisite:* TELE 276.

TELE 286
Telecommunications II
3-3-4

This course is designed to train students in the organization, architecture, setup, hardware and software aspects of interconnecting local area networks (LANs). Topics include: introduction to networks, types and characteristics of different network architectures and network topologies, intra and inter-network devices, network operating systems, peer-to-peer and client/server environments, LAN setup and maintenance, network printing, and internal web servers. A hands-on approach will be taken, with team projects throughout. *Prerequisite:* TELE 181 and 281. *Corequisite:* TELE 271.

TELE 291
Telecommunications III
3-3-4

This course is the continuation of Telecommunications II. The Verizon Next Step students are introduced to the organization, architecture, setup, hardware and software aspects of interconnecting local and wide area networks (WANs). Topics include: introduction to intra and inter-network devices, network operating systems, client/server environments, LAN/WAN setups, network printing, and internal web server. A hands-on approach will be taken, with team projects throughout. *Prerequisite:* TELE 286.

TELE 296
Telecommunications IV
3-3-4

A survey of current and emerging technologies in Telecommunications will be presented. Lectures, interactive learning. Demonstrations, and site visits will be employed. *Prerequisite:* TELE 291.

TELE 310
Telecommunications Law and Policy
3-0-3

The domestic and international regulatory framework of telecommunications including telephone, broadcasting, cable and private radio is discussed. Historical, economic and legal aspects of telecommunications regulation will be included. First Amendment rights, privacy, copyright, antitrust, contract and product liability, and developing areas such as satellite communications networks and integrated services digital networks (ISDN) are presented. *Prerequisite:* TELE 110 or equivalent.

TELE 321
Cellular and Wireless Technologies
3-0-3

The fundamental concepts of wireless networks, physical layer (air interface) issues and cell planning are introduced. Access technologies, including FDMA, TDMA and CDMA, in Cellular Systems, first Generation Cellular Systems (AMPS), and second Generation Digital Systems are also discussed. The course concludes with a coverage of paging systems and satellite communications. *Prerequisites:* TELE 110.

TELE 325
Network Engineering and Management
3-0-3

Approaches for solving telecommunication network design problems are given. A network simulation program is used. The technical and management issues associated with the administration of complex integrated networks is examined. Case studies are used to illustrate practical situations. *Prerequisites:* TELE 220, CTEC 204.

TELE 330
High Speed Information Networks
3-0-3

The application, architecture, and protocols of high speed information networks are examined along with their unique challenges and opportunities. Included in this examination are frame relay networks, BISDN/ATM, high speed LANs and MANs, and the emerging user applications in this environment. *Prerequisites:* TELE 110

TELE 335
Telecommunications Seminar
3-0-3

Critical analysis of telecommunications management within the framework of generation, dissemination and utilization of information. Corporate, national and international communication systems are examined. Integration of telecommunications principles by examining current issues and future trends with emphasis on the strategic use of telecommunication systems. Offered regularly, but not every semester. *Prerequisite:* Approval of department chairperson.

TELE 340
Advanced Topics in Telecommunications
3-0-3

This seminar-based course will examine emerging trends in telecommunications and networking. May be repeated once. *Prerequisite:* TELE 220.

TELE 345
LAN and Internetworking
3-0-3

The interconnection of dissimilar data networks to provide users with access to network resources from anywhere at anytime is discussed. The role of the Internet and intranets is examined along with the internetworking devices: routers, bridges, and gateways. Important internetworking protocols arediscussed and their application is examined. Selected user applications made possible by this environment will be presented. *Prerequisite:* TELE 220.

TELE 350
Telecommunications Project
3-0-3

This capstone course will focus on the analysis of a telecommunications system from an economic or managerial point of view. The work will require a written and oral proposal, followed by periodic progress reports (oral and written). The project will culminate in a document suitable for publication. *Prerequisite:* Approval of department chairperson and completion of junior year.

TELE 410
Advanced Cellular and Wireless Systems
3-0-3

Cellular and wireless systems are reviewed. Fixed Wireless Systems such as wireless local loop (WLL), wireless LANS (802.11) and packet data over wireless are discussed. Evolution of second Generation Cellular Systems to packet based technologies (GPRS and EDGE) is presented. Third Generation Systems (3G) are introduced. *Prerequisite:* TELE 321.

TELE 420
Internetworking Technology I
3-3-4

Commonly used networking terminology and topologies, fundamental network devices, and internetworking fundamentals are covered. The OSI model and local area network (LAN) protocols are discussed. Network components such as repeaters, hubs, bridges, routers and switches will be used in basic network design. *Prerequisite:* CTEC 204, TELE 210.

TELE 431
Internetworking Technology 2
3-3-4

The design, configuration and maintenance of switches, local area networks (LANs), virtual local area networks (VLANs) and wide area networks (WANs) are covered. Advanced router configurations, network management and security are also discussed. Working on a class project provides critical hands-on experience. Lectures followed by lab sessions. *Prerequisite:* TELE 420