

ENGINEERING & COMPUTING SCIENCES DEPARTMENT

The Department of Engineering and Computing Sciences offers programs in Computer Science, Computer Science Education, Cybersecurity, Information Technology, Computer Engineering, Electrical Engineering, and Mechanical Engineering.

The Department's programs contain a total of eight four-year undergraduate degree programs, four two-year degree programs, and two certificate programs. In addition, the department offers three graduate programs at the Masters level. The program in Computer Science is accredited by the Computing Accreditation Commission of ABET and the programs leading to the BS Computer Engineering, BS Electrical Engineering, and BS Mechanical Engineering degrees are accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>) (<https://www.abet.org/>).

The Department is housed in Corley Hall which contains faculty offices, classrooms and labs used by the programs within the department. The departmental office is located in room 111.

Programs

- Computing Sciences (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/>)
 - Computer Networking, Certificate of Proficiency (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/computer-networking-cp/>)
 - Computer Programming, Certificate of Proficiency (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/computer-programming-cp/>)
 - Computer Science, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/computer-science-bs/>)
 - Cybersecurity, Associate of Applied Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/cybersecurity-aas/>)
 - Cybersecurity, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/cybersecurity-bs/>)
 - Information Technology, Associate of Applied Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/it-aas/>)
 - Information Technology, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/computing-sciences/it-bs/>)
- Electric Circuit Design and Analysis, Certificate of Proficiency (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electric-circuit-design-analysis/>)
- Electrical Engineering (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electrical-engineering/>)
 - Computer Engineering, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electrical-engineering-computer-engineering-bs/>)
 - Electrical Engineering, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electrical-engineering-electrical-engineering-bs/>)
 - Electrical Engineering, Bachelor of Science - Biomedical (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electrical-engineering-electrical-engineering-bs-biomedical/>)
 - Mechanical Engineering (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/mechanical-engineering/>)
 - Manufacturing, Associate of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/mechanical-engineering/manufacturing-as/>)
 - Mechanical Engineering, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/mechanical-engineering/mechanical-engineering-bs/>)
 - Nuclear Technology, Associate of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/mechanical-engineering/nuclear-technology-as/>)

Courses

Computer/Information Science

COMS 1003 Introduction to Computer Based Systems

ACTS Common Course - CPSI 1003.

Provides students with both computer concepts and hands-on applications. Although little or no prior computer experience is required for this course, keyboarding proficiency is assumed. Topics include PC basics, file maintenance, and hardware and software components. Students will gain experience in the use of Windows, e-mail, the Internet, word processing, spreadsheets, databases, and presentation packages. The integration of software packages will also be covered.

Note: This course may not be taken for credit after completion of COMS 2003 or BUAD 2003.

COMS 1011 Programming Foundations I Lab

Offered: Fall, Spring, Summer.

Laboratory for COMS 1013 Programming I course. This course is graded pass/fail.

Note: Previously offered as lab portion of COMS 2104.

COMS 1013 Programming Foundations I

Offered: Fall, Spring, Summer.

Co-requisite: COMS 1011.

Prerequisite: MATH 1113 or higher.

An introduction to the foundational concepts of programming using structured programming concepts of C++ as an implementation tool. Topics include sequential, selection, and iterative control structures, functions, strings, and arrays.

Note: Previously offered as COMS 2104.

COMS 1333 Web and Mobile Technologies

Offered: Fall, Spring, Summer.

An introduction to planning, designing, and maintaining effective web sites on desktop and mobile devices. Topics include how to implement web pages by writing HTML and CSS code; format web pages using text, images, multimedia, and page layout techniques; design responsive sites for mobile technologies; and publish the sites to a web server.

COMS 1403 Orientation to Computing, Information, and Technology

An overview of hardware, software, technology, and information systems concepts and terms as well as ethics and opportunities within the three fields.

Note: Required of all students who have declared a major in Computer Science, Information Systems, or Information Technology.

COMS 1411 Computer and Information Science Lab

An introduction to the computing resources of the department and the university.

COMS 1921 Microsoft Excel

Preparation to pass the Microsoft Office Specialist: Excel Associate Certification exam. Topics covered include creating and managing worksheets and workbooks, creating cells and ranges, creating tables, applying formulas and functions and creating charts and objects. Credit for this course may be awarded to any student who has already obtained the MOS: Excel Associate certification.

COMS 2003 Microcomputer Applications

Offered: Fall.

Prerequisite: COMS 1003 or BUAD 2003.

This course provides hands-on experience with several software applications. Topics include intermediate and advanced word processing; spreadsheet design, formulas, and charts; database design principles and implementation; presentation design and techniques; and integration among these applications. Students will be required to apply each package on a semester project related to their major.

COMS 2163 Scripting Languages

Offered: Fall, Spring.

Prerequisite: COMS 1333 and COMS 2203.

An introduction to web program development using modern scripting languages.

COMS 2203 Programming Foundations II

Offered: Fall, Spring.

Prerequisite: COMS 1013 with a grade of "C" or better.

A continuation of Programming I which introduces object-oriented programming as well as other topics, including multi-dimensional arrays, functions, string processing, pointers, structs, and records.

COMS 2213 Data Structures

Offered: Fall, Spring.

Prerequisite: COMS 2203 with a grade of "C" or better, and MATH 2703.

A study of abstract data structures and the implementation of these abstract concepts as computer algorithms. Topics include recursion, linked lists, stacks, queues, searching and sorting algorithms, binary trees, and graphs.

COMS 2223 Computer Organization and Programming

Offered: Fall, Spring.

Prerequisite: COMS 2203 and MATH 2703.

Introduction to organizing and structuring hardware components of computers. Topics include internal data representation, data transfer and control, I/O, memory hierarchy, and programming in assembly.

COMS 2233 Introduction to Databases

This course develops a detailed understanding of a database software package developed for microcomputer applications. Topics include how to design, implement, and access a personal database. Entity relationship diagrams are emphasized in design. The use of macros, data conversion operations, linking, and complex selection operations are used in implementation. Advanced report generation mechanisms are covered along with custom-designed menus and user interfaces.

COMS 2323 Programming in Python

Prerequisite: COMS 2203.

Introduction to the Python programming language where students will learn the basics through advanced concepts including basic data types, control structures, regular expressions, input/output, and textual analysis.

COMS 2333 Web Publishing II

Prerequisite: COMS 1333 or consent of instructor.

This course is a continuation of COMS 1333. Students are introduced to multimedia design concepts and software. Multimedia applications and design tools are used to create and maintain multimedia products such as dynamic graphics, animation, interactive websites, and video.

COMS 2701 Computer Architecture and Networks Laboratory

Laboratory exercises repairing and networking computers.

COMS 2703 Computer Hardware and Architecture

Offered: Fall, Spring.

An introduction to modern computer hardware and architecture. Students receive hands-on experience in building a PC, as well as computer maintenance and troubleshooting skills. \$20 course fee.

COMS 2713 Survey of Operating Systems

Offered: Spring.

Definition and brief history of computer operating systems, processes and their structure, CPU scheduling, process synchronization, deadlocks, swapping, memory management, paging and virtual memory, storage, secondary storage structure, and basic utility programs.

COMS 2733 Introduction to Computer Forensics and Security

An introduction to the fundamentals of computer forensic technology. The course emphasizes techniques for identifying and minimizing the threats to, and vulnerabilities of computer systems. These techniques include methods and tools for tracking suspicious activity, for recovering and preserving digital media, and for doing post-mortem analysis.

COMS 2803 Programming in C

Prerequisite: MATH 1113 or higher.

For non-computing majors. This course involves the design, coding, debugging, and implementation of programs using the C language. The UNIX operating system is introduced.

Note: May not be taken for credit after the successful completion of COMS 1013.

COMS 2903 Discrete Structures for Technical Majors

Prerequisite: MATH 1113 and a C or better In COMS 2104 or equivalent.

Fundamental mathematical concepts related to computing, including logic and proof techniques; sets, sequences, relations, and functions; combinatorics; algebraic structures and Boolean algebra ; trees and graphs.

COMS 2981 Special Topics

Prerequisite: Permission of the department.

This course will be offered on an "as-needed" basis to cover those topics and subject areas in computing that are emerging in a technological sense, but that do not yet warrant the addition of a new course to the curriculum.

Note: This course may be repeated for credit if course content differs.

COMS 2982 Special Topics

Prerequisite: Permission of the department.

This course will be offered on an "as-needed" basis to cover those topics and subject areas in computing that are emerging in a technological sense, but that do not yet warrant the addition of a new course to the curriculum.

Note: This course may be repeated for credit if course content differs.

COMS 2983 Special Topics

Prerequisite: Permission of the department.

This course will be offered on an "as-needed" basis to cover those topics and subject areas in computing that are emerging in a technological sense, but that do not yet warrant the addition of a new course to the curriculum.

Note: This course may be repeated for credit if course content differs.

COMS 2984 Special Topics

Prerequisite: Permission of the department.

This course will be offered on an "as-needed" basis to cover those topics and subject areas in computing that are emerging in a technological sense, but that do not yet warrant the addition of a new course to the curriculum.

Note: This course may be repeated for credit if course content differs.

COMS 3053 Ethical Issues in Technology

Prerequisite: Junior standing in a computing or related degree.

Ethical issues faced by members of a complex technological society and by professionals in a technology-related field. Topics covered include professional ethics and ethical decision making, as well as issues related to privacy, intellectual property, software development, productivity, and computer crime.

COMS 3163 Web Programming

Offered: Spring.

Prerequisite: COMS 1333, COMS 2213 and COMS 3233.

How to create a dynamic user experience based on the data available on the web application. Topics include database interactions with web-based scripting languages, logic-driven content, data manipulation, form validation, session and cookie management, security, and other concepts.

COMS 3213 Algorithm Design and Analysis

Offered: Fall.

Prerequisite: COMS 2213.

Concepts, implementation, and application of trees, hashing, graphs, and other advanced data structures will be studied.

COMS 3233 Database Design and Implementation

Prerequisite: COMS 2203.

The design and implementation of relational database systems, including conceptual design and normalization. Students will also gain experience in database and query implementation using a DBMS and SQL.

COMS 3243 Data Mining

Offered: Spring.

Prerequisite: COMS 3233 and 3 hours statistics.

Introduction to knowledge discovery from large databases: terminology, algorithms, methodologies, software, limitations, implications, and current trends. Students will implement and evaluate data mining techniques.

COMS 3313 Software Engineering

Offered: Spring.

Prerequisite: COMS 3213.

Software engineering fundamentals. Topics include analyzing system requirements, applicable methods of design, verification and validation, team software development, software project management, and building large, and reliable software systems.

Note: Course previously offered as COMS 4163.

COMS 3363 Server Administration

Offered: Fall.

Prerequisite: COMS 2703 and 2713.

The tools and techniques needed to administer a server, including installation, configuration, and administration of a variety of servers on different platforms.

Note: Course previously offered as COMS 4313.

COMS 3373 Data Center Operations

Offered: Spring.

Prerequisite: CSEC 2223 and COMS 3363.

An overview of the construction, design, and utilization of a data center, for IT professionals. The course will start with physical realities of data center design and construction, and proceed to discussion on data center level networking, storage requirements, server utilization, and common administrative tasks in a data center environment.

COMS 3413 App Development

Offered: Fall.

Prerequisite: COMS 1333 and COMS 2213.

Development of native and web applications for mobile devices with an emphasis on security.

COMS 3503 Visual Programming

Offered: Spring of even years.

Prerequisite: COMS 2213.

The design and development of event-driven programs using an object-oriented visual programming language.

COMS 3513 Administering and Using the IBM Platform

Prerequisite: COMS 1013.

This course is an introduction to the operations of the IBM midrange computer system. Topics include architecture, system security, user interface, and work management. Coverage will also extend to applications and programming using an introduction to DB2 and RPG.

COMS 3523 Human Factors in Information Technology

Prerequisite: Junior standing in a computing or related degree.

A study of the major factors involved in Human-Computer Interaction. A system-oriented, multi-disciplinary approach to understanding the human considerations in the design, testing, implementation, and administration of computer-based systems and information technology.

COMS 3703 Advanced Operating Systems

Offered: Fall, Spring Prerequisites: COMS 2213 and COMS 2223.

Basic operating system concepts and structures, CPU management, sharing resources (disks, networks, and processors), process management, threads, CPU scheduling, synchronization, deadlocks, memory management, segmentation, paging, swapping, file/device management, protection mechanisms, distributed systems, Unix/Linux environments and kernel internals, shell script programming, Unix/Linux file system, and case studies.

COMS 3903 Systems Software and Architecture

Prerequisite: COMS 1013.

This course covers the implementation of production operating systems, the fundamentals of digital logic, and machine architecture.

Note: This course does not count as credit toward a degree in Computer Science.

COMS 3913 Advanced Discrete Structures

Prerequisite: COMS 2203, COMS 2903 and MATH 2914.

Advanced topics in discrete mathematics applicable to modeling, analysis, and computer theory. Topics include relations, graphs, analysis of algorithms, and computability.

Electrical Engineering

ELEG 1011 Introduction to Electrical Engineering

Prerequisite: Math ACTE score of 24 or higher, or a grade of C or higher in MATH 1113, or MATH 1914, or MATH 1203, or consent of the instructor.

An introductory lecture/lab course to acquaint students with the fundamental techniques in the field of electrical engineering. Topics include technical aspects of electrical engineering including an introduction to computational techniques/software, basic introduction to computer-aided drafting (CAD), an introduction to programming, and basic circuit prototyping. \$25 per credit hour curriculum content fee.

ELEG 2103 Electric Circuits I

Prerequisite: MATH 2924 with a grade of C or better.

An introduction to circuit theory and electrical devices. Topics include resistive circuits, independent and dependent sources; analysis methods, network theorems; RC and RL first order circuits, and RLC second order circuits. \$25 per credit hour curriculum content fee.

ELEG 2111 Electric Circuits Laboratory

Prerequisite: ELEG 2103.

Report writing; use of basic electrical measurement devices; voltmeters, ammeters, R meters, wattmeters, and oscilloscopes. Computer modeling and data analysis of AC and DC circuits. Emphasis on developing laboratory techniques through experiments paralleling topics in ELEG 2103 and ELEG 2113. Laboratory three hours per week. \$40 laboratory fee. \$25 per credit hour curriculum content fee.

ELEG 2113 Electric Circuits II

Prerequisite: ELEG 2103 with a C or better and MATH 3243 or consent of instructor.

A continuation of ELEG 2103 covering phasor analysis, steady state power, complex network functions, frequency response, transformers, Laplace methods. \$25 per credit hour curriculum content fee.

ELEG 2130 Digital Logic Design Lab

Co-requisite: ELEG 2134 or consent of instructor.

Laboratory must be taken during the same semester as the lecture, ELEG 2134. A study of basic digital logic circuit design and implementation. Circuit schematic development utilizing computerized automated design tools. Computer modeling and simulation of digital systems. Emphasis will be placed on proper laboratory techniques, including data collection, data reduction, and report preparation. Laboratory three hours. \$40 laboratory fee.

ELEG 2134 Digital Logic Design

Prerequisite: ELEG 1011 or COMS 1013 Co-requisites: ELEG 2130 Binary numbers and codes, Boolean algebra, combinational and sequential logic including: minimization techniques, memory systems, register transfers, control logic design, and state machines.

\$25 per credit hour curriculum content fee.

ELEG 3000 Engineering Internship/Research Experience

Cross-listed: MCEG 3000.

Offered: As needed.

Prerequisite: A minimum of 60 hours applicable toward the ATU Electrical/Mechanical engineering program requirements with a minimum 3.5 GPA; and acceptance in an Engineering Internship or Research Experience for Undergraduates Program.

A minimum of six weeks of supervised on-the-job training with a university research program, engineering firm, manufacturer, municipality, or company employing engineers. A written report is required within one week of internship completion. Students will also present their internship experience to an engineering class or at a student engineering RSO meeting.

Note: Satisfies College of Distinction requirement.

ELEG 3003 System Modeling and Analysis

Cross-listed: MCEG 3003 Prerequisites: COMS 1013 or MCEG 2203 and MATH 3243 Reduction of engineering systems to mathematical models; methods of analysis using computers; interpretation of numerical results; optimization of design variables.

Examples are drawn from various engineering disciplines. \$25 per credit hour curriculum content fee.

ELEG 3103 Electronics I

Prerequisite: ELEG 2111 and ELEG 2113 Physics and electrical characteristics of diodes, bipolar transistors, and field effect transistors, behavior of these devices as circuit elements; common electronic circuits in discrete and integrated form; digital circuits including standard IC gates and flip flops, linear circuits including standard discrete and integrated amplifier configurations and their characteristics. \$25 per credit hour curriculum content fee.

ELEG 3123 Signals and Systems

Prerequisite: MATH 3243 and ELEG 2113.

Signal and system modeling, time and frequency domain analysis, singularity functions, the Dirac Delta function, impulse response, the superposition integral and convolution, Fourier series and Fourier and Laplace transformations. \$25 per credit hour curriculum content fee.

ELEG 3133 Microprocessor Systems Design

Prerequisite: ELEG 2134 and ELEG 2130.

Digital design using microprocessors. Microcomputer architecture, memory structures, I/O interfaces, addressing modes, interrupts, assembler programming, and development tools. This course should also attract computer science students interested in hardware. \$25 per credit hour curriculum content fee.

ELEG 3143 Electromagnetics

Prerequisite: MATH 2934 and PHYS 2124.

An introduction to static and dynamic electromagnetic fields using vector methods. Transmission lines, electrostatic fields, magnetostatic fields, Maxwell's equations, plane electromagnetic wave propagation, reflection, refraction, attenuation, antennas, reciprocity, and gain. \$25 per credit hour curriculum content fee.

ELEG 3153 Electrical Machines

Prerequisite: ELEG 2113.

Steady state analysis of single phase and polyphase transformers, direct current machines, synchronous machines, induction machines, and special purpose machines. Special emphasis will be given to the modeling and control of these machines. \$25 per credit hour curriculum content fee.

ELEG 3163 Electric Power Systems

Prerequisite: ELEG 2113 and PHYS 2124.

Introduction to power system analysis and operation. Topics included: mathematical modeling of power system components, power flow analysis, symmetric and asymmetric faults and economic operation of power systems. \$25 per credit hour curriculum content fee.

ELEG 3203 Renewable Energy Technology

Prerequisite: ELEG 2113.

An introduction and comprehensive overview of renewable energy technology. Topics include distributed generations and renewable energies including wind power, solar power, fuel cells and hydropower. Emphasis will be placed on basic concepts, operation principles and economics of existing and emerging renewable energy technologies. \$25 per credit hour curriculum content fee.

Mechanical Engineering

MCEG 1002 Engineering Graphics

General course in the most important types of engineering drawings. A foundation course in lettering, geometrical exercises, orthographic projections, including auxiliary views, sections, pictorial representation. The computer is introduced as a drafting tool. Lecture and laboratory four hours. \$25 per credit hour curriculum content fee.

MCEG 1011 Introduction to Mechanical Engineering

Prerequisite: Math ACTE score of 24 or higher, or grade of C or higher in MATH 1113, MATH 1914, or MATH 1203, or consent of instructor.

An introductory lecture/lab course to acquaint students with the technical aspects of mechanical engineering and professional responsibility. \$25 per credit hour curriculum content fee.

MCEG 2013 Statics

Prerequisite: MATH 2924 and PHYS 2114.

Principles of statics, resultants, equilibrium, and analysis of force systems. Structure analysis, forces in space, friction, centroids, and moments of inertia. \$25 per credit hour curriculum content fee.

MCEG 2023 Engineering Materials

Prerequisite: CHEM 2124.

A study of the mechanical and physical properties, micro structure, and the various testings of engineering materials (metals, plastics, woods, and concrete) from the viewpoint of manufacture and construction. \$25 per credit hour curriculum content fee.

MCEG 2033 Dynamics

Prerequisite: MCEG 2013.

A continuation of MCEG 2013. Study of problems of unbalanced force systems. Kinematics and kinetics of rigid bodies. Work and energy, impulse and momentum. \$25 per credit hour curriculum content fee.

MCEG 2203 Computational Methods in Engineering

Prerequisite: MCEG 1011 and MATH 2914.

An introduction to common computational methods, tools, and procedures used in the solution of common engineering problems. A standard solution methodology is introduced along with instruction in units systems, spreadsheet and calculator computations and the use of engineering software. \$25 per credit hour curriculum content fee.

MCEG 3000 Engineering Internship/Research Experience

Cross-listed: ELEG 3000.

Offered: As needed.

Prerequisite: A minimum of 60 hours applicable toward the ATU Electrical/Mechanical engineering program requirements with a minimum 3.5 GPA; and acceptance in an Engineering Internship or Research Experience for Undergraduates Program.

A minimum of six weeks of supervised on-the-job training with a university research program, engineering firm, manufacturer, municipality, or company employing engineers. A written report is required within one week of internship completion. Students will also present their internship experience to an engineering class or at a student engineering RSO meeting.

Note: Satisfies College of Distinction requirement.

MCEG 3003 System Modeling and Analysis

Cross-listed: ELEG 3003.

Prerequisite: COMS 1013 or MCEG 2203 and MATH 3243.

Reduction of engineering systems to mathematical models; methods of analysis using computers; interpretation of numerical results; optimization of design variables. Examples are drawn from various engineering disciplines. \$25 per credit hour curriculum content fee.

MCEG 3013 Mechanics of Materials

Prerequisite: MCEG 2013.

Fundamental stress and strain relationships, torsion, shear and bending moments, stresses and deflections in beams; introduction to statically indeterminate beams, columns, combined stresses, and safety factors. \$25 per credit hour curriculum content fee.

MCEG 3023 Manufacturing Processes

Prerequisite: MCEG 2023 and 3013.

Morphological aspects of manufacturing processes, testing of engineering metals, metal working processes, metal forming processes, machining, non-destructive inspection methods, statistical process control, control charts, and total quality management concepts. \$25 per credit hour curriculum content fee.

MCEG 3313 Thermodynamics I

Prerequisite: MATH 2924 and PHYS 2114.

An introduction to thermodynamics, including thermodynamic properties of pure substances, heat and work, the first and second laws of thermodynamics, and entropy with applications to power and refrigeration cycles. \$25 per credit hour curriculum content fee.

MCEG 3333 Alternative Energy Systems

A study of the design and implementation of alternative energy sources in power production and other applications. Renewable sources are emphasized. \$25 per credit hour curriculum content fee.

MCEG 3403 Machine Dynamics

Prerequisite: MCEG 2033 and MATH 3243.

The study of the relative motion of machine components, force systems applied to these components, the motions resulting from these forces, and their effect on machine design criteria. \$25 per credit hour curriculum content fee.

MCEG 3413 Fundamentals of Mechanical Design

Prerequisite: MCEG 2033, 3013, and MATH 3243.

Analysis of machines and components through application of basic fundamentals and principles. \$25 per credit hour curriculum content fee.

MCEG 3442 Mechanical Laboratory I

Prerequisite: MCEG 2023 and MCEG 3013.

A study of the basic materials testing procedures and instrumentation. Emphasis will be placed on proper laboratory techniques including data collection, data reduction, and report preparation. Lecture one hour, laboratory three hours. \$40 course fee. \$25 per credit hour curriculum content fee.

MCEG 3453 Energy Management

Prerequisite: MCEG 3313.

Energy management in commercial building and industrial plants. Utility rate structures. Sources of primary energy. Energy conversion devices. Prime movers of energy. Heat. Electricity. Lighting. HVAC Equipment. Building envelope. Electric motors. Estimating energy savings. Economic justification. Energy auditing. \$25 per credit hour curriculum content fee.

MCEG 3503 Basic Nuclear Engineering

Prerequisite: MATH 2924, CHEM 2124 and PHYS 2114.

An introduction to atomic and nuclear processes and to nuclear science and engineering fundamentals, including the nature of nuclear radiation, the nuclear chain reaction, criticality, power reactor types, and applications of nuclear technology. \$25 per credit hour curriculum content fee.

MCEG 3512 Radiation Detection Laboratory

Prerequisite: ASNT major and MCEG 3503 or MCEG 3523.

A study of each of the common kinds of nuclear radiation, including the detection and analysis methods and applications to nondestructive assays. Use of computers in analyses. Lecture one hour, laboratory three hours. \$40 course fee. \$25 per credit hour curriculum content fee.

MCEG 3523 Radiation Health Physics

Prerequisite: MATH 2914, CHEM 2124, or consent.

A study of the protection of individuals and population groups against the harmful effects of ionizing radiation. Included in the study is: (1) radiation detection and measurement, (2) relationships between exposure and biological damage, (3) radiation and the environment, (4) design criteria for processes, equipment, and facilities so that radiation exposure is minimized, and (5) environmental impact of nuclear power plants. \$25 per credit hour curriculum content fee.

MCEG 3612 Manufacturing Laboratory

Co-requisite: MCEG 3023.

Prerequisite: MCEG 2023.

Students will conduct various hands-on activities associated with manufacturing processes using industry typical practices. One hour lecture, one hour lab. \$40 course fee. \$25 per credit hour curriculum content fee.

MCEG 3663 Engineering Internship

Prerequisite: Mechanical engineering major with junior standing and a minimum GPA of 2.75/4.000; MCEG 3013 and 3313.

Students will gain experiential learning in an industrial environment by participation in an engineering internship with an approved industry partner. Students will be required to participate in engineering project(s) under supervision of an engineer at the selected partner industry, complete written and oral reports. \$25 per credit hour curriculum content fee.

Note: May not be repeated for credit.

MCEG 3991 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.

MCEG 3992 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.

MCEG 3993 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.

MCEG 3994 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.