APPLIED ENGINEERING AND SCIENCES

The Applied Engineering and Sciences Department prepares graduates in analytics, computer science, data science, electrical engineering technology, information technology, and mechanical engineering technology. The department also contributes to the UNH Discovery curricula with computing, data science, engineering, and mathematics courses in the Quantitative Reasoning and Environment, Technology and Society categories. Our students learn to integrate the application of core concepts and practices in their program of study to solve complex problems in the face of today's unprecedented challenges. The City of Manchester and Concord-Manchester-Nashua corridor extend the department's cutting-edge lab facilities with internship and research project learning experiences sponsored by our industry, nonprofit, and government agency partners. The department's talented faculty are active researchers and caring advisors engaged in high-caliber and inclusive teaching, student mentorship, scholarly activities directly tied to student learning, and service to the profession and community.

http://manchester.unh.edu/applied-engineering-sciences

Programs

- Analytics and Data Science
- Computing
- Engineering Technology

Courses

Analytics (DATA)

DATA 557 - Introduction to Data Science and Analytics
Credits: 4
An introduction to data science and analytics. The landscape of analytics, including an overview of industries and sectors using analytics or expected to use analytics in the near future. Data generation, data management, data cleaning, and data preparation. Ethical use of data. Focus on visual and exploratory analysis. Project-based, with an emphasis on collaborative, experiential learning. Programming and statistical software will be used, but previous experience is not required.
Attributes: Environment,TechSociety(Disc)
Grade Mode: Letter Grading

DATA 674 - Predictive and Prescriptive Analytics I
Credits: 4
A first course in predictive and prescriptive analytics. Supervised learning models including linear models and CART models. Model assessment and scoring methods, including cross-validation. Regularization and model tuning. Unsupervised learning models including k-means clustering. Project-based, with an emphasis on collaborative, experiential learning. Statistical software will be used and programming required.
Prerequisite(s): MATH 425 with a minimum grade of D- and COMP 570 with a minimum grade of D- and DATA 557 with a minimum grade of D-.
Grade Mode: Letter Grading

DATA 675 - Predictive and Prescriptive Analytics II
Credits: 4
A second course in predictive and prescriptive analytics. Time series analysis and model ensembles. Bootstrapping, simulation, optimization. Monte Carlo methods. Project-based, with an emphasis on collaborative experiential learning. Statistical software will be used and programming required.
Prerequisite(s): DATA 674 with a minimum grade of D-.
Grade Mode: Letter Grading

DATA 690 - Internship Experience
Credits: 1-4
A field-based learning experience via placement in a business, non-profit, or government organization using analytics. Under the guidance of a faculty advisor and workplace supervisor, students gain practical experience solving problems and improving operational processes using analytics. May be repeated but no more than 4 credits may fill major requirements.
Prerequisite(s): UMST 582 with a minimum grade of D-.
Repeat Rule: May be repeated for a maximum of 8 credits.
Grade Mode: Credit/Fail Grading

DATA 750 - Neural Networks
Credits: 4
Artificial neural networks power the recent advances in computer vision, speech recognition, and machine translation. This is a first course on neural networks with a focus on applications in computer vision and natural language processing. Topics will include generic feedforward neural networks, convolutional neural networks for computer vision tasks, and recurrent neural networks with application to natural language processing, with other topics to be selected based on the interests of the instructor and the class.
Equivalent(s): COMP 750
Grade Mode: Letter Grading

DATA #757 - Mining Massive Datasets
Credits: 4
A first course in large-scale analytics and data science. Characteristics of big data and the emerging software stack for working with massive datasets, including Hadoop and MapReduce. Algorithms for extracting information from massive datasets. A first course in linear algebra is not a prerequisite, but is recommended.
Prerequisite(s): MATH 425 with a minimum grade of D- and DATA 557 with a minimum grade of D-.
Grade Mode: Letter Grading

DATA #790 - Capstone Project
Credits: 4
Under direction of a faculty mentor, students work in teams to find solutions to complex real-world problems using analytics. Projects may come from internal or external sources. Students define the problem, obtain the necessary data, develop suitable models and solutions, and present their results.
Grade Mode: Letter Grading

Computer Technology (COMP)

COMP 405 - Introduction to Web Design and Development
Credits: 4
Students learn the fundamentals of how the Internet works, gain practice with foundational technologies that power websites and learn how to solve problems like a programmer. A significant portion of he course covers web front-end design and development; students create a website using HTML/CSS, and are introduced to JavaScript language and responsive web design techniques. Topics include Internet history and structure, legal and ethical issues. No prior programming experience is required.
Attributes: Environment,TechSociety(Disc)
Equivalent(s): IT 403
Grade Mode: Letter Grading

COMP 415 - Mobile Computing First and For Most
Credits: 4
This course examines how mobile computing is transforming our everyday lives and the society and environment in which we live. In this course the students will engage the mobile ecosystem by inventing apps and solving problems of personal, social, and environmental relevance. Students will learn computational thinking skills and create mobile apps using AppInventor, a free and open source visual blocks-based programming environment. Students will share their creative apps with peers and communities. They will also exercise inclusion, civic engagement, and peer learning in the context of innovating with free and open source software that empower individuals and communities.
Attributes: Environment,TechSociety(Disc)
Grade Mode: Letter Grading

COMP 424 - Applied Computing 1: Foundations of Programming
Credits: 4
Integrates three essential computing competencies: Problem solving, data analysis, and programming. Problems are chosen from data-driven real-world examples such as astronomy, cryptography, environmental simulation, image processing, and video games. Emphasis is on formulating problems, thinking creatively about how computations can solve problems, and expressing solutions clearly and accurately. Using Python, students learn design, implementation, testing, and analysis of algorithms and programs.
Equivalent(s): CS 410, CS 414, CS 415
Grade Mode: Letter Grading

COMP #425 - Introduction to Programming
Credits: 4
An introduction to problem solving and object-oriented programming. Emphasis is on programming concepts and techniques and their application to software development. Students learn to write, review, document, share, and demonstrate interactive applications and participate in pair programming, peer-led tutoring, and collaborative learning throughout the course.
Equivalent(s): CS 410, CS 414
Grade Mode: Letter Grading

COMP 430 - Systems Fundamentals
Credits: 4
The underlying hardware and software infrastructure upon which applications are constructed is collectively described by the term "computer systems." Computer systems broadly span the subdisciplines of operating systems, parallel and distributed systems, communications networks, and computer architecture. The class will present an integrative view of these fundamental concepts in a unified albeit simplified fashion, providing a common foundation for the different specialized mechanisms and policies appropriate to the particular domain area.
Grade Mode: Letter Grading

COMP 500 - Discrete Structures
Credits: 4
This course prepares students for understanding computational complexity; i.e., what makes a given task/problem hard and how hardness is measured. It accomplishes this through the study of algorithms, permutations, combinations, probability, graph theory, and trees.
Grade Mode: Letter Grading

COMP 520 - Database Design and Development
Credits: 4
An introduction to developing database applications with business users. Topics include fundamentals of the relational model, structured query language, data modeling and database design and implementation. Students use a variety of database management system tools to model, code, debug, document, and test database applications. Students complete real-world team projects.
Equivalent(s): CIS 520, IT 505
Grade Mode: Letter Grading

COMP 525 - Data Structures Fundamentals
Credits: 4
Data structures and algorithms are fundamental to developing solutions for computational problems. In this course students design and implement data and functional abstractions; analyze and select appropriate data structures to solve computational problems; practice programming and software development techniques to implement computational solutions.
Prerequisite(s): COMP 424 with a minimum grade of D- or COMP #425 with a minimum grade of D-.
Equivalent(s): CS 416, CS 417
Grade Mode: Letter Grading

COMP 530 - Machine and Network Architecture
Credits: 4
Examines the following topics. Machine organization: program and data representation; registers, instructions, and addressing modes; assemblers and linkers. Impact of hardware on software and software on hardware. Introduces the Internet protocol suite and network tools and programming and discusses various networking technologies.
Prerequisite(s): COMP 430 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 550 - Networking Concepts
Credits: 4
Explores the fundamentals of data communications and networking requirements for an organization, including the standard layers of network organization; network technologies; and protocols for LANs, WANs, wireless networks, and switched and routed networks. Includes issues of security, topology, management, and future developments.
Grade Mode: Letter Grading

COMP 560 - Ethics and the Law in the Digital Age
Credits: 4
Examines classical and ethical and legal constructs as they pertain to current and topical issues. Students develop and articulate a personal point of view on a broad range of issues based on sound ethical principles and consider the impact of such views on co-workers, employers, and society in general. Topics also include: major social issues involving intellectual property, privacy, current U.S. and international relations relevant to ethical theories. The interplay between ethics and law is explored through current case studies and students formulate and support conclusions based on ethical constructs presented in class. Case study analysis is a major component in course delivery.
Attributes: Humanities(Disc); Writing Intensive Course
Grade Mode: Letter Grading

COMP 570 - Statistics in Computing and Engineering
Credits: 4
An introduction to tools from probability and statistics that are needed by computing and engineering professionals. Exploratory data analysis including graphic data analysis. discrete and continuous probability distributions, inference, linear regression, and analysis of variance, with applications from artificial intelligence, machine learning, data mining, and related topics. Project work and use of statistical software are an integral part of the course.
Prerequisite(s): MATH 425 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 574 - Applied Computing 2: Foundations of Machine Learning
Credits: 4
Introduction to making informed, data-based decisions with machine learning, data representation and analysis tools, and programming. Emphasis is on the importance of gathering, cleaning, normalizing, visualizing and analyzing data to drive informed decision-making in any field of study. Students learn to use tools and techniques to work on real-world datasets using procedural and basic machine learning algorithms. Students also learn to ask good, exploratory questions and develop metrics to come up with a well-thought-out analysis.
Prerequisite(s): COMP 424 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 625 - Data Structures and Algorithms
Credits: 4
An introduction to object-oriented design, analysis, and implementation of data structures and algorithms. Students apply concepts and techniques to develop information processing applications. Best programming practices of editing, debugging, documentation, testing, and code review are stressed. Familiarity with an object-oriented programming language and experience with application development are required.
Prerequisite(s): COMP #425 with a minimum grade of D-.
Equivalent(s): CS 515
Grade Mode: Letter Grading

COMP 630 - Systems Software
Credits: 4
Today's organizations need to deliver applications and services by automating processes that develop and deploy software and manage scalable computing infrastructures. Students will learn how to integrate development, operations, and cloud computing and gain experience with design approaches, version control, continuous integration, cloud-based APIs, and monitoring metrics. Key to systems software tools and automation processes are increased communication and collaboration practiced in the course team projects. Students who took COMP 698 Sp/ Topic Systems Software cannot repeat for credit.
Prerequisite(s): COMP 530 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 650 - Network Administration and Maintenance
Credits: 4
Advances the understanding of networks through practical application of administering and maintaining and intranet and its servers. Students use a modern server operating system and network management tools. Routine tasks include: install and configure servers, setup directory services and access privileges, tune network services, understand and implement network security, perform routine maintenance, and practice troubleshooting techniques.
Prerequisite(s): COMP 550 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 690 - Internship Experience
Credits: 4
The internship provides field-based learning experience through placement in a computing field. Students gain practical computing experience in a business, non-profit, or government organization. Under the direction of a faculty advisor, the student is expected to contribute to the information technology products, processes, or services of the organization. Majors only. May be repeated but no more than 4 credits may fill major requirements.
Prerequisite(s): UMST 582 with a minimum grade of D-.
Repeat Rule: May be repeated for a maximum of 8 credits.
Grade Mode: Letter Grading

COMP 698 - Special Topics
Credits: 1-4
Course topics not offered in other courses. Topics covered vary depending on contemporary computing topics, programmatic need, and availability and expertise of faculty. Barring duplication of subject, may be repeated for credit.
Repeat Rule: May be repeated for a maximum of 8 credits.
Grade Mode: Letter Grading

COMP 705 - Full Stack Development
Credits: 4
Students work in teams and implement, test, document, demonstrate, and deploy web systems that solve organizational needs expressed by real clients. Emphasis is on advanced server-side and client-side programming and integration of web application with database and web server applications. Free and open source development and communication tools are used to carry out the course project.
Grade Mode: Letter Grading

COMP 715 - Information Security
Credits: 4
Topics include general security principles and practices, network and system security, access control methodology, and cryptography. Students develop a simple cryptographic system based on sound mathematical principals, work to improve it, and find ways to attack it. Some programming required.
Grade Mode: Letter Grading

COMP 720 - Database Systems and Technologies
Credits: 4
This is a project course that provides practical experience with developing a storage subsystem of a computer information system. Topics include data modeling, database design, system implementation, and integration with a target application. Emphasis is on implementation activities, database application development artifacts, project communication, and supporting system development and project management tools.
Grade Mode: Letter Grading

COMP 721 - Big Data for Data Engineers
Credits: 4
In this course students gain practical experience developing data-oriented applications in modern infrastructure frameworks, also known as the cloud data solutions. Guided by what a data scientist profile is, students become familiar with the use cases of data oriented applications. They will apply key data modeling and data design concepts to meet business requirements. Students will also apply modern software development to iteratively construct solutions using established reference architectures. Project work will be based in Google Cloud Platform and Amazon Web Services.
Grade Mode: Letter Grading
Special Fee: Yes

COMP 725 - Programming Languages
Credits: 4
Explores the main features of modern, high-level, general purpose programming languages from the user point of view. Provides students with an opportunity to use non-imperative programming paradigms, such as object-oriented, functional, and visual, and to learn how specific features of such languages can be used efficiently in solving problems. The purpose is to gain knowledge regarding the languages studied as well as providing the basis to conduct analysis related to comparisons and divergence in capabilities.
Equivalent(s): CIS 698, COMP 698, ET 647
Grade Mode: Letter Grading

COMP 730 - Software Development
Credits: 4
Presents an iterative methodology for developing software systems. Development activities include requirements elicitation and analysis, system and object design, implementation and testing, project and configuration management, infrastructure maintenance, and system deployment to end user. Students work in teams, assume developer roles, build models of a real-world system, and deliver a proof-of-concept or prototype.
Attributes: Writing Intensive Course
Prerequisite(s): COMP 525 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 740 - Machine Learning Applications and Tools
Credits: 4
Introduces students to practical approaches of machine learning. The course is an exploration of creative applications of artificial intelligence using modern machine learning components and tools. Different application domains are considered, such as computer vision, natural language processing, and cyber security. Students learn to evaluate machine learning systems as well as their potential prediction problems. Cannot receive credit if credit earned for COMP 780 AdvTop/ML Tools & Appl.
Grade Mode: Letter Grading

COMP 741 - Practical Artificial Intelligence
Credits: 4
Balancing the science of AI with its engineering applications, the course focuses on AI foundations and principles for building intelligent computational systems. Reasoning, planning, learning, explaining, and acting with certainty and uncertainty are AI areas in which students will practice how to build AI systems that solve real-world problems. Particular attention is given to the impact of AI applications on our society and related ethical, privacy, security, and safety implications.
Prerequisite(s): COMP 525 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 745 - Fundamentals of Computer Vision
Credits: 4
This course provides a comprehensive introduction to computer vision, covering both the theoretical and practical skills needed to pursue a career in computer vision, pattern recognition, image processing, and signal processing. Students will learn basic concepts as well as hands-on experience to solve various real-life problems in image processing, feature extraction, object recognition, and image understanding. Not offered for credit if credit is received for COMP 780 "Computer Vision".
Grade Mode: Letter Grading

COMP 750 - Neural Networks
Credits: 4
Artificial neural networks power the recent advances in computer vision, speech recognition, and machine translation. This is a first course on neural networks with a focus on applications in computer vision and natural language processing. Topics will include generic feedforward neural networks, convolutional neural networks for computer vision tasks and recurrent neural networks with application to natural language processing, with other topics to be selected based on the interests of the instructor and the class.
Equivalent(s): DATA 750
Grade Mode: Letter Grading

COMP 755 - Digital Forensics
Credits: 4
This course studies cyber-attack prevention, planning, detection, response, and investigation with the goals of counteracting cybercrimes. The topics covered in this course include fundamentals of digital forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anti-forensics techniques, anonymity and pseudonymity, computer security policies and guidelines, and methods and standards for extraction and preservation of digital evidence.
Prerequisite(s): COMP 525 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 760 - Data Visualization & Communication
Credits: 4
Through hands-on experience with a leading data visualization tool, the course introduces the concepts of data visualization to allow students to communicate and analyze data effectively using visual techniques.
Grade Mode: Letter Grading

COMP 780 - Advanced Topics in Computing
Credits: 1-4
The course includes advanced topics and emerging areas in computing. Barring duplication of subject, the course may be repeated for credit.
Grade Mode: Letter Grading

COMP 785 - Applied Cryptography
Credits: 4
This course aims to give students an overview of cryptographic concepts and methods, a good knowledge of some commonly used cryptographic primitives and protocols, a sound understanding of theory and implementation, as well as limitations and vulnerabilities, and an appreciation of the engineering difficulties involved in employing cryptographic tools to build secure systems. Some programming required.
Prerequisite(s): COMP 525 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 790 - Capstone Project
Credits: 4
This course requires the development of a real world project that responds to an IT organizational need. The project is undertaken by a team of students. An iterative approach is used to incrementally address the project requirements while constructing a prototype of the IT solution to the original problem.
Attributes: Writing Intensive Course
Prerequisite(s): COMP 690 with a minimum grade of D- and CIS 610 with a minimum grade of D-.
Grade Mode: Letter Grading

COMP 791 - Senior Thesis
Credits: 4
This course requires the development of a real world project representative of the computing discipline of their major. An iterative approach is used to incrementally address the project requirements while constructing a prototype of the solution to the original problem. A thesis, describing the work, will be the final product, submitted at the end of the course and presented to a committee of faculty.
Prerequisite(s): COMP 690 with a minimum grade of D-.
Equivalent(s): COMP 790
Grade Mode: Letter Grading

COMP 795 - Independent Study
Credits: 1-4
Advanced individual study under the direction of a faculty mentor. Content area to be determined in consultation with faculty mentor. May be repeated.
Grade Mode: Letter Grading

Engineering Technology (ET)

ET 401 - Introduction to 3D Printing
Credits: 4
This project-based course explores the latest techniques in designing and fabricating 3D models using 3D printing technology. Through the integration of techniques from mathematics, engineering, and computing, students learn to design 3D models and manufacture them using 3D printers. The course challenges students to apply their skills in a variety of engineering projects that require creative problem-solving and critical thinking.
Attributes: Environment,TechSociety(Disc)
Grade Mode: Letter Grading

ET 405 - Engineering Design
Credits: 4
This course introduces the engineering design process and solid modeling software tools to create 3D CAD models and generate professional industry engineering drawings. Industry codes and procedures are practiced e.g. Geometric Dimensioning & Tolerancing (GD&T). Students complete hands-on projects and activities. The engineering design process includes: problem identification, concept creation, modeling, analysis, and documentation. Industry standard 3D modeling software is used with project design methodology for graphical, written, and oral communication of mechanical design ideas.
Attributes: Inquiry (Discovery)
Grade Mode: Letter Grading

ET 411 - Manufacturing and Materials Processing
Credits: 0 or 4
This course covers the basic manufacturing processes used to convert raw materials into finished goods. Various manufacturing methods including both traditional and computer controlled covered include: machining, forming, casting, welding, 3D printing. The complex relationship between design and manufacturability is investigated and emphasized. The lab portion of this course will demonstrate the use of various machining processes which are capable in the UNHM Machine Shop Lab.
Prerequisite(s): MATH 418 with a minimum grade of C- and ET 405 with a minimum grade of C-.
Grade Mode: Letter Grading
Special Fee: Yes

ET 421 - Digital Electronics I
Credits: 0 or 4
The fundamental analysis and design concepts of digital theory needed for more advanced study of digital circuits. Topics covered include: number systems, codes, Boolean algebra, K-mapping, and combinational, sequential digital circuits. Lab exercises explore modern integrated circuit technology and introductory design using Electronic Design Automation (EDA) tools.
Co-requisite: COMP 424
Prerequisite(s): MATH 418 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 431 - Circuit Analysis I
Credits: 0 or 4
First course in electronic circuit analysis exploring the fundamental idea of current and voltage. Topics include the basic laws and theorems that govern simple electrical systems; Kirchoff's laws, Ohm's law, power relationships, resistance, inductance, and capacitance. Laboratory exercises will introduce the student to the basic measurement techniques of electronic systems using circuit building, power supplies, multi-meters and oscilloscopes. This course will also introduce basic circuit simulation techniques.
Prerequisite(s): MATH 418 (may be taken concurrently) with a minimum grade of C-.
Grade Mode: Letter Grading

ET 432 - Circuit Analysis II
Credits: 0 or 4
Second course in electronic circuit analysis, introducing time varying circuits and more advanced electronic circuit analysis; including super position, node/mesh methods, phasor representation, frequency response, impedance, and reactance. Lab exercises use oscilloscopes, function generators to build and analyze circuits with reactive elements.
Co-requisite: MATH 425
Prerequisite(s): MATH 418 with a minimum grade of C- and ET 431 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 450 - Statics and Strength of Materials
Credits: 0 or 4
The statics portion of the course analyzes equilibrium force systems applied to rigid bodies and the internal stresses and strains which result. The strength of materials portion of the course investigates the relationship between internal stress and strain to material properties and behavior. Topics include free body diagrams, equilibrium force analysis, tension, compression, shear and moment diagrams, torsion, bending, trusses, and beam deflection analysis. Lab.
Prerequisite(s): MATH 418 with a minimum grade of C- and PHYS 407 (may be taken concurrently) with a minimum grade of C-.
Grade Mode: Letter Grading

ET 502 - Measurement and Control
Credits: 0 or 4
The course covers basic electricity and electronics (analog and digital) and electronic components (transistors, op-amps, SCR's). Electromechanical principles are introduced involving sensors and transducers used in production processes. Programming using the Arduino software and microcontroller is introduced. The basics of Programmable Logic Control (PLC) using Relay Ladder Logic programming is covered. Students use both hardware and software covered in the lecture portion of the course in the laboratory session.
Prerequisite(s): MATH 418 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 505 - Material Science
Credits: 0 or 4
This course studies the properties and behavior of engineering materials. Materials considered are ferrous and nonferrous metals and alloys, as well as plastics, ceramics, and composites. Material property and behavior modification through thermal and mechanical means is studied: such as heat treatment of steel or cold work forming. Selection of materials based upon manufacturing and design requirements is emphasized. Lab experiments will complement lecture material where appropriate.
Prerequisite(s): MATH 425 with a minimum grade of C- and ET 450 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 522 - Digital Electronics II
Credits: 0 or 4
Advanced topics in digital design techniques. Topics covered include: complex digital circuits, Flip-Flop circuits, counters, state machines, state diagrams, and memory devices. Laboratory exercises work with modern digital design methods with schematic entry, synthesis using VHDL, simulation modern digital systems implemented on Field Programmable Gate Arrays (FPGA).
Prerequisite(s): ET 421 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 529 - Introduction to Thermodynamics
Credits: 4
This course covers the fundamentals of equilibrium thermodynamics. Topics include: thermodynamic properties of gases and liquids, thermodynamic tables, ideal gas laws, open and closed systems, thermodynamic processes and process diagrams, First and Second Laws of Thermodynamics, entropy, and an introduction to thermodynamic cycles.
Prerequisite(s): MATH 425 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 541 - Electronic Devices
Credits: 4
Introductory course in Electronic devices looking at modern components used in current electronic systems. This course will develop techniques to analyze basic semiconductor devices such as diodes, field effect transistors and bipolar transistors. Specific diode circuits covered include: rectifying, clipping, and clamping circuit configurations. Methods to model, analyze and bias the basic transistor amplification circuits will be developed. Lab exercises will explore these types of circuit both in physical prototyping and simulation.
Prerequisite(s): MATH 425 with a minimum grade of C- and ET 431 with a minimum grade of C- and ET 432 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 542 - Analog Electronics
Credits: 0 or 4
Design of fundamental analog circuit blocks in electronic systems. Multistage amplifiers; feedback systems and stability; power amplifiers. Nonlinear electronic circuits: oscillators, function generators; clippers and peak detectors; A/D and D/A conversion. Laboratory exercises will explore building physical prototypes and the use of simulation to build and analyze Analog systems.
Grade Mode: Letter Grading

ET 550 - Dynamics and Machine Design I
Credits: 0 or 4
The dynamics portion of the course covers basic fundamentals of particle and rigid body dynamics, rectilinear and curvilinear motion, and kinematic motion. The machine design portion covers static and dynamic stress analysis theories, combined stress, and fatigue and endurance strength. Introduction to various machine element analyses are begun including fasteners, springs, and shaft design. Computer applications are employed where appropriate using CAD and Excel. Lab.
Prerequisite(s): ET 405 with a minimum grade of C- and ET 450 with a minimum grade of C- and MATH 425 (may be taken concurrently) with a minimum grade of C-.
Grade Mode: Letter Grading

ET 560 - Machine Design II
Credits: 0 or 4
This course is a continuation of ET 550 Machine Design portion. Additional machine elements and their related analyses are covered. Power transmission drive components such as gears, belts, chains, clutches and brakes are covered. Lab projects will involve individual components or combined items above. Computer application software is used where appropriate, including CAD and Excel. Lab.
Prerequisite(s): ET 550 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 590 - Embedded Microcontrollers
Credits: 0 or 4
The purpose of this course is to explore the subject of microprocessors and embedded systems, covering architectural issues, programming, and interfacing. The course will also cover processor organization, emphasizing the typical structure of today's microcontrollers, processor models, and programming styles. Throughout the material, the consideration of input/output systems to the use of various embedded peripherals and interfacing external loads for a spectrum of diverse applications will be addressed.
Prerequisite(s): ET 522 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 625 - Technical Communications
Credits: 4
Designed to improve students' capabilities to prepare and present technical information in written and oral form and through electronic means. ET majors should take this course early in their program of study so that proficiencies developed can be utilized in later courses. (Also listed as ENGL 502.)
Attributes: Writing Intensive Course
Equivalent(s): ENGL 502, ENGL 502H
Grade Mode: Letter Grading

ET 635 - Fluid Technology and Heat Transfer
Credits: 0 or 4
Fundamental principles of fluid technology and basic principles of heat transfer, with applications in solving practical problems, and how these concepts are used in the HVAC area. Lab.
Prerequisite(s): ET 529 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 641 - Production Systems
Credits: 4
Market forecasting; waiting line theory; manufacturing inventories and their control; production scheduling; quality control.
Prerequisite(s): MATH 425 with a minimum grade of C-.
Grade Mode: Letter Grading
Special Fee: Yes

ET 644 - Mechanical Engineering Technology Concepts in Analysis and Design
Credits: 4
Kinematics, kinetics, work and energy, fluids, heat transfer; application of these concepts to problems in mechanical design.
Prerequisite(s): ET 450 with a minimum grade of C- and ET 560 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 645 - Fluid Technology and Heat Transfer II
Credits: 0 or 4
The course prepares the student to apply thermal and fluid engineering principles to situations typical of those encountered in industry. Topics covered include thermodynamics of two phase fluids, fluid dynamics of piping systems, principles of turbomachinery, and analysis of power cycles. No credit for students who have taken ET #696 Special Topics in Mechanical Engineering Technology for credit. Lab.
Prerequisite(s): ET 635 with a minimum grade of C- and MATH 425 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 671 - Digital Systems
Credits: 0 or 4
Digital systems design and application using TTL and CMOS devices, design of systems, and interfacing. Digital design project required. Lab.
Prerequisite(s): ET 522 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 674 - Control Systems and Components
Credits: 0 or 4
Topics include linear systems analysis, the Laplace transform and its properties, controllers, root locus technique, transient response analysis, first- and second-order systems, error analysis, and control system design. Lab.
Prerequisite(s): MATH 425 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 675 - Electrical Technology
Credits: 0 or 4
Electrical circuits: DC and AC network analysis, power factors, transformers, power supplies. Electronic circuits--diodes, transistors and operational amplifiers. Digital circuits and introduction to computer-aided engineering. Lab.
Prerequisite(s): MATH 425 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 677 - Analog Systems
Credits: 0 or 4
Operational amplifiers. Transducers and measurement systems. Frequency response. Grounding and shielding. Signal and power interfacing techniques. Design project. Lab.
Prerequisite(s): ET 542 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 680 - Communications and Fields
Credits: 0 or 4
Topics include Fourier series analysis; the Fourier transform and its properties; convolution; correlation including PN sequences; modulation theory; encoding and decoding of digital data (NRZ-M, NRZ-S, RZ, Biphase-L, and Manchester); antennas and antenna pattern; Radar Range Equation; and an introduction to information theory. Lab.
Prerequisite(s): MATH 425 with a minimum grade of C-.
Grade Mode: Letter Grading

ET #696 - Topics in Mechanical Engineering
Credits: 0-4
New or specialized courses not covered in regular course offerings.
Repeat Rule: May be repeated for a maximum of 4 credits.
Equivalent(s): ET 695
Grade Mode: Letter Grading

ET #697 - Topics in Electrical Engineering Technology
Credits: 0-4
New or specialized courses not covered in regular course offerings.
Repeat Rule: May be repeated for a maximum of 4 credits.
Grade Mode: Letter Grading

ET 751 - Mechanical Engineering Technology Project
Credits: 4 or 8
Students are required to find solutions to actual technological problems in design, fabrication, and testing as posed by industry. Students define the problem, prepare a budget, and work with the client company to research, design, build, and test the software and/or hardware needed. A year-long course: 4 credits per semester; an IA grade (continuous course) given at the end of first semester. Withdrawal from course results in loss of credit.
Attributes: Writing Intensive Course
Repeat Rule: May be repeated for a maximum of 8 credits.
Grade Mode: Letter Grading

ET 781 - Introduction to Automation Engineering
Credits: 4
Students are introduced to the topics needed to develop a good understanding of the basic principles of Automation Engineering. This introductory course covers a wide variety of topics such as performance of sensors, actuators, motors and drives, PLC's and HMI, environmental controls , robots, machine vision systems, and controls and system integration. Open to Electrical Engineering Technology, and Mechanical Engineering Technology majors only.
Grade Mode: Letter Grading

ET 788 - Introduction to Digital Signal Processing
Credits: 0 or 4
This course will deal with the topics of spectral representation of periodic and non-periodic analog signals followed by discrete sampling and aliasing and how it relates to Nyquist sampling theorem. The z-transform will be introduced as the required mathematical tool along with an introduction to MATLAB and its associated DSP tool box. Spectral analysis of digital signal will be accomplished using these tools. Convolution and digital filtering will also be covered. Lab.
Prerequisite(s): ET 680 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 790 - Microcomputer Technology
Credits: 0 or 4
Microcomputer systems design, including assembly language, interfacing, processor timing and loading, and inter-processor communications via local area networks. Hardware, software, and architecture of both Intel 80X86 and Motorola 68XX0 microprocessors. Microcomputer applications with emphasis on lab work using Motorola HCII microcontroller. Lab.
Prerequisite(s): ET 671 with a minimum grade of C-.
Grade Mode: Letter Grading

ET 791 - Electrical Engineering Technology Project
Credits: 4 or 8
Students are required to find solutions to actual technological problems in design, fabrication, and testing, as posed by industry. Students define the problem, prepare a budget, and work with the client company to research, design, build, and test the software and/or hardware needed. A year-long course: an IA grade (continuous course) given at end of first semester. Withdrawal from course results in loss of credit.
Attributes: Writing Intensive Course
Repeat Rule: May be repeated for a maximum of 8 credits.
Grade Mode: Letter Grading

Faculty

Applied Engineering and Sciences Faculty