

# APPLIED ENGINEERING AND SCIENCES

The Applied Engineering and Sciences Department prepares graduates in analytics, computer science, cybersecurity engineering, 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.

Prereq: MATH 425, COMP 570, DATA 557.

**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. Prereq: DATA 674.

**Grade Mode:** Letter Grading

#### DATA 690 - Internship Experience

**Credits:** 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. Prereq: UMST 582.

**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. Prereq: Senior status.

**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. Prereq: MATH 425, DATA 557, or instructor permission.

**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. Prereq: Senior status.

**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 the 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 Applinventor, 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.

**Equivalent(s):** ECE 401

**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. Prereq: COMP 424 or COMP 425.

**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. Prereq: COMP 430.

**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. Writing intensive.

**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. Prereq: MATH 425.

**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. Prereq: COMP 424.

**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. Prereq: COMP 525.

**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. Prereq: COMP 530.

**Grade Mode:** Letter Grading**COMP 650 - Network Administration and Maintenance****Credits:** 4

Advances the understanding of networks through practical application of administering and maintaining an 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. Prereq: COMP 550.

**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. Prereq: UMST 582.

**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. Prereq: Senior status.

**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. Prereq: Senior status.

**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. Prereq: Senior status.

**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. Prereq: Senior Status. Special fee.

**Grade Mode:** Letter Grading**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. Prereq: Senior status.

**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. Prereq: COMP 525.

**Attributes:** Writing Intensive Course**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. Prereq: Senior status.

**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. Prereq: COMP 525.

**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. Prereq: Senior status.

**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. Prereq: COMP 525.

**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. Prereq: Senior status or permission.

**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. Prereq: COMP 525.

**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. Prereq: COMP 690 and CIS 610. Writing intensive.

**Attributes:** Writing Intensive Course**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. Prereq: permission. May be repeated.

**Grade Mode:** Letter Grading**Engineering Technology (ET)****ET 401 - Introduction to Additive Manufacturing****Credits:** 4

This project-based course introduces current methods in the design and fabrication of #D models. Students will apply and integrate techniques from mathematics, engineering, and computing design #D models and then manufacture them by the use of 3D printers. Credit cannot be earned by students who have completed UMST 599 SpcTop/Intro to 3D Printing. Special fee.

**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. Prereq: MATH 418, ET 405.

**Grade Mode:** Letter Grading**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. Prereq: MATH 418.

**Co-requisite:** COMP 424**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.

**Co-requisite:** MATH 418**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. Prereq: MATH 418; ET 431.

**Co-requisite:** MATH 425**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. Prereq: MATH 418. Pre-or Co-req: PHYS 407.

**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. Prereq: MATH 418.

**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. Prereq: MATH 425, ET 450.

**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). Prereq: ET 421.

**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. Prereq: MATH 425.

**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. Prereq: MATH 425; ET 431; ET 432.

**Grade Mode:** Letter Grading**ET 542 - Analog Electronics****Credits:** 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. Prereq: ET 405, ET 450. Pre- or Co-req: MATH 425.

**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. Prereq: ET 550.

**Grade Mode:** Letter Grading**ET 590 - Embedded Microcontrollers****Credits:** 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.

**Equivalent(s):** ET 522**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.) Writing intensive.

**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. Prereq: Thermodynamics; Mechanical Engineering Tech majors.

**Grade Mode:** Letter Grading**ET 641 - Production Systems****Credits:** 4

Market forecasting; waiting line theory; manufacturing inventories and their control; production scheduling; quality control. Prereq: differential and integral calculus.

**Grade Mode:** Letter Grading**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. Prereq: strength of materials and dynamics and ET 637.

**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. Prereq: ET 635, MATH 425.

**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.

Prereq: introductory digital design. Special fee. Lab.

**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. Prereq: differential and integral calculus. Lab.

**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. Prereq: differential and integral calculus. Lab.

**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. Prereq: intro. analog design. Special fee. Lab.

**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, Biphas-L, and Manchester); antennas and antenna pattern; Radar Range Equation; and an introduction to information theory. Prereq: differential and integral calculus. Lab.

**Grade Mode:** Letter Grading**ET 696 - Topics in Mechanical Engineering****Credits:** 0-4

New or specialized courses not covered in regular course offerings. Prereq: permission.

**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. Prereq: permission.

**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. Prereq: senior standing in E.T. 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.

**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. Prereq: ET 674 Control Systems and Components. 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. Prereq: ET 680 Communications and Fields or equivalent.

**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 HCLII microcontroller. Prereq: ET 671. Special fee. Lab.

**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. Prereq: senior standing in E.T. Special fee. A year-long course: an IA grade (continuous course) given at end of first semester. Withdrawal from course results in loss of credit.

**Repeat Rule:** May be repeated for a maximum of 8 credits.**Grade Mode:** Letter Grading

## Faculty

[Applied Engineering and Sciences Faculty](#)