

# ENGINEERING TECHNOLOGY (ET)

# Course numbers with the # symbol included (e.g. #400) have not been taught in the last 3 years.

## 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)

## 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)

## ET 411 - Manufacturing and Materials Processing

**Credits:** 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.

## ET 421 - Digital Electronics I

**Credits:** 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

## 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

## ET 432 - Circuit Analysis II

**Credits:** 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

## ET 450 - Statics and Strength of Materials

**Credits:** 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.

## ET 502 - Measurement and Control

**Credits:** 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.

## ET 505 - Material Science

**Credits:** 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.

## ET 522 - Digital Electronics II

**Credits:** 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.

## 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.

**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.

**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.

**ET 550 - Dynamics and Machine Design I****Credits:** 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.

**ET 560 - Machine Design II****Credits:** 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.

**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**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**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.

**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.

**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.

**ET 645 - Fluid Technology and Heat Transfer II****Credits:** 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.

**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.

**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.

**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.

**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.

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

**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**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.**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.**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.

**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.

**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 HC11 microcontroller. Prereq: ET 671. Special fee. Lab.

**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.