MECHANICAL ENGINEERING

The Department of Mechanical Engineering (https://www.uakron.edu/engineering/ME/) offers programs leading to the Bachelor of Science in Mechanical Engineering and the Bachelor of Science in Aerospace Systems Engineering. The department also offers programs leading to the Associate of Applied Science and the Bachelor of Science in Mechanical Engineering Technology, the Associate of Applied Science in Advanced Manufacturing Engineering Technology, and the Bachelor of Science in Automated Manufacturing Engineering Technology, as well as a certificate in Drafting and Computer Drafting. The Department offers graduate programs leading to a Master of Science in Mechanical Engineering, and an interdisciplinary Doctor of Philosophy in Engineering.

Information specific to the available program options in mechanical engineering and aerospace systems engineering is available:

- Aerospace Systems Engineering, BS (https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/mechanical-engineering/aerospace-systems-engineering-co-op-bs/)
- Automated Manufacturing Engineering Technology, AAS (https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/mechanical-engineering/adv-manufacturing-engineering-tech/)
- Automated Manufacturing Engineering Technology, BS (https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/mechanical-engineering/automated-manufacturing-engineering-technology-bs/)
- Drafting and Computer Drafting, Certificate (https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/mechanical-engineering/drafting-computer-certificate/)
- Mechanical Engineering Technology, AAS (https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/mechanical-engineering/mechanical-engineering-technology-aas/)
- Mechanical Engineering Technology, BS (https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/mechanical-engineering/mechanical-engineering-technology-bs/)
- Mechanical Engineering, BS (https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/mechanical-engineering/mechanical-engineering-bs/)

Automated Manufacturing Engineering Technology (AMET)

AMET:100 Basic Principles of Manufacturing Management (4 Credits)
A survey of basic concepts of management and their interrelationships to a manufacturing environment. Includes production control, quality control, work measurement, and employee motivation. (Formerly 2880:100)

AMET:101 Introduction to Advanced Manufacturing (2 Credits)
This course defines advanced manufacturing and provides students with an overview of the knowledge, skills, and abilities necessary to succeed in an advanced manufacturing career. (Formerly 2880:101)

AMET:110 Manufacturing Processes (3 Credits)
Study of the machines, methods, and processes used in manufacturing. (Formerly 2880:110)

AMET:130 Work Measurement & Cost Estimating (3 Credits)
Prerequisite: MATH 152. Time and motion study. Development of accurate work methods and production standards, and their relationship to manufacturing cost estimates. (Formerly 2880:130)

AMET:140 Computer Aided Drawing (3 Credits)
Drafting procedures and techniques used for creating drawings using AutoCAD software. Topics include basic components, drawing, editing, dimensioning, layers, text, blocks, plotting, and hatch. (Formerly 2880:140)

AMET:151 Industrial Safety & Environmental Protection (2 Credits)
A contemporary overview of the science and management of occupational health and safety programs, policies, and procedures in an industrial and business type environment. (Formerly 2880:151)

AMET:201 Robotics & Automated Manufacturing (3 Credits)
Prerequisite: AMET 101. Study of manufacturing automation and the computer-based products and processes available for this task. Robots, machine controllers, and machine/process interfaces are investigated. (Formerly 2880:201)

AMET:211 Manufacturing Operations (3 Credits)
A study of all functions involved in a manufacturing production system. Areas covered include product design, forecasting, capacity planning, scheduling, materials management, and project management. (Formerly 2880:211)

AMET:225 Computer Aided Tool Design (3 Credits)
Prerequisite: AMET 140 or MCET 121. The study of standard tool design practices and procedures utilizing industry-standard computer-aided design software. (Formerly 2880:225)

AMET:230 3-D Modeling & Design (3 Credits)
Prerequisite: AMET 140 or MCET 121. This course covers advanced topics in the use of AutoCAD. These topics include 3-D modeling. Laboratory. (Formerly 2880:230)

AMET:232 Labor Management Relations (3 Credits)
Prerequisite: AMET 100. Study of historical background of labor movement, management viewpoints, legal framework for modern labor organizations and collective bargaining process. (Formerly 2880:232)

AMET:241 Introduction to Quality Assurance (3 Credits)
Prerequisite: MATH:152, MATH:143, MATH:144, or MATH:145 . Theory and practice of inspection and sampling techniques for measurement of quality, QC charts, sampling plans, mill specs, checking machine capabilities, and setting tolerances. (Formerly 2880:241)

AMET:248 Introduction to CNC and Additive Manufacturing (3 Credits)
Prerequisites: MATH 153 and [AMET 140 or MCET 121] or permission. This course provides an overview of CNC manual programming utilizing the G-code programming language along with an introduction to additive manufacturing processes. (Formerly 2880:248)

AMET:290 Special Topics: Industrial Technology (1-2 Credits)
Prerequisite: Permission. Selected topics or subject areas of interest in industrial technology. (May be repeated for a total of four credits) (Formerly 2880:290)

AMET:301 Computer Control of Automated Systems (3 Credits)
The development of computer based systems and computer programs using robotics and machine controllers as the solutions for automated manufacturing problems. (Formerly 2870:301)

AMET:311 Facilities Planning (3 Credits)
Prerequisite: MCET:121 or permission. An application based study of facilities analysis, design and layout utilizing software based solutions. (Formerly 2870:311)

AMET:332 Management of Technology Based Operations (3 Credits)
A study of the techniques and knowledge necessary to effectively manage technical personnel. (Formerly 2870:332)

AMET:348 CNC Programming I (3 Credits)
Prerequisites: [MATH 154 and MCET 121] or AMET 248, or permission. Introduction to CAM (Computer Aided Manufacturing) based CNC (Computer Numerical Control) programming; development of milling, drilling, and turning programs. (Formerly 2870:348)

AMET:441 Advanced Quality Practices (3 Credits)
Prerequisite: AMET 241 or permission. Specific quality assurance procedures will be developed conceptually, proven mathematically, and then tested in lab exercises. Industry accepted SQC software will be used. (Formerly 2870:441)

AMET:448 CNC Programming II (3 Credits)
Prerequisite: AMET 348. The study of advanced CNC programming techniques utilizing an industry standard CAM programming software package and CNC program verification software. (Formerly 2870:448)

AMET:470 Simulation of Manufacturing Systems (3 Credits)
Prerequisite: AMET 211. Computer simulation solutions applied to the traditional manufacturing problems of equipment justification, production line balancing, and capacity planning. (Formerly 2870:470)

AMET:480 Automated Production (3 Credits)
Prerequisites: AMET 301, AMET 448, and AMET 201. A study of the automated production system. The various systems studied thus far, CNC, robotics, automated machines via PLCs, and facilities design, are integrated and analyzed from a production standpoint. (Formerly 2870:480)

AMET:485 SME Manufacturing Technologist Certification Preparation (2 Credits)
Prerequisites: AMET 441 and MCET 347. Pre/Corequisite: AMET 480. Provides a review for the SME Manufacturing Technologist Certification Exam. Topics include a review of materials and manufacturing processes, automated systems and control, quality and process control methods, manufacturing management, and other topics appearing on the exam. (Formerly 2870:485)

AMET:490 Manufacturing Project (2 Credits)
Prerequisite: Senior status. Advanced CADCAM topics are presented. A comprehensive project is undertaken. (Formerly 2870:490)

AMET:495 Individual Investigation in Manufacturing Engineering Technology (2 Credits)
Selected topic(s) that provide for specific individual study in the area of manufacturing engineering technology under the direct supervision of a faculty member. (Formerly 2870:495)

AMET:496 Special Topics in Manufacturing Engineering Technology (1-3 Credits)
Prerequisite: Permission. Selected topic(s) that provide for specific course work in the area of manufacturing engineering technology offered once or only occasionally in areas where no formal course exists. (Formerly 2870:496)

AMET:499 Workshop in Manufacturing Engineering Technology (1-3 Credits)
Prerequisite: Permission. Group studies of special topics in manufacturing engineering technology. (Formerly 2870:499)

Mechanical Engineering Technology (MCET)

MCET:100 Survey of Mechanical Engineering Technology (2 Credits)
Corequisite: MATH 154. Overview of the Mechanical Engineering Technology degree programs; pre-testing; career opportunities; professional societies & certification; standards; and useful tools of the MET field. (Formerly 2920:100)

MCET:101 Introduction to Mechanical Design (3 Credits)
Prerequisite: AMET 140 or MCET 121. Corequisites: [AMET 230 or MCET 100] and MATH 154. Topics in engineering drawing: conventions, sections, dimensioning and tolerancing. Detail drawings, subassembly and assembly drawings. Introduction to various mechanical components and mechanical design tools. (Formerly 2920:101)

MCET:102 Introduction to Engineering Technology (2 Credits)
This introductory course stresses skills needed for academic success. Discussion of fields in engineering technology, job searches, calculators, and data measurement and analysis are included. (Formerly 2820:100)

MCET:110 Physical Science for Technicians (3 Credits)
Elementary presentation of theory and facts of general chemistry and physics (excluding electricity). Includes atomic structure, chemical reactions, energy, electromagnetic radiation, sound and mechanics. (Formerly 2820:110)

MCET:121 Fundamentals of Engineering Drawing (3 Credits)
Fundamentals of engineering drawing using freehand sketching and CAD; orthographic and isometric projections, sectioning, assemblies, and introduction to geometric dimensioning and tolerancing. Laboratory. (Formerly 2920:121)

MCET:130 Introduction to Hydraulics and Pneumatics (3 Credits)
Principles of hydrostatic forces, pressure, density, viscosity, incompressible and compressible fluids. Principles of hydraulic and pneumatic devices and systems. (Formerly 2920:130)

MCET:131 Software Applications for Technology (1 Credit)
Prerequisite: MATH 153. Word processing and spreadsheets used within technical applications. this course focuses on using software for technical reports and data analysis. Laboratory. (Formerly 2820:131)

MCET:142 Introduction to Material Technology (3 Credits)
Fundamental properties of materials. Material testing. Applications of methods to control material properties. (Formerly 2920:142)

MCET:243 Kinematics (3 Credits)
Prerequisite: COET 125. Corequisite: MCET 101. Study of rigid-body motions of simple linkages, cams, gears, and gear trains. Vector solutions emphasized. Industrial applications presented and computers used to analyze mechanisms. (Formerly 2920:243)

MCET:245 Mechanical Design II (5 Credits)
Prerequisites: MCET 101, MCET 243, and COET 225. Corequisite: MCET 142. Advanced stress and fatigue analysis, theories of failure. Design of machine elements: gears, keys and keyways. Experimental stress analysis and design projects. (Formerly 2920:245)

MCET:249 Applied Thermal Energy I (2 Credits)
Prerequisites: MATH 255 and PHYS 164. Thermodynamic principles. Study of power cycles. Applications in I.C. engines, compressors, steam power cycles, refrigeration. (Formerly 2920:249)

MCET:251 Fluid Power (2 Credits)
Prerequisites: PHYS 160 and PHYS 164. Statics and dynamics of fluids. Viscosity, energy and momentum relationships. Fluid machinery and measurements. (Formerly 2920:251)

MCET:252 Thermo-Fluids Laboratory (1 Credit)
Prerequisite: MCET 251. Corequisite: MCET 249. Laboratory experiments in applied thermal energy and fluid power. (Formerly 2920:252)

MCET:290 Special Topics: Mechanical Engineering Technology (1-3 Credits)
Prerequisite: Permission. Selected topics or subject areas of interest in Mechanical Engineering Technology. (May be repeated for a total of four credits) (Formerly 2920:290)

MCET:310 Economics of Technology (3 Credits)
Prerequisite: 64 credits or permission. Economic principles as they pertain to technology. Equivalence, alternatives, costs, depreciation, valuation. Project studies. (Formerly 2920:310)

MCET:312 Programming for Technologists (2 Credits)
Prerequisites: MCET 131 and MATH 255. A study of a technical programming language with applications in engineering technology. Limited to students in Engineering & Science Technology Department programs. (Formerly 2820:310)

MCET:344 Dynamics (3 Credits)
Prerequisites: MCET 243, MATH 255, and COET 125. Introduces particle dynamics, displacement, velocity, and acceleration of constrained rigid bodies in plane motion. Kinetics of particles and rigid bodies, work and energy, mechanical vibration. (Formerly 2920:344)

MCET:346 Mechanical Design III (4 Credits)
Prerequisites: MCET 245 and MCET 344. Continuation of design of mechanical components: gears, bearings, shafts, springs, and fasteners. Special topics presented will be coordinated with assigned design projects. (Formerly 2920:346)

MCET:347 Production Machinery & Processes (3 Credits)
Prerequisites: MATH 255 and [AMET 110 or MCET 142]. Study of manufacturing processes (casting, forging, welding, forming sheet metal), integrating material technology, mechanical design, and mechanics of materials. (Formerly 2920:347)

MCET:365 Applied Thermal Energy II (3 Credits)
Prerequisites: MATH 255, MCET 249, and MCET 251. Review and application of basic thermodynamic principles used in designing automotive engines and refrigeration equipment. Introduction to heat transfer, heating, ventilation, and air conditioning. (Formerly 2920:365)

MCET:370 Plastics Design & Process (3 Credits)
Prerequisite: CHEM 151. Introduction to structure and properties of polymers, selection based on properties and cost, design of products and tools, basic principles of the major processes. (Formerly 2920:370)

MCET:402 Mechanical Projects (2 Credits)
Prerequisites: MCET 310, MCET 365, MCET 370, MCET 490, and [AMET 301 or MCET 405]. Individual projects emphasizing creative technical design. (Formerly 2920:402)

MCET:405 Introduction to Industrial Machine Control (3 Credits)
Prerequisite: EEET 370. Principles and design of industrial machine control systems. Application oriented study of typical control devices. Utilization of programmable controllers as the system logic controllers. (Formerly 2920:405)

MCET:470 Plastics Processing & Testing (2 Credits)
Prerequisite: MCET 370 or permission. Use of basic polymer testing methods. Setup and operation of modern molding and extrusion equipment. Basic troubleshooting procedures. Study of processing effects on final properties. (Formerly 2920:470)

MCET:490 Mechanical Engineering Technology Senior Seminar (1 Credit)
Prerequisites: MCET 346 and MCET 347. An opportunity for post-testing of all MET students and the presentation of social and professional responsibilities, diversity, professional certification, life-long learning, and career opportunities. (Formerly 2920:490)

MCET:497 Senior Honors Project in Mechanical Engineering Technology (1-3 Credits)
Prerequisites: Senior standing in Honors Program, permission of area honors preceptor, and major in mechanical technology. Independent research leading to completion of senior honors thesis or other original work. (May be repeated for a total of six credits) (Formerly 2920:497)

MCET:498 Independent Study in Mechanical Engineering Technology (1-4 Credits)
Prerequisite: Permission. Directed study in a special field of interest chosen by the student in consultation with the instructor. (May be repeated for a total of six credits). (Formerly 2920:498)

Mechanical Engineering (MECE)

MECE:165 Tools for Mechanical Engineering (2 Credits)
Pre/Corequisite: MATH 149 or placement test. Introduction to the mechanical engineering profession and curriculum, and solid modeling. (Formerly 4600:165)

MECE:166 ME Freshman Design Project (2 Credits)
Prerequisite: MECE 165. Pre/Corequisite: MATH 221. Teamwork and project planning; semester project involving project design and manufacturing.

MECE:203 Dynamics (3 Credits)
Prerequisites: MATH 222, PHYS 291, and CIVE 201. Corequisite: MATH 223. Kinematics and kinetics of particles and rigid bodies. Principles of work, energy, momentum and impulse. (Formerly 4600:203)

MECE:260 Engineering Analysis I (2 Credits)
Prerequisite: MATH 222. Corequisite: MATH 223. Introduction to numerical methods in mechanical engineering; applications of computer tools (MatLab). (Formerly 4600:260)

MECE:300 Thermodynamics I (3 Credits)
Prerequisites: MATH 223 and admission to an engineering major within the College of Engineering and Polymer Science. Corequisite: PHYS 292. Basic concepts of thermodynamics. Pure substances, closed and open systems, the first and second laws of thermodynamics. Entropy, vapor power cycles and vapor compression refrigeration. (Formerly 4600:300)

MECE:301 Thermodynamics II (2 Credits)
Prerequisites: MATH 335, MECE 300 and admission to an engineering major within the College of Engineering and Polymer Science. Absorption refrigeration. Gas cycles. Thermodynamics of state, gas mixtures and gas-vapor mixtures. Combustion. (Formerly 4600:301)

MECE:305 Thermal Science (2 Credits)
Prerequisite: MATH 223 and admission to an engineering major within the College of Engineering and Polymer Science. Corequisite: PHYS 292. Credit not allowed for both 300 and 305. Introduction to first and second laws of thermodynamics, perfect gas relationships, equations of state, cycle analysis. Introduction to conduction, convection and radiation heat transfer. (Formerly 4600:305)

MECE:310 Fluid Mechanics I (2 Credits)
Prerequisites: MATH 223, MECE 203 and admission to an engineering major within the College of Engineering and Polymer Science. Properties and behavior of gases and liquids at rest and in motion. Energy equation. Flow in conduits. Forces on body submerged in moving fluid. Dimensional analysis and similitude. (Formerly 4600:310)

MECE:311 Fluid Mechanics II (3 Credits)
Prerequisites: MATH 335, MECE 310 and admission to an engineering major within the College of Engineering and Polymer Science. Navier-Stokes equations. The boundary layer. External viscous flows and potential flow. Fundamentals of compressible flow. Concepts of computational fluid dynamics. (Formerly 4600:311)

MECE:315 Heat Transfer (3 Credits)
Prerequisites: MECE 300, [MECE 310 or BMEN 360], [MECE 360 or BMEN 220] and admission to an engineering major within the College of Engineering and Polymer Science. Fundamentals of heat transfer by conduction, convection and radiation. (Formerly 4600:315)

MECE:321 Kinematics of Machines (2 Credits)
Prerequisites: MECE 165, MECE 203 and admission to an engineering major within the College of Engineering and Polymer Science. Displacements, velocities, accelerations and introduction to plan motion mechanisms. Introduction to design of gears, gear trains and cams. (Formerly 4600:321)

MECE:336 Analysis of Mechanical Components (3 Credits)
Prerequisites: CIVE 202 and admission to an engineering major within the College of Engineering and Polymer Science. Corequisite: MATH 335. Analysis of stress and strain at a point. Mohr's circles, shear centers, elastic instability. Stresses in thick and thin cylinders. Fatigue analysis. (Formerly 4600:336)

MECE:337 Design of Mechanical Components (3 Credits)
Prerequisites: [MECE 336 or AESE 336] and admission to an engineering major within the College of Engineering and Polymer Science. Application of stress analysis to design of fasteners, welds, springs, ball bearings and gears. Introduction to journal bearings and lubrication. Component design projects. (Formerly 4600:337)

MECE:340 Systems Dynamics & Response (3 Credits)
Prerequisites: MATH 335, MECE 203 and admission to an engineering major within the College of Engineering and Polymer Science. A unified approach to modeling, analysis, response and stability of engineering systems: analog, digital and hybrid computer simulation of interdisciplinary engineering problems are included. (Formerly 4600:340)

MECE:360 Engineering Analysis II (2 Credits)
Prerequisites: MATH 335, MECE 260 and admission to an engineering major within the College of Engineering and Polymer Science. Numerical methods of solution of mechanical engineering problems. (Formerly 4600:360)

MECE:380 Introduction to Materials Science and Engineering (2 Credits)
Prerequisites: CHEM 153 and admission to an engineering major within the College of Engineering and Polymer Science. Corequisite: CIVE 202. Introduction to metallurgy and advanced engineering materials including polymers, composites and ceramics. Topics include structure of materials, macroscopic mechanical behavior, phase change and heat treatment of metals, and theories of failure. (Formerly 4600:380)

MECE:400 Thermal System Components (3 Credits)
Prerequisites: MECE 315, [MECE 311 or MECE 411], and full admission to an engineering program in the College of Engineering and Polymer Science. Performance analysis and design of basic components of thermal energy exchange and conversion systems. Components studied include heat exchangers, pumps, compressors, turbines and expansion engines. (Formerly 4600:400)

MECE:402 Senior Seminar (1 Credit)
Prerequisite: Admission to an engineering program in the College of Engineering and Polymer Science. Pre/Corequisites: MECE 315 and [MECE 337 or AESE 460]. Students need further education in ethics, codes and standards, intellectual property, product liability, safety issues, technical writing, diversity, and job opportunities. (Formerly 4600:402)

MECE:410 Heating & Air Conditioning (3 Credits)
Prerequisite: MECE 301 or permission. Corequisite: MECE 315 or permission. Thermodynamics of gas mixtures. Design and selection of air conditioning equipment. Control of gas mixtures, heating, cooling and humidity. (Formerly 4600:410)

MECE:411 Compressible Fluid Mechanics (3 Credits)
Prerequisites: MECE 300, MECE 310 and full admission to an engineering program in the College of Engineering and Polymer Science. Subsonic and supersonic flow in nozzles, diffusers and ducts. One-dimensional reactive gas dynamics. Prandtl-Myer theory. Applications to design and analysis of compressors, turbines and propulsion devices. (Formerly 4600:411)

MECE:412 Fundamentals of Flight (3 Credits)
Prerequisites: [MECE 311 or MECE 411], MECE 413 and full admission to an engineering program in the College of Engineering and Polymer Science. Introduction to basic aerodynamics, airplane performance, stability and control, astronautics and propulsion. Design considerations are emphasized. (Formerly 4600:412)

MECE:413 Introduction to Aerodynamics (3 Credits)
Prerequisites: MECE 300, MECE 310, and full admission to an engineering program in the College of Engineering and Polymer Science. Introduction of aerodynamic concepts; includes conformal transformations, theory of thin airfoils, two-dimensional airfoil theory, wings of finite span, lifting line theories, lumped vortex, vortex lattice, and panel methods. (Formerly 4600:413)

MECE:414 Introduction to Aerospace Propulsion (3 Credits)
Prerequisites: [MECE 311 or MECE 411] and full admission to an engineering program in the College of Engineering and Polymer Science. Introduction to propulsion systems currently used in aerospace fields; propulsion principles for turbojets, turbofans, ramjets, chemical rockets, and electrical rocket propulsion. (Formerly 4600:414)

MECE:415 Energy Conversion (3 Credits)
Prerequisites: MECE 301 or permission. Corequisite: MECE 315 or permission. Topics from fields of internal combustion engines, cycle analysis, modern conversion devices. (Formerly 4600:415)

MECE:416 Heat Transfer Processes (3 Credits)
Prerequisite: MECE 315 or permission. Analysis, design of extended surfaces. Natural convection and mixed convection, combined modes of heat transfer and heat transfer with phase changes. (Formerly 4600:416)

MECE:420 Introduction to Finite Element Method (3 Credits)
Prerequisites: CIVE 202, [MECE 315 or BMEN 362], and admission to an engineering major within the College of Engineering and Polymer Science. Introduction to matrix and finite element methods. Stiffness and flexibility formulations in solid mechanics and thermal sciences. Basic finite element methods and its implementation. (Formerly 4600:420)

MECE:422 Experimental Stress Analysis I (3 Credits)
Prerequisite: MECE 336 or permission. Experimental methods of determining stress or strain: brittle lacquer, strain gages, photoelasticity, full field techniques. (Formerly 4600:422)

MECE:430 Machine Dynamics (3 Credits)
Prerequisite: MECE 321 or permission. Static and dynamic forces in machines, products of inertia, dynamic equivalence, flywheels. Balancing of rotating, reciprocating, cyclic plane motion. Computer simulation of transient mechanism dynamics, other topics in advanced dynamics. (Formerly 4600:430)

MECE:431 Fundamentals of Mechanical Vibrations (3 Credits)
Prerequisites: MATH 335, MECE 203 and admission to an engineering major within the College of Engineering and Polymer Science or permission. Undamped and forced vibrations of systems having one or two degrees of freedom. (Formerly 4600:431)

MECE:432 Vehicle Dynamics (3 Credits)
Prerequisites: MECE 203 and MATH 335 or permission. Application of dynamic systems analysis techniques to road vehicles. Newtonian and Lagrangian methods. Tire/road interface. Ride characteristics, handling and stability. Digital simulation. (Formerly 4600:432)

MECE:440 System Dynamics & Control (4 Credits)
See department for course description. (Formerly 4600:440)

MECE:441 Control Systems Design (3 Credits)
Prerequisites: MECE 340 and admission to an engineering major within the College of Engineering and Polymer Science or permission. Methods of feedback control design such as minimized error, root-locus, frequency domain. Compensation techniques. Multivariable and nonlinear design methods and computer-aided control design. (Formerly 4600:441)

MECE:442 Industrial Automatic Control (3 Credits)
Prerequisite: MECE 441 or permission. Operation of basic control mechanisms. Study of mechanical, hydraulic, pneumatic, fluidic control systems, including application areas. Tuning of control devices for optimum performance of system. Case studies on control applications from industry, e.g. boilers, furnaces, process heaters. (Formerly 4600:442)

MECE:443 Optimization Methods in Mechanical Engineering (3 Credits)
Prerequisite: MECE 360 or permission. Development and method of solution of optimization problems in mechanical engineering. The use of dynamic programming and operational research methods for optimization including computer utilization and applications. (Formerly 4600:443)

MECE:444 Robot Design, Control & Application (3 Credits)
Prerequisites: MECE 321, MECE 441 and admission to a degree-granting program in the College of Engineering and Polymer Science. Robot design and control. Kinematic transformations, velocities and accelerations, path trajectories and dynamics, control and sensing in robotics. The automated factory with robot applications. (Formerly 4600:444)

MECE:450 Introduction to Computational Fluid Flow & Convection (3 Credits)
Prerequisites: MECE 315 and MECE 360 or permission. Numerical modeling of fluid/thermal systems; numerical solution of the momentum and thermal boundary layer equations; flow simulation using advanced heat transfer/fluid/graphics packages. (Formerly 4600:450)

MECE:460 Concepts of Design (3 Credits)
Prerequisites: MECE 337 and admission to an engineering major within the College of Engineering and Polymer Science. Design process. Creativity and inventiveness. Tools of decision making, engineering economics, reliability, optimization. Case studies. (Formerly 4600:460)

MECE:461 ME Senior Design Project I (2 Credits)
Prerequisite: Admission to an engineering major within the College of Engineering and Polymer Science. Pre/Corequisites: MECE 301, MECE 340 and MECE 337. Detailed senior design project. Design, feasibility, and cost analysis. (Formerly 4600:461)
Gen Ed: - Capstone

MECE:462 Pressure Vessel Design (3 Credits)
Prerequisite: MECE 336 or permission. Introduction to modern pressure vessel technology. Topics include basic structural considerations, materials and their environment and design-construction features. (Formerly 4600:462)

MECE:463 Computer Aided Design & Manufacturing (3 Credits)
Prerequisites: MECE 165 and MECE 360 or permission. The use of computer systems to assist in the creation, modification, analysis, or optimization of engineering designs, and to plan, manage, and control manufacturing plants. (Formerly 4600:463)

MECE:465 Technology Based Startups: Ideate, Invent and Innovate (3 Credits)
Prerequisite: Permission of the department. This course will provide students with the opportunity to extend their fundamental knowledge of entrepreneurship within the specific interdisciplinary context of technology commercialization. Working in interdisciplinary groups the student teams/groups will be taught design thinking approaches that put the customer at the center of the creative process. Brainstorming exercises will be held to solve open ended problems on special topics (e.g. biomimicry, software, medical devices, sensors etc.) so that teams can ideate and conceptualize product, process or service based ideas that solve real problems. In some cases, students can be assigned known research technologies and learn how to come up with applications that have commercialization potential. The evaluation will include, but not be limited to, evaluation of the underlying technology, determination of potential customer value proposition(s), determination of market feasibility, examination of licensing/spin-off options, identification of potential licensees, estimation of potential market size and value, and development of recommendations for further funding, growth (or abandonment). By working in teams, students will learn how to create/invent a product prototype, learn how to listen to potential customers and come back to describe the value proposition that will make the startup successful. (Formerly 4600:465)

MECE:471 ME Senior Design Project II (2 Credits)
Prerequisites: MECE 461 and admission to an engineering major within the College of Engineering and Polymer Science. Detailed senior design project. Final design and implementation. (Formerly 4600:471)

MECE:480 Materials Selection in Design (3 Credits)
Prerequisites: [CHEE 305 or MECE 380] and admission to an engineering major within the College of Engineering and Polymer Science or permission. Materials selection from the perspective of design including material properties, processing approaches, shape considerations, hybrid materials, and tradeoffs including environmental and cost. (Formerly 4600:480)

MECE:482 Fundamentals of Composite Processing and Mechanics (3 Credits)
Prerequisites: MATH 335, CIVE 202, and admission to an engineering major within the College of Engineering and Polymer Science. Polymer-matrix composite processing, manufacturing, and mechanics. The emphasis is on discontinuous fiber reinforcements. (Formerly 4600:482)

MECE:483 Measurements Laboratory (2 Credits)
Prerequisites: MECE 300, MECE 310, and full admission to an engineering program in the College of Engineering and Polymer Science. Development of methods to measure temperature, pressure, flow rate, viscosity and motion. Includes both lecture and laboratory experience and emphasizes calibration and accuracy of appropriate instruments. (Formerly 4600:483)

MECE:484 Mechanical Engineering Laboratory (2 Credits)
Prerequisites: MECE 301, MECE 311, MECE 315, MECE 380, MECE 431, MECE 483, and admission to an engineering major within the College of Engineering and Polymer Science. Corequisite: MECE 441. Laboratory experiments in area of dynamics, vibrations, thermodynamics, fluids, heat transfer and controls. (Formerly 4600:484)

MECE:485 3D Printing and Additive Manufacturing (3 Credits)
Prerequisites: MECE 165, MECE 360, and junior or greater standing or permission. Introduction to 3D Printing and Additive Manufacturing including various processes, materials, and applications; Hands-on practice and design/manufacturing project; State of the art of 3D Printing. (Formerly 4600:485)

MECE:486 Special Topics: Mechanical Engineering (1-3 Credits)
Prerequisite: Permission. Brief description of current content to be announced in schedule of classes. (Formerly 4600:486)

MECE:497 Honors Project in Mechanical Engineering (2 Credits)
Prerequisites: MECE 461 and admission to an engineering major in the College of Engineering and Polymer Science. Capstone design project in thermal science, mechanics or a research topic relevant to mechanical engineering, supervised by faculty member of the department. (Formerly 4600:497)

MECE:498 Experimental Investigation in Mechanical Engineering (1-2 Credits)
Individual independent laboratory investigations in areas relevant to mechanical engineering. Student suggests a project and makes appropriate arrangements with faculty for supervision. (Formerly 4600:498)

Aerospace Systems Engineering (AESE)

AESE:165 Tools for Aerospace Systems Engineering (2 Credits)
Pre/Corequisite: MATH 149. Computer applications, solid modeling, introduction to programming, and introduction to aerospace engineering program and curriculum; outside speakers; project involving design and construction of small RC aircraft. (Formerly 4900:165)

AESE:166 Aerospace Systems Project Management (1 Credit)
Prerequisite: AESE 165. Teamwork and project planning; semester project involving continuation of design and construction of small RC aircraft in conjunction with SAE Aero Design. (Formerly 4900:166)

AESE:240 Aerospace Systems Engineering I (3 Credits)
Prerequisite: MATH 223. An introductory systems course focusing on systems thinking, systems engineering tools, reliability, life-cycle analysis and statistics. (Formerly 4900:240)

AESE:320 Aerospace Systems Engineering II (3 Credits)
Prerequisites: MECE 360, AESE 240 and full admission to an engineering program in the College of Engineering and Polymer Science. An extended study of systems topics including linear programming, optimization, decision making, critical path scheduling, and verification. (Formerly 4900:320)

AESE:336 Aerospace Structures (3 Credits)
Prerequisites: CIVE 202, MATH 335. Basic theory and methods for analysis and design of aerostructures are covered. Topics include torsion, shear flow, buckling, fracture, and fatigue of beams and plates. (Formerly 4900:336)

AESE:340 Avionics I (3 Credits)
Prerequisites: ELEN 307 and admission to an engineering major within the College of Engineering and Polymer Science. Electronics for aircraft applications. Amplifiers, filters, regulators, current sources, buffers, sensor and actuator circuits, transmitters, and receivers. (Formerly 4900:340)

AESE:380 Aerospace Materials (3 Credits)
Prerequisites: CHEM 151, CHEM 152, CIVE 202 and admission to an engineering major within the College of Engineering and Polymer Science or permission. Theory in science and application of materials for aerospace structures, macroscopic behavior of materials, order and disorder in mechanical behavior, evaluating and quantifying mechanical response. (Formerly 4900:380)

AESE:420 Model-based Systems Engineering (3 Credits)
Prerequisites: AESE 320 and admission to an engineering major within the College of Engineering and Polymer Science. This course introduces model-based engineering through SysML, a graphical systems modeling language that is being promoted as an alternative to the unified modeling language (UML) to address systems engineering. (Formerly 4900:420)

AESE:440 Avionics II (3 Credits)
Prerequisites: AESE 340 and admission to an engineering major within the College of Engineering and Polymer Science. Pre/Corequisite: MECE 412. Communication and control for aircraft applications. Fourier analysis, AM and FM principles, modulators demodulators, communication systems. aircraft system dynamics, classical control system principles and applications. (Formerly 4900:440)

AESE:450 Aerospace Computations (3 Credits)
Prerequisites: CIVE 202, MECE 315, MECE 360, MECE 411 and admission to an engineering major within the College of Engineering and Polymer Science or permission of instructor. Introduction to finite element and finite volume methods in aerospace engineering; fundamental principles of FEM and FVM discussed and illustrated through structural, and aerodynamic applications. (Formerly 4900:450)

AESE:460 Aerospace Systems Manufacturing (3 Credits)
Prerequisites: MECE 360 or equivalent and admission to an engineering major within the College of Engineering and Polymer Science or permission of instructor. Using computer systems to assist in creation, modification, analysis, or optimization of engineering designs, planning, management and control of manufacturing, CAD software with manufacturing applications. (Formerly 4900:460)

AESE:490 Aerospace Design Project (2 Credits)
Prerequisites: Senior standing and admission to an engineering major within the College of Engineering and Polymer Science or permission. Detailed senior design project. Design, feasibility and cost analysis, final design and implementation; engine, airframe and aerodynamic testing. (Formerly 4900:490)
Gen Ed: - Complex Issues Facing Society

AESE:491 Aerospace Design Project I (1 Credit)
Prerequisites: Senior standing and admission into the Aerospace Systems Engineering program. Preliminary senior design project including the design proposal, feasibility, cost analysis and preliminary design. (Formerly 4900:491)
Gen Ed: - Capstone

AESE:492 Aerospace Design Project II (2 Credits)
Prerequisite: AESE 491. Detailed senior design project. Final design, testing and implementation (Formerly 4900:492)

AESE:497 Aerospace Honors Project (2 Credits)
Prerequisite: Senior standing in Honors College or permission. Individual creative project in Aerospace Systems, supervised by faculty member of the department. Includes design, feasibility and cost analysis, final design and implementation. (Formerly 4900:497)
Gen Ed: - Complex Issues Facing Society