

MECHANICAL ENGINEERING (MECE)

MECE 165 Tools for Mechanical Engineering (2 Units)

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 Units)

Prerequisite: MECE 165. Pre/Corequisite: MATH 221. Teamwork and project planning; semester project involving project design and manufacturing.

MECE 203 Dynamics (3 Units)

Prerequisites: MATH 222, PHYS 291, and CIVE 201. Pre/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 Units)

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 Units)

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 Units)

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 Units)

Prerequisite: MATH 223 and admission to an engineering major within the College of Engineering and Polymer Science. Pre/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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

Prerequisites: CIVE 201 and admission to an engineering major within the College of Engineering and Polymer Science. Pre/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 Units)

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 Units)

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 (3 Units)

Prerequisites: [MECE 166 or AESE 166], MATH 223, admission to an engineering major within the College of Engineering and Polymer Science, and sophomore or greater standing. Pre/Corequisite: MATH 335. Numerical methods of solution of mechanical engineering problems including topics from linear algebra, root finding, least squares regression, interpolation and splines, numerical integration, differentiation and differential equations. (Formerly 4600:360)

MECE 380 Introduction to Materials Science and Engineering (3 Units)

Prerequisites: CHEM 151, admission to an engineering major within the College of Engineering and Polymer Science, and sophomore or greater standing. Pre/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 Units)

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 Unit)

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 Units)

Prerequisite: MECE 301 or permission. Pre/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 Units)

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 Aircraft Flight Mechanics (3 Units)

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 Units)

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 Units)

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 Units)

Prerequisites: MECE 301 or permission. Pre/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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

See department for course description. (Formerly 4600:440)

MECE 441 Control Systems Design (3 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 451 Tribology (3 Units)

Prerequisite: MECE 380 or CHEE 305 or BMEN 300 or PSPE 202. Fundamentals of friction lubrication and wear are treated; includes origins of friction and wear, material properties and contacting surfaces, lubricants and their function, and engineering approaches to mitigate friction and wear. Specific topics include adhesive and abrasive friction/wear, boundary lubrication, fluid film bearings and their lubrication, rolling element bearings, bearing modeling, materials and engineering.

MECE 460 Concepts of Design (3 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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 Units)

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)