MECHANICAL ENGINEERING-MECH (MECH)

Courses

MECH 103 Introduction to Mechanical Engineering Credits: 3 (3-0-0)
Course Description: Introduction to mechanical engineering, including relevant programming and computer technologies such as MATLAB and Excel.
Prerequisite: None.
Registration Information: Credit allowed for only one of the following: ENGR 111, ENGR 123, MECH 103, or MECH 104A. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 104A Study Abroad--Germany: Introduction to Mechanical Engineering Credits: 3 (0-0-0)
Course Description: Introduction to mechanical engineering, and relevant programming and computer technologies, including MATLAB and Excel. Exploration of global engineering in Berlin, Germany. Explore concepts through guest lectures, discussion with German engineers, and visits to German engineering companies.
Prerequisite: None.
Registration Information: Written consent of advisor. Credit allowed for only one of the following: MECH 103, MECH 104A, or MECH 182A.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 105 Mechanical Engineering Problem Solving Credits: 3 (3-0-0)
Course Description: Programming and engineering problem solving techniques, algorithms and processes based on first principles of physics and calculus.
Prerequisite: (MATH 159, may be taken concurrently or MATH 160, may be taken concurrently) and (MECH 103 and PH 141, may be taken concurrently).
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: MECH 102, MECH 105, or MECH 305.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 200 Introduction to Manufacturing Processes Credits: 3 (2-2-0)
Course Description: Engineering drawings, materials, manufacturing, and safety. Hand tools, cutting, drilling, the lathe, mill and numerical control.
Prerequisite: MECH 105.
Registration Information: Mechanical Engineering and Biomedical Engineering-Mechanical Engineering dual majors only. Must register for lecture and laboratory. Credit not allowed for both MECH 200 and MECH 200A. Credit not allowed for both MECH 200 and MECH 200B.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 200A Introduction to Manufacturing Processes: Lecture Credits: 3 (3-0-0)
Course Description: Design for manufacturing principles and manufacturing processes with focus on safety and engineering ethics. Machining, polymer and sheet metal forming, casting, forging, CNC milling and turning, welding, and industrial automation. Materials selection, geometric dimensioning and tolerancing, and industry certifications.
Prerequisite: MECH 201 or MECH 210, may be taken concurrently.
Registration Information: Mechanical Engineering and Biomedical Engineering-Mechanical Engineering majors only. Credit not allowed for both MECH 200 and MECH 200A. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 200B Introduction to Manufacturing Processes : Laboratory Credit: 1 (0-2-0)
Course Description: Applied introduction to engineering drawings, materials, manufacturing processes, and shop safety. Basic hand tools, cutting, grinding, the lathe, mill, introduction to numerical control. Experiential learning is emphasized through hands-on laboratory activities.
Prerequisite: MECH 200A, may be taken concurrently.
Registration Information: Mechanical Engineering and Biomedical Engineering-Mechanical Engineering dual majors only. Credit not allowed for both MECH 200 and MECH 200B.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 201 Engineering Design I Credits: 2 (1-2-0)
Course Description: Engineering design methods used to portray three-dimensional objects and visually communicate design information, with an emphasis on computer-aided design using parametric solid modeling, and geometric dimensioning / tolerancing.
Prerequisite: MECH 105.
Registration Information: Must register for lecture and laboratory. Sections may be offered as Mixed Face-to-Face or Online.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 202 Engineering Design II Credits: 3 (2-2-0)
Course Description: The engineering design process with emphasis on teamwork, ideation, decision-making, and project planning as applied to a group design project in mechanical engineering.
Prerequisite: (MECH 200, may be taken concurrently or MECH 200A, may be taken concurrently and MECH 200B, may be taken concurrently) and (MECH 201).
Registration Information: Must register for lecture and laboratory. Credit not allowed for both ENGR 114 and MECH 202.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 207 Mechatronics I Credits: 3 (2-2-0)
Course Description: Passive and active circuit elements, DC and AC circuits analysis, transient and steady-state responses, and introduction to logic networks. Design, build, and test electrical circuits for mechatronic systems.
Prerequisite: MATH 161 and PH 142.
Registration Information: Must register for lecture and laboratory. Mechanical Engineering majors only. Sections may be offered: Online. Credit not allowed for both ECE 204 and MECH 207.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 210 Engineering Design--3D Modeling and Printing Credits: 2 (1-2-0)
Course Description: Transformation of mechanical engineering concepts into practical designs through computer aided design (CAD) and working drawings. Hands-on experience operating 3D printers to create, refine, and optimize mechanical devices.
Prerequisite: None.
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online. Mechanical Engineering majors and Biomedical Mechanical Engineering majors only. Credit not allowed for both MECH 201 and MECH 210.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 231 Engineering Experimentation Credits: 2 (1-2-0)
Course Description: Measurement systems, experimental design, and data acquisition / analysis techniques for engineering applications.
Prerequisite: (MECH 103 or ENGR 111 or MECH 104A or ENGR 123) and (MATH 261, may be taken concurrently).
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 237 Introduction to Thermal Sciences Credits: 3 (3-0-0)
Course Description: First and second laws of thermodynamics, properties of substances, energy conversion, heat transfer, and thermodynamic applications.
Prerequisite: (MATH 159 or MATH 160) and (PH 141).
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: CBE 210, ENGR 337, MECH 237, MECH 337, MECH 339, or MECH 439.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 261 Dynamics for Mechanical Engineers Credits: 3 (3-0-0)
Course Description: Kinematics and kinetics of particles; concepts of work-energy and impulse-momentum; vector notation.
Prerequisite: CIVE 260.
Registration Information: Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 262 Engineering Mechanics Credits: 4 (4-0-0)
Course Description: Forces, static equilibrium, mass center, moments of inertia, kinematics and kinetics of particles and rigid bodies.
Prerequisite: (MATH 161) and (PH 141).
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 301A Engineering Design III: Finite Element Analysis Credit: 1 (0-2-0)
Course Description: Application of computer-aided finite element analysis (FEA) tools for the simulation and prediction of robustness and performance of mechanical components and assemblies.
Prerequisite: CIVE 360 and MECH 202, may be taken concurrently.
Registration Information: This is a partial semester course. Sections may be offered: Mixed Face-to-Face or Online. Credit not allowed for both (MECH 301 and MECH 301A) or (MECH 301A and MECH 302).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 301B Engineering Design III: Computational Fluid Dynamics Credit: 1 (0-2-0)
Course Description: Application of computer-aided computational fluid dynamics (CFD) tools for the simulation and prediction of robustness and performance of mechanical components and assemblies.
Prerequisite: CIVE 360 and MECH 202, may be taken concurrently and MECH 301A, may be taken concurrently and MECH 342, may be taken concurrently.
Registration Information: This is a partial semester course. Sections may be offered: Mixed Face-to-Face or Online. Credit not allowed for both (MECH 301 and MECH 301B) or (MECH 301B and MECH 302).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 305 Mechanical Engineering Computational Methods Credits: 3 (3-0-0)
Course Description: Mechanical engineering applications of numerical methods, data analysis, programming, and machine learning.
Prerequisite: MATH 340, may be taken concurrently.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 105 and MECH 305.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 307 Mechatronics II Credits: 3 (2-2-0)
Course Description: Sensors; actuators; applied electronics; microcontroller interfacing and programming; open and closed loop control systems; mechatronic systems analysis and design.
Prerequisite: (CIVE 261 or MECH 261) and (ECE 204 or ECE 206 or MECH 207) and (MATH 340).
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 324 Dynamics of Machines Credits: 4 (3-2-0)
Course Description: Analysis and synthesis of moving machinery.
Prerequisite: (CIVE 261 or MECH 261) and (MATH 340, may be taken concurrently).
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 325 Machine Design with Finite Element Analysis Credits: 4 (3-2-0)
Course Description: Design of mechanical components with application of computer-aided finite element analysis (FEA) tools. Stress analysis, failure theories, and mechanical components in design.
Prerequisite: CIVE 360.
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 331 Introduction to Engineering Materials Credits: 4 (3-2-0)
Course Description: Characteristics of metallic, plastic, and ceramic material; basic principles which relate properties of materials to their atomic and microstructure.
Prerequisite: CHEM 111 and CHEM 112 and MECH 231.
Registration Information: Must register for lecture and laboratory.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 331A Introduction to Engineering Materials: Lecture Credits: 3 (3-0-0)
Course Description: Characteristics of metallic, plastic, and ceramic materials; basic principles that relate properties of materials to their atomic and micro-structure.
Prerequisite: (CHEM 111 and CHEM 112 or CHEM 120 and CHEM 121) and (CIVE 360, may be taken concurrently).
Registration Information: Mechanical engineering and biomedical engineering-mechanical engineering dual majors only. Sections may be offered: Online. Credit not allowed for both MECH 331 and MECH 331A.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 331B Introduction to Engineering Materials : Lab Credit: 1 (0-2-0)
Course Description: Experiments to study and test metallic, plastic, and ceramic material, including approaches to relate properties of materials to their atomic and micro-structure.
Prerequisite: MECH 331A, may be taken concurrently.
Registration Information: Mechanical engineering and biomedical engineering-mechanical engineering dual majors only. Sections may be offered: Online. Credit not allowed for both MECH 331 and MECH 331B.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 337 Thermodynamics Credits: 4 (3-0-1)
Course Description: First and second laws of thermodynamics, properties of pure substances, analysis of open and closed thermodynamic systems, applications of thermodynamic principles to power and refrigeration cycles.
Prerequisite: MATH 261 and PH 141.
Registration Information: Must register for lecture and recitation. Sections may be offered: Online. Credit allowed for only one of the following: CBE 210, ENGR 337, MECH 237, MECH 337, MECH 339, or MECH 439.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 338 Thermal/Fluid Sciences Laboratory Credit: 1 (0-3-0)
Course Description: Experimental methods in heat transfer, fluid flow, and thermodynamics.
Prerequisite: MECH 344, may be taken concurrently.
Registration Information: Biomedical Engineering with ME and Mechanical Engineering majors only.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 339 Thermodynamics I for Mechanical Engineers Credits: 3 (3-0-0)
Course Description: Energy, energy transfer, and general energy analysis. Properties of pure substances, first and second laws of thermodynamics, entropy, introduction to power and refrigeration cycles.
Prerequisite: MATH 261 and PH 141.
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: CBE 210, ENGR 337, MECH 237, MECH 337, MECH 339, or MECH 439.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 342 Fluid Mechanics for Mechanical Engineers Credits: 3 (3-0-0)
Course Description: Thermodynamic properties of fluids, control volume and differential analysis, conservation of mass, momentum, and energy, measurements, dimensional analysis, boundary layer theory, Navier-Stokes equations and exact solutions; internal and external flows, lift and drag, mechanical engineering applications such as pumps, compressors, turbines, and airfoils.
Prerequisite: (ENGR 337 or MECH 337 or MECH 339, may be taken concurrently) and (MATH 340 and PH 141).
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: CBE 331, CIVE 300, ENGR 342, or MECH 342.

Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 344 Heat and Mass Transfer Credits: 3 (3-0-0)
Course Description: Thermal transport properties of substances, conduction, convection, radiation, transient heat transfer, numerical methods, and heat exchangers.
Prerequisite: (ENGR 337 or MECH 337 or MECH 339) and (MECH 342, may be taken concurrently).
Registration Information: Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 392 Graduate Education and Research Seminar Credit: 1 (0-0-1)
Course Description: Research in graduate school and industry as a career option for mechanical engineers.
Prerequisite: MECH 231 and MECH 237.
Registration Information: Written consent of instructor.
Terms Offered: Fall, Spring.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 403 Energy Engineering Credits: 3 (3-0-0)
Course Description: Energy generation, conversion, distribution, storage, and efficiency, including analysis of power generation systems associated with fossil fuels, biofuels, solar, wind, geothermal, hydropower, tidal, and nuclear energy.
Prerequisite: CBE 310 or ENGR 337 or MECH 237 or MECH 337 or MECH 339.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 303 and MECH 403.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 407 Laser Applications in Mechanical Engineering Credits: 3 (3-0-0)
Course Description: Review of electromagnetic waves; applications of lasers and optics in engineering, e.g., position sensing, flowfield measurement, cutting and welding.
Prerequisite: PH 142.
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 408 Applied Engineering Economy Credits: 3 (3-0-0)
Course Description: The basic principles and calculations of engineering economy with application to real problems, including energy and the environment.
Prerequisite: MATH 161.
Registration Information: Credit not allowed for both MECH 408 and MECH 410. Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 411 Manufacturing Engineering Credits: 3 (3-0-0)
Course Description: Casting, forming, machining, and welding processes used in manufacturing operations.
Prerequisite: (CIVE 360) and (MECH 331 or MECH 331A and MECH 331B).
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 414 Machine Learning-Mechanical Engr Automation Credits: 3 (2-2-0)
Course Description: Machine Learning Algorithm; Physics-Informed Neural Networks; Engineer automation; embedded systems; data-driven modelling; system identification; intelligent control; adaptive solutions.
Prerequisite: MECH 307.
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 415 Rotorcraft Modeling and Control Credits: 3 (2-2-0)
Course Description: Fundamentals of rotorcraft, reference frames, kinematic equations, dynamic equations, quadrotor modeling in Simulink, conventional control strategies, Proportional-Integral-Derivative controllers, and advanced controllers. Hands-on experimentation with quadrotor platform and components.
Prerequisite: ECE 411 or MECH 417.
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 416 Introduction to Robotic Manipulators Credits: 3 (2-3-0)
Course Description: Fundamentals for robotic manipulators, including position and velocity kinematics, Jacobians, and trajectory generation. Design, implement, and analyze robotic manipulators.
Prerequisite: ECE 253 or MECH 307.
Registration Information: Must register for lecture and laboratory. Sections may be offered: Online. Credit not allowed for both ECE 455 and MECH 416.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 417 Control Systems Credits: 3 (3-0-0)
Course Description: Feedback and forward loop control design and simulation; discrete time and frequency domain methods with implementation considerations.
Prerequisite: (ECE 312 or MECH 307) and (MATH 340).
Registration Information: Sections may be offered: Online. Credit not allowed for both ECE 411 and MECH 417.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 419 Compressible Flow Credits: 3 (3-0-0)
Course Description: Introduction to compressible fluid dynamics, including speed of sound and Mach number, isentropic 1-D flow in variable area ducts, waves, choked flow, converging-diverging nozzles, moving shocks, blast waves, shock tubes, Rayleigh flow, Fanno flow, normal and oblique shocks, expansion waves, and Crocco's theorem.
Prerequisite: MECH 342.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 419 and MECH 480A6.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 420 Aerospace Structures Credits: 3 (3-0-0)
Course Description: Analysis of aerospace structures; introduction to theory of elasticity, stress analysis of thin-walled structures in bending, torsion, and shear, and finite element methods and applications to aerospace structures.
Prerequisite: MATH 340 and MECH 325.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 421 Fundamentals of Wind Energy Credits: 3 (3-0-0)
Course Description: Fundamental concepts and principles of operation of wind turbines, wind resource prospecting, wind turbine siting and layout, economics of wind power generation, and introduction to design of wind turbines.
Prerequisite: (CIVE 260 or MECH 262) and (MATH 261).
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 421 and MECH 481A5.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 424 Advanced Dynamics Credits: 3 (3-0-0)
Course Description: The fundamentals of kinematics and dynamics of rigid bodies with applications to mechanical engineering. Hamilton's principle and Lagrange's equations for lumped-parameter extended bodies and distributed systems.
Prerequisite: MECH 324.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 425 Mechanical Engineering Vibrations Credits: 4 (3-2-0)
Course Description: Vibrations applied to rotating machinery and structures. SDOF and MDOF systems, mode shapes, vibration measurements and control. Hands-on lab.
Prerequisite: MECH 324.
Registration Information: Must register for lecture and laboratory.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 426 Advanced Machine Design Credits: 3 (3-0-0)
Course Description: Advanced design of mechanical components to avoid / control failure during operation. Design and implementation of specific machine components for real-world applications, including correlations with advanced materials and advanced computational tools.
Prerequisite: (MECH 325) and (MECH 331 or MECH 331A and MECH 331B).
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 427A Study Abroad--Europe: Advanced Machine Design Credits: 3 (0-0-3)
Course Description: Advanced design of mechanical components to avoid / control failure during operation. Design and implementation of specific machine components for real-world applications, including correlations with advanced materials and advanced computational tools. Exploration of global engineering in Europe through guest lectures, discussion with European engineers, and visits to European engineering companies.
Prerequisite: (MECH 325) and (MECH 331 or MECH 331A and MECH 331B).
Registration Information: Written consent of instructor.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 428 Probabilistic Design Credits: 3 (3-0-0)
Course Description: Modeling of uncertainty, probability distributions, determination of distributions from observed data, fundamental reliability analysis methods, Monte-Carlo simulation, reliability-based design, topology optimization, generative design, design for manufacturing, prognostics fundamentals.
Prerequisite: (MATH 261 and MECH 325) and (MECH 231 or STAT 315).
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 431 Metals and Alloys Credits: 3 (3-0-0)
Also Offered As: MSE 431.
Course Description: Engineering metals and alloys, modification of properties by alloying, plastic deformation, and heat treatment. Fundamentals of physical metallurgy.
Prerequisite: MECH 331 or MECH 331A and MECH 331B or CHEM 263.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 431 and MSE 431.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 432 Engineering of Nanomaterials Credits: 3 (3-0-0)
Course Description: Structure, properties, and processing of extremely small (10 to the minus 9 m) synthetic and natural materials.
Prerequisite: MECH 331 or MECH 331A and MECH 331B.
Term Offered: Fall (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 434 Materials Selection for Mechanical Design Credits: 3 (3-0-0)
Course Description: Procedures for selecting the optimal material(s) for mechanical engineering design under multiple constraints, including reliability, safety, functionality, cost, and environmental impact.
Prerequisite: (MECH 325) and (MECH 331 or MECH 331A and MECH 331B).
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 434 and MECH 481A3.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 436 Green Engineering--Materials and Environment Credits: 3 (3-0-0)
Also Offered As: MSE 436.
Course Description: Principles of green engineering in the context of materials, human dependence on materials, and the environmental consequences of materials selection. Perspective, background, methods, and data for evaluating and designing with materials to minimize the environmental impact.
Prerequisite: MECH 325 and MECH 331A.
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: MECH 436, MECH 481A4, or MSE 436.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 437 Internal Combustion Engines Credits: 3 (2-0-1)
Course Description: Application of thermodynamics, heat transfer, and fluid mechanics to internal combustion engines.
Prerequisite: MECH 344.
Registration Information: Must register for lecture and recitation.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 439 Thermodynamics II for Mechanical Engineers Credits: 3 (3-0-0)
Course Description: Irreversibility and exergy, in-depth analysis of power and refrigeration cycles, thermodynamic relations, ideal gas mixtures, psychrometrics, chemical reactions, phase and chemical equilibrium.
Prerequisite: ENGR 337 or MECH 337 or MECH 339.
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: CBE 210, ENGR 337, MECH 237, MECH 337, MECH 339, or MECH 439.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 450 Aerospace Propulsion Credits: 3 (3-0-0)
Course Description: Basic concepts of aerospace propulsion. Foundational concepts of thermodynamics, compressible flow, and boundary layer theory. Characteristics, operation and analysis of air breathing and rocket propulsion applications.
Prerequisite: MECH 342.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 450 and MECH 480A8.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 460 Aeronautics Credits: 3 (3-0-0)
Course Description: Thermodynamics and fluid mechanics principles applied to the mechanics, aerodynamics, performance, stability, and control of airplanes.
Prerequisite: MECH 342.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 463 Building Energy Systems Credits: 3 (3-0-0)
Course Description: Comfort, psychrometrics, loads, solar radiation, heating and cooling system design, transport, solar system design, economics.
Prerequisite: MECH 344.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 464 Injection Molding Credits: 3 (3-0-0)
Course Description: Part design, material selection, mold design, processing, post-processing operations, and cost estimation for injection molding.
Prerequisite: MECH 201 or MECH 210.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 468 Space Propulsion and Power Engineering Credits: 3 (3-0-0)
Course Description: Orbital mechanics and space missions; chemical, nuclear, and electric rockets; nuclear heat sources; thermoelectric and photovoltaic devices.
Prerequisite: ECE 204 and MECH 337 and MECH 342.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 476 Mechanical Engineering Data Analysis in R Credits: 3 (3-0-0)
Course Description: The use of the R language for data analysis in mechanical engineering, including data cleaning and manipulation, exploratory data analysis and visualization, and applications related to sampling and measurement, calibration, figures of merit, and modeling.
Prerequisite: ENGR 111 or MECH 103.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 476 and MECH 481A6.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 477 Algorithms in Scientific Computing Credits: 3 (3-0-0)
Course Description: Numerical methods for scientific computing relevant to problems arising in mechanical and aerospace engineering, with an emphasis on applications, mathematical principles and algorithms, code development, and tool building.
Prerequisite: MATH 340 or MATH 345.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 478 Computational Fluid Dynamics Credits: 3 (3-0-0)
Course Description: Introduction to fundamentals of numerical analysis, ordinary differential equations and partial differential equations related to fluid mechanics. Study of error control, stability considerations, and convergence issues. Application of modern CFD software including geometry building, mesh generation, solution methods, and flow analysis and visualization.
Prerequisite: MECH 342.
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 486A Engineering Design Practicum: I Credits: 3 (2-3-0)
Course Description: Capstone engineering design project; transition experience to the mechanical engineering profession in industry and graduate education.
Prerequisite: (MECH 105 or MECH 305) and (MECH 325 and MECH 342, may be taken concurrently and MECH 307 and MECH 324, may be taken concurrently).
Registration Information: Must register for lecture and laboratory.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 486B Engineering Design Practicum: II Credits: 3 (1-6-0)
Course Description: Capstone engineering design project; transition experience to the mechanical engineering profession in industry and graduate education.
Prerequisite: MECH 486A.
Registration Information: Must register for lecture and laboratory.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 495 Independent Study Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 498A Engineering Research Practicum: I Credits: 3 (1-4-0)
Course Description: Capstone engineering research project; transition experience to graduate research and education.
Prerequisite: (MECH 105 or MECH 305) and (MECH 307 and MECH 325, may be taken concurrently and MECH 339).
Registration Information: Must register for lecture and laboratory.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 498B Engineering Research Practicum: II Credits: 3 (1-4-0)
Course Description: Capstone engineering research project; transition experience to graduate research and education.
Prerequisite: MECH 498A.
Registration Information: Must register for lecture and laboratory.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 500 Foundations of Materials Science Credits: 3 (3-0-0)
Also Offered As: MSE 500.
Course Description: The structure and processing of materials from a scientific perspective covering metals, ceramics, and polymers.
Prerequisite: (MATH 340 with a minimum grade of B or MATH 345 with a minimum grade of B) and (MECH 331 with a minimum grade of B or MECH 331A with a minimum grade of B and MECH 331B with a minimum grade of B).
Restriction: Must not be a: Freshman, Sophomore, Junior.
Registration Information: Senior standing. Sections may be offered: Online. Credit allowed for only one of the following: MECH 500, MECH 580B9, MSE 500, or MSE 580B9.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 502 Advanced/Additive Manufacturing Engineering Credits: 3 (3-0-0)
Also Offered As: BIOM 502.
Course Description: Materials, controls, and mechanics applied to additive manufacturing; rapid prototyping; direct digital manufacturing.
Prerequisite: MECH 331A.
Registration Information: Sections may be offered: Online. Credit not allowed for both BIOM 502 and MECH 502.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 505 Steam Power Plants Credits: 3 (3-0-0)
Course Description: Technology review and application of engineering sciences and economics to the analysis and design of vapor power generation systems. Vapor power cycles, steam generation, and auxiliary systems associated with power plants. Overall design of power plants as well as component design. Fossil fuel and nuclear energy systems are considered.
Prerequisite: MECH 337.
Restriction: Must be a: Graduate.
Registration Information: Graduate standing. Sections may be offered: Online. Required field trips. Credit not allowed for both MECH 505 and MECH 581A3.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 507 Laser Diagnostics for Thermosciences Credits: 3 (3-0-0)
Course Description: Basics of optics, spectroscopy, and lasers. Physics and applications of laser diagnostic techniques used in thermosciences.
Prerequisite: PH 142.
Registration Information: Sections may be offered: Online.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 509 Design and Analysis in Engineering Research Credits: 3 (3-0-0)
Course Description: Design, model building, analysis and reporting in engineering and manufacturing research and experimentation.
Prerequisite: MATH 340 and STAT 315.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 513 Simulation Modeling and Experimentation Credits: 3 (3-0-0)
Course Description: Logic/analytic modeling in simulations. Event and transient entity-based simulation languages. Simulation design, experimentation and analysis.
Prerequisite: STAT 315.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 515 Advanced Topics in Mechanical Vibrations Credits: 3 (2-2-0)
Course Description: Structural modal analysis, rotordynamics, and torsional vibrations. Lectures are supported with practical application labs.
Prerequisite: MECH 324.
Registration Information: Junior standing. Must register for lecture and laboratory. Sections may be offered: Online.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 516 Life Cycle and Techno-Economic Assessment Credits: 3 (3-0-0)
Course Description: Techniques for effective sustainability assessment of engineering process and products, including factors such as upstream energy and material burdens, model boundaries, sensitivity analysis, end of life, material and energy recycling, scalability, and optimization. Engineering process models will be used to assess technologies through economic feasibility and life cycle impacts.
Prerequisite: (MECH 331 or MECH 331A and MECH 331B) and (MECH 344).
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 516 and MECH 681A3.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 517 Chemical Rocket Propulsion Credits: 3 (3-0-0)
Course Description: Principles of chemical rocket propulsion theory, including practical applications of rocket propulsion system design and analysis.
Prerequisite: MECH 342.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 517 and MECH 581A4.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 518 Orbital Mechanics Credits: 3 (3-0-0)
Course Description: Orbital elements, motion, and analyses, including the design and characterization of the common orbit regimes and orbital maneuver options and design. Emphasis on developing technical analytical capabilities, engineering judgement, and intuitive understanding of orbital maneuvers.
Prerequisite: MATH 340 and PH 142.
Restriction: Must be a: Graduate.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 518 and MECH 580B3.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 519 Aerospace Vehicles Trajectory and Performance Credits: 3 (3-0-0)
Course Description: Trajectory modeling physics and philosophy, and implementation of theories to create and optimize trajectories to several orbits. Launch vehicle conceptual design and sizing, optimal staging, and definition of margins and prediction of mission losses.
Prerequisite: MATH 340 and PH 142.
Restriction: Must be a: Graduate.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 519 and MECH 580B4.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 520 Finite Element Analysis in Mechanical Engr Credits: 3 (3-0-0)
Course Description: Application of FEA as a tool to analyze mechanical engineering problems.
Prerequisite: (CIVE 360) and (MATH 340 or MATH 530).
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 524 Principles of Dynamics Credits: 3 (3-0-0)
Course Description: Kinematics and dynamics of rigid body motion; Lagrangian and Hamiltonian formulations of mechanics; applications to engineering problems.
Prerequisite: MECH 324.
Restriction: Must be a: Graduate.
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 525 Cell and Tissue Engineering Credits: 3 (3-0-0)
Also Offered As: BIOM 525.
Course Description: Cell and tissue engineering concepts and techniques with emphasis on cellular response, cell adhesion kinetics, and tissue engineering design.
Prerequisite: BC 351 or BMS 300 or BMS 500 or BZ 310 or NB 501.
Registration Information: Credit only allowed for one of the following: MECH 525, BIOM 525, and CBE 525. Sections may be offered: Online.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 527 Hybrid Electric Vehicle Powertrains Credits: 3 (3-0-0)
Course Description: Hybrid powertrains and modeling including vehicle dynamics, internal combustion engine, electric motor, energy storage, and control.
Prerequisite: MECH 307.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 529 Advanced Mechanical Systems Credits: 3 (3-0-0)
Course Description: Modeling, analysis, and synthesis of practical mechanical devices in which dynamic response is dominant consideration.
Prerequisite: MECH 307.
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 530 Advanced Composite Materials Credits: 3 (3-0-0)
Course Description: Materials aspects of advanced composite constituents and how their combination yields synergistic results.
Prerequisite: (CIVE 360) and (MECH 331 or MECH 331A and MECH 331B).
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 531 Materials Engineering Credits: 3 (3-0-0)
Also Offered As: BIOM 531.
Course Description: Selection of structural engineering materials by properties, processing, and economics; materials for biomedical and biotechnology applications.
Prerequisite: MECH 331 or MECH 331A and MECH 331B or MECH 431.
Registration Information: Credit not allowed for both BIOM 531 and MECH 531. Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 532 Materials Issues in Mechanical Design Credits: 3 (3-0-0)
Also Offered As: BIOM 532.
Course Description: Failure mechanisms from materials viewpoint with emphasis on use in design. Fracture, creep, fatigue, and corrosion.
Prerequisite: MECH 331 or MECH 331A and MECH 331B.
Registration Information: Credit not allowed for both BIOM 532 and MECH 532. Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 533 Composites Product Development Credits: 3 (2-2-0)
Course Description: Practical application of advanced fiber reinforced materials in mechanical design, including composite constituent materials selection, performance, analysis, and manufacturing.
Prerequisite: (CIVE 360) and (MECH 331 or MECH 331A and MECH 331B).
Registration Information: Graduate standing. Must register for lecture and laboratory. Credit not allowed for both MECH 533 and MECH 580A6.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 534 Energy & Env. Impacts of Transportation Credits: 3 (3-0-0)
Course Description: Energy use and environmental impacts of the transportation sector. Topics include vehicle design, dynamics and efficiency; combustion and emission formation; internal combustion engines, fuel cells, batteries, and powertrains; conventional and alternative fuels; travel demand and modes; and life cycle analysis and criteria pollutant emissions.
Prerequisite: MECH 337.
Restriction: Must be a: Graduate.
Registration Information: Graduate standing. Sections may be offered: Online. Credit not allowed for both MECH 534 and MECH 580A8.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 535 Mechanics of Composite Materials Credits: 3 (3-0-0)
Course Description: Classical lamination theory of fiber-reinforced composite materials; Mechanical behavior of composite laminates and honeycomb structures; Failure modes and failure criteria. Design of composite structures; Computer modeling of composites.
Prerequisite: (MATH 340 and MECH 325) and (MECH 331 or MECH 331A and MECH 331B).
Registration Information: Sections may be offered: Online.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 537 Processing of Polymer Composites Credits: 3 (3-0-0)
Course Description: Basic principles of the processing science of polymer composites, physical and chemical phenomena that occur during manufacturing processes, and solutions to address issues that arise.
Prerequisite: (CIVE 360) and (MECH 331 or MECH 331A and MECH 331B).
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 537 and MECH 581A9.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 538 Mechanical Engineering Thermodynamics Credits: 3 (3-0-0)
Course Description: First and second laws of thermodynamics applied to engineering devices and systems. Introduction to exergy, equilibrium, chemical reactions, thermodynamic relations, and special topics.
Prerequisite: ENGR 337 or MECH 337 or MECH 439.
Restriction: .
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 539 Advanced Fluid Mechanics Credits: 3 (3-0-0)
Course Description: Kinematics, Navier-Stokes equations, vorticity, viscous flows, scaling analysis, boundary layers, secondary flows, entropy generation and transport, stability and transition, turbulence.
Prerequisite: CIVE 300 or MECH 342.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 543 Biofluid Mechanics Credits: 3 (3-0-0)
Also Offered As: BIOM 543.
Course Description: Fluid dynamic concepts for understanding fluid motion in living organs/organisms; advanced research applications.
Prerequisite: (BIOM 421 or CBE 331 or CIVE 300 or MECH 342) and (BMS 300 and PH 121 or PH 141 and BMS 300 or BMS 420).
Restriction: .
Registration Information: Sections may be offered: Online. Credit not allowed for both BIOM 543 and MECH 543.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 544 Advanced Heat Transfer Credits: 3 (3-0-0)
Course Description: Fundamentals and engineering applications of heat transfer including conduction, convection, and radiation.
Prerequisite: MECH 344.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 551 Physical Gas Dynamics I Credits: 3 (3-0-0)
Course Description: Characteristics of real gases in reacting and nonequilibrium systems; equilibrium air; statistical mechanics, chemical thermodynamics.
Prerequisite: MECH 342.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 552 Applied Computational Fluid Dynamics Credits: 3 (3-0-0)
Course Description: Introductory theory of CFD, formulation of engineering problems for CFD analyses, mesh generation, solver settings, and postprocessing.
Prerequisite: CIVE 300 or CBE 331 or MECH 342.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 553 Industrial Engines Credits: 3 (3-0-0)
Course Description: Technology review, and application of engineering sciences and economics to the analysis and design of large industrial engines. Combustion cycles, fuels, emissions control, and auxiliary systems associated with industrial engines are examined. Study overall systems design of engines as well as application requirements and design limitations.
Prerequisite: ENGR 337 or MECH 337 or MECH 339.
Restriction: Must be a: Graduate.
Registration Information: Graduate standing. Sections may be available: Online. Credit not allowed for MECH 553 and MECH 580B1.
Term Offered: Fall (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 557 Turbomachinery Credits: 3 (3-0-0)
Course Description: Application of fundamental principles of thermodynamics and fluid mechanics to turbomachinery. Topics include types of turbomachines, selection of an appropriate fluid machinery, derivation of energy transfer equations, engineering analysis and design, and performance characteristics.
Prerequisite: (ENGR 337 or MECH 337 or MECH 439) and (MECH 342).
Restriction: Must be a: Graduate.
Registration Information: Graduate standing. Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 558 Combustion Credits: 3 (3-0-0)
Course Description: Combustion processes: explosions, detonations, flame propagation, ignition, generation of pollutants in moving and stationary energy conversion systems.
Prerequisite: MECH 342.
Registration Information: Sections may be offered: Online.
Term Offered: Fall (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 564 Fundamentals of Robot Mechanics and Controls Credits: 3 (3-0-0)
Course Description: Kinematics of robots, controls for robots.
Prerequisite: (ECE 411 or MECH 417) and (PH 141).
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 567 Broad-Beam Ion Sources Credits: 3 (3-0-0)
Course Description: Physical processes in broad-beam electron-bombardment ion sources for space propulsion and ion machining applications.
Prerequisite: MATH 340.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 568 Computational Methods for Mechanical Eng. Credits: 3 (3-0-0)
Course Description: Fundamental principles which provide the foundation for the software and algorithms used in Mechanical Engineering. Sections may be offered: Online.
Prerequisite: MATH 450 or MATH 451.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 570 Bioengineering Credits: 3 (3-0-0)
Also Offered As: BIOM 570.
Course Description: Physiological and medical systems analysis using engineering methods including mechanics, fluid dynamics, control electronics, and signal processing.
Prerequisite: CBE 332 or ECE 311 or MECH 331A.
Restriction: Must not be a: Freshman, Sophomore, Junior.
Registration Information: Sections may be offered: Online. Credit not allowed for both BIOM 570 and MECH 570.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 572 Regenerative Bioengineering with Stem Cells Credits: 3 (3-0-0)
Also Offered As: BIOM 572.
Course Description: Current status and future direction of bioengineering and regenerative technologies with stem cells. Topics include tissue-specific applications of pluripotent stem cells and multipotent adult stem cells, genetic and epigenetic engineering, organoids, and manufacturing, including scale-up, sorting and preservation.
Prerequisite: BC 351 or BMS 300 or BZ 310.
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: BIOM 572, BIOM 580A9, MECH 572, or MECH 580A9.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 573 Structure and Function of Biomaterials Credits: 3 (3-0-0)
Also Offered As: BIOM 573.
Course Description: Structure-function relationships of natural biomaterials; application to analysis of biomimetic materials and biomaterials used in medical devices.
Prerequisite: MECH 331 or MECH 331A and MECH 331B.
Registration Information: Sections may be offered: Online. Credit not allowed for both BIOM 573 and MECH 573.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 574 Bio-Inspired Surfaces Credits: 3 (3-0-0)
Also Offered As: BIOM 574.
Course Description: Analysis of surface functionalities of various biological species; identification of design principles.
Prerequisite: (CHEM 111 or CHEM 120) and (MECH 342).
Registration Information: Sections may be offered: Online. Credit not allowed for both BIOM 574 and MECH 574.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 575 Solar and Alternative Energies Credits: 3 (3-0-0)
Course Description: Solar radiation, flat-plate collectors, energy storage, space heating and cooling, power generation, applications, simulation.
Prerequisite: MECH 337 and MECH 342 and MECH 344.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 576 Quantitative Systems Physiology Credits: 4 (4-0-0)
Also Offered As: BIOM 576.
Course Description: Quantitative, model-oriented approach to cellular and systems physiology with design examples from biomedical engineering.
Prerequisite: BMS 300 and CHEM 113 and MATH 340 and PH 142.
Registration Information: Credit not allowed for both BIOM 576 and MECH 576. Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 577 Aerosol Physics and Technology Credits: 3 (3-0-0)
Course Description: Aerosols and their applications in science and engineering, air pollution control, atmospheric science, and public health. Topics cover the physical and chemical principles underlying the behavior of particles suspended in air, including particle size, aerodynamics, motion of particles in a force field, particle size statistics, and optical and electrical properties.
Prerequisite: PH 141.
Registration Information: Senior standing. Sections may be offered: Online.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 578 Musculoskeletal Biosolid Mechanics Credits: 3 (3-0-0)
Also Offered As: BIOM 578.
Course Description: Application of engineering concepts to quantify the mechanical behavior of load-bearing biological tissues and orthopaedic implant performance.
Prerequisite: CIVE 360.
Registration Information: Graduate standing. Sections may be offered: Online. Credit not allowed for both BIOM 578 and MECH 578.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 579 Cardiovascular Biomechanics Credits: 3 (3-0-0)
Also Offered As: BIOM 579.
Course Description: Bio-mechanical principles and approaches applied in cardiovascular research.
Prerequisite: MATH 340 and PH 142.
Restriction: Must be a: Graduate.
Registration Information: Graduate students only. Sections may be offered: Online. Credit allowed for only one of the following: BIOM 579, BIOM 581A8, MECH 579, or MECH 581A8.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 630 Biologically Inspired Robotics Credits: 3 (3-0-0)
Course Description: Analysis of various locomotion methods (e.g. terrestrial, aquatic, and aerial) found in animals or insects and examination of a variety of biologically inspired robots utilizing these locomotion capabilities.
Prerequisite: MECH 564.
Restriction: Must be a: Graduate, Professional.
Registration Information: Sections may be offered: Online. Credit not allowed for both MECH 630 and MECH 681A4.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 631 Defects in Crystals Credits: 3 (3-0-0)
Also Offered As: MSE 631.
Course Description: Mechanics, thermodynamics and kinetics of defects in crystalline solids including point defects, dislocations, and grain boundaries.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Sections may be offered: Online. Credit allowed for only one of the following: MECH 631, MSE 631, or MECH 681A2.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 657 Advanced Computational Gas Dynamics Credits: 4 (3-2-0)
Course Description: Advanced computational algorithms for gas dynamics.
Prerequisite: MECH 568.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 658 Advanced Combustion Theory and Modeling Credits: 3 (3-0-0)
Course Description: Asymptotic structure of flames, limit phenomena and multi-phase combustion.
Prerequisite: MECH 558.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 661 Theory/Control of Internal Combustion Engines Credits: 3 (3-0-0)
Course Description: Theory and applications of internal combustion engines. Alternative fuels, engine control, and pollution prevention.
Prerequisite: MECH 437.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 684 Supervised College Teaching Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 692 Seminar Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695A Independent Study: Bioengineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695B Independent Study: Energy Conversion Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695C Independent Study: Environmental Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695D Independent Study: Heat and Mass Transfer Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695E Independent Study: Industrial and Systems Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695F Independent Study: Mechanics and Design Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695G Independent Study: Computer-Assisted Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695H Independent Study: Robotics Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695I Independent Study: Solar Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695J Independent Study: Computational Fluids Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695K Independent Study: Materials Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695L Independent Study: Plasma Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 695M Independent Study: Motorsport Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 699A Thesis: Bioengineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699B Thesis: Energy Conversion Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699C Thesis: Environmental Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699D Thesis: Heat and Mass Transfer Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699E Thesis: Industrial and Systems Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699F Thesis: Mechanics and Design Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699G Thesis: Computer-Assisted Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699H Thesis: Robotics Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699I Thesis: Solar Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699J Thesis: Computational Fluids Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699K Thesis: Materials Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 699L Thesis: Plasma Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 699M Thesis: Motorsport Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 699N Thesis: Aerospace Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 699O Thesis: Advanced Manufacturing Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 778 Advanced Computational Modeling of Fluids Credits: 3 (3-0-0)
Course Description: Advanced topics in computational fluid dynamics, finite element methods, and linear/nonlinear engineering optimization techniques.
Prerequisite: MECH 568.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 784 Supervised College Teaching Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799A Dissertation: Bioengineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799B Dissertation: Energy Conversion Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799C Dissertation: Environmental Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799D Dissertation: Heat and Mass Transfer Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799E Dissertation: Industrial and Systems Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799F Dissertation: Mechanics and Design Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799G Dissertation: Computer-Assisted Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799H Dissertation: Robotics Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799I Dissertation: Solar Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799J Dissertation: Computational Fluids Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799K Dissertation: Materials Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MECH 799L Dissertation: Plasma Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 799M Dissertation: Motorsport Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 799N Dissertation: Aerospace Engineering Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MECH 799O Dissertation: Advanced Manufacturing Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.