DEPARTMENT OF MECHANICAL ENGINEERING

Engineering Building, Room A101
(970) 491-6558, (970) 491-0924
engr.colostate.edu/me (http://www.engr.colostate.edu/me)

Professor Susan P. James, Department Head
Toni-Lee Viney, Manager of Undergraduate Programs
Angelica Hernandez, Undergraduate Advisor
Star Sullivan, Undergraduate Advisor

Undergraduate

Majors

• Major in Mechanical Engineering
• Major in Biomedical Engineering combined with Mechanical Engineering

Graduate

Graduate Programs in Mechanical Engineering

Programs are offered leading to the Master of Science, Master of Engineering (Mechanical Engineering specialization), and Doctor of Philosophy. Students interested in graduate work should refer to the Graduate and Professional Bulletin and the Department of Mechanical Engineering (http://www.engr.colostate.edu/me).

Master's Programs

• Master of Science in Mechanical Engineering, Plan A
• Master of Science in Mechanical Engineering, Plan B
• Master of Engineering, Plan C, Mechanical Engineering Specialization

Ph.D.

• Ph.D. in Mechanical Engineering

Courses

Mechanical Engineering (MECH)

MECH 101 Introduction to Mechanical Engineering Credits: 3 (3-0-0)
Course Description: The discipline of Mechanical Engineering as described in problems and problem solving methods—energy, materials, motion, fluids.
Prerequisite: None.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 103 Introduction to Mechanical Engineering Credits: 3 (3-0-0)
Course Description: The discipline of Mechanical Engineering as described in problems and problem solving methods—energy, materials, motion, fluids.
Prerequisite: None.
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 from physics and calculus first principles.
Prerequisite: MECH 103 and MATH 160 and PH 141, may be taken concurrently.
Registration Information: Credit not allowed for both MECH 105 and MECH 102.
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 engineering science majors only. Must register for lecture and laboratory.
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 process and the roles of visual communication with emphasis on 3D physical solid modelers and Pro/ENGINEER.
Prerequisite: MECH 105.
Registration Information: Must register for lecture and laboratory.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 202 Engineering Design II Credits: 3 (2-2-0)
Course Description: Engineering design process with emphasis on teamwork, ideation, decision-making, project planning applied to a group design project.
Prerequisite: MECH 201 and MECH 200, may be taken concurrently.
Registration Information: Must register for lecture and laboratory.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.
### MECH 231 Engineering Experimentation Credits: 3 (2-2-0)
**Course Description:** Measurement systems; experimental design; data acquisition and analysis techniques.
**Prerequisite:** (MECH 102 or MECH 105) and (PH 142).
**Registration Information:** Must register for lecture and laboratory.
**Terms Offered:** Fall, Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 237 Introduction to Thermal Sciences Credits: 3 (3-0-0)
**Course Description:** First and second laws of thermodynamics, properties of materials, energy conversion, statistical aspects, heat transfer.
**Prerequisite:** PH 141 and MATH 160.
**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).
**Term Offered:** Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 301 Engineering Design III Credits: 2 (1-2-0)
**Course Description:** Computer-aided engineering tools FEA and CFD for analysis and prediction of robustness and performance of mechanical components and assemblies.
**Prerequisite:** (CIVE 360) and (MECH 202, may be taken concurrently) and (MECH 342).
**Registration Information:** Credit not allowed for both MECH 301 and MECH 302.
**Term Offered:** Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 303 Energy Engineering Credits: 3 (3-0-0)
**Course Description:** Energy generation (coal, oil, natural gas, solar, wind, geothermal, hydropower, tidal, biofuel, nuclear...), conversion, distribution, storage, efficiency.
**Prerequisite:** CBE 310 or ECE 341 or MECH 237 or MECH 337 or PH 361.
**Term Offered:** Fall.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 306 Mechatronics and Measurement Systems Credits: 4 (3-3-0)
**Course Description:** Mechatronic and measurement system analysis and design; applied electronics; data acquisition; microcontroller interfacing and programming.
**Prerequisite:** CIVE 261 and ECE 204 and MATH 340 and MECH 231.
**Registration Information:** Must register for lecture and laboratory.
**Terms Offered:** Fall, Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** Yes.

### MECH 307 Dynamics of Machines Credits: 4 (2-2-0)
**Course Description:** Analysis and synthesis of moving machinery.
**Prerequisite:** CIVE 261 and MATH 340, may be taken concurrently.
**Registration Information:** Must register for lecture and laboratory.
**Term Offered:** Fall.
**Grade Mode:** Traditional.
**Special Course Fee:** Yes.

### MECH 313 Machine Design Credits: 3 (3-0-0)
**Course Description:** Design of mechanical components to avoid failure during operation. Stress analysis, failure theories, and specific mechanical components in design context.
**Prerequisite:** CIVE 360.
**Term Offered:** Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 314 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:** Yes.

### MECH 325 Machine Design Credits: 3 (3-0-0)
**Course Description:** Design of mechanical components to avoid failure during operation. Stress analysis, failure theories, and specific mechanical components in design context.
**Prerequisite:** CIVE 360.
**Term Offered:** Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 326 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:** Yes.

### MECH 330 Energy Engineering Credits: 3 (3-0-0)
**Course Description:** Energy generation (coal, oil, natural gas, solar, wind, geothermal, hydropower, tidal, biofuel, nuclear...), conversion, distribution, storage, efficiency.
**Prerequisite:** CBE 310 or ECE 341 or MECH 237 or MECH 337 or PH 361.
**Term Offered:** Fall.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 332 Thermodynamics Credits: 4 (3-0-1)
**Course Description:** First and second laws, property relationships, characteristic functions, thermodynamics solver, various thermodynamics applications.
**Prerequisite:** MATH 261 and PH 141.
**Registration Information:** Must register for lecture and recitation.
**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 337 and MECH 342.
**Term Offered:** Fall, Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 342 Mechanics and Thermodynamics of Flow Processes Credits: 3 (3-0-0)
**Course Description:** Engineering details of viscous flow with losses, measurements, compressibility, turbomachinery, convective heat transfer.
**Prerequisite:** MATH 340 and PH 141 and MECH 337, may be taken concurrently.
**Term Offered:** Fall.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

### MECH 344 Heat and Mass Transfer Credits: 3 (3-0-0)
**Course Description:** Transport and rate processes, conduction, convection, and radiation.
**Prerequisite:** MECH 342.
**Term Offered:** 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 402 Mechanical Engineering Experimental Analysis Credits: 3 (2-2-0)
Course Description: Analysis of large data sets associated with mechanical engineering experimentation; optimization; variability; design of experiments.
Prerequisite: MECH 307 and MECH 324 and MECH 331.
Registration Information: Must register for lecture and laboratory.
Term Offered: Fall, Spring.
Grade Mode: Traditional.
Prerequisite: MECH 344.
Term Offered: Spring.
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 410 Engineering Economy Principles/Calculations Credit: 1 (0-0-1)
Course Description: Basic principles and calculation of engineering economy.
Prerequisite: MATH 161.
Registration Information: Credit not allowed for both MECH 410 and MECH 408. Offered as an online course only. Sections may be offered: Online.
Term Offered: Fall, Spring, Summer.
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.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 417 Control Systems Credits: 3 (2-2-0)
Course Description: Feedback and forward loop control design and simulation; discrete time and frequency domain methods with implementation considerations.
Prerequisite: MATH 340 and MECH 307.
Registration Information: Must register for lecture and laboratory.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 424 Advanced Dynamics Credits: 3 (3-0-0)
Course Description: Kinematics and dynamics of rigid bodies. Hamilton's principle and Lagrange's equations for lumped parameter extended bodies and distributed systems.
Prerequisite: MECH 324.
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 431 Metals and Alloys Credits: 3 (3-0-0)
Course Description: Engineering metals and alloys, modification of properties by alloying, plastic deformation, and heat treatment. Fundamentals of physical metallurgy.
Prerequisite: MECH 331.
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.
Term Offered: Fall (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 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 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 470 Biomedical Engineering  Credits: 3 (3-0-0)
Also Offered As: BIOM 470.
Course Description: Engineering application in human/animal physiology, diagnosis of disease, treatment, rehabilitation, human genome manipulation.
Prerequisite: (MATH 155 or MATH 160) and (PH 141).
Registration Information: Credit not allowed for both MECH 470 and BIOM 470.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 486A Engineering Design Practicum: I  Credits: 4 (1-12-0)
Course Description: Capstone engineering design project; transition experience to the mechanical engineering profession in industry and graduate education.
Prerequisite: MECH 301 and MECH 325 and MECH 344 and MECH 402, may be taken concurrently.
Registration Information: Must register for lecture and laboratory.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: Yes.

MECH 486B Engineering Design Practicum: II  Credits: 4 (1-12-0)
Course Description: Capstone engineering design project; transition experience to the mechanical engineering profession in industry and graduate education.
Prerequisite: MECH 338 and MECH 486A.
Registration Information: Must register for lecture and laboratory.
Term Offered: 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: Fall  Credits: 4 (1-12-0)
Course Description: Capstone engineering research project; transition experience to graduate research and education.
Prerequisite: MECH 301 and MECH 325 and MECH 402, may be taken concurrently.
Registration Information: Must register for lecture and laboratory.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 498B Engineering Research Practicum: Spring  Credits: 4 (1-12-0)
Course Description: Capstone engineering research project; transition experience to graduate research and education.
Prerequisite: MECH 338 and MECH 498A.
Registration Information: Must register for lecture and laboratory.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 502 Advanced/Additive Manufacturing Engineering  Credits: 3 (3-0-0)
Course Description: Materials, controls, and mechanics applied to additive manufacturing; rapid prototyping; direct digital manufacturing.
Prerequisite: MECH 202 and MECH 331.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 503 Engineering Maintenance Process  Credits: 3 (0-0-3)
Course Description: Design for engineering maintainability development and management of effective maintenance programs applicable to typical industrial environments.
Prerequisite: None.
Registration Information: Admission to the M.E. program. Offered as an online course only.
Term Offered: Summer.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 504 Specification and Procurement of Engr Systems  Credits: 3 (0-0-3)
Course Description: Specification and procurement of engineering systems, including contracts, legal, ethics and Statement of Work development.
Prerequisite: None.
Registration Information: Admission to the M.E. program. Offered as an online course only.
Term Offered: Summer.
Grade Mode: Traditional.
Special Course Fee: No.

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 power 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 511 Engineering Decision Making Under Uncertainty Credits: 3 (3-0-0)
Course Description: Systems engineering and engineering economic methodologies for evaluating interdependent capital expenditure proposals under incomplete information.
Prerequisite: MECH 410 and STAT 315.
Registration Information: Sections may be offered: Online.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 512 Reliability Engineering Credits: 3 (3-0-0)
Course Description: Models to predict time to failure of mechanical or electronic devices, reliability data analysis and case studies.
Prerequisite: STAT 315 and MECH 513.
Registration Information: Sections may be offered: Online.
Term Offered: Fall (even years).
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.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: Yes.

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 523 Vehicle Energy Storage System Design Credits: 3 (3-0-0)
Course Description: Develop vehicle system designs utilizing electrochemical energy storage systems such as batteries and capacitors.
Prerequisite: MECH 331.
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.
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 526 Fundamentals of Vehicle Dynamics Credits: 3 (3-0-0)
Course Description: Kinetics of vehicle suspensions, steady-state and transient stability and control, tires, wheel and suspension geometry and loads, dampers, steering.
Prerequisite: MECH 324.
Term Offered: Spring.
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: MECH 337.
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 431.
Registration Information: Credit not allowed for both MECH 531 and BIOM 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.
Registration Information: Credit not allowed for both MECH 532 and BIOM 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: MECH 331 and CIVE 360.
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  Advanced Fluid Mechanics  Credits: 3 (3-0-0)
Course Description: Properties, kinematics; vorticity; exact solutions; instability; boundary layers; turbulence; wakes; compressible flow; supersonic flow; shockwaves.
Prerequisite: CIVE 300 or MECH 342.
Term Offered: Fall.
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 availability, energy, and lost work analysis.
Prerequisite: MECH 337.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 539  Advanced Fluid Mechanics  Credits: 3 (3-0-0)
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: Must be a: Graduate.
Registration Information: Graduate standing. Sections may be offered: Online.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 543  Biofluid Mechanics  Credits: 3 (3-0-0)
Course Description: Application of fundamental principles of thermodynamics and fluid mechanics to turbomachinery.
Prerequisite: MECH 337 and MECH 342.
Term Offered: Spring.
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.
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: Introduction to computational fluid dynamics (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 554  Advanced Composite Materials  Credits: 3 (3-0-0)
Course Description: Materials aspects of advanced composite constituents and how their combination yields synergistic results.
Prerequisite: MECH 337.
Term Offered: Fall (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MECH 557  Turbomachinery  Credits: 3 (3-0-0)
Course Description: Kinematics of robots, controls for robots.
Prerequisite: MECH 417.
Term Offered: Spring.
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: Fundamentals and engineering applications of heat transfer including conduction, convection, and radiation.
Prerequisite: MECH 344.
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.
Prerequisite: MATH 450 or MATH 451.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MECH 569  Micro-Electro-Mechanical Devices  Credits: 3 (3-0-0)
Also Offered As: ECE 569.
Course Description: Micro-electro-mechanical processes and applications in sensors, optics, and structures.
Prerequisite: MECH 344 with a minimum grade of C or ECE 331 with a minimum grade of C.
Registration Information: Credit not allowed for both ECE 569 and MECH 569. Sections may be offered: Online.
Term Offered: Spring.
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: MECH 307 and MECH 324.
Registration Information: Credit not allowed for both MECH 570 and BIOM 570. Sections may be offered: Online.
Term Offered: Spring.
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.
Registration Information: Credit not allowed for both MECH 573 and BIOM 573. Sections may be offered: Online.
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: MECH 342 and CHEM 111.
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. 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 628  Applied Fracture Mechanics  Credits: 3 (3-0-0)
Course Description: Stress distribution near cracks; energy criteria for fracture; design criteria; fracture toughness testing.
Prerequisite: CIVE 560.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring (even years).
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 651.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

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

MECH 695A  Independent Study: Bioengineering  Credits: Var[1-18] (0-0-0)
Course Description: 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: 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: 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: 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: 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: 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: 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 695A 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.

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: 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.

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.