ME - MECHANICAL ENGINEERING (ME)

ME 123 - Computer Programming 4 Credits

Hours: 4R-0L-4C
Term Available: F,W,S
Graduate Studies Eligible: No
Prerequisites: None

Software tools and engineering processes for mechanical engineers. Topics may include: structured programming (Matlab), simulation of rigid body motion, presentation software, and spreadsheets.Introduction to teaming and creativity.

ME 193 - Selected Topics in Design 1-4 Credits

Hours: 0R-0L-(1 - 4)C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Selected student design projects. May include testing and/or computer aided design.

ME 199 - Professional Experience 1 Credit

Hours: 1R-0L-1C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

The professional experiences course captures the practical work experiences related to the student's academic discipline. Students are required to submit a formal document of their reflections, which communicates how their employment opportunity reinforced and enhanced their academic studies.

ME 201 - Applications of Thermodynamics 4 Credits

Hours: 4R-0L-4C
Term Available: F,W
Graduate Studies Eligible: No
Prerequisites: ES 201 or CE 205 or CHE 201

Extend the conservation and accounting framework to examine energy-conversion systems. Topics include thermodynamic properties of pure substances, gas mixtures, exergy analyses, power and refrigeration cycles, psychrometric processes, combustion, and propulsion.

ME 227 - Numerical Methods 4 Credits

Hours: 3R-3L-4C
Term Available: W,S
Graduate Studies Eligible: No
Prerequisites: (ME 123 or BE 100 or CSSE 120) and MA 222

This is an inter-disciplinary course focusing on the generation and interpretation of numerical solutions and the processing of numerical data for engineering problems. Topics include approximate solutions to nonlinear algebraic and differential equations, initial and boundary value problems, numerical integration and differentiation, optimization, data conditioning, and regression analysis. Trade-offs between accuracy and cost are emphasized. Matlab is used as the programming language.

ME 230 - Mechatronic Systems 4 Credits

Hours: 3R-3L-4C
Graduate Studies Eligible: No
Prerequisites: (ME 123 or CSSE 120 or BE 100 or ENGD 120) and (ES 213 and ES 213L) or (ECE 203 or ENGD 120 or BE 131)

Applications of microprocessors and microcontrollers and digital electronics to the design and utilizations of embedded control systems in smart systems and products. Topics include Boolean logic and algebra, system hardware and software development, and interfacing for mechanical applications.

ME 293 - Selected Topics in Design 1-4 Credits

Hours: 0R-0L-(1 - 4)C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Selected student design projects. May include testing and/or computer aided design.

ME 302 - Heat Transfer 4 Credits

Hours: 4R-0L-4C
Term Available: F,S
Graduate Studies Eligible: No
Prerequisites: (MA 221 or MA 211) and (ES 212 or ES 312 or CHE 301 or EM 301)

Introduces the basic modes of heat transfer, heat transfer properties, steady and unsteady one-dimensional heat conduction, free and forced convection, radiation and heat exchangers. Other topics may include numerical methods and boiling and condensation.

ME 304 - Introduction to the Design of Mechanisms 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: ME 123 or CSSE 120 or BE 100 or ENGD 120

This course will cover a set of computational tools to design and analyze mechanisms to achieve specific goals. The specific focus of this course is to study kinematics (study of motion without regards to forces) of a mechanism.Students learn how to model and solve for the position, velocity, acceleration of linkages using vectors. They also study the kinematics of gear trains and specifically, planetary gear trains.

ME 305 - Introduction to Aerospace Engineering 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: ES 212 or ES 312

Application of fundamental engineering concepts to aerospace systems. Aircraft performance and stability. Physical properties of the standard atmosphere. Aerodynamics of the airplane including lift, drag and pitching moment estimation. Introduction to orbital mechanics.

ME 306 - Control Systems 4 Credits

Hours: 3R-3L-4C
Graduate Studies Eligible: No
Prerequisites: ES 205 or ES 305

Basic principles of feedback control theory. Mathematical modeling and performance analysis of dynamical systems. Includes stability analysis, root locus compensation and design, frequency response analysis. Implementation of control system analysis and design is gained with several laboratory experiences.

ME 317 - Design for Manufacturing 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: EM 104 or ENGD 100 or ENGD 101

This is an introductory course that examines the interactions between design and manufacturing from the designer's point of view. Common manufacturing processes will be introduced and design guidelines will be developed for each process. The successful student will leave this class with an appreciation that a designer must consider the method of manufacture during the design process to ensure that a product is functional, economically viable, and safe.

ME 321 - Measurement Systems 4 Credits

Hours: 3R-3L-4C
Term Available: W,S
Graduate Studies Eligible: No
Prerequisites: MA 223 and (ES 205 or ES 305) and (EM 103 or MDS 201 or ENGD 100)

Fundamentals of measurement systems in mechanical engineering including transducer operation, signal conditioning, data reduction, and presentation of results. Transducer and measurement system characteristics including resolution, sensitivity, loading, time response, and frequency response. Operating principles of basic instrumentation for measurement of mechanical quantities such as force, torque, pressure, temperature, and flow. Topics include uncertainty analysis, data analysis, calibration, data acquisition, presentation of results, and an introduction to experiment design.

ME 327 - Numerical Methods of Engineering Analysis 4 Credits

Hours: 3R-3L-4C
Term Available: W,S
Graduate Studies Eligible: No
Prerequisites: (ME 123 or BE 100 or CSSE 120 or (ENGD 110 and ENGD 120)) and (MA 212 or MA 222)

This is an inter-disciplinary course focusing on the generation and interpretation of numerical solutions and the processing of numerical data for engineering problems. Topics include approximate solutions to nonlinear algebraic and differential equations, initial and boundary value problems, numerical integration and differentiation, optimization, data conditioning, and regression analysis. Trade-offs between accuracy and cost are emphasized. Matlab is used as the programming language.

ME 328 - Materials Engineering 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: CHEM 111 or CHEM 201 or CHEM 112 or CHEM 105 or CHEM RA100

ntroduces properties of metals, ceramics, polymers, and composites. Relates material processing to properties through underlying material structure. Overviews the materials available to engineers and discusses applications and material selection.

ME 359 - Vehicle System Modeling 4 Credits

Hours: 4R-0L-4C
Term Available: F
Graduate Studies Eligible: No
Prerequisites: ES 201

Excel and Simulink are used to create reactive and predictive models of vehicle powertrains, both electric and internal combustion. Drive cycles are introduced, the powertrains are iteratively refined, and insightful observations are made with respect to vehicle performance. The course concludes with modeling a vehicle of the student's choosing.

ME 380 - Machine Component Design 4 Credits

Hours: 4R-0L-4C
Graduate Studies Eligible: No
Prerequisites: EM 204 or BE 222 or EM 203

Applications of fundamentals of engineering mechanics in analysis and synthesis of machine components and systems. Special emphases placed on stress/strength analyses and fatigue failures. Design of mechanical components and systems including threaded fasteners, springs, bearings, gears, shafts, clutches, brakes, belts, chains, and couplings.

ME 393 - Selected Topics in Design 0-4 Credits

Hours: 0R-0L-(0 - 4)C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: None

Selected student design projects. May include testing and/or computer aided design.

ME 397 - Special Topics in Mechanical Engineering 1-4 Credits

Hours: (1 - 4)R-0L-(1 - 4)C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Topics of current interest in mechanical engineering at the 300-level.

ME 401 - Foundations of Fluid Mechanics 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: Yes
Prerequisites: (ES 202 or ES 212 or ES 312 or EM 301 or CHE 301) and (MA 222 or MA 212)

Covers the fundamental concepts of fluid dynamics with an emphasis on physical understanding. Topics include control-volume and differential analyses of fluid motion, similitude, potential flow, vorticity transport, low Reynolds number flow, boundary-layer physics, turbulent transport, and compressible flow. Numerical and experimental methods for solving fluid engineering problem are introduced in a weekly laboratory including wind tunnel, particle image velocimetry, hot wire anemometry, and optical techniques. Other topics may be added or deleted as needed.

ME 402 - Advanced Heat Transfer 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ME 302

This course covers additional topics in conduction, convection and radiation heat transfer as well as an introduction to mass transfer, phase change and numerical methods.

ME 404 - Advanced Design of Mechanisms 4 Credits

Hours: 4R-0L-4C
Term Available: F, S
Graduate Studies Eligible: No
Prerequisites: ES 214 and ME 304

This course will cover some intermediate topics in the design of mechanisms including position analysis of three, four, five and sixbar linkages, cam analysis and design, including motion of the cam/follower system, the method of constraints in kinematics, and velocity, acceleration and force analysis using the method of constraints. The method of virtual work will be used to conduct force analysis for the inverse dynamic problem. Extensive use will be made of MATLAB (or similar software) for plotting and animating solutions to mechanism design problems.

ME 405 - Theoretical Aerodynamics 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: Yes
Prerequisites: ES 212 or ES 312

Introduction to aerodynamics theory. Development of equations of conservation of mass and momentum. Vorticity, induced velocity and irrotational flow. Stream function, velocity potential, Laplace's equation and the principle of superposition. Flow about a body, the Kutta-Joukowski Theorem. Concepts of thin airfoil and finite wing theory. Exact solutions to elementary viscous flow problems.

ME 407 - Power Plants 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ME 301 or ME 201

Steam, cogeneration and combined cycles are studied with the aid of property software. Various components of the cycles are studied in detail. A survey of alternative power sources is presented. Tours of power plants are taken when available.

ME 408 - Renewable Energy 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: ES 202 or ES 212 or ES 312

Covers renewable energy sources such as solar heating and cooling, wind energy, biomass, and photovoltaic energy. Surveys the energy availability of these sources and life cycle cost and present value used to evaluate the system. Students will design a system which utilizes a renewable energy source and economically evaluate the system.

ME 409 - Air Conditioning 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: (ES 202 or ES 312 or ES 212) and ME 302

Human comfort and the properties of air. Air conditioning in residences, public and industrial buildings using vapor compression and absorption units. Cooling loads, psychrometry, fans, duct sizing and layout, automatic control, and acoustic design considerations.

ME 410 - Internal Combustion Engines 4 Credits

Hours: 4R-0L-4C
Term Available: F
Graduate Studies Eligible: Yes
Prerequisites: ME 201 or CHE 303

Study of spark ignition and compression ignition engines. Influences of engine design features on performance, economy, and air pollution. Influence of the combustion process, carburetion, fuel injection and ignition characteristics on engine operation.

ME 411 - Propulsion Systems 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: ME 301 or ME 201

Application of basic principles in the study of the performance characteristics of air and space vehicles. Aerodynamics of steady one dimensional isentropic compressible flow. Shock waves, gas turbines, turbojet, turbofan, turboprop, turboshaft, ram jet, rocket, nuclear propulsion and space propulsion systems are discussed and compared.

ME 412 - Lean Manufacturing 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: None

This course introduces students to lean manufacturing - the identification of value and elimination of waste in a manufacturing process. The course will feature frequent assigned reading and discussion as well as factory simulations, factory tours, and projects. Students will develop a fundamental understanding of lean principles and will be able to apply their knowledge in any profession.

ME 416 - Introduction to MEMS: Fabrication & Applications 4 Credits

Hours: 3R-3L-4C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: None

Properties of silicon wafers; wafer-level processes, surface and bulk micromachining, thin-film deposition, dry and wet etching, photolithography, process integration, simple actuators. Introduction to microfluidic systems. MEMS applications: capacitive accelerometer, cantilever and pressure sensor. Cross-listed with NE 410, ECE 416, and CHE 405.

ME 417 - Advanced Materials Engineering 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ME 328 and (EM 203 or EM 204)

Fundamentals of deformation and fracture in metals, polymers, and ceramics with application to design. Emphasis on time-temperature dependence of polymers, brittle behavior of advanced ceramics, and the fracture mechanics approach to design of high strength and critical application materials.

ME 420 - Consulting Engineering Seminar 2 Credits

Hours: 2R-0L-2C
Graduate Studies Eligible: No
Prerequisites: None

Discusses problems in the field of consulting engineering; seminars presented by practicing consulting engineers. Cross-listed with BE 400, ECE 466, CHE 420, and CE 420.

ME 421 - Mechanical Engineering Laboratory 2 Credits

Hours: 0R-6L-2C
Term Available: F,W
Graduate Studies Eligible: No
Prerequisites: (ME 311 or ME 321) and (RH 330 or ENGL H290 or ENGD 250 or ENGD 251)

Introduction to engineering experimentation, centered on an experimental project planned and executed by students. Uncertainty analysis, instrumentation systems, and statistical design of experiments. Emphasis on project on project planning and execution, developing a scope of work, interim deliverables, and reporting engineering results.

ME 422 - Finite Elements for Engineering Applications 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: Yes
Prerequisites: EM 204 or BE 204 or BE 222

Introduces finite element methodology from a strongly theoretical perspective. Emphasizes solving various 1D and 2D static, transient, and modal problem statements including trusses, beams, plane stress, plane strain, and axisymmetric models. Problems of interest similar to those found in Statics I and II, as well as Machine Component Design. Also assesses higher order bases, time stepping procedures, and iterative solvers. Utilizes Matlab and ANSYS for computational work. Upon completion of this class you should be "useful" to a Computer Aided Engineering group from both a theory and implementation standpoint.

ME 423 - Fatigue 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: EM 204 or EM 203 or BE 222

Introduces modern methods in fatigue analysis and testing, with a focus on metal fatigue. Covers the stress-life approach, the strain-life approach, and crack growth analysis based on fracture mechanics.

ME 424 - Mechanics of Composites 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: EM 204 and ME 328

Introduction to the basic mechanical aspects of composite materials such as: types / classification of composites, micro and macro-mechanical models for material properties, stress/strain analysis, and the manufacturing or composites. Specific focus is given to fiber-reinforced composite materials. Project work is emphasized.

ME 426 - Turbomachinery 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: ES 205 or ES 305

Introduces the theory and issues related to the design of axial and radial flow turbines, compressors and pumps. Euler's equation and vector diagrams are used to evaluate energy transfer and efficiency.

ME 427 - Introduction to Computational Fluid Dynamics 4 Credits

Hours: 3R-3L-4C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: (ES 202 or ES 312 or ES 212) or EM 301 or CHE 301 and (ME 323 or ME 327 or ME 227)

Covers the key components of a CFD calculation: mesh generation, numerical algorithm and turbulence modeling. Survey of solution strategy includes both the finite volume and the finite difference methods. Issues on formal order of accuracy, dissipation, dispersion, stability and space-time coupling are discussed in detail. Both structured programs and commercial software will be used as vehicles in obtaining a CFD solution.

ME 435 - Robotics Engineering 4 Credits

Hours: 3R-3L-4C
Term Available: F
Graduate Studies Eligible: Yes
Prerequisites: ME 430 or ECE 230 or ME 230

Interdisciplinary course in robotics focusing on communication, software development, kinematics, robot GUI design, sensing, control, and system integration.Labs in the course cover MATLAB GUI development with GUIDE, Denavit-Hartenberg parameters, Arduino programming, Arduino to Android communication, Android app development, and OpenCV4Android image recognition.Students in the course will program an Android + Arduino, 6-wheeled mobile robot with 5 DOF servo arm to participate in an outdoor GPS robotics challenge. Cross-listed with CSSE 435.

ME 441 - Advanced Modeling and Simulation Techniques 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: ES 205 or ES 305

Covers cross-disciplinary system analysis, modeling, simulation, and control using specialized techniques. Systems to be investigated include linear mechanical, rotational mechanical, electrical, thermal, pneumatic, electro-magnetic, and combinations thereof. Bond graph method for modeling. System simulation and controller design using MATLAB and Simulink. Discussion of modeling, simulation, and control of nonlinear systems. Special topics may be added if time permits.

ME 445 - Robot Dynamics and Control 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: ME 406 or ECE 320 or BE 350

This course introduces students to the basics of kinematic and dynamic modeling of serial manipulators.Students will also learn joint-space position control and gain familiarity with Cartesian-space control.

ME 450 - Combustion 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: ME 301 or CHE 303 or ME 201

Study of the thermodynamics and kinetics of combustion processes and the underlying chemical processes. Topics covered include deflagration and detonation waves, combustion of solid, liquid, and gaseous fuels, and environmental impacts of compustion. Laboratory experience via in-class, hands-on exercises.

ME 461 - Aircraft Design 4 Credits

Hours: 4R-0L-4C
Term Available: F
Graduate Studies Eligible: Yes
Prerequisites: ME 305

Fundamentals of conceptual aircraft design. Aerodynamic analysis, design constraints based on customer requirements, mission profiles, aircraft sizing, optimization, and presentation of performance capabilities. Oral and written communication emphasized. Design teams.

ME 462 - Thermal Design 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: (ES 202 or ES 312 or ES 212) and ME 302

Applications of the thermodynamic, heat transfer, and fluid flow principles to the modeling and design of thermal systems. These systems include pumps, fans, and heat and mass exchangers. A team project which includes the design, construction and testing of a fluid or thermal device or system provides the focus for the course.

ME 470 - Capstone Design I 4 Credits

Hours: 2R-6L-4C
Term Available: F,S
Graduate Studies Eligible: No
Prerequisites: ME 230 and ME 302 and ME 321

Students work in teams with three to five members on design projects furnished from clients. The emphasis is on creating design solutions, with appropriate analyses, to meet stakeholders' needs. In addition to regular meetings with their faculty advisors, the teams are expected to maintain close and continuous communications with their clients during the quarter. The ten week projects culminate in interim reports which are submitted to the clients.

ME 471 - Capstone Design II 4 Credits

Hours: 2R-6L-4C
Term Available: F,W
Graduate Studies Eligible: No
Prerequisites: ME 470

This course is a continuation of ME470.Students continue work in teams with three to five members developing the project started in ME470. The emphasis is on detailing design solutions identified in the first quarter. In addition to regular meetings with their faculty advisors, the teams are expected to maintain close and continuous communications with their clients during the quarter. The ten week projects culminate in interim reports which are submitted to the clients.This course is intended to be taken in the quarter immediately following ME470.

ME 472 - Capstone Design III 4 Credits

Hours: 2R-6L-4C
Term Available: W,S
Graduate Studies Eligible: No
Prerequisites: ME 471

This course is a continuation of ME 471. The student teams test their prototype solutions and transfer the project results to their client. Continuous and regular communication with the outside clients, as well as with the faculty advisors, is expected. The course culminates with a final report that documents the design process.This course is intended to be taken in the quarter immediately following ME471.

ME 490 - Directed Research 1-4 Credits

Hours: 0R-0L-(1 - 4)C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Selected projects for student research.

ME 491 - Directed Research 1-4 Credits

Hours: 0R-0L-(1 - 4)C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Selected projects for student research.

ME 493 - Selected Topics in Design 1-4 Credits

Hours: 0R-0L-(1 - 4)C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Selected student design projects. May include testing and/or computer aided design.

ME 497 - Special Topics in Mechanical Engineering 1-5 Credits

Hours: 0R-0L-(1 - 5)C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Topics of current interests in mechanical engineering.

ME 501 - Advanced Thermodynamics 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: ME 301 or ME 201

Study of advanced thermodynamic topics: modeling of transient systems, exergy (availability) analysis, equations of state and thermodynamics relationships for simple, compressible substances.

ME 506 - Advanced Control Systems 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: ME 406

Physical models for control; system response, analysis and design. Time domain; system response, analysis and design. Frequency domain; state variable representation/description; stability, controllability, observability; linear quadratic regulator, pole-placement, state estimation/observers.

ME 510 - Gas Dynamics 4 Credits

Hours: 4R-0L-4C
Term Available: F
Graduate Studies Eligible: Yes
Prerequisites: (ES 212 or ES 312) and (ME 301 or ME 201)

Introduction to the dynamics of a compressible flow. Equations of motion for subsonic and supersonic flow. Nozzle flow. Normal and oblique shock waves, Prandtl-Meyer flow. Steady and unsteady, one dimensional gas flow with friction and heat transfer.

ME 516 - Introduction to MEMS: Fabrication & Applications 4 Credits

Hours: 3R-3L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: None

Properties of silicon wafers; wafer-level processes, surface and bulk micromachining, thin-film deposition, dry and wet etching, photolithography, process integration, simple actuators. Introduction to microfluidic systems. MEMS applications: capacitive accelerometer, cantilever and pressure sensor.Cross-listed with NE 510, ECE 516, CHE 505, and BE 516.

ME 517 - Mechanics of Metal Forming 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: EM 204

Fundamentals of plasticity, 2D and 3D stress and strain tensors, characteristics of yield surfaces, flow rules and constitutive relations for elasto-plastic materials. Modelling of metal forming processes using work balance, slab and upper bound analysis techniques. Friction in metal forming. The mechanics of bulk metal forming processes such as extrusion, sheet metal forming, stamping, rolling, drawing, and stretching. Design forming tool dies.

ME 520 - Computer-Aided Design & Manufacturing (CAD/CAM) 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: EM 104

Use and management of computer in engineering for drafting, design management, documentation, and manufacturing. Covers drafting methods and standards, design data management, CNC operations and implementation.

ME 522 - Advanced Finite Element Analysis 4 Credits

Hours: 4R-1L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: ME 422

A continuation of ME 422. Includes multi-dimensional extensions of 2-D theory for transient, nonlinear problem statements in engineering. Utilizes Matlab and Ansys for developing and assessing FEA solutions to real world problems via theory developed in ME 422.

ME 523 - Fatigue 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: None

Same as ME 423, with the additional requirement that students enrolled in ME 523 must complete an experimental, computational, and/or theoretical project including complexities not covered in ME 423.Students may not receive credit for both ME 423 and ME 523.

ME 524 - Mechanics of Composites 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: Yes
Prerequisites: EM 204 and ME 328

Same as ME 424 with the requirement that ME 524 is only open to graduate students. Students enrolled in ME 524 must complete an additional laboratory project in the course extending the principles developed in the course beyond what is directly covered during the course itself. Students may not receive credit for both ME 424 and ME 524.

ME 526 - Turbomachinery 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: ES 205 or ES 305

Introduces the theory and issues related to the design of axial and radial flow turbines, compressors and pumps. Euler's equation and vector diagrams are used to evaluate energy transfer and efficiency. Students enrolled in ME 526 must complete a design project including complexities not covered in ME 426. Students may not receive credit for both ME 426 and ME 526

ME 527 - Computational Fluid Dynamics 4 Credits

Hours: 3R-3L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: (ES 202 or ES 312 or ES 212) or EM 301 or CHE 301 and (ME 323 or ME 227 or ME 327)

Covers the key components of a CFD calculation: mesh generation, numerical algorithmand turbulence modeling. Survey of solution strategy includes both the finite volume and the finite difference methods. Issues on formal orderof accuracy, dissipation, dispersion, stability and space-time coupling are discussed in detail. Both structured programs and commercial software will be used as vehicles in obtaining a CFD solution. Students enrolled in ME527 must complete a design project not covered in ME 427. Students may not receive credit for both ME 427 and ME 527.

ME 536 - Computational Intelligence in Control Engineering 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: ME 406

Machine learning and adaptation applied to feedback control, guidance and navigation. Neural Networks for pattern recognition, modeling and control. Radial basis function model identification by recursive least squares. Fuzzy logic controllers. Genetic algorithm for optimization and turning of controllers including fuzzy logic control.

ME 541 - Advanced Modeling and Simulation Techniques 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: Yes
Prerequisites: ES 205 or ES 305

This course is the same as ME 441 with the addition of greater depth on modeling, simulation, and control of nonlinear systems. ME 541 students will also complete a course project not part of ME 441. Students may not receive credit for both ME 441 and ME 541.

ME 545 - Robot Dynamics and Control 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: ME 406 or ECE 320 or BE 350

This course is the same as ME445 with the additional topic of orientation representation and greater depth on dynamic modeling. ME545 students will also complete a course project. Students may not receive credit for both ME445 and ME545.

ME 550 - Combustion 4 Credits

Hours: 4R-0L-4C
Term Available: S
Graduate Studies Eligible: Yes
Prerequisites: ME 301 or CHE 303 or ME 201

Study of the thermodynamics and kinetics of combustion processes and the underlying chemical processes. Topics covered include deflagration and detonation waves, combustion of solid, liquid, and gaseous fuels, and environmental impacts of combustion. Laboratory experience via in-class, hands-on exercises. Students enrolled in ME 550 must complete a design project not covered in ME 450. Students may not receive credit for both ME 450 and ME 550.

ME 559 - xEV Analysis and Design 4 Credits

Hours: 4R-0L-4C
Term Available: W
Graduate Studies Eligible: Yes
Prerequisites: ME 359

This course extends the concepts learned in ME359 VSM to design, analyze, and compare various levels of vehicle hybridization ranging from pure ICE to pure electric. Experimental data for an IC engine, electric motor, and Li-ion battery are provided. The course is subject to specification-based grading. Simulink is the modeling environment.

ME 590 - Thesis Research 1-12 Credits

Hours: 0R-0L-(1 - 12)C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: None

Credits as assigned; however, not more than 12 credits will be applied toward the requirements of an M.S. degree.

ME 597 - Selected Topics for Graduate Students 1-4 Credits

Hours: (1 - 4)R-0L-(1 - 4)C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: None

None available

ME 699 - Professional Experience 1 Credit

Hours: 1R-0L-1C
Term Available: See Department
Graduate Studies Eligible: Yes
Prerequisites: None

The professional experiences course captures the practical work experiences related to the student's academic discipline. Students are required to submit a formal document of their reflections, which communicates how their employment opportunity reinforced and enhanced their academic studies. The work experiences should be informative or integral to the advancement or completion of the student's program requirements.