ME 4330 Introduction to Robotics (3)  
Cross-listed as ELC 4330  
See ELC 4330 for course information.

ME 4346 Introduction to Aeronautics (3)  
Pre-requisite(s): A grade of C or better in ME 2321 and a grade of C or better or concurrent enrollment in ME 2345  
Introduces the applied science of atmospheric flight. The course teaches about airplanes and how they fly from a design and application perspective. Included are topics in fluid dynamics, airfoil and wing theory, aircraft performance, stability, and aircraft design.

ME 4347 Analysis and Design of Propulsion Systems (3)  
Pre-requisite(s): A grade of C or better in ME 3321 and ME 2345  
Introduction to compressible flow, including flows with simple area change, heat addition, friction, and shock waves. Analysis, parametric design, and performance of ramjets, turbojets, turbofans, and turboprops. Introduction to the operating principles of major engine components. Introduction to rockets.

ME 4377 Solar Energy (3)  
Cross-listed as ELC 4377  
See ELC 4377 for course information.

ME 4382 Selection of Materials and Manufacturing Processes in Design (3)  
Pre-requisite(s): A grade of C or better in ME 3320, ME 3322, and ME 3323  
Systematic approach for selection of materials and manufacturing process in design that balances performance requirements with cost of materials and manufacturing. Material properties, manufacturing processes and types of materials. Advanced computer software and case studies are used to illustrate application of principles.

ME 4396 Special Topics in Mechanical Engineering (3)  
Pre-requisite(s): Consent of Department Chair  
Study of advanced topics in mechanical engineering. This course may be repeated once under a different topic.

ME 4V97 Special Projects in Mechanical Engineering (1-6)  
Pre-requisite(s): Consent of department chair  
Advanced topics and/or special project activities in Mechanical Engineering.

ME 5199 Non-Thesis Degree Completion (1)  
To fulfill requirements for non-thesis master’s students who need to complete final degree requirements other than coursework during their last semester. This may include such things as a comprehensive examination, oral examination, or foreign language requirement. Students are required to be registered during the semester they graduate.

ME 5302 Engineering Analysis (3)  
Cross-listed as EGR 5302, ELC 5302  
See ELC 5302 for course information.

ME 5322 Computer-Aided Engineering and Design (3)  
Design and analysis of engineering components and systems using interactive computer programs with inclusion of computer simulation.

ME 5323 Introduction to Finite Element Methods (3)  
Introductory course on the theory and techniques of finite element analysis for numerical solutions of partial differential equations beginning from energy concepts and foundational constitutive equations. Numerical implementations and solutions are demonstrated by user-created code using modern computer technologies.

ME 5324 Advanced Dynamics (3)  
Pre-requisite(s): Graduate standing in Engineering  
An advanced study of the mechanical dynamics of systems involving multiple, interconnected rigid bodies. Topics include mathematical expressions of body kinematics, various methods to derive dynamic equations of motion, three-dimensional inertial properties, and dynamic motion constraints.

ME 5325 Advanced Finite Element Methods (3)  
Pre-requisite(s): ME 3321 (or equivalent), 4324 (or equivalent), and 4345 (or equivalent)  
Advanced analysis of the finite element model with emphasis on nonlinear applications for thermal and fluidic applications. Course will formulate the finite element model from several classes of constitutive equations, discuss solution methods, and construct and implement algorithms for solving the finite element model.

ME 5333 Introduction to Combustion (3)  
Understand and apply fundamentals for 1) combustion of gas, solid and liquid fuels; 2) combustion equilibrium and calculation of equilibrium compositions and flame temperature; 3) characterization of flame types; 4) quenching, flammability, ignition, and stabilization of flames; 5) soot formation; and 6) detonations and deflagrations.

ME 5335 Composite Materials (3)  
Pre-requisite(s): ME 3322 or equivalent  
Introduction to composite materials, micromechanics of fiber reinforced composites, lamina mechanics, mechanical behavior of composite laminates, hygrothermal effects, and failure models.

ME 5336 Thermal Systems Design (3)  
Pre-requisite(s): A grade of C or better in ME 3321; and a grade of C or better in or concurrent enrollment in ME 4345  
Design, analysis, and simulation of thermal energy systems such as pipe networks, HVAC systems, and steam power plants. Specification of energy system components such as pumps, pipes, control valves, and heat exchangers. Estimation and optimization of initial and operational costs.

ME 5338 Experimental Methods in Heat Transfer and Fluid Flow (3)  
Pre-requisite(s): ME 4335 or consent of instructor  
Consideration of experimental methods including experiment planning and design, error and uncertainty analysis, temperature measurement (in fluids and solids), flow rate measurement, flow visualization, and advanced data analysis; selected experiments conducted.
ME 5339 Tribology (3)
Topics include the nature of rough surfaces, contact mechanics between nonconformal and nominally-flat surfaces, nature of friction, lubricants and lubrication theory, and surface damage and fatigue. Computational analyses of surfaces and lubricant flow are performed using Python.

ME 5340 Intermediate Fluid Mechanics (3)
Pre-requisite(s): ME 3321
Introduction to vectors and tensors, deformation and stress in fluids, kinematics of fluid flows, conservation laws, Navier-Stokes equations, energy equation, introduction to computational fluid dynamics (CFD), introduction to vorticity dynamics and selected topics in compressible fluid flow.

ME 5341 Intermediate Heat Transfer (3)
Pre-requisite(s): ME 4345 (or equivalent)
Study of conduction, convection, and radiation. Steady and transient one- and multi-dimensional heat transfer with emphasis on analytical methods, numerical techniques, and approximate solutions.

ME 5342 Inviscid Flows (3)
Pre-requisite(s): ME 5340 or concurrent enrollment
Introduction to the dynamics of inviscid, incompressible fluids; vector representation theorems; vorticity transport theorem; solution methods to steady and unsteady, two-dimensional, axisymmetric and three-dimensional flows; computational methods for inviscid flows; and forces and moments on bodies in two-dimensional flows.

ME 5343 Computational Fluid Dynamics (3)
Pre-requisite(s): ME 3321

ME 5344 Viscoelasticity (3)
The Theory of Viscoelasticity is fundamental in the study of time rate dependent materials, with specific emphasis on applications to engineering systems with plastics and materials with polymeric behavior.

ME 5346 Introduction to Aeronautics (3)
Introduces the applied science of atmospheric flight. The course teaches about airplanes and how they fly from a design and application perspective. Included are topics in fluid dynamics, airfoil and wing theory, aircraft performance, stability, and aircraft design.

ME 5347 Analysis and Design of Propulsion Systems (3)
Pre-requisite(s): ME 3321, 3345
Introduction to compressible flow, including flows with simple area change, heat addition, friction, and shock waves. Analysis, parametric design, and performance of ramjets, turbojets, turbofans, and turboprops. Introduction to the operating principles of major engine components. Introduction to rockets.

ME 5348 Wind Energy (3)
This course presents fundamentals about wind turbines, both commercial and residential. Included are topics in aerodynamics, structures, power generation, control economics, environments, noise, and design.
ME 5383  Deformation and Fracture in Metals  (3)
Pre-requisite(s): ME 3320 or equivalent and ME 3322 or equivalent
This course introduces students to advanced theories of deformation and fracture that limit lifetimes in service of components and structures made of metals and alloys. Fracture mechanics are introduced as a tool in the life prediction of components that develop cracks before catastrophic failure. Plastic collapse, creep, fatigue, and environmental stress cracking are covered. Failure analysis methodology and tools are introduced and illustrated.

ME 5385  Failure Analysis: Theory and Practice  (3)
Pre-requisite(s): ME 3322
Introduction to basic failure theories and their application to the analysis of component and system failure in service; methodology of systematic failure analysis of actual service failures; introduction to tools used in failure analysis; case studies used extensively for teaching and assignments.

ME 5396  Special Topics in Engineering  (3)
Pre-requisite(s): Approval of department chair
Study of special topics in mechanical engineering. This course may be repeated for a total of six times with different topics.

ME 5397  Special Topics in Engineering  (3)
Cross-listed as BME 5397, EGR 5397, ELC 5397
See EGR 5397 for course information.

ME 5V99  Master's Thesis  (1-6)
Students completing a master's program with a thesis must complete six hours of ME 5V99.

ME 6396  Advanced Topics in Engineering  (3)
Study of advanced topics in engineering. This course may be repeated for a total of four times.

ME 6V97  Engineering Research  (1-12)
Pre-requisite(s): Consent of student's supervisory graduate committee and admission to doctoral candidacy
Doctoral students may enroll in up to 12 semester hours of engineering research hours prior to taking the preliminary exam and being accepted into candidacy for the doctoral degree. These engineering research hours will count toward the degree.

ME 6V99  Dissertation  (1-6)
Required of all doctoral candidates. In no case will fewer than 12 semester hours be accepted for a dissertation. Students may not enroll for doctoral research hours until they have been officially accepted into candidacy for the doctoral degree. After initial enrollment, students must register for at least one semester hour of doctoral research every term thereafter (summer term excluded).