

MECHANICAL & AEROSPACE ENGINEERING

Not all courses are offered every semester. Refer to the schedule of courses for each term's specific offerings.

More Info (<https://one.ufl.edu/soc/>)

Unless otherwise indicated in the course description, all courses at the University of Florida are taught in English, with the exception of specific foreign language courses.

Department Information

The Department of Mechanical and Aerospace Engineering (MAE) is the largest academic program on campus by student enrollment. The Mechanical Engineering program celebrated its 100 year anniversary in 2009 and is one of the founding departments of the Herbert Wertheim College of Engineering. More than a decade after the successful merger of the mechanical and aerospace programs, MAE remains a vibrant and intellectually diverse program at both the undergraduate and graduate level.

Website (<https://mae.ufl.edu/>)

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MECHANICAL & AEROSPACE ENGINEERING C

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Map (<http://campusmap.ufl.edu/#/index/0183>)

Curriculum

- Aerospace Engineering
- Biomechanics Minor
- Combination Degrees
- Mechanical Engineering

The prerequisites for all courses offered by the Department of Mechanical and Aerospace Engineering may require classification as a student in good standing in aerospace engineering, mechanical engineering, and/or another engineering program for which the particular course is required.

Courses

ATT 2100 Learn to Fly 3 Credits

Grading Scheme: Letter Grade

Science and engineering of flight. Preparation for FAA private pilot written exam. Underlying engineering principles of design, operation, and construction of aircraft. Aerodynamics, aerospace materials, structures, propulsion, aircraft instrumentation, stability and control, flight planning, safe aircraft operation, and pilot physiology.

Prerequisite: PHY 2048 with a minimum grade of C.

EAS 2011 Introduction to Aerospace Engineering 3 Credits

Grading Scheme: Letter Grade

Overview of aerospace engineering. Standard atmosphere, basic aerodynamics, airplane performance, stability and control, propulsion, and space flight.

Prerequisite: PHY 2048 or PHY 2060, with minimum grade of C.

EAS 3020C Introduction to Flight 3 Credits

Grading Scheme: Letter Grade

Introduction to the science and engineering of aircraft. Overview of applied aerodynamics, performance, stability, propulsion and structures. Includes lab sessions flying and making measurements in a general aviation aircraft.

Prerequisite: (PHY 2048 or PHY 2053) and MAC 2311; or instructor permission.

EAS 4101 Aerodynamics 3 Credits

Grading Scheme: Letter Grade

Incompressible aerodynamics, integral and differential governing equations, potential flow, boundary layers, airfoils, wings, numerical techniques.

Prerequisite: (EAS 2011 or EAS 3020C or EGN 3353C) and COP 2271 and EML 3100 and MAC 2313 and MAP 2302 with minimum grades of C.

EAS 4132 Compressible Flow 3 Credits

Grading Scheme: Letter Grade

One-dimensional and quasi one-dimensional compressible fluid flows. Includes mach waves, normal shocks, oblique shocks, Prandtl-Meyer expansions, isentropic flow with area change, Fanno flow and Rayleigh flow.

Prerequisite: EAS 4101 or EGN 3353C

EAS 4200 Aerospace Structures 3 Credits

Grading Scheme: Letter Grade

Review of plane states of stress and strain. Includes analysis of thin-walled beams with open and closed section, unsymmetrical bending of wing sections, torsion of skin-stringer and multi-cell sections, flexural shear in open and closed sections, Shear Center and failure criteria. Also includes introduction to composite materials and demonstration of behavior of some simple structural elements.

Prerequisite: EGM 3520 with minimum grade of C.

EAS 4240 Aerospace Composites 3 Credits

Grading Scheme: Letter Grade

Various types and applications of structural composites used in flight structures. Also includes an introduction to analysis of structural composites.

Prerequisite: EGM 3520 with minimum grade of C .

EAS 4300 Aerospace Propulsion 3 Credits

Grading Scheme: Letter Grade

Basics of air-breathing and rocket engines used in flight systems.

Prerequisite: EAS 4132.

EAS 4400 Stability and Control of Aircraft 3 Credits

Grading Scheme: Letter Grade

Static stability and control, equations of motion, stability derivatives, stability of longitudinal and lateral motion of aircraft.

Prerequisite: EAS 4101 and EML 4312.

EAS 4412 Dynamics and Control of Space Vehicles 3 Credits

Grading Scheme: Letter Grade

Review of aerospace applications in current guidance and control systems. Includes synthesis of open and closed loop guidance and control systems using classical and modern control theory.

Prerequisite: EGM 4313 or MAP 4305 or MAP 5304

EAS 4510 Astrodynamics 3 Credits

Grading Scheme: Letter Grade

Introduces the solar system. Includes study of two-body motion, Hohmann transfer, patched conics for interplanetary and lunar trajectories, and the restricted three-body problem. Also includes an introduction to powered flights and artificial satellite orbits.

Prerequisite: EGM 3401 with minimum grade of C and (EGM 4313 or MAP 4305 or MAP 5304).

EAS 4530 Space Systems Design 3 Credits

Grading Scheme: Letter Grade

A discussion of the component systems of a spacecraft and a typical mission's requirements. The operation and character of different spacecraft hardware is presented as well as typical mission timelines from early conception to final operations. Topics include the space environment, guidance/control/navigation systems, spacecraft sensors and actuators, propulsion systems, thermal systems, power systems, launch systems, communication systems, structural systems and mission operations. This course is useful to engineers, scientists, computer scientists and any profession that uses data.

Prerequisite: EAS 4510.

EAS 4700 Aerospace Design 1 3 Credits

Grading Scheme: Letter Grade

Applications of the principles of analysis and design to aerospace vehicles. Emphasizes astronautics.

Prerequisite: EAS 4510 and EML 4312.

EAS 4710 Aerospace Design 2 3 Credits

Grading Scheme: Letter Grade

Applications of the principles of analysis and design to aerospace vehicles. Emphasizes aeronautics.

Prerequisite: EAS 4101 and EAS 4400.

EAS 4810C Aerospace Sciences Lab and Design 3 Credits

Grading Scheme: Letter Grade

Experimental investigations of aerospace engineering systems. Wind tunnel testing. Design project with experimental validation.

Prerequisite: EAS 4101 and EAS 4132 and EML 3301C.

EAS 4905 Individual Study in Aerospace Engineering 1-4 Credits

Grading Scheme: Letter Grade

Selected problems or projects in the student's major field of engineering study.

Prerequisite: department chair recommendation.

EAS 4912 Integrated Product and Process Design 1 3 Credits**Grading Scheme:** Letter Grade

The first of a two-course sequence in which multidisciplinary teams of engineering and business students partner with industry sponsors to design and build authentic products and processes-on time and within budget. Working closely with industry liaison engineers and a faculty coach, students gain practical experience in teamwork and communication, problem solving and engineering design, and develop leadership, management and people skills.

Prerequisite: EAS 4101 and EGM 3520 and EML 3301C.**EAS 4913 Integrated Product and Process Design 2 3 Credits****Grading Scheme:** Letter Grade

The second part of the integrated design sequence in which multidisciplinary teams of engineering and business students partner with industry sponsors to design and build authentic products and processes-on time and within budget.

Prerequisite: EAS 4912.**EAS 4939 Special Topics in Aerospace Engineering 1-4 Credits****Grading Scheme:** Letter Grade

Special topics in aerospace engineering.

Prerequisite: Engineering major of junior standing or higher.**EAS 4949 Co-op Work Experience 1 Credit****Grading Scheme:** S/U

Practical engineering work under industrial supervision, as set forth in the college regulations.

Prerequisite: Engineering major of sophomore standing or higher.**EGM 2511 Engineering Mechanics: Statics 3 Credits****Grading Scheme:** Letter Grade

Reduction of force systems, equilibrium of particles and rigid bodies, vector methods and their application to structures and mechanisms.

Prerequisite: PHY 2048;**Corequisite:** MAC 2313.**EGM 3344 Introduction to Numerical Methods of Engineering Analysis 3 Credits****Grading Scheme:** Letter Grade

Methods for numerical solution of mathematical problems with emphasis on engineering applications using MATLAB. Includes roots, optimization, linear algebraic equations, matrices, curve fitting, differentiation, integration and ordinary differential equations.

Prerequisite: MAC 2313 and COP 2271;**Corequisite:** MAP 2302.**EGM 3401 Engineering Mechanics: Dynamics 3 Credits****Grading Scheme:** Letter Grade

Continues the dynamics sequence begun in EGM 3400 plus extended coverage of three-dimensional rigid-body dynamics and orbital motion.

Prerequisite: EGM 2511 or EGM 2500, and MAC 2313.**EGM 3520 Mechanics of Materials 3 Credits****Grading Scheme:** Letter Grade

Stress and strain at a point, stress-strain-temperature relations and mechanical properties of materials. Systems subject to axial load, torsion and bending. Design concepts, indeterminate structures and applications.

Prerequisite: EGM 2511 and MAC 2313.**EGM 4590 Biodynamics 3 Credits****Grading Scheme:** Letter Grade

Dynamic analysis of the human musculoskeletal system. Includes development of lumped mass, planar rigid body and 3-D rigid body models of human movement. Also includes calculation of internal forces in muscles and joints and analysis of muscle function using dynamics principles and musculoskeletal geometry.

Prerequisite: EGM 3400 or EGM 3401, or instructor permission.**EGM 4592 Bio-Solid Mechanics 3 Credits****Grading Scheme:** Letter Grade

Introduction to solid and fluid mechanics of biological systems. Includes rheological behavior of materials subjected to static and dynamic loading, the mechanics of cardiovascular, pulmonary and renal systems, and the mathematical models and analytical techniques used in biosciences.

Prerequisite: EGM 3520.**EGM 4853 Bio-Fluid Mechanics and Bio-Heat Transfer 3 Credits****Grading Scheme:** Letter Grade

A study of biothermal fluid sciences with an emphasis on the physiological processes occurring in human blood circulation and the underlying mechanisms from an engineering prospective.

Prerequisite: EGN 3353C.

EGN 3353C Fluid Mechanics 3 Credits

Grading Scheme: Letter Grade

Statics and dynamics of incompressible fluids. Application to viscous and inviscid flows. Dimensional analysis. Compressible flow.

Prerequisite: MAC 2313 with a minimum grade of C and EGM 2511 and (EML 3100 or EML 3007 or BME 3060).

EGN 4912 Engineering Directed Independent Research 0-3 Credits

Grading Scheme: S/U

Provides firsthand, supervised research with a faculty advisor or postdoctoral or graduate student mentor. Projects may involve inquiry, design, investigation, scholarship, discovery or application. (S-U)

EGS 1005 Prep for Success 1-4 Credits

Grading Scheme: S/U

Freshman success course that includes academic preparation in calculus, chemistry, student success and technical communications. (S-U)

Prerequisite: EG student.

EMA 4450 Li-ion Next Generation Batteries 3 Credits

Grading Scheme: Letter Grade

Qualities and reactions that characterize Li-ion batteries and other electrochemical cells. Emphasis on mechanical properties. Li-ion and Sodium-ion batteries, fuel cells, capacitors, and hydrogen storage.

Prerequisite: EGM 3520 with a minimum grade of C and EMA 3010.

EML 2023 Computer Aided Graphics and Design 3 Credits

Grading Scheme: Letter Grade

Sketching, descriptive geometry, computer graphics, computer aided drafting and design projects.

EML 2322L Design and Manufacturing Laboratory 2 Credits

Grading Scheme: Letter Grade

Study and application of design, problem formulation, conceptual design, prototype development. Study of common manufacturing processes.

Prerequisite: EML 2023 and ENC 3246 and (Aerospace Engineering or Mechanical Engineering major).

EML 2920 Department and Professional Orientation 1 Credit

Grading Scheme: Letter Grade

Principles of mechanical and aerospace engineering practice, professional standards, engineering ethics.

EML 3005 Mechanical Engineering Design 1 3 Credits

Grading Scheme: Letter Grade

Design process, kinematics, gear trains, and standard mechanical components.

Prerequisite: COP 2271 and EML 2322L and EGM 3520 with a minimum grade of C and EGM 3401 with a minimum grade of C.

EML 3100 Thermodynamics 3 Credits

Grading Scheme: Letter Grade

Application of the first and second laws of thermodynamics to closed and open systems and to cyclic heat engines. Includes the development of procedures for calculating the properties of multiphase and singlephase pure substances.

Prerequisite: CHM 2045, MAC 2313 and PHY 2048.

EML 3301C Mechanics of Materials Laboratory 3 Credits

Grading Scheme: Letter Grade

Experimental characterization of the mechanical properties of engineering materials, precision instruments, computer-based data acquisition, statistical uncertainty analysis, preparation of engineering reports. (WR)

Prerequisite: EMA 3010 and (EGM 3520 with a minimum grade of C) and COP 2271 and (ENC 2210 or ENC 3254 or ENC 3246).

Attributes: Satisfies 6000 Words of Writing Requirement

EML 4140 Heat Transfer 3 Credits

Grading Scheme: Letter Grade

Steady state and transient analysis of conduction and radiation heat transfer in stationary media. Also discusses heat transfer in fluid systems, including forced and free convection.

Prerequisite: MAP 2302 with minimum grade of C and (EAS 4101 or EGN 3353C).

EML 4147C Thermal Sciences Design and Laboratory 3 Credits

Grading Scheme: Letter Grade

Thermodynamics, fluid mechanics, and heat transfer integrated with design and laboratory.

Prerequisite: EML 3100 with a minimum grade of C and EML 3301C and EML 4140.

EML 4220 Vibrations 3 Credits

Grading Scheme: Letter Grade

Single and multiple degree of freedom systems, including application to mechanical systems with problems employing computer techniques.

Prerequisite: EGM 3344 and EGM 3401 and EGM 3520 and MAP 2302 with minimum grades of C.

EML 4304C Thermo/Fluid Design and Laboratory 3 Credits**Grading Scheme:** Letter Grade

Design and laboratories for turbomachinery, compressible flow, chemical reactions, and thermodynamic cycles.

Prerequisite: EGN 3353C and EML 3100 and EML 3301C.**EML 4312 Control of Mechanical Engineering Systems 3 Credits****Grading Scheme:** Letter Grade

Theory, analysis and design of control systems, including mechanical, electromechanical, hydraulic, pneumatic, and thermal components and systems.

Prerequisite: EGM 3401 and EGM 3344 and MAP 2302 with minimum grades of C.**EML 4314C Dynamics and Controls System Design Laboratory 3 Credits****Grading Scheme:** Letter Grade

Experiments on dynamic systems in mechanical and aerospace engineering and design of relevant control systems.

Prerequisite: EML 3301C and EML 4312.**EML 4321 Manufacturing Engineering 3 Credits****Grading Scheme:** Letter Grade

Traditional and nontraditional manufacturing processes and equipment. Application of engineering analysis tools to manufacturing.

Prerequisite: EMA 3010 and EML 2322L and EML 3005.**EML 4410 Combustion Engineering 3 Credits****Grading Scheme:** Letter Grade

Fundamentals of combustion processes and systems; including thermochemistry, rates and mechanisms, pollutant analysis, premixed and diffusion flames and applications to engines and turbomachinery.

Prerequisite: EML 3100.**EML 4450 Energy Conversion 3 Credits****Grading Scheme:** Letter Grade

Thermomechanical and thermoelectric energy conversion, conventional and unconventional techniques and analysis of energy systems interactions.

EML 4500C Reengineering Historic Machinery 3 Credits**Grading Scheme:** Letter Grade

Studies historic commercial machine or vehicle, including theory of operation, embedded engineering principles, and design. Reengineering and design of enhancements. Laboratory includes disassembly, observation of characteristics and conditions, implementation of enhancements, and rebuilding.

Prerequisite: EML 2322L and EML 3005 and EML 3100 with minimum grades of C.**EML 4501 Mechanical Engineering Design 2 3 Credits****Grading Scheme:** Letter Grade

Integrated design and presentation of a mechanical system.

Prerequisite: EGN 3353C and EML 2322L and EML 3005 and (EGM 3401 with a minimum grade of C).**EML 4502 Mechanical Engineering Design 3 3 Credits****Grading Scheme:** Letter Grade

Design and realization of a mechanical engineering system, component, or process subject to appropriate standards and constraints. Team Project.

Prerequisite: EML 4501;**Corequisite:** EML 4321.**EML 4507 Finite Element Analysis and Design 3 Credits****Grading Scheme:** Letter Grade

Stress-strain analysis and design of machine elements and finite element analysis.

Prerequisite: EGM 3344 and EGM 3520 and MAP 2302 with minimum grades of C.**EML 4600 Refrigeration and Air Conditioning Fundamentals 3 Credits****Grading Scheme:** Letter Grade

Fundamentals of refrigeration theory, vapor compression and absorption, refrigeration components and systems, psychrometric theory, analysis of cooling and dehumidifying coils.

Prerequisite: EML 3100.**EML 4601 Heating and Air Conditioning System Design 3 Credits****Grading Scheme:** Letter Grade

Heating and air conditioning systems: equipment selection, system arrangement, load calculations, advanced psychrometrics, duct and piping system design, air distribution system design and indoor air quality.

Prerequisite: EML 3100.

EML 4722 Introduction to Computational Fluid Dynamics 3 Credits

Grading Scheme: Letter Grade

General theory, skepticism, and practice of computational fluid dynamics. Computational grids and generation, boundary conditions, fluid dynamics, numerical methods, visualization, turbulence modelling, and various special topics.

Prerequisite: EAS 4101 or EGN 3353C

EML 4737 Hydraulics and Pneumatics for Building Systems 3 Credits

Grading Scheme: Letter Grade

Applications, design, maintenance and operations of various pneumatic, hydronic and other process systems. Includes in-depth design concepts and techniques as well as preparation of specifications and cost estimates.

Prerequisite: EGN 3353C.

EML 4738 Hydraulic and Mechanical Power Transmission 3 Credits

Grading Scheme: Letter Grade

Transmission of power in machines by hydraulic and mechanical means, including analytical design of components and their functions.

Prerequisite: EML 3005.

EML 4905 Individual Study in Mechanical Engineering 1-3 Credits

Grading Scheme: Letter Grade

Selected problems or projects in the student's major field of engineering study.

Prerequisite: 2.3 UF GPA and department permission.

EML 4912 Integrated Product and Process Design 1: Mechanical Engineering 3 Credits

Grading Scheme: Letter Grade

The first part of a two-course sequence in which multidisciplinary teams of engineering and business students partner with industry sponsors to design and build authentic products and processes-on time and within budget. Working closely with industry liaison engineers and a faculty coach, students gain practical experience in teamwork and communication, problem solving and engineering design, and develop leadership, management and people skills.

Prerequisite: EGN 3353C and EGM 3401 and EML 3005 and EML 3301C.

EML 4913 Integrated Product and Process Design 2: Mechanical Engineering 3 Credits

Grading Scheme: Letter Grade

The second part of the integrated design sequence in which multidisciplinary teams of engineering and business students partner with industry sponsors to design and build authentic products and processes-on time and within budget.

Prerequisite: EML 4912.

EML 4926 Mechanical Consulting Practice 3 Credits

Grading Scheme: Letter Grade

Synthesis and analysis of mechanical engineering systems, planning and execution of engineering contracts, and supervision of construction and tests.

Prerequisite: senior standing.

EML 4930 Special Topics in Mechanical Engineering 1-3 Credits

Grading Scheme: Letter Grade

Variable content in mechanical engineering not offered in other courses.

Prerequisite: Engineering major of junior standing or higher.

EML 4945 Practical Work in Mechanical Engineering 1 Credit

Grading Scheme: S/U

Practical engineering work under industrial supervision, as set forth in the Herbert Wertheim College of Engineering regulations.

Prerequisite: Engineering major with a 2.0 UF GPA.

EML 4949 Co-op Work Experience 1 Credit

Grading Scheme: S/U

Practical co-op work experience under approved industrial supervision.

Prerequisite: Engineering major with a 2.0 UF GPA.
