Mechanical Engineering

Undergraduate Courses/[**link to graduate courses**](http://www.fau.edu/academic/registrar/PREcatalog/engineeringDES.php#mechgrad)

Core Courses

Electro-Mechanical Devices (EGM 4045) 3 credits
Prerequisite: PHY 2044 and (MAP 3305 or MAP 2302) or equivalent with minimum grades of "C"~~Prerequisite or Corequisite: EGN 3343 with minimum grade of "C"~~Principles of electrical circuits, DC and AC devices, electrical machines and sizing of electrical systems for mechanical loads. Design of circuits and filters for data acquisition. Introduction to applied electrical specification of motors and NEC codes.

Finite Element Analysis for Engineering Design (EGM 4350) 3 credits
Prerequisite: *EML 4500* ~~EGN 3331 or equivalent,~~ or EOC 3410C or CES 3102C with a minimum grade of "C"
Fundamental concepts of finite element software to perform the stress, vibration, and heat transfer analyses of various engineering design problems.

Engineering Graphics (EGN 1111C) 3 credits
Sketching techniques. Multiview drawings, pictorials, section views, auxiliary views, and engineering problem layout. Descriptive geometry. Three-dimensional modeling and computer graphics.
Computer Applications in Engineering 1 (EGN 2213) 3 credits
Prerequisite or Corequisite: ~~Prerequisite:~~ ~~MAC 2282 or~~ MAC 2312 with minimum grade of "C"
An introduction to programming in MATLAB, this course includes some matrix concepts, input/output statements, for and while loops, if and else-if statements, built-in functions, self-written functions, some built-in solvers and projects illustrating applications to engineering topics.

Statics (EGN 3311) 3 creditsDynamics (EGN 3321) 3 creditsStrength of Materials (EGN 3331) 3 credits
Engineering Thermodynamics (EGN 3343) 3 credits
Engineering Materials 1 (EGN 3365) 3 credits
Dynamic Systems (EGN 4432) 3 credits
[*(See Interdisciplinary courses, this section)*](http://www.fau.edu/academic/registrar/PREcatalog/engineeringDES.php#interdisc)

Experimental Methodology (EML 3523C) 3 credits
Prerequisite: ~~EGN 3321 or equivalent,~~ ~~EGN 3331 or equivalent,~~ EML 3701 with a minimum grade of C

Pre-requisites and Corequisites EGN 3321, EGM 4045 and STA 4032, all with minimum grades of "C"
Study of typical measuring systems. Solutions of engineering problems by experimental means, to include analysis of experimental data. Course consists of two hours of lecture and three hours of lab.

Fluid Mechanics (EML 3701) 3 credits
Prerequisites: EGN 3311 or equivalent, EGN 3343 or equivalent ~~and (MAP 3305 or MAP 2302)~~ all with minimum grades of "C"
Characteristics of a fluid, fluid statics, flow fields, fundamental laws, control volume concept, some applications of the fundamental laws in integral form, dimensional analysis and similitude, flow in pipes, single-path pipe line problems, networks, and boundary layer concepts.

Applied Thermal-Fluid Engineering (EML 4127) 3 credits
Prerequisite: EML 4142 with minimum grade of "C"
Applications of fluid mechanics and heat transfer, including: turbomachinery, heat exchangers, condensation and boiling heat transfer, special topics in fluid mechanics, heat transfer, and design projects.

Heat Transfer (EML 4142) 3 credits
Prerequisites: ~~EGN 2213 and~~ EML 3701 with minimum grades of "C"
Modes of heat transfer, one- and two-dimensional steady state heat conduction, unsteady heat conduction, numerical methods, computer program projects, empirical relations for forced and free convection, radiation properties, shape factors, radiation heat exchange between gray bodies.

Machine Design 2 (EML 4262) 3 credits
Prerequisites: EGN 1111C, EGN 3321 and EGN 3331 or equivalents with minimum grades of "C"
The study of kinematics, dynamics, and design of machinery and related components. Topics include analysis and synthesis of linkages, cams, bearings, gears, and gear trains.

~~System Dynamics (EML 4380) 3 credits
Prerequisites: EGN 3321 or equivalent, EGN 2213 and MAP 3305 with minimum grades of "C"
Modeling and analysis of dynamics of physical systems including mechanical, electrical, fluid, thermal and mixed systems, with emphasis on linear, lump-parameter approach using analytical and computer-aided numerical techniques.~~

Machine Design ~~1~~ (EML 4500) 3 credits
Prerequisites: ~~EGN 3331 or equivalent and~~ ~~EGN 2213~~ EGM 4523C and EGN 1111C, all with minimum grades of C

Corequisite: EML 4730L
Introduction to machine design; fundamental principles in strength of materials; static and fatigue failure theories; design of machine elements; and design projects.

Engineering Design (EML 4521C) 3 credits
Prerequisites: EML 4127 and EML 4500, EGM 4350, all with minimum grades of "C"

Corequisites: EGM 4350 and EML 4263C
The design process, including decision theory, creativity concepts, human factors, optimization techniques, reliability, statistics and professional ethics. Engineering economy. Material selection and testing. Fatigue and fracture design.

Computer Applications in Mechanical Engineering 2 (EML 4534) 3 credits
Prerequisites: ~~EGN 3331 or equivalent,~~ (MAP 3305 or MAP 2302) and (EGN 2213 or COP 2220) all with minimum grades of "C"
Review of MATLAB Language, numerical methods utilized in solving mechanical engineering problems, projects related to solid body mechanics, and thermal systems.

Design Project (EML 4551) 3 credits
Prerequisite: EML 4521C (EML 4551 may be taken concurrently with EML 4521C with permission of instructor only.)
Continuation and completion of individual and group projects initiated in prerequisite course EML 4521C, Engineering Design.

Mechanical Engineering Lab (EML 4730L) 3 credits
Prerequisites: ~~EGN 3365 or equivalent and~~ EML 3523C with a minimum grade of "C"~~Prerequisites or Corequisites: EML 4142 and (EML 4380 or EGN 4432) with minimum grades of "C"~~Experimental work related to heat transfer, fluid mechanics, mechanical systems, materials and solid mechanics.

Intermediate Strength of Materials (EGM 4523C) 3 credits
Prerequisites: EGN 3331 with a minimum grade of "C"An extension of the theories and applications of the principles of mechanics of materials taught in EGN 3331 Strength of Materials, including determining the deflection of beams by deferent methods, solving statically indeterminate problems, studying the phenomenon of stress concentration in practical situations, and applying static failure theories in design.

Fabrication of Mechanical Engineering Systems (EML 4263C) 2 credits
Prerequisites: EGN 3365 with a minimum grade of "C"An introductory course directed at acquainting mechanical engineering students with the basic machinery and machining processes used to fabricate parts of mechanical engineering systems.

Electives

Nanotechnology (BME 4571) 3 credits
Prerequisites: Some math, physics, and chemistry
Fundamental science behind nanotechnology. Tools of nanosciences. Smart materials. Sensors. Biomedical applications. Energy capture, transformation, and storage. Optics and electronics. Fabrication and modeling. Nano business and nano industry.

Plastics and Composites (EML 4236) 3 credits
Prerequisites: EGN 3331 or equivalent and EGN 3365 or equivalent with minimum grades of "C"
Course covers the structure and properties of polymers and the design of plastic parts. It also provides an introduction to composite materials.

Mechanical Control System (EML 4312) 3 credits
Prerequisites: ~~MAP 2302 and~~ ~~EML 4380~~ EGN 4432 with a minimum grade of "C"
A course in mechanical control systems; introduction, modeling and analysis. Stability and performance characteristics.

Manufacturing Methods (EML 4321) 3 credits
Prerequisite: EGN 3365 or equivalent with minimum grade of "C"
Structure and properties of materials, thermal treatments and material selection for particular applications. Casting, powder metallurgy, forming, machining and joining processes.

Vibration Synthesis and Analysis (EGN 4323) 3 credits
Prerequisites: (MAP 3305 or MAP 2302) and EGN 3321 with minimum grades of "C"
Free and forced vibration of mechanical systems, damping, periodic and transient excitations, two degree of freedom and continuous systems.

Introduction to Solar Energy (EML 4416C) 3 credits
Prerequisite:EGN 3343 or equivalent with minimum grade of "C"Pre or Corequisite: EML 4142 with minimum grade of "C"
Energy and the human condition. The sun and the earth. A review of first principles. Collection of solar energy. Applications of solar energy. Two hours lecture, six hours lab.

Internal Combustion Engines (EML 4421) 3 credits
Prerequisites: EGN 3343 or equivalent, EML 3701 and EML 4142 all with minimum grades of "C"
Course focuses on the fundamental principles of engine operation and application; engine types; criteria to judge the performance of ICEs; review of thermodynamic and combustion principles; understanding the concept of fuel-air cycle analysis; main differences between spark ignition and diesel engines; engine modeling and testing.

Design Against Uncertainty (EML 4571) 3 credits
Prerequisite: EGN 3331 or equivalent with minimum grade of "C"
The basic modern concepts for design of engineering structures against uncertainty will be elucidated in this course. The following topics will be studied: safety factors, probabilistic design through reliability, convex modeling of uncertainty, fuzzy subsets based design, Taguchi methods.

Directed Independent Study (EML 4905) 1-3 credits
Prerequisite: Permission of instructor
Study of topics relating to the special needs and interests of individual students. May be taken for repeated credit.

Special Topics (EML 4930) 1-3 credits
Prerequisite: Permission of instructor
Topics in specialized areas, such as analytical methods in mechanical engineering, statistical analysis in engineering, and engineering design practice, not adequately covered in other courses. May be repeated for credit.

Special Projects in Mechanical Engineering (EML 4932) 1-3 credits
Prerequisite: Permission of instructor
Experimental work in the laboratory and/or with the computer on topics not adequately covered in other courses. May be repeated for credit.

Cooperative Education - Mechanical Engineering (EML 4949) 1-3 credits
Cooperative work study with mechanical-oriented organizations for mechanical engineering students who have completed at least one full semester of upper-level mechanical engineering courses. May be used for a total of 2 or 3 credits toward technical electives. Grading: S/U

**Interdisciplinary Courses:**

Statics (EGN 3311) 3 credits
Prerequisite: PHY 2048 with minimum grade of "C"
Prerequisite or Corequisite: MAC 2312
Analysis of force and moment systems for static equilibrium of trusses, beams, frames, and machines; elements of frictions; centroid, center of gravity, center of mass, and moment of inertia.

Dynamics (EGN 3321) 3 credits
Prerequisite: EGN 3311 with minimum grade of "C"
Dynamics of particles and rigid bodies, applications of free-body diagrams, Newton's second law, the impulse-momentum method and the work-energy principle to solve dynamic problems in mechanical systems.

Strength of Materials (EGN 3331) 3 credits
Prerequisite: EGN 3311 with minimum grade of "C"
Concepts of stress and strain; mechanical properties of materials, force, deformation and stress analysis of structural members; stress and strain transformations; principal stresses; failure theories; and concept of buckling.

Engineering Thermodynamics (EGN 3343) 3 credits
Prerequisite: PHY 2048 with minimum grade of "C"Prerequisite ~~or Corequisite~~: MAC 2312 with a minimum grade of "C"
Topics include properties of a simple pure compressible substance, equations of state, the first law of thermodynamics, internal energy, specific heats, enthalpy and the application of the first law to a system or a control volume. The study of the second law of thermodynamics is also discussed leading to the discovery of entropy as a property and its ramifications.

Engineering Materials 1 (EGN 3365) 3 credits
Prerequisites or Corequisite: EGN 3331 ~~and EGN 3343~~ with a minimum grade of "C"
Structure of material systems from the atomic, micro and macroscopic standpoints. Equilibrium and non-equilibrium structures. Relationship between structure and electrical, thermal, mechanical and failure properties of metals, ceramics and polymeric materials. Strengthening mechanisms in materials.

Dynamic Systems (EGN 4432) 3 credits
Prerequisites: EGN 3321 or equivalent and (MAP 3305 or MAP 2302) and (EEL 2161 or EGN 2213 or equivalent)
Acquaints students with basic knowledge about dynamic systems, systems stability analysis and basic controller design.