

# MECHANICAL ENGINEERING

## Program Information

The Department of Mechanical and Aerospace Engineering offers the degrees of Master of Science (thesis or non-thesis), Master of Engineering (thesis or non-thesis), and Doctor of Philosophy in Mechanical Engineering. Official minimum requirements for these degrees are given in the Graduate Degrees (<http://catalog.ufl.edu/graduate/degrees/>) section of this catalog.

### Master of Science & Master of Engineering

Any master's degree candidate may elect to pursue the Master of Science degree (M.S.), however only those holding ABET-accredited baccalaureate degrees in engineering may choose the Master of Engineering degree (M.E.). All other degree requirements remain the same.

A total of 30 credit hours is required for the Master's degree. The Master's degree, with thesis option, includes a minimum of 24 graded credit hours of coursework (excluding S/U courses) and up to 6 credits of thesis research. For students pursuing the non-thesis degree option, a total of 30 graded credit hours (excluding S/U courses) is required. For both the thesis and non-thesis degree, up to 6 credits of out of department coursework at the 3000 or 4000 level (excluding EGN courses and S/U courses) may be completed to satisfy degree requirements, as long as the coursework completed is included in an approved Plan of Study.

A comprehensive final examination is required by the Graduate School for the M.E. or M.S. non-thesis degree option. Passing the written qualifying Ph.D. exam may substitute for the M.S. non-thesis examination for those continuing towards for Ph.D. **Note:** The exam must be completed in either the semester of graduation or the proceeding semester in which the degree is to be conferred.

### Doctor of Philosophy

The Doctor of Philosophy (Ph.D.) is a research intensive degree requiring independent mastery of a field of knowledge. As such, considerable flexibility is allowed by the Graduate School and by MAE in the tailoring of individual programs.

All Ph.D. students must take a minimum of 39 graded credit hours (excludes S/U graded courses) beyond the B.S. degree. Students are expected to complete a Plan of Study by the second term of enrollment, which should include a tentative title for the student's dissertation. As the student progresses toward the degree, any significant deviations in their program from the approved Plan of Study should be discussed and approved by the student's advisor, and recorded in the submission of a revised Plan of Study.

### Guidelines for Plan of Study

During the first year of graduate study, each student should complete a minimum of three didactic courses in the Fall and Spring semesters. Generally, core courses are selected, as well as an appropriate mix of elective courses for the chosen specialization. (Ph.D. Students should include coursework to prepare for the qualifying exam.) Except for a minority of students doing interdisciplinary specializations whose Plans of Study will be reviewed by the Graduate Committee, a student will follow the requirements of one of the three MAE graduate study groups:

- Dynamics, Systems, and Control (DSC)
- Solid Mechanics, Design, and Manufacturing (SMDM)
- Thermal Science and Fluid Dynamics (TSFD)

The Plan of Study (and qualifying exam if a Ph.D. student) will be based upon the chosen group. Please reference the MAE degree programs and requirements (<http://www.mae.ufl.edu/current/graduate/degree-programs-requirements>) for complete details.

Additional information about the department can be found at <http://www.mae.ufl.edu>.

## Degrees Offered

### Degrees Offered with a Major in Mechanical Engineering

- Doctor of Philosophy
  - without a concentration
  - concentration in Clinical and Translational Science
- Master of Engineering
- Master of Science

Requirements for these degrees are given in the Graduate Degrees (<http://catalog.ufl.edu/graduate/degrees/>) section of this catalog.

## Courses

### Mechanical and Aerospace Engineering Departmental Courses

Code	Title	Credits
BME 5580	Introduction to Microfluidics and BioMEMS	3
EAS 5242	Mechanics of Composite Materials	3
EAS 5938	Special Topics in Aerospace Engineering	1-4
EAS 6135	Molecular Theory of Fluid Flows	3
EAS 6138	Gasdynamics	3
EAS 6242	Advanced Structural Composites	3
EAS 6413C	Spacecraft Attitude Estimation and Control	3
EAS 6415	Guidance and Control of Aerospace Vehicles	3
EAS 6905	Aerospace Research	1-6
EAS 6910	Supervised Research	1-5
EAS 6939	Special Topics in Aerospace Engineering	1-6
EAS 6971	Research for Master's Thesis	1-15
EAS 7979	Advanced Research	1-12
EAS 7980	Research for Doctoral Dissertation	1-15
EGM 5111L	Experimental Stress Analysis	3
EGM 5121C	Data Measurement and Analysis	3
EGM 5423	High Strain Rate Behavior of Materials	3
EGM 5533	Applied Elasticity and Advanced Mechanics of Solids	3
EGM 5584	Biomechanics of Soft Tissue	3
EGM 5816	Intermediate Fluid Dynamics	3
EGM 6321	Principles of Engineering Analysis I	3
EGM 6322	Principles of Engineering Analysis II	3
EGM 6341	Numerical Methods of Engineering Analysis I	3
EGM 6342	Fundamentals of Computational Fluid Dynamics	3
EGM 6352	Advanced Finite Element Methods	3
EGM 6365	Structural Optimization	3
EGM 6570	Principles of Fracture Mechanics	3

EGM 6611	Continuum Mechanics	3
EGM 6671	Inelastic Materials	3
EGM 6812	Fluid Mechanics I	3
EGM 6813	Fluid Mechanics II	3
EGM 6855	Bio-Fluid Mechanics and Bio-Heat Transfer	3
EGM 6905	Individual Study	1-6
EGM 6934	Special Topics in Engineering Mechanics	1-6
EGM 6936	Graduate Seminar	1
EGM 7819	Computational Fluid Dynamics	3
EGM 7845	Turbulent Fluid Flow	3
EGM 7979	Advanced Research	1-12
EGM 7980	Research for Doctoral Dissertation	1-15
EGN 5949	Practicum/Internship/Cooperative Work Experience	1-6
EGN 6640	Entrepreneurship for Engineers	3
EGN 6913	Engineering Graduate Research	0-3
EML 5045	Computational Methods for Design and Manufacturing	3
EML 5104	Classical and Statistical Thermodynamics	3
EML 5131	Combustion	3
EML 5215	Analytical Dynamics I	3
EML 5223	Structural Dynamics	3
EML 5224	Acoustics	3
EML 5233	Failure of Materials in Mechanical Design	3
EML 5311	Control System Theory	3
EML 5318	Computer Control of Machines and Processes	3
EML 5465	Energy Management for Mechanical Engineers	3
EML 5515	Gas Turbines and Jet Engines	3
EML 5516	Design of Thermal Systems	3
EML 5526	Finite Element Analysis and Application	3
EML 5595	Mechanics of the Human Locomotor System	3
EML 5598	Orthopedic Biomechanics	3
EML 5605	Advanced Refrigeration	3
EML 5714	Introduction to Compressible Flow	3
EML 6154	Conduction Heat Transfer	3
EML 6155	Convective Heat Transfer I	3
EML 6156	Multiphase Convection Heat Transfer	3
EML 6157	Radiation Heat Transfer	3
EML 6229	Introduction to Random Dynamical Systems	3
EML 6267	Advanced Manufacturing Processes and Analysis	3
EML 6281	Geometry of Mechanisms and Robots I	3
EML 6282	Geometry of Mechanisms and Robots II	3
EML 6323	Nontraditional Manufacturing	3
EML 6324	Fundamentals of Production Engineering	3
EML 6350	Introduction to Nonlinear Control	3
EML 6351	Nonlinear Control II: Adaptive Control	3
EML 6352	Optimal Estimation and Kalman Filtering	3
EML 6365	Robust Control Synthesis	3
EML 6417	Solar Energy Utilization	3
EML 6451	Energy Conversion	3
EML 6606	Advanced Air Conditioning	3
EML 6905	Individual Projects in Mechanical Engineering	1-3
EML 6934	Special Topics in Mechanical Engineering	1-4
EML 6971	Research for Master's Thesis	1-15
EML 7979	Advanced Research	1-12
EML 7980	Research for Doctoral Dissertation	1-15

## College of Engineering Courses

Code	Title	Credits
EEE 5354L	Semiconductor Device Fabrication Laboratory	3
EGN 5010L	NRF Training Lab	1
EGN 5949	Practicum/Internship/Cooperative Work Experience	1-6
EGN 6640	Entrepreneurship for Engineers	3
EGN 6642	Engineering Innovation	3
EGN 6913	Engineering Graduate Research	0-3
EGN 6933	Special Topics	1-3
EGN 6937	Engineering Fellowship Preparation	0-1
EGS 6039	Engineering Leadership	3
EGS 6101	Divergent Thinking	3
EGS 6626	Fundamentals of Engineering Project Management	3
EGS 6628	Advanced Practices in Engineering Project Management	3
EGS 6681	Advanced Engineering Leadership	3
EMA 6581	Polymeric Biomaterials	3
ESI 6900	Principles of Engineering Practice	1-4

### Student Learning Outcomes

#### mechanical engineering (PHD)

##### SLO 1 Knowledge

Ability to identify, formulate, and solve engineering problems. Ability to critically read and integrate engineering research literature

##### SLO 2 Skills

Ability to use applied mathematical and/or modern experimental techniques. Ability to use modern engineering tools for practice at an advanced level

##### SLO 3 Professional Behavior

Ability to communicate effectively

#### Mechanical Engineering (Me & Ms)

##### SLO 1 Knowledge

Ability to identify, formulate, and solve engineering problems

##### SLO 2 Skills

Ability to use applied mathematical techniques. Ability to use modern engineering tools for practice at an advanced level

##### SLO1 Comprehensive Knowledge

Describe knowledge of the normal structure and physiologic function of the human body and how failure of normal function is associated with disease