MATERIALS SCIENCE AND ENGINEERING

Graduate Coordinator: W.M. Sigmund

The University of Florida's Materials Science and Engineering (MSE) graduate program offers students a world-class education in a world-class research environment, offering two graduate degrees: a Master of Science and a Doctor of Philosophy.

UF's MSE graduate program includes more than 40 graduate faculty members across multiple colleges and departments and numerous research institutes. Faculty routinely conduct multidisciplinary research with researchers in other departments. This provides graduate students exposure to a broad spectrum of concepts and skills, access to state-of-the-art research instrumentation, and the experience of a vibrant collaborative culture.

MSE graduate students master a set of core concepts and principles critical to a fundamental understanding of materials science and engineering, but also have tremendous flexibility in designing a sequence of coursework and research.

Degrees Offered

Degrees Offered with a Major in Materials Science and 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://gradcatalog.ufl.edu/graduate/degrees/) section of this catalog.

Courses

Materials Science and Engineering Program Courses

Code	Title	Credits
EMA 5008	Particle Science and Technology: Theory and Practice	3
EMA 5095	Critical Analysis of Research in Materials Science & Engineering	3
EMA 5108	Vacuum Science and Technology	3
EMA 5365	Biomimetic Synthesis	3
EMA 6001	Properties of Materials - A Survey	3
EMA 6005	Thin and Thick Films	3
EMA 6105	Fundamentals and Applications of Surface Science	3
EMA 6106	Advanced Phase Diagrams	3
EMA 6107	High Temperature Materials	3
EMA 6110	Electron Theory of Solids for Materials Scientists I	3
EMA 6111	Electron Theory of Solids for Materials Scientists II	3
EMA 6114	Properties of Functional Materials	3
EMA 6128	Materials Microstructures	3
EMA 6136	Diffusion, Kinetics, and Transport Phenomena	3
EMA 6165	Polymer Physical Science	3
EMA 6166	Polymer Composites	3
EMA 6227	Advanced Mechanical Metallurgy II	3
EMA 6265	Mechanical Properties of Polymers	3
EMA 6313	Structure and Mechanical Properties of Materials	3
EMA 6316	Materials Thermodynamics	3
EMA 6319	Applied Colloid and Interfacial Chemistry for Engineers	3
EMA 6412	Synthesis and Characterization of Electronic Materials	3
EMA 6416	Organic Electronics	3
EMA 6445	Electroceramics	3
EMA 6446	Solid State Ionics	3
EMA 6448	Ceramic Processing	3
EMA 6461	Polymer Characterization	3
EMA 6507	Scanning Electron Microscopy and Microanalysis	3
EMA 6507L	Scanning Electron Microscopy and Microanalysis Lab	1
EMA 6510	Survey of Materials Analysis Techniques	3
EMA 6516	X-Ray Methods for Materials Characterization	3
EMA 6516L	X-Ray Methods Laboratory for Materials Characterization	1
EMA 6518	Transmission Electron Microscopy	3
EMA 6518L	Transmission Electron Microscopy Laboratory	1
EMA 6519L	Specialized Research Techniques in Materials Science	1-2
EMA 6540	Fundamentals of Crystallography	3
EMA 6541	Applied Crystallography and Powder Diffraction	3
EMA 6580	Science of Biomaterials I	3
EMA 6581	Polymeric Biomaterials	3
EMA 6583	The Science of Cell Material Interactions	3
EMA 6589	Mechanical Behavior of Biomaterials	3
EMA 6590	Advances in Biomaterials and Tissue Engineering for Healthcare	3
EMA 6591	Clinical Applications of Biomaterials and Tissue Engineering	3
EMA 6616	Advanced Electronic Materials Processing	3
EMA 6625	Advanced Metals Processing	3
EMA 6667	Polymer Processing	2-3
EMA 6715	Fracture of Brittle Materials	3
EMA 6803	Classical Methods in Computational Materials Science	3
EMA 6804	Quantum Methods in Computational Materials Science	3
EMA 6808	Error Analysis and Optimization Methodologies in Materials Research	3
EMA 6905	Individual Work in Materials Science and Engineering	1-4
EMA 6910	Supervised Research	1-5
EMA 6920	Professional Development for Materials Science and Engineering	1
EMA 6936	Seminar in Materials Science and Engineering	1
EMA 6938	Special Topics in Materials Science and Engineering	1-4
EMA 6971	Research for Master's Thesis	1-15

EMA 7979	Advanced Research	1-12
EMA 7980	Research for Doctoral Dissertation	1-15
ENU 6805	Introduction to Nuclear Reactor Materials	3

Materials Science and Engineering Departmental Courses

Code	Title	Credits
ECH 6726	Interfacial Phenomena I	3
ECH 6727	Interfacial Phenomena II	3
EGN 5949	Practicum/Internship/Cooperative Work Experience	1-6
EGN 6640	Entrepreneurship for Engineers	3
EGN 6913	Engineering Graduate Research	0-3
EMA 5008	Particle Science and Technology: Theory and Practice	3
EMA 5095	Critical Analysis of Research in Materials Science & Engineering	3
EMA 5108	Vacuum Science and Technology	3
EMA 5365	Biomimetic Synthesis	3
EMA 6001	Properties of Materials - A Survey	3
EMA 6005	Thin and Thick Films	3
EMA 6105	Fundamentals and Applications of Surface Science	3
EMA 6106	Advanced Phase Diagrams	3
EMA 6107	High Temperature Materials	3
EMA 6110	Electron Theory of Solids for Materials Scientists I	3
EMA 6111	Electron Theory of Solids for Materials Scientists II	3
EMA 6114	Properties of Functional Materials	3
EMA 6128	Materials Microstructures	3
EMA 6136	Diffusion, Kinetics, and Transport Phenomena	3
EMA 6165	Polymer Physical Science	3
EMA 6166	Polymer Composites	3
EMA 6227	Advanced Mechanical Metallurgy II	3
EMA 6265	Mechanical Properties of Polymers	3
EMA 6313	Structure and Mechanical Properties of Materials	3
EMA 6316	Materials Thermodynamics	3
EMA 6319	Applied Colloid and Interfacial Chemistry for Engineers	3
EMA 6412	Synthesis and Characterization of Electronic Materials	3
EMA 6416	Organic Electronics	3
EMA 6445	Electroceramics	3
EMA 6446	Solid State Ionics	3
EMA 6448	Ceramic Processing	3
EMA 6461	Polymer Characterization	3
EMA 6507	Scanning Electron Microscopy and Microanalysis	3
EMA 6507L	Scanning Electron Microscopy and Microanalysis Lab	1
EMA 6510	Survey of Materials Analysis Techniques	3
EMA 6516L	X-Ray Methods Laboratory for Materials Characterization	1
EMA 6516	X-Ray Methods for Materials Characterization	3
EMA 6518L	Transmission Electron Microscopy Laboratory	1
EMA 6518	Transmission Electron Microscopy	3
EMA 6519L	Specialized Research Techniques in Materials Science	1-2
EMA 6540	Fundamentals of Crystallography	3
EMA 6541	Applied Crystallography and Powder Diffraction	3
EMA 6580	Science of Biomaterials I	3
EMA 6581	Polymeric Biomaterials	3
EMA 6583	The Science of Cell Material Interactions	3
EMA 6589	Mechanical Behavior of Biomaterials	3
EMA 6590	Advances in Biomaterials and Tissue Engineering for Healthcare	3
EMA 6591	Clinical Applications of Biomaterials and Tissue Engineering	3
EMA 6616	Advanced Electronic Materials Processing	3
EMA 6625	Advanced Metals Processing	3
EMA 6667	Polymer Processing	2-3
EMA 6715	Fracture of Brittle Materials	3
EMA 6803	Classical Methods in Computational Materials Science	3
EMA 6804	Quantum Methods in Computational Materials Science	3
EMA 6808	Error Analysis and Optimization Methodologies in Materials Research	3
EMA 6905	Individual Work in Materials Science and Engineering	1-4
EMA 6910	Supervised Research	1-5
EMA 6920	Professional Development for Materials Science and Engineering	1
EMA 6936	Seminar in Materials Science and Engineering	1
EMA 6938	Special Topics in Materials Science and Engineering	1-4
EMA 6941	Supervised Teaching	1-5
EMA 6971	Research for Master's Thesis	1-15
EMA 7979	Advanced Research	1-12
EMA 7980	Research for Doctoral Dissertation	1-15
ENU 6805	Introduction to Nuclear Reactor Materials	3

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

Materials science & Engineering (PHD)

SLO 1 Knowledge
Identify unknown aspects of structure-property-processing relationships for a materials system and formulate an approach to elucidating those aspects using engineering and/or scientific principles at a level appropriate to a doctoral research.

SLO 2 Knowledge
Demonstrate proficiency on appropriate experimental or computational techniques used for materials characterization, and uses these techniques to investigate structure-property-relationships in material systems at a level appropriate to doctoral research.

SLO 3 Skills
Obtain information from primary literature and technical reports, and integrate that information to reach conclusions regarding the current state of the art and areas in which further research is needed.

SLO 4 Skills
Write and/or orally present the results of a research project or literature review in a manner that clearly communicates one or more of the following: current state of the art, areas in which additional research is needed, research objectives, procedures, results, and conclusions.

SLO 5 Professional Behavior
Write reports and research papers following ethical standards regarding appropriate citation and plagiarism.

SLO 6 Professional Behavior
Work cooperatively with others, interact with supervisors, follow guidelines for appropriate management of data, and follow safety requirements for working in a research laboratory. develop leadership skills

Materials Science & Engineering (ME & MS)

SLO 1 Knowledge
Identify unknown aspects of structure-property-processing relationships for a materials system and formulate an approach to elucidating those aspects using engineering and/or scientific principles at a level appropriate to a master student.

SLO 2 Skills
Obtain information from primary literature and technical reports, and integrate that information to reach conclusions regarding the current state of the art and areas in which further research is needed

SLO 3 Skills
Write and/or orally present the results of a research project or literature review in a manner that clearly communicates one or more of the following: current state of the art, areas in which additional research is needed, research objectives, procedures, results, and conclusions

SLO 4 Professional Behavior
Write reports and research papers following ethical standards regarding appropriate citation and plagiarism