Materials Science and Engineering (MSEN)

Courses

MSEN 52503. Emerging Technologies in Industry. 3 Hours.
Business leaders present technologies used by their companies. Focusing on Arkansas-based companies, technology needs for the industry and innovative ideas for solutions or advancements are discussed. Students work to develop solutions to address company needs or further develop a company's current technology. (Typically offered: Fall and Spring) May be repeated for up to 9 hours of degree credit.

MSEN 53103. Structure and Properties of Materials. 3 Hours.
Structure and Properties of Materials, covers core concepts of materials science and engineering and is foundational for students interested in studying materials from different fields. The structures of materials at the atomic scale, nanoscale, microscale, and macroscale are studied and the impact of this organization of matter on its physical and chemical properties are examined. Principles for measurement and characterization of material structure and properties are introduced. Emphasis is placed on materials important for use for electronic, photonic, energy, and biological applications. Advances in nanoscale materials as established fundamentals of macroscale structural materials are covered. Prerequisite: Graduate standing or consent of the instructor. (Typically offered: Fall)

MSEN 53202. Materials Characterization. 2 Hours.
Lecture and hands-on experience for using characterization tools to study the properties of materials. Techniques covered will include x-ray diffraction, x-ray photoelectron spectroscopy, scanning electron microscope, transmission electron microscope, and others. Use of these techniques for studies of material failure and reliability will also be examined. Corequisite: Lab component. Prerequisite: MSEN 53103 or instructor consent. (Typically offered: Fall)

MSEN 53803. Research Commercialization and Product Development. 3 Hours.
This survey course examines research commercialization through analysis of IP, technology space, market space, manufacturability, financials, and business plans. Entrepreneurial behaviors and product development within large companies are also discussed. A case study using a current UA faculty member's research commercialization effort will be developed. Prerequisite: Graduate Standing. (Typically offered: Spring)

MSEN 53903. Product Development Process. 3 Hours.
Demonstration of a student's technical and management knowledge integration by creating a commercially viable product development process to meet a new societal need, with the technical solution based on micro to nanoscale technology. Final grade based on a detailed written report and oral presentation to a panel. Non-thesis students only. Pre- or Corequisite: MSEN 53803. Prerequisite: Instructor permission. (Typically offered: Spring)

MSEN 55103. Applied Research in External Technical Organizations. 3 Hours.
A one semester narrow focus graduate level research effort while working at an external technical organization's site. Requires a final report of style and quality suitable for journal submission. This course available only to Professional Path M.S. MSEN students, and may substitute for an MSEN 5880V External Internship. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

MSEN 55203. Applied On-Campus Collaborative Research with External Technical Organizations. 3 Hours.
A one semester narrow focus graduate level on-campus research effort performed in collaboration with an external technical organization. Requires a final report of style and quality suitable for journal submission. This course available only to Professional Path M.S. MSEN students. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

MSEN 5550V. Internship in External Technical Organization. 1-3 Hour.
Used to document a MSEN grad student internship experience in an external technical organization for a minimum duration of six weeks (6-9 weeks=one hour, 10-12 weeks=two hours, and 13-15 weeks=three hours). It may not be used to meet the research requirements of a M.S. degree. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer)

MSEN 56101. Research Communication Seminar of MS Students. 1 Hour.
This course serves as a forum for MS students to develop oral presentation skills and to exchange research ideas. Research presentations will be on various topics in the area of micro to nanoscale materials, processing, and devices, with research management and planning also being addressed. Prerequisite: Graduate standing. (Typically offered: Fall and Spring)

MSEN 57103. Advanced Nanomaterials Chemistry. 3 Hours.
Science and engineering graduates are using more nanomaterials, and modern industry demands that its scientists and engineers have materials chemistry knowledge. Materials from the micro to nanoscale will be examined in this course from the perspective of fundamental chemistry principles to build a picture of tomorrow's materials. (Typically offered: Irregular) May be repeated for up to 3 hours of degree credit.

MSEN 57303. Materials Processing. 3 Hours.
This hands-on lab course will cover the disciplines needed to process materials and make active electronic and photonic devices utilizing nanoscale structures and fabrication techniques presently used in research and industry. Prerequisite: Graduate standing and permission of the instructor. (Typically offered: Spring)

MSEN 58101. 1st Year Operations Seminar - Infrastructure Management. 1 Hour.
Weekly seminar for 1st year Materials Science and Engineering graduate students to discuss issues that increase professional performance in technology-centered organizations. The discussions will focus on issues that affect organizational infrastructure, career planning, organizational structures, and may include examples from current events. Prerequisite: Graduate standing. (Typically offered: Fall)

MSEN 58201. Ethics for Scientists and Engineers. 1 Hour.
This course will introduce methods useful in the practice of ethical decision making in the high technology academic and industrial work place. An emphasis will be placed on applying the methods discussed in the text to student and instructor past professional experiences. Prerequisite: Graduate standing. (Typically offered: Summer)

MSEN 5870V. Special Topics in Materials Science and Engineering. 1-4 Hour.
Consideration of current materials science and engineering topics not covered in other courses. One section will be created for each topic only after a syllabus is submitted to the MSEN office by the faculty member teaching the course. (Typically offered: Irregular) May be repeated for up to 9 hours of degree credit.

MSEN 5880V. Special Problems in Materials Science and Engineering. 1-3 Hour.
Opportunity for individual study of advanced subjects related to a graduate degree in Materials Science and Engineering to suit individual requirements. One section will be created for each student only after a syllabus is submitted to the MSEN office by the supervising faculty member. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

MSEN 59101. 1st Year Operations Seminar - Personnel Management. 1 Hour.
Weekly seminar for 1st year Materials Science and Engineering graduate students to discuss issues that increase professional performance in technology-centered organizations. The discussions will focus on issues that affect personnel management, team building and structures, and may include examples from current events. Prerequisite: Graduate standing. (Typically offered: Spring)

MSEN 6000V. Master's Thesis. 1-6 Hour.
Master's Thesis. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

MSEN 6260V. Emerging Technologies in Industry Practicum. 1-3 Hour.
Students engage in demand-driven research projects inspired by Arkansas companies as part of the interdisciplinary IGNITE (Industry Generating New Ideas and Technology through Education) program. These projects, which often result from interactions with companies during MSEN 52503, include visiting company locations; developing project goals, budgets, and timelines; and performing research. (Typically offered: Fall, Spring and Summer) May be repeated for up to 9 hours of degree credit.

MSEN 63103. Advanced Materials Science and Engineering. 3 Hours.
This course will introduce students to the core principles of the design, nature and processing of advanced materials and the mechanisms of failure of materials. The course also integrates materials behavior and materials processing relevant to a wide range of industrial sectors while it covers traditional structural materials, functional materials, nanomaterials and biomaterials. Students learn to achieve enhanced functionality through convergence and integration of biological, organic, electronic, and structural materials; self-assembly creation of new materials; and tailoring of interfaces to produce nanocomposites. In this way, it will provide students with a depth of core knowledge and skills allowing students to make informed choices concerning applications, selection and design of advanced materials. Prerequisite: MSEN 53103 and permission of the Instructor. (Typically offered: Spring)

MSEN 63203. Materials Engineering Design. 3 Hours.
This course will provide concrete training on the generation of a sound prototype design and R&D plan, in addition to the generation of a quality proposal based on specific federal solicitation criteria. Finally, each student will pick a topic/prototype for which they will prepare a full preliminary design, R&D plan and federal grant proposal from a list of real, suitable topics. The students will be required to follow the specific topic/solicitation instructions provided by the federal agency supporting the research. Prerequisite: Graduate standing or consent of the instructor. (Typically offered: Fall)

MSEN 66101. Research Communication Seminar of PhD Students. 1 Hour.
This course serves as a forum for Ph.D. students to develop oral presentation skills and to exchange research ideas. Research presentations will be on various topics in the area of materials, processing, and devices, with research management and planning also being addressed. Prerequisite: Graduate standing. (Typically offered: Fall and Spring)

MSEN 68101. 2nd Year Operations Seminar - Management and Leadership. 1 Hour.
Weekly seminar for 2nd year Materials Science and Engineering graduate students to discuss issues that increase professional performance in technology-centered organizations. The discussions will focus on issues that affect management and leadership effectiveness and efficiency, and may include examples from current events. Prerequisite: Graduate standing. (Typically offered: Fall)

MSEN 69101. 2nd Year Operations Seminar - Advanced Management and Leadership. 1 Hour.
Weekly seminar for 2nd year Materials Science and Engineering graduate students to discuss advanced issues that increase professional performance in technology-centered organizations. The discussions will focus on the complex issues that affect management and leadership effectiveness and efficiency, and may include examples from current events. Prerequisite: Graduate standing. (Typically offered: Spring)

MSEN 7000V. Doctoral Dissertation. 1-21 Hour.
Doctoral dissertation. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.