MKTG 4810. Special Topics in Marketing or Logistics. 3 hours. Investigation, analysis and discussion of a variety of topics that are important in marketing and logistics. Topics may include supply chain management, transportation, logistics, distribution and channel management, product development and management, sales management, consultative and team selling, promotion, market segmentation and opportunity analysis, and strategic pricing. Prerequisite(s): completion of 9 hours of upper-division marketing courses. May be repeated for credit as topics vary.

MKTG 4880. Advanced Marketing Management. 3 hours. Application of concepts, tools and procedures employed by practicing marketing managers. Specific attention is given to product development and management, promotion development and management, channel selection and management, physical distribution management and price setting and management. Students acquire skills in the essentials of case analysis and written as well as oral presentation of their analysis. Oral presentations may be made using electronic media. Groups may be required for case work. Prerequisite(s): MKTG 3700 and MKTG 3710.

MKTG 4890. Applied Marketing Problems. 3 hours. Capstone marketing course. Students work in team settings to develop a comprehensive marketing plan. The marketing plan requires students to integrate a wide range of marketing principles and practices. The integrated marketing plan requires students to identify market opportunities and challenges, formulate actionable plans to address organizational strengths and weaknesses, and execute a marketing mix strategy. Requires both oral and written presentation of the marketing plan. Prerequisite(s): MKTG 3650, MKTG 3700, MKTG 3710 and graduating senior status.

MKTG 4900. Special Problems. 1–3 hours each.

MKTG 4951. Honors College Capstone Thesis. 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

Master's Engineering Systems

see *Graduate Catalog*

Materials Science and Engineering

Materials Science and Engineering, MTSE

MTSE 2900-MTSE 2910. Introduction to Materials Science Research. 1–3 hours. Individualized laboratory instruction. Students may begin training on laboratory research techniques.

MTSE 3010. Bonding and Structure. 3 hours. Amorphous and crystalline structures in metals, ceramics and polymers, point defects in crystals, structure determination by X-ray diffraction. Prerequisite(s): ENGR 3450.

MTSE 3020. Microstructure and Characterization of Materials. 3 hours. Introduction to dislocations, grain boundaries, surfaces and multiphase microstructures. Optical and electron microscopic characterization of microstructures. Prerequisite(s): ENGR 3450.

MTSE 3030. Thermodynamics and Phase Diagrams. 3 hours. First three laws of thermodynamics; phase equilibria, reaction equilibria and solution theory. Principles and applications of phase diagrams. Prerequisite(s): ENGR 3450.

MTSE 3040. Transport Phenomena in Materials. 3 hours. Principles of transport phenomena (momentum, heat and mass transport) in materials processes including heat, mass and momentum transport. Emphasis on applications of appropriate differential equations and boundary conditions to solve real materials processing problems. Prerequisite(s): MATH 3310 and ENGR 3450.

MTSE 3050. Mechanical Properties of Materials. 3 hours. Macroscopic mechanical response of ceramics, metals, polymers and composite materials, with an introduction to the underlying microstructural processes during deformation and fracture. Prerequisite(s): ENGR 3450.

MTSE 3060. Phase Transformations in Materials. 3 hours. Principles of structural transformations in materials. Thermodynamics and kinetics of nucleation, growth, precipitation and martensitic reactions. Prerequisite(s): MTSE 3030 and MTSE 3040.

MTSE 3070. Electrical, Optical and Magnetic Properties of Materials. 3 hours. Bonding and the electronic structure and properties of metallic, ceramic, semiconducting and polymeric materials. Prerequisite(s): ENGR 3450.

MTSE 3080. Materials Processing. 3 hours. Basic principles and strategies for processing metals, ceramics, polymers, composites and electronic materials. Prerequisite(s): MTSE 3040.

MTSE 3090. Materials Science and Engineering Laboratory I. 1 hour. (0;1) Laboratory designed to introduce students to some of the most common materials testing and characterization methods. Topics include optical metallography, tensile testing, hardness testing, impact testing, heat treating, melting and casting. Prerequisite(s): ENGR 3450.

MTSE 3100. Materials Science and Engineering Laboratory II. 1 hour. (0;1) Sequel laboratory designed to continue to introduce students to some of the most common materials testing and characterization methods. Topics include differential scanning calorimetry, rheology, powder processing and sintering, density, scanning electron microscopy, and x-ray diffraction. Prerequisite(s): MTSE 3090.

MTSE 4010. Physical Metallurgy Principles. 3 hours. Physical metallurgy principles with a focus on understanding structure-property relationships in metals and alloys. Topics include structure, dislocations, mechanical behavior, grain boundaries, annealing, recrystallization, grain growth, diffusion, phase diagrams, transformations, strengthening mechanisms, fatigue, creep and fracture. Emphasis on the basic structure-property-processing relationships in metals and how they differ from other material classes. Prerequisite(s): MTSE 3010, MTSE 3030 and MTSE 3040.

MTSE 4020. Materials in Medicine. 3 hours. The science and engineering of materials having medical applications. Provides students with an understanding of the challenges that materials (metals, polymers and ceramics) face/create during short- and long-term contact with mammalian physiology. Develops the student's understanding of the relationships controlling acceptance or failure of a given material in the body. Exposes students to strategies used in current and future biomaterials. Prerequisite(s): MTSE 3010 and MTSE 3050.

MTSE 4030. Ceramic Science and Engineering. 3 hours. Emphasis on structure-property relationships: chemical bonding, crystal structures, crystal chemistry, electrical properties, thermal behavior, defect chemistry. Processing topics: powder preparation, sol-gel synthesis, densification, toughening mechanisms. Materials topics: glasses, dielectrics, superconductors, aerogels. Prerequisite(s): MTSE 3010, MTSE 3020, MTSE 3040.

MTSE 4040. Computational Materials Science. 3 hours. Introduction to the basic principles used to simulate, model and visualize the structure and properties of materials. Topics include the various methods used at different length and time scales ranging from the atomistic to the macroscopic. Prerequisite(s): MTSE 3010 and MTSE 3030; MATH 3310.

MTSE 4050. Polymer Science and Engineering. 3 hours. Chemical structures, polymerization, molar masses, chain conformations. Rubber elasticity, polymer solutions, glassy state and aging. Mechanical properties, fracture mechanics and viscoelasticity. Dielectric properties. Polymer liquid crystals. Semi-crystalline polymers, polymer melts, rheology and processing. Thermal analysis, microscopy, diffractometry and spectroscopy of polymers. Computer simulations of polymer-based materials. Prerequisite(s): ENGR 3450.

MTSE 4060. Materials Selection and Performance. 3 hours. Integration of structure, properties, processing and performance principles to formulate and implement solutions to materials engineering problems. Prerequisite(s): MTSE 3030, MTSE 3040 and MTSE 3050.

MTSE 4070. Electronic Materials. 3 hours. Intensive study of electronic, optical and magnetic properties of materials with an emphasis on the fundamental physics and chemistry associated with these material systems. Prerequisite(s): ENGR 3450 and MATH 3310.

MTSE 4090. Senior Research Project I. 2 hours. Provides students with experience in research and development. Students pick a faculty mentor for this class and attend bi-weekly meetings with the other students to discuss progress, strategies, outcomes, etc. Designed primarily for the students to do a literature survey on the selected topic and a research plan to be initiated either late in the semester or in the follow-on course in the subsequent semester. Prerequisite(s): MTSE 3010, MTSE 3020, MTSE 3030, MTSE 3040, MTSE 3050, MTSE 3070 and MTSE 3080.

MTSE 4100. Senior Research Project II. 2 hours. Follow-on course from MTSE 4090, Senior Research Project I. Students continue to work with the same faculty mentor for this class and will continue to attend bi-weekly meetings with the other students to discuss progress, strategies, outcomes, etc. Designed primarily for the students to perform the proposed research plan established in MTSE 4090. Prerequisite(s): MTSE 4090.

MTSE 4500. Internship in Materials Science. 3 hours. A supervised industrial internship requiring a minimum of 150 hours of work experience. Prerequisite(s): consent of department.

MTSE 4580. Materials for a Sustainable Environment. 3 hours. Properties of renewable and nonrenewable, sustainable and non-sustainable materials, effects of product application and needs on material choices for a sustainable environment; degradation mechanisms; and influence of the environment on mechanisms. Prerequisite(s): CHEM 1415 or equivalent or CHEM 1410/CHEM 1430; PHYS 1710/PHYS 1730; MATH 1710.

MTSE 4900. Special Topics in Materials Science and Engineering. 1–3 hours (maximum of 8 credits). Lectures, laboratory or other experiences covering specially selected topics in materials science and engineering. Prerequisite(s): MATH 1710, CHEM 1410/CHEM 1430. May be repeated as topics vary.

MTSE 4910. Materials Science Research. 1–3 hours. Introduction to research; may consist of an experimental, theoretical or review topic.

MTSE 4920. Cooperative Education in Materials Science. 3 hours. Supervised work in a job directly related to the student's major, professional field of study or career objectives. Prerequisite(s): 12 hours of credit in materials science; student must meet employer's requirements and have consent of department. May be repeated for credit.

MTSE 4951. Honors College Capstone Thesis. 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

Mathematics

Mathematics, MATH

Students taking mathematics courses at the 2000 level or above are expected to be competent in computer programming using languages such as BASIC, C, FORTRAN or PASCAL. This competency can be obtained through completion of CSCE 1020.

For all mathematics courses, a grade of C or better is strongly recommended before progressing to the next course.

MATH 1010. Fundamentals of Algebra. 3 hours. Basic algebraic operations, linear equations and inequalities, polynomials, rational expressions, factoring, exponents and radicals, and quadratic equations. Prerequisite(s): consent of department. Students may not enroll in this course if they have credit for any other UNT mathematics course. Credit in this course does not fulfill any degree requirement.