

The Undergraduate Curriculum Committee recommends approval of the following:

1. The minutes of the December 4, 2015 meeting.
2. New Courses

MSEN 210. Thermodynamics of Materials. (3-0). Credit 3. Basic concepts and fundamental laws of thermodynamics; processes and thermodynamic engines; phase equilibria and phase diagrams of simple substances; chemical reactions of condensed phases; computational software for thermodynamic and phase diagram calculations. Prerequisites: MSEN 201 and MATH 152. Concurrent enrollment: MSEN 201 and MATH 152.

MSEN 220. Physics and Chemistry of Inorganic Materials. (3-0). Credit 3. Structure, properties and function of materials developed from an atomistic and molecular perspective emphasizing quantum chemical descriptions; elements of solid-state chemistry and physics including bonding, crystal structure and symmetry, origin of electronic band structure, synthesis and characterization tools in materials chemistry, and role of finite size effects. Prerequisite: PHYS 208 or CHEM 102. Concurrent enrollment: PHYS 208 or CHEM 102.

MSEN 240. Kinetics of Materials. (3-0). Credit 3. Application of physical principles that drive evolution of materials as they approach thermodynamic equilibrium states; includes Gibbs free energy, driving forces, point defects, diffusion in solids, interface and grain boundary motion, nucleation, growth, transformation diagrams, precipitation, phase separation, ordering and solidification. Prerequisite: MSEN 210.

MSEN 250. Soft Matter. (3-0). Credit 3. Structure, properties and function of various classes of soft matter including colloids, polymers, amphiphils, liquid crystals and biomacromolecules; basic concepts of viscoelasticity, glass transition, liquid-liquid and liquid-solid transitions and gelation; forces acting between mesoscopic objects; supramolecular self-assembly in soft condensed matter. Prerequisites: PHYS 208, CHEM 102 and CHEM 112.

MSEN 281. Materials Science and Engineering Seminar. (1-0). Credit 1. Presentation of technical advances in the field of materials science and engineering; applications toward solving engineering challenges; presentations from visiting industry, academic speakers, and faculty; introduction to current research themes and focal points in industry. Prerequisite: MSEN 201.

MSEN 301. Unified Materials Lab I. (2-3). Credit 3. Integration of materials synthesis, structural characterization and property evaluation; theory and practice of experimental and simulation techniques; emphasis on relationship between processing parameters and resulting materials structure. Prerequisites: MSEN 240 and MSEN 310. Concurrent enrollment: MSEN 240 and MSEN 310.

MSEN 302. Unified Materials Lab II. (2-3). Credit 3. Integration of materials synthesis, structural characterization and property evaluation; theory and practice of experimental and simulation techniques; emphasis on relationship between materials structure and resulting materials physical properties. Prerequisite: MSEN 301.

MSEN 320. Deformation and Failure Mechanisms in Engineering Materials. (3-0). Credit 3. Survey of deformation and failure mechanisms in different materials, including metals, ceramics, polymers and composites; effect of atomistic structure, defects and microstructure on deformation and

failure; deformation and failure mechanism maps and effects of temperature and deformation rate.

Prerequisite: MSEN 310 or approval of instructor.

MSEN 330. Numerical Methods for Materials Scientists and Engineers. (2-3). Credit 3.

Computing platforms addressing scientific/engineering problems related to materials science and engineering; analyze data; implement mathematical models of materials behavior; numerical methods to solve materials-related problems. Prerequisite: MATH 307.

MSEN 340. Case Studies in Materials. (2-0). Credit 2. Case studies illustrating materials failure and consequences thereof; materials selection process in the face of uncertainty; industry standards and regulatory frameworks; design tradeoffs and cost analysis; ethical and business implications of materials failure. Prerequisite: MSEN 310.

MSEN 370. Computational Materials Science and Engineering. (2-3). Credit 3. Studio emphasizing methods to simulate materials behavior across multiple scales; includes electronic structure calculations, classical molecular dynamics, computational thermodynamics and kinetics of materials, microstructure evolution simulation and continuum models of materials behavior. Prerequisites: MSEN 210 and MSEN 330.

MSEN 400. Design and Analysis of Materials Experiments. (2-3). Credit 3. Systematic design of experimental investigations; team approach to identify topics and develop experiment designs including establishing the need, associated requirements and objective; conduct experiments; characterize materials; analyze and interpret results; documenting the procedures, analysis, results and conclusions; present written and oral reports. Prerequisites: MSEN 220, MSEN 302 and MSEN 320.

MSEN 401. Materials Research and Design I. (2-3). Credit 3. Research and design process; need definition, functional analysis, performance requirements, evaluation criteria, conceptual design evaluation; introduction to systems engineering; parametric and risk analysis, failure analysis, material selection and manufacturability; cost and life cycle issues, project management; topics from sponsored research or an industry-sponsored design project. Prerequisites: MSEN 281, MSEN 340 and MSEN 400.

MSEN 402. Materials Research and Design II. (2-3). Credit 3. Continuation of MSEN 401; development of innovative solutions to research or industry-provided design challenges; structured framework and methodology for design activities; innovation, computational materials science, synthesis/processing and analysis/characterization of material components; project definition, management, customer interaction and effective team participation; presentations and design reviews. Prerequisite: MSEN 401.

MSEN 415. Defects in Solids. (3-0). Credit 3. Overview of point, line and surface defects in solids; relates defect properties to diffusion, deformation, phase transformations; focuses on atomic defects in crystals, with additional examples from liquid crystals, superconductors and ferromagnets; incorporates atomistic modeling to examine defect structure. Prerequisite: MSEN 310 or approval of instructor.

MSEN 426. Polymer Laboratories. (2-3). Credit 3. Laboratory to prepare those interested in polymer research with necessary experimental and analytical skills to conduct and analyze experimental work. Prerequisite: MSEN 250 or approval of instructor.

MSEN 430. Nanomaterials Science. (3-0). Credit 3. Nanotechnology and nanomaterials; types, fabrication, characterization methods and applications; current roles in technology and future impact of such systems on industry targeting. Prerequisite: MSEN 310, junior or senior classification; or approval of instructor.

MSEN 440. Materials Electrochemistry and Corrosion. (3-0). Credit 3. Survey of thermodynamic and kinetic fundamentals of electrochemistry; multiscale materials corrosion mechanisms; details of interfacial aqueous electrochemical mechanisms and the environmental effects when materials are exposed to different conditions. Prerequisite: MSEN 220 or approval of instructor.

MSEN 444. Corrosion and Electrochemistry Lab. (2-3). Credit 3. Laboratory practice and principles for corrosion and electrochemistry methods; design, carry out and analyze a series of labs illustrating the most important techniques in the field; builds to an open-ended corrosion engineering problem resulting in preparation of a technical report for a hypothetical client. Prerequisite: MSEN 440.

MSEN 446. Corrosion Prevention and Control Methods. (3-0). Credit 3. Cathodic protection and coatings; functional engineering approach to controlling and preventing aqueous corrosion; impressed current, galvanic anodes, organic, inorganic and hybrid coatings; case studies in oil and gas, energy, automotive and different industries. Prerequisites: MSEN 360 and MEEN 444.

MSEN 458. Fundamentals of Ceramics. (3-0). Credit 3. Structure-property relationships of ceramics and ceramic composites; atomic bonding in ceramics; crystalline and glassy structures; phase equilibria and ceramic reactions; mechanical, electrical, thermal, dielectric, magnetic and optical properties; ceramic processing; different properties of ceramics will be related to their underlying structure. Prerequisite: MSEN 310 or approval of instructor.

MSEN 462. Advanced Materials Characterization. (2-3). Credit 3. Principles and techniques used in characterization of different materials, including metals, ceramics, polymers, composites and semiconductor systems; microstructural, chemical/compositional and surface analysis methods; interpretation and analysis of the characterization results. Prerequisites: MSEN 220, MSEN 250, and MSEN 310; or approval of instructor.

MSEN 472. Atomistic Simulation of Materials. (3-0). Credit 3. Modern methods of computational modeling and simulation of materials properties and phenomena at the atomistic scale; quantum, classical and statistical mechanical methods, including semi-empirical atomic and molecular-scale simulations, and other modeling techniques using macroscopic input. Prerequisite: MSEN 370 or approval of instructor.

MSEN 474. Materials Modeling of Phase Transformation and Microstructural Evolution. (2-3). Credit 3. Computer modeling and simulation of microstructural evolution during various phase transformation processes in solid materials, including spinodal decomposition, ordering, martensitic transformation, ferroelectric and ferromagnetic domain evolution, nucleation, growth, and solidification. Prerequisite: MSEN 370 or approval of instructor.

MSEN 476. Multi-Scale Computational Materials Science. (2-3). Credit 3. Advanced and problem-based; illustrating elements of challenges associated with multi-scale simulations; examination of multi-scale modeling of elastic response of a multi-phase microstructure; elements of uncertainty quantification and propagation. Prerequisite: MSEN 370 or approval of instructor.

MSEN 480. Communicating Materials Science and Engineering. (1-0). Credit 1. Effective communication of technical topics in materials science and engineering to technical and non-technical audiences; emphasis on oral and visual presentations. Prerequisite: MSEN 401. Concurrent enrollment: MSEN 401.

MSEN 484. Internship. Credit 0 to 4. Practical experience working in a professional materials science and engineering setting offered on an individual basis. Must be taken on a satisfactory/unsatisfactory basis. Prerequisites: Junior or senior classification and approval of instructor.

TCMG 486. Cybersecurity Capstone Seminar. (1-1). Credit 1. Capstone seminar on significant issues in industry; examination of current trends in the cybersecurity field; investigation into the multidisciplinary nature of cybersecurity events and incursions. Prerequisites: CSCE 110 or CSCE 121; CSCE 206 or CSCE 221; TCMG 308; junior or senior classification.

3. Change in Courses

ANSC 291. Research.

Variable credit hours

From: Credit 1 to 4.

To: Credit 0 to 4.

ANSC 485. Directed Studies.

Variable credit hours

From: Credit 1 to 4.

To: Credit 0 to 4.

ANSC 491. Research.

Variable credit hours

From: Credit 1 to 4.

To: Credit 0 to 4

ANSC 494. Internship.

Variable credit hours

From: Credit 1 to 5.

To: Credit 0 to 5.

DASC 485. Directed Studies.

Variable credit hours

From: Credit 1 to 4.

To: Credit 0 to 4.

MSEN 201. Introduction to Materials Science.

Course Title

From: Introduction to Materials Science.

To: Fundamentals of Materials Science and Engineering.

Course Description

From: Processing, structure, properties and performance in materials; materials structure and defects over many orders of scale; mechanical, thermal, electrical, magnetic and optical properties.

To: Fundamental principles of materials science and engineering and their application toward complex engineering challenges; relationship between materials structure and structural and functional properties of engineered materials; property-performance relationships; principle classes of materials, as illustrated through key materials advances; current directions in the field.

MSEN 310. Structure of Materials.

Course Description

From: Symmetry, unit cell and the atomic structure of crystalline and non-crystalline materials; the bonding forces and energy for van der Waals, metallic, ionic and covalent crystals.

To: Materials structure over many orders of scale; structure of non-crystalline materials; symmetry, unit cell and the atomic structure of crystalline materials; liquid crystals; structural defects in ordered solids; microstructures and hierarchical structures.

MSEN 410. Materials Processing.

Lecture and lab contact hours

From: (3-0). Credit 3.

To: (2-3). Credit 3.

MSEN 420. Polymer Science.

Course Description

From: Polymer structure, processing, property characterization at the molecular, microscopic and macroscopic dimensional levels for thermosets, thermoplastics, elastomers, fibers and advanced non-particle filled composites and smart multi-performance structures.

To: Types of polymerization; molecular characteristics of polymer chains; single chain statistics and rubber elasticity; phase transitions, glass transition, viscoelasticity and time-temperature superposition; polymer structure at the molecular, microscopic and macroscopic level; polymer thermosets, thermoplastics, elastomers, fibers, and advanced nanoparticle-filed composites.

Prerequisites

From: MSEN 201, MSEN 222, AERO 413, BMEN 343, CHEN 313, CVEN 306, ENTC 206, or NUEN 206, or approval of instructor.

To: PHYS 208, CHEM 102 and CHEM 112; or approval of instructor.

MSEN 460. Electronic, Optical and Magnetic Properties of Materials.

Course Title

From: Electronic, Optical and Magnetic Properties of Materials.

To: Properties of Functional Materials.

MSEN 485. Directed Studies.

Variable credit hours

From: Credit 1 to 4.

To: Credit 0 to 4.

MSEN 491. Research.

Variable credit hours

From: Credit 1 to 4.

To: Credit 0 to 4.

POSC 491. Research.

Variable credit hours

From: Credit 1 to 4.

To: Credit 0 to 4.

TCMG 476. Managing Technical Networks.

Prerequisites

From: TCMG 272 and TCMG 274 with a grade of C or better; junior or senior classification.

To: TCMG 308 with a grade of C or better or approval of instructor.

4. Change in Curriculum

College of Science

Department of Physics and Astronomy

BA in Physics

BS in Physics

5. Special Consideration

Dwight Look College of Engineering

Department of Materials Science and Engineering

BS in Materials Science and Engineering

Request for a new degree program

6. Texas A&M University at Qatar

a. Change in Courses

PETE 336. Petroleum Technical Presentations I.

Course Description

From: Preparation of a written technical paper on a subject related to petroleum technology and an oral presentation of the paper in a formal technical conference format; oral presentations judged by petroleum industry professionals.

To: Preparation of a written technical paper on a subject related to petroleum technology.

PETE 436. Petroleum Technical Presentations II.

Course Description

From: Preparation of a written technical paper on a subject related to petroleum technology and an oral presentation of the paper in a formal technical conference format; oral presentations judged by petroleum industry professionals at the departmental student paper contest held during the same academic year.

To: Preparation of a written technical paper on a subject related to petroleum technology and an oral presentation of the paper in a formal technical conference format.

b. Change in Curriculum

Texas A&M University at Qatar
Petroleum Engineering Program
BS in Petroleum Engineering