The Undergraduate Curriculum Committee recommends approval of the following:

1. **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.
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 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 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 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.

2. 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


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.


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.
3. Change in Curriculum

**College of Science**
Department of Physics and Astronomy
BA in Physics
4. Change in Curriculum

**College of Science**
Department of Physics and Astronomy
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
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.
7. Texas A&M University at Qatar
   b. Change in Curriculum

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