Materials Science and Engineering - Undergraduate Programs

Overview

The interdisciplinary field of materials science and engineering has become critical to many emerging areas of science and advanced technology. As a result, there is a growing demand for engineers and scientists with education and training in materials science and engineering. The Materials Science and Engineering Department provides students with such education and training through its graduate master's and doctoral degree programs. Additionally, the department offers undergraduate courses for use as electives in science and engineering, in Fast Track Programs in Materials Science and Engineering, in minor programs in this discipline and in Certificate in Nanotechnology.

Minor Program in Materials Science and Engineering

Outcomes and Goals

The goal of the minor program in Materials Science and Engineering is to give students a foundation in the governing principles of materials science which complements their major field of study, as well as an understanding of the latest trends. As such, the program is flexible in coursework requirements and can be tailored to each student's interest.

Admission to the Minor Program in Materials Science and Engineering

Admission to the minor program in Materials Science and Engineering requires GPA of 2.0 or higher and approval by the Materials Science and Engineering Department undergraduate advisor as well as the student's home department. Information on admissions and course requirements can be obtained from the Materials Science and Engineering undergraduate program advisor. The minor will be conferred at the same time the degree is conferred and the degree and minor will be recorded on the student's transcript. The minor will not be on the diploma. Minors may not be conferred retroactively upon students who have graduated.

SCHOLARSHIPS, RESEARCH EXPERIENCE, and INTERNSHIP

Scholarships may be available for students who meet the academic requirements set by the Materials Science and Engineering minor program. Minor program students may also work as undergraduate research assistants for Materials Science and Engineering faculty. Internship opportunities at nearby industries may be arranged for students with interest.

Requirements for a Minor in Materials Science and Engineering

To receive a minor in Materials Science and Engineering, a student must complete 18 hours of the following courses with a grade of C or better in each course. Courses must be approved in advance by the MSE undergraduate program advisor. A student must complete:

Foundation courses for all tracks (6 hours)

MSE 3300 INTRODUCTION TO MATERIALS SCIENCE AND ENGINEERING

MSE 4320 NANOSCALE MATERIALS

Select at least 2 core courses for each track (6 hours)

1. Structural Materials and Process Track

MSE 4310 POLYMER MATERIALS SCIENCE

MSE 4312 MECHANICAL BEHAVIOR OF MATERIALS (MAE 4336 for MAE majors)

MSE 4315 INTRODUCTION TO COMPOSITES (MAE 4315 for MAE majors)

MSE 4321 PHASE TRANSFORMATIONS OF MATERIALS

MSE 4337 FATIGUE OF ENGINEERING MATERIALS

MSE 4339 FRACTURE MECHANICS (MAE 4339 for MAE majors)

MSE 4357 SYNTHESIS AND PROPERTIES OF MODERN ENGINEERING MATERIALS

MSE 4359 FAILURE ANALYSIS AND RELIABILITY ENGINEERING

MAE 4338 FAILURE ANALYSIS

CHEM 3315 INTRODUCTION TO BIOPHYSICAL CHEMISTRY

CHEM 3321 PHYSICAL CHEMISTRY I

CHEM 4318 INORGANIC CHEMISTRY

CHEM 4346 ADVANCED SYNTHETIC METHODS

Selected courses offered as special topics in MAE and CHEM may be used if approved by MSE advisor

2. Semiconductor Materials and Technology Track

MSE 4354 ELECTRONIC MATERIALS AND DEVICES

MSE 4359 FAILURE ANALYSIS AND RELIABILITY ENGINEERING

EE 4329 SEMICONDUCTOR DEVICES

PHYS 4325 SOLID STATE PHYSICS

PHYS 4326 INTRODUCTION TO QUANTUM MECHANICS

Selected courses offered as special topics in EE and Physics may be used if approved by MSE advisor

3. Magnetic Materials and Technology Track

MSE 4321 PHASE TRANSFORMATIONS OF MATERIALS

MSE 4333 INTRODUCTION TO MAGNETIC MATERIALS

MSE 4357 SYNTHESIS AND PROPERTIES OF MODERN ENGINEERING MATERIALS

PHYS 4325 SOLID STATE PHYSICS

PHYS 4326 INTRODUCTION TO QUANTUM MECHANICS

4. Energy Materials and Technology Track

MSE 4353 FUNDAMENTALS OF SUSTAINABLE ENERGY

MSE 4355 MATERIALS FOR ENERGY

REE 3301 PRINCIPLES OF ENERGY ENGINEERING

REE 3302 SUSTAINABLE ENERGY SYSTEMS

EE 3302 FUNDAMENTALS OF POWER SYSTEMS

Select 2 elective courses (6 hours)

(1) courses in other tracks

(2) courses recommended by MSE advisor and/or listed below

MSE 4310 POLYMER MATERIALS SCIENCE

MSE 4390 SPECIAL TOPICS IN MATERIALS SCIENCE & ENGINEERING

MAE 3344 INTRODUCTION TO MANUFACTURING ENGINEERING

PHYS 3313 INTRODUCTION TO MODERN PHYSICS

PHYS 3455 ELECTRONICS

Minor Program in Nanotechnology

Program Objective

The minor in Nanotechnology is designed to provide undergraduate students majoring in either science or engineering with fundamental knowledge of the nanotechnology that is emerging as one of the most influential technologies shaping the future. This program intends to introduce the fundamentals

and applications of nanotechnology in the areas of Nanoelectronics and human health, with weighted emphasis on the development of new materials and their applications.

Admission to the Minor Program in Nanotechnology

Admission to the minor program in Nanotechnology requires GPA of 2.0 or higher and approval by the Materials Science and Engineering Department undergraduate advisor as well as the student's home department. Information on admissions and course requirements can be obtained from the Materials Science and Engineering undergraduate program advisor. The minor will be conferred at the same time the degree is conferred and the degree and minor will be recorded on the student's transcript. The minor will not be on the diploma. Minors may not be conferred retroactively upon students who have graduated.

Research Experience

Minor program students are encouraged to experience research in nanotechnology by working as undergraduate research assistants. The advisor in Materials Science and Engineering may provide a list of faculty whose research field is closely related to the student's major and career interest.

Requirements for a Minor in Nanotechnology

Students must complete 18 hours of coursework as outlined below. Transferred course credit cannot be used for the minor. Prerequisites must be met for all courses and all courses used to satisfy the certificate requirements must be passed with a minimum grade of C and their combined GPA must be at least 3.0. Consultation with the Materials Science and Engineering (MSE) advisor is encouraged to check the course availability and any changes in the course requirements.

Course Requirements

Required Courses (9 Hours):

MSE 3300 INTRODUCTION TO MATERIALS SCIENCE AND ENGINEERING

MSE 4320 NANOSCALE MATERIALS

MSE 4351 CURRENT TOPICS IN NANOTECHNOLOGY

Three elective courses are required from a single track below: Elective courses are chosen with consultation and approval of the minor advisor. Undergraduate Research Course (3 hour) can be included in the electives with appropriate course number and research topic selected in agreement with the faculty and MSE advisor. The letter grade will be given after evaluation of student's performance by evaluation committee. A partial list of recommended courses include:

1. Micro/Nano electronics Track

MSE 4354 (http://catalog.uta.edu/archives/2023-2024/search/?P=MSE%204354) ELECTRONIC MATERIALS AND DEVICES OR EE 4329 SEMICONDUCTOR DEVICES

MSE 4359 FAILURE ANALYSIS AND RELIABILITY ENGINEERING

EE 4320 DIGITAL VLSI DESIGN

PHYS 4326 INTRODUCTION TO QUANTUM MECHANICS

Selected courses offered as special topics in EE and MAE may be used if approved by MSE advisor.

2. Nanobio Track

MSE 4343 NANOBIOTECHNOLOGY

BE 4333 NANO BIOMATERIALS AND LIVING-SYSTEMS INTERACTION

BE 4372 DRUG DELIVERY SYSTEMS

BE 4373 FORMULATION AND CHARACTERIZATION OF DRUG DELIVERY SYSTEMS

BE 4314 BIOMEDICAL IMPLANTS

BE 4390 UNDERGRADUATE RESEARCH PROJECT

Selected courses offered as special topics in EE and MAE may be used if approved by MSE advisor.

Certificate in Nanotechnology

PROGRAM OBJECTIVE

The objective of the Certificate in Nanotechnology is to provide the fundamentals, principles and applications of the emerging and exciting field of nanotechnology in the areas of energy, environment, security and human health, with weighted emphasis on the development of new materials and their applications. This program aims at the dual goal of exploring the potential of nanotechnology in addressing current global technological needs while acting as a resource for developing and educating the future workforce. Course material can be available over the internet upon request to accommodate participants from industry who do not have regular access to campus.

ADMISSION REQUIREMENTS

The certificate is open to all current science and engineering degree-seeking students and holders of a bachelor's degree in science or engineering. For those who have not completed a bachelor's degree, the Certificate in Nanotechnology will be awarded concurrently with an undergraduate degree. The completed certificate program of study will be forwarded to the Office of Admissions, Records and Registration for verification and notation on the student's transcript. A formal certificate will be prepared for the student by the university and recognition will be given at the graduation ceremonies.

ACADEMIC REQUIREMENTS

Students must complete 15 hours of coursework as outlined below. Transferred course credit cannot be used for the certificate. Prerequisites must be met for all courses and all courses used to satisfy the certificate requirements must be passed with a minimum grade of C and their combined GPA must be at least 3.0. Consultation with the Materials Science and Engineering (MSE) advisor is encouraged to check the course availability and any changes in the course requirements.

Required Courses (6 Hours):

MSE 3300 INTRODUCTION TO MATERIALS SCIENCE AND ENGINEERING

MSE 4320 NANOSCALE MATERIALS

Three elective courses are required from a single track below:

Micro/Nano Electronic Track

MSE 4354 ELECTRONIC MATERIALS AND DEVICES

MSE 4359 FAILURE ANALYSIS AND RELIABILITY ENGINEERING

EE 4320 DIGITAL VLSI DESIGN

MAE 3309 THERMAL ENGINEERING

MAE 4301 SPECIAL TOPICS IN MECHANICAL AND AEROSPACE ENGINEERING

3 hour Undergraduate Research Course: research course under listed faculty, with appropriate course number, and research topic selected in agreement with the faculty and MSE advisor. The letter grade will be given after evaluation of student's performance by evaluation committee.

Nanobio Track

MSE 4343 NANOBIOTECHNOLOGY

MSE 4358 ORTHOPEDIC IMPLANTS - MATERIAL SELECTION AND CHARACTERIZATION

BE 4372 DRUG DELIVERY SYSTEMS

BE 4373 FORMULATION AND CHARACTERIZATION OF DRUG DELIVERY SYSTEMS

BE 4333 NANO BIOMATERIALS AND LIVING-SYSTEMS INTERACTION

BE 4300 SPECIAL TOPICS IN BIOENGINEERING (with MSE advisor approval)

3 hour Undergraduate Research Course: research course under listed faculty, with appropriate course number, and research topic selected in agreement with the faculty and MSE advisor. The letter grade will be given after evaluation of student's performance by evaluation committee.

Energy Materials Track

MSE 4353 FUNDAMENTALS OF SUSTAINABLE ENERGY

MSE 4355 MATERIALS FOR ENERGY

EE 3302 FUNDAMENTALS OF POWER SYSTEMS

EE 4328 CURRENT TOPICS IN ELECTRICAL ENGINEERING

MAE 4301 SPECIAL TOPICS IN MECHANICAL AND AEROSPACE ENGINEERING (with MSE advisor approval)

3 hour Undergraduate Research Course: research course under listed faculty, with appropriate course number, and research topic selected in agreement with the faculty and MSE advisor. The letter grade will be given after evaluation of student's performance by evaluation committee.

FACULTY FOR UNDERGRADUATE RESEARCH COURSE

Wei Chen (Physics, nanomaterials for energy conversion)

Hyeok Choi (CE, Environmental Nanotechnology)

Yaowu Hao (MSE, nanostructured bio-sensors)

Yi Hong (BE, NanoBiomaterials)

Choong-Un Kim (MSE, micro/nano electronics)

Seong-Jin Koh (MSE, nanoelectronics and bio-sensors)

Ping Liu (Physics, nanomagnetics)

Cheng Luo (MAE, NEMS)

Robert Magnusson (EE, NanoPhotonics)

Stathis Meletis (MSE, thin films and nanostructured devices)

Hyejin Moon (MAE, Nanothermal)

Kytai Nguyen (BE, Nanobiomaterials)

Kyungsuk Yum (MSE, nanomaterials for bio applications)

Weidong Zhou (EE, NanoPhotonics)