

# EMAT - Materials Engineering

## **EMAT 251 Materials Structures and Prop: 3 Credits (3 Lec)**

PREREQUISITE: CHMY 141 or CHMY 121IN

COREQUISITE: M 165Q OR M 171Q. Chemistry and internal structure of solids and the relationship of structure to physical and mechanical properties of metals and nonmetallic solids

## **EMAT 252 Materials Struct and Prop Lab: 1 Credits (1 Lab)**

PREREQUISITE: WRIT 101W; CHMY 141 for ME Majors; CHMY 121IN for MET Majors

COREQUISITE: EMEC 250; M 172Q for ME majors; M 165Q for MET majors. This course is intended to supplement current materials lecture course offerings. Provides students with hands-on lab experience to identify and quantify physical, electrical, and mechanical properties of engineering materials via experimental measurements. Experimental procedures and reporting are emphasized

## **EMAT 350 Engineering Materials: 3 Credits (3 Lec)**

PREREQUISITE: EMAT 251 or EMEC 250, and EMAT 252. Application of materials selection to the engineering design process. Development of microstructure-processing-properties relationships on the mechanical and functional behavior of materials

## **EMAT 460 Polymeric Materials: 3 Credits (3 Lec)**

PREREQUISITE: EMAT 251 or EMEC 250. Interrelationships of molecular structure, morphology and mechanical behaviors of polymers. Topics will also include manufacture and application of polymeric materials

## **EMAT 461 Friction and Wear of Materials: 3 Credits (3 Lec)**

PREREQUISITE: EMEC 326 and EMEC 342; or ETME 321 and ETME 341; or instructor approval. Introduction to elastic and elastoplastic deformation, microfracture, and surface interactions at the micro-and nano-scale. Application of fundamental knowledge to control friction and wear behavior through lubrication, selection of materials and coatings in practical situations

## **EMAT 462 Manufacturing of Composites: 3 Credits (2 Lec, 2 Lab)**

PREREQUISITE: EMAT 251 or EMEC 250

This course will examine the fundamentals of composite manufacturing, focusing on fiber reinforced plastics. Techniques such as open molding, resin transfer molding, pultrusion, and filament winding will be covered.

## **EMAT 463 Composite Materials: 3 Credits (3 Lec)**

PREREQUISITE: EMEC 341 or ETME 341. Structure and properties of composite materials and design procedures for composite structures

## **EMAT 464 Biomedical Materials Engineering: 3 Credits (3 Lec)**

PREREQUISITE: EGEN 331 or EGEN 335 or ECHM 321 or EBIO 324, and EMEC 250 or EMAT 251 or EGEN 205. This course will include materials engineering as related to the selection, fabrication, and design of biomaterials, largely for medical applications. Topics will include soft and hard materials, testing and characterization techniques. Emphasis will be placed on mechanics, design, and testing

## **EMAT 511 Catalysis/Applied Surface Chem: 3 Credits (3 Lec)**

PREREQUISITE: CHBE 328. The fundamental principles of catalysis, surface chemistry, and reactor design at a working research level

## **EMAT 550 Failure of Materials: 3 Credits (3 Lec)**

PREREQUISITE: One of the following: EMAT 463, EGEN 415, or EMEC 444. Concepts of brittle and ductile fracture, fatigue, creep-rupture and environmentally assisted fracture. Applications to metals, polymers, ceramics and composite materials. -

## **EMAT 552 Advanced Ceramics: 3 Credits (3 Lec)**

PREREQUISITE: Either EMAT 251 or EMEC 250, and both EMAT 252 and EMAT 350. Advanced treatment of ceramic material including phase transformations, defect chemistry, thermodynamics, synthesis/processing, sintering theory, grain growth, and characterization. Emphasis is placed on functional properties of oxide ceramics for applications in energy conversion. -

## **EMAT 553 Advanced Composite Materials: 3 Credits (3 Lec)**

PREREQUISITE: EMAT 463. Advanced treatment of composite materials, including constituent properties, interfaces, micromechanics, microscopic behavior, modes and mechanisms of failure. -

## **EMAT 560 Polymeric Materials: 3 Credits (3 Lec)**

PREREQUISITES: Equivalent of EMAT 251 or EMEC 250

(undergraduate course in Materials Science, requiring an introductory chemistry class and lab as a prerequisite) or a sufficient related background in materials or chemistry, as evaluated by the instructor. Interrelationships of molecular structure, morphology and mechanical behaviors of polymers. Topics will also include manufacture and application of polymeric materials.