

MECE 5397/6397 Special Topic: Functional Engineering Materials, Science and Applications

This course has been offered in online lecture in collaboration with Dr. Li Sun.

Required Textbook: Course materials in ppt format posted in Blackboard Learn

Recommended Reading: William D. Callister, Jr. and David G. Rethwisch, *Materials Science and Engineering, An Introduction*, 9th edition, John Wiley and Sons Publishers 2010. 978-01-118-32457-8.

Recommended Prerequisites: MATH 1431 1432 and 2433 (Calculus); CHEM 1331 and 1332 (Fundamentals of Chemistry); .PHYS 1321 and 1322 (University Physics); MECE 3345 (Materials Science)

Grading Policy:

Exams	90%
Homework assignments and take-home exam	10%

Course Topics:

- Ceramics (Fundamentals and applications)
- Polymers (Fundamentals and applications)
- Composites (Fundamentals and applications)
- Corrosion (Fundamentals and applications)
- Electrical properties and electronic materials
- Thermal properties
- Magnetic properties and magnetic materials
- Optical properties and optical materials
- Economic, environmental, and societal impact of materials (optional)

Learning Objectives:

Students who successfully complete this course are expected to meet the following course outcomes.

- Students will add to their knowledge base in the fundamentals of mechanical engineering and materials science and engineering, especially in the area of engineering materials, in part by gaining a greater understanding of key physical concepts in mechanical, chemical, structural properties of materials. Students will use this knowledge and understanding to identify and solve problems in engineering. (ABET outcome e)
- Students will further develop their basic skills of problem solving and critical thinking by learning physical concepts in engineering materials and by applying this

knowledge of mathematics, science, and engineering to efficiently solve problems related to materials and devices. (ABET outcome a)

- Students will learn how to design engineering materials and to conduct experiments based on data interpreted in order to meet desired needs within realistic constraints. (ABET outcome b and c)
- Students will form a team of experimental group and learn teamwork and effective communication skills to achieve a goal of experiments. (ABET outcome d and g)
- Students will learn broader impact related to engineering materials. Student will also learn state-of-the-art development of materials. (ABET outcome h and j)

Additional Statements:

Syllabus is subject to change.