# MECH3420 Engineering Materials II

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<tr>
<th>Course Code: MECH3420</th>
<th>Course Title: Engineering Materials II</th>
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<tr>
<td>Required Course Or Elective Course: Elective</td>
<td>Terms Offered (Credits): Fall (3 credits)</td>
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<td>Faculty In Charge: Hong Tao</td>
<td>Pre-Requisites: MECH 2410</td>
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<td>Course Structure: 3 hour lecture per week, 1 hour tutorial per week</td>
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<td>Textbook/Required Material: MATERIALS SCIENCE AND ENGINEERING: AN INTRODUCTION; 9TH EDITION, WILLIAM D. CALLISTER, JR.</td>
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**Bulletin Course Description:**
- Equip the students with fundamental knowledge of structure, properties, and fabrication of ceramics and polymers
- Extend the students’ knowledge in engineering materials with a focus in green/smart building and aerospace engineering
- Establish the students’ capability in advanced materials applications in green/smart buildings and aerospace engineering

**Course Topics:**

1. Introduction to Engineering Materials II

**Module I – Properties of General Engineering Materials**
2. Electrical Properties
3. Thermal Properties
4. Magnetic Properties
5. Optical Properties

**Module II – Green / Smart Building Materials**
6. Ceramics – Crystal Structures, Properties, and Fabrications
7. Polymers – Structures, Properties, Synthesis, and Applications
8. Smart Insulation Materials for Buildings

**Module III – Aerospace Engineering Materials**
9. Basics about airplane selection, analysis, and future concepts (Guest Lecture by Boeing Team) OR Materials Applications in Power industry (Guest Lecture by CLP)
10. Understanding Aerospace Materials
11. Aluminum Alloys and Magnesium Alloys for Aerospace Structures
12. Titanium Alloys for Aerospace Structures and Engines
13. Superalloys for Gas Turbine Engines
14. Materials degradation and Non-destructive Monitoring of Aerospace materials

**Course Objectives:**

1. Equip the students with fundamental knowledge of electrical, thermal, magnetic, optical properties of engineering materials and their applications in real life products
2. Equip the students with fundamental knowledge of structure, properties, and fabrication of ceramics and polymers, respectively
(3) Extend the students’ capability in applying advanced thermal insulation materials in green building and smart windows
(4) Extend the students’ knowledge in advanced metal alloys with a focus in their application in aerospace structures and engines

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<th>Course Outcomes:</th>
<th>On successful completion of this course, students are expected to be able to:</th>
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<td>A.</td>
<td>Conduct calculation and analysis of parameters of electrical, thermal, magnetic, optical properties of engineering materials.</td>
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<td>B.</td>
<td>Analyze basic structure and properties relationship of ceramics and polymers, respectively.</td>
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<td>C.</td>
<td>Analyze the materials selections factors in design of green buildings.</td>
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<td>D.</td>
<td>Perform analysis of advanced metal alloys applications in aerospace structures and engines.</td>
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| Assessment Tools: | In-Class Quizzes – 5%
Assignments– 15%
Mid-term Exam - 30%
Final examination – 50% |