

## MECH4430 Materials Characterization

<b>Course Code:</b> MECH 4430	<b>Course Title:</b> Materials Characterization
<b>Required Course Or Elective Course:</b> elective	<b>Terms Offered (Credits):</b> Fall or Spring (3 credits)
<b>Faculty In Charge:</b> Charles KWAN	<b>Pre/Co-Requisites:</b> MECH2410 and MECH3420
<b>Course Structure:</b> 3 hour lectures per week, 4 lab hours in total	
<b>Textbook/Required Material:</b> YANG LENG, "MATERIALS CHARACTERIZATION: INTRODUCTION TO MICROSCOPIC AND SPECTROSCOPIC METHODS" JOHN WILEY & SONS, 2008.	
<b>Course Description:</b> This course is aimed at introducing to basic principles and techniques of modern analytical methods for engineering materials characterization. The characterization includes analysis of microstructure and chemical compositions, using light and electron microscopy; x-ray diffraction; spectroscopic methods; and thermal analysis methods.	
<b>Course Topics:</b> <ol style="list-style-type: none"><li>1. Introduction</li><li>2. Light microscopy</li><li>3. Brief overview of non-destructive testing (dye penetrant testing and ultrasonic-testing)</li><li>4. X-ray diffraction</li><li>5. Transmission electron microscopy</li><li>6. Scanning electron microscopy</li><li>7. X-ray spectroscopy for elemental analysis</li><li>8. Vibrational Spectroscopy</li><li>9. Thermal analysis</li><li>10. Scanning probe microscopy</li><li>11. Surface chemical analysis and other advanced techniques</li></ol>	
<b>Course Objectives:</b>	<ol style="list-style-type: none"><li>1. To introduce basic techniques for materials characterization.</li><li>2. To introduce the working principles and instrumentation of main techniques.</li><li>3. To introduce the interpretation of the characterization technique outputs</li><li>4. To practice metallographic examinations and ultrasonic testing.</li><li>5. To observe operations of characterization equipment.</li></ol>
<b>Course Outcomes:</b>	<ol style="list-style-type: none"><li>A. Students will be able to identify suitable techniques for specific materials characterization.</li><li>B. Students will be able to use light microscopy for characterization</li><li>C. Students will be able to understand the basic microscopy images of materials</li><li>D. Students will be able to read the basic spectra of materials characterizations.</li></ol>
<b>Assessment Tools:</b>	Four Assignments Two examinations

	One written lab reports One written project
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