EMAT 353
Microstructural Interpretation
Instructor: Sudhakar Vadiraja, PhD, PE
Office: ELC 218, x4267
Office Hours: M through F: 11:00-11:50 a.m. or by appointment
Lecture: M 2:00-2:50 pm
Lab: M 3:00–4:50 pm

Catalogue Description:
A laboratory course designed to develop skills, experience and knowledge of metallographic preparation and analysis. Simple metal systems are analyzed with the metallurgical microscope complemented by other tools. Application of phase diagrams, hardness and other data are used to interpret microstructures. Laboratory experiments are performed requiring engineering reports. Laboratory safety is emphasized.

Credits: 1.0 Credit (Lecture & Lab)

Designation: Required course (Metallurgical and Materials Engineering, General Engineering-Welding Option)

Prerequisites: EMAT 251, Co-requisite EMAT 351, or permission.

Textbook: None, lab précis will be provided.

References: As per lab précis.

Relationship of Course to Metallurgical and Materials Engineering Program Outcomes:
This course provides practical experience in the fundamental themes in materials science and engineering.

Objectives: The objective of this course is to provide the student with:
1) Practical experience with the processing-microstructure-performance of materials, and
2) Practical experience with the relationships between them.

Outcomes: Graduates of the course will be experienced in technical report writing, in which the graduates will have related their familiarity with:
1) Material behavior as a result of microstructural changes,
2) Performance measures in materials testing,
3) Common microstructures encountered in ferrous alloys,
4) The effect of heat treatments on microstructures of ferrous alloys, and
5) Hardenability of steels.
6) Fulfill ABET outcomes 6 and 9 (consult the Course Catalog and Department Guidelines)
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<tr>
<th>Date</th>
<th>Tentative Laboratory plan</th>
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<tr>
<td>Week 1</td>
<td>Safety demonstration video and sign-up</td>
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<td>Holiday Labor Day</td>
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<td>Week 2</td>
<td>Lab Orientation – Optical Microscopy, Sample Preparation, Lab report writing</td>
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<td>Week 3</td>
<td>Expt. 1: Grain Size Determination</td>
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<td>Week 4</td>
<td>Expt. 2: Hardness Measurements</td>
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<td>Week 5</td>
<td>Expt. 3: Heat Treatment of Steel</td>
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<td>Week 7</td>
<td>Spare</td>
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<td>Week 8</td>
<td>Expt. 4: Jominy Hardenability (quench) Test</td>
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<tr>
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<td>Week 10</td>
<td>Expt. 5: Cast iron/Steel Microstructure and Characterization</td>
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<td>Week 11</td>
<td>Expt. 5: Cast iron/Steel Microstructure and Characterization</td>
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<td>Week 12</td>
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<td>Week 13</td>
<td>Final class meeting/Returning all graded lab reports</td>
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**Expectations:**
1) Attend the lab, and let me know if and when you will need to be elsewhere PRIOR to any class.
2) **Note that all reports must be satisfactorily completed before a grade is assigned. You will lose 1 point per day for late submission.**

**Assessment:**
The assessment will be an *average of the lab reports submitted PLUS attendance, and active participation in the lecture class and labs.*

A = (92-100), A− = (90-91.9), B+ = (88-89.9), B = (82-87.9), B− = (80-81.9), C+ = (78-79.9), C = (72-77.9), C− = (70-71.9), D+ = (68-69.9), D = (62-67.9), D− = (60-61.9), F = (0-59.9)

**Contribution to Professional Component:**
- Engineering Topics - Yes
- Engineering Design - No
- Computer Usage - Yes – spreadsheets, word processor
- Ethics - No
- Statistics - Yes
- Safety - Yes

**ABET outcomes covered: 6 and 9**
- (6) Design and conduct experiments, analyze and interpret data
- (9) To integrate the understanding of the scientific and engineering principles underlying the four major elements of the field: structure, properties, processing, and performance related to material systems appropriate to the field.

Prepared by: **Dr. Sudhakar Vadiraja**