

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)

<u>Date</u>	<u>Tentative Laboratory Plan</u>
Week 1	Safety demonstration video & sign-up
Week 2	Lab report writing guidelines & Lab orientation
Week 3	Labor Day - Holiday
Week 4	Expt. 1: Grain Size Determination
Week 5	Expt. 2: Hardness Measurements
Week 6	Expt. 3: Heat Treatment of Steel
Week 7	Expt. 3: Heat Treatment of Steel... <i>Lab Report #1 due (of Expt. 1&2 combined)</i>
Week 8	Expt. 4: Jominy Hardenability (quench) Test
Week 9	Expt. 4: Jominy Hardenability (quench) Test... <i>Lab Report #2 due (of Expt. 3)</i>
Week 10	Expt. 5: Cast iron/Steel Microstructure & Characterization
Week 11	Expt. 5: Cast iron/Steel Microstructure & Characterization... <i>Lab Report #3 due (Expt. 4)</i>
Week 12	<i>Spare</i>
Week 13	<i>Spare.....Lab Report #4 due (of Expt. 5)</i>
Week 14	<i>Spare</i>
Week 15	Final class meeting/Return all graded lab reports

Requirements and 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 (unexcused absence).*

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)

Excessive absence will result in lowering of the final grade.

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.

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