EMAT 353: Microstructural Interpretation

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 to interpretation of 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 b and m (consult the Course Catalog and Department Guidelines)
## Tentative Laboratory Plan

<table>
<thead>
<tr>
<th>Date</th>
<th>Laboratory Plan</th>
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<tbody>
<tr>
<td>Sep 08</td>
<td>Lab Orientation – Safety, Optical Microscopy, Sample Prep.</td>
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<tr>
<td>Sep 15</td>
<td>Expt 1: Grain Size Determination</td>
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<td>Sep 22</td>
<td>Expt 2: Hardness Measurements</td>
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<td>Sep 29</td>
<td>Expt 3: Heat Treatment of Steel</td>
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<td>Oct 06</td>
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<td>Oct 13</td>
<td>Expt 4: Jominy Hardenability (quench) Test</td>
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<td>Oct 27</td>
<td>Expt 5: Cast iron/Steel Microstructure and Characterization</td>
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<td>Nov 03</td>
<td>Spare (Election day, 4th)</td>
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<td>Nov 10</td>
<td>Spare (Veteran’s day, 11th)</td>
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<td>Nov 17</td>
<td>Expt 5: Cast iron/Steel Microstructure and Characterization</td>
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<td>Nov 24</td>
<td>Expt 6: Stainless Steel Welds</td>
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<td>Dec 01</td>
<td>Practical Microstructural Examination</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.**

### Assessment:

The assessment will be an average of the lab reports submitted **plus a short practical examination.** *(The practical exam has the same weight as one lab report).* The practical examination will be conducted on an individual appointment basis where a series of samples are provided and you have to provide a **description and interpretation of the microstructure of each.**

### 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: b and m

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Date: **August 25, 2014**