

**MATERIALS LABORATORY 1**

<b>Instructor:</b>	Peter Lagerlöf White Building Room 512 Phone: 368 - 6488 e-mail: pxl4
<b>TA's:</b>	TBD
<b>Lab hours:</b>	Th 9.00 a.m. – 12.00 noon (backup Tu 9.00 a.m. – 12.00 noon)
<b>Office hours:</b>	Tu 9.00 a.m. – 11.00 a.m.
<b>Location:</b>	White Building Room 300

**PRELIMINARY OUTLINE****Introduction:**

The objectives with EMSE 270 are:

- To learn some of the basic techniques used for characterization and analysis of a materials microstructure and to relate the microstructure to the materials composition and thermal history.
- To use fundamental principles of Physics and Chemistry to understand and relate the microstructure of a material to its processing history (*e.g.*, sintering characteristics, solidification, and crystallization behavior).
- To provide experience in analyzing and reporting experimental results in a standard laboratory report format.

Thirteen lab exercises form the backbone of EMSE 270. These will be complemented with 5 Quizzes, and an oral presentation.

EMSE 270, like all lab courses, requires pre-class preparation, in-class performance, and post-class report writing. Before class, each student is expected to read the assigned background material that describes that week's activity. Each lab or demonstration will be preceded by a brief lecture covering relevant scientific principles and experimental techniques. After each session, students are encouraged to begin preparing their results for inclusion in the final report (*i.e.* plotting, tabulating and analyzing the data).

**Schedule:**

<b>Week</b>	<b>Content</b>
1 1/17	Introduction – Lab objectives and organization

**Experiment #1: The Pb-Sn Phase Diagram and Metallography:**

<b>Week</b>	<b>Content</b>
2 1/24	Lab #1: Solidification Cooling Curves - Preparing of Mixtures
3 1/31	Lab #2: Solidification Cooling Curves - Measurements
4 2/7	Lab #3: Solidification Cooling Curves - Metallographic Sample Prep.
5 2/14	Lab #4: Optical Microscopy and SEM
6 2/21	Lab #5: Quantitative Metallography (Pb-Sn system)
<b>Report #1 (Labs #1-5) Due on Thursday 2/28</b>	

**Experiment #2: Ceramic Processing:**

<b>Week</b>	<b>Content</b>
7 2/28	Lab #6: Ceramic Powder Synthesis
8 3/6	Lab #7: Thermal Analysis
<b>Report #2 (Labs #6-7) Due on Thursday 3/20</b>	

9 3/13 **SPRING BREAK**

**Experiment #3: Consolidation, Sintering and Grain Growth:**

<b>Week</b>	<b>Content</b>
10 3/20	Lab #8: Powder Mixing and Consolidation
11 3/27	Lab #9: Sintering
12 4/3	Lab #10: Grain Growth
13 4/10	Lab #11: Ceramographic Examination
<b>Report #3 (Labs #8-11) Due on Thursday 4/16</b>	

**Experiment #4: Glass and Glass Ceramics:**

<b>Week</b>	<b>Content</b>
14 4/17	Lab #12: Structure of Glass and Glazes
15 4/24	Lab #13: Color of Glass and Glazes
<b>Report #4 (Labs #12-13) Due on Thursday 4/29</b>	

**4/29 Oral Presentations**

<b>Grading:</b>	<b>20%</b>	Lab Report #1
	<b>15%</b>	Lab Report #2
	<b>20%</b>	Lab Report #3
	<b>15%</b>	Lab Report #4
	<b>10%</b>	Quizzes
	<b>15%</b>	Oral Presentation
	<b>5%</b>	Attendance and Lab Performance

**Grading Scale:** A 90 - 100; B 80 – 90; C 70 – 80; D 50 – 70; F < 50

**Laboratory Reports:**

The four formal lab reports to be written by each student will combine results from the lab exercises:

Report 1: Phase Diagrams and Solidification Microstructures (Labs 1-5).

Report 2: Ceramic Powder processing and Thermal Analysis (Labs 6-7).

Report 3: Sintering and Grain Growth and Ceramic Microstructure (Labs 8-11).

Report 4: Glasses and Glazes (Labs 12-13).

Each report will include data taken over a span of several weeks; so begin the report while the lab experience is still fresh in your mind. Remember that *writing a lab report is a major undertaking*. Leaving the data analysis and report writing until the week (or night!) before it is due will make the job unnecessarily difficult. You will receive another handout explaining in detail the lab report format to be used in this course.

**Quizzes:**

There will be 5 brief (15 minutes) Quizzes during the semester, which will cover basic theory and “*how-to*” details for the lab or demonstration to be performed that day (or previously performed). The purpose with the Quizzes is to motivate the students to come to class well prepared for the lab, and to evaluate each student's understanding of aspects of the class that are not ordinarily a part of laboratory reports.

**Oral Presentations:**

During the first Reading day, each student will make a 15-20 minute oral presentation to the rest of the class (with appropriate visual aids). The presentations will focus on each of the four experiments, and should be a critical review of what learned from the experiments. The specific content of the presentations will be determined at the appropriate time, and will depend on the number of students registered for the class.

**Lab Practice:**

Regular attendance is expected of all students. Unexcused absences will reduce the student's Lab Performance Grade. Quizzes will not be re-administered for absentees except in special circumstances.

Carelessness in the handling of equipment or materials can result in serious injury, either from electricity, chemicals, high or low temperatures, or mechanical sources. The student will be held responsible for the proper use of all equipment and the conservation of materials. The student is required to observe all rules of safety as well as to use common sense. The lab should be left in as good *or better* condition that when the class began.

Safety considerations will be presented in relevant lectures, and the lab assistants will demonstrate the use of all equipment before being used. In the event that some question arises during the experiment consult the instructor or teaching assistant.

Any malfunction should be reported immediately. If any injury does occur, no matter how minor, it must be reported to the instructor immediately.