Syllabus
MSE 308: Materials Laboratory-II
Spring 2019

Instructor: Dr. Jessica TerBush, 207 Ceramics, 300-9924, jterbush@illinois.edu

Lecture: 1:00 PM – 1:50 PM Tuesday, 103 Talbot Lab
(first week) 1:00 PM – 1:50 PM Thursday, 103 Talbot Lab

Discussions: 1:00 PM – 1:50 PM Tuesday and Thursday, 122 Kiln House

Office Hours: 10:00 AM – 12:00 PM Tuesday and Thursday, or by appointment

Laboratory: 2:00 PM – 5:00 PM (T-F), 105-108 Kiln House

NOTE: NO MONDAY SECTION THIS SEMESTER

Course Objectives:
1) To learn the basic skills required to properly use materials science instruments;
2) To learn the principles of materials science and engineering through lab investigation;
3) To learn to organize the lab results into logic, concise and accurate reports.
4) To develop writing and communications skills for effective presentation of technical materials.

Text: Handouts for individual experiments (on Compass website)

Website for course materials: https://compass2g.illinois.edu/

Course Outline:

1. Heat Diffusion (HD) 2 Wk
2. Polymer Crystallization (PX) 2 Wk
3. Mechanical Properties (MP) 2 Wk
4. Photoelectric Energy Conversion (PEC) 2 Wk
5. Viscosity (VI) 2 Wk
6. Creep (CR) 2 Wk
**Schedule: Spring 2019**

(Student will be assigned to group A, B, or C. See last page for group assignments.)

<table>
<thead>
<tr>
<th>Week</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Week</th>
<th>Tuesday</th>
<th>Thursday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No lab</td>
<td>No lab</td>
<td>No lab</td>
<td>1/14-1/18</td>
<td>Intro</td>
<td>MP - all</td>
</tr>
<tr>
<td>2</td>
<td>MP1*</td>
<td>PX1</td>
<td>HD1</td>
<td>1/21-1/25</td>
<td>HD- Disc-C</td>
<td>PX- Disc-B</td>
</tr>
<tr>
<td>3</td>
<td>MP2*</td>
<td>PX2</td>
<td>HD2</td>
<td>1/28-2/1</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>4</td>
<td>HD1</td>
<td>MP1*</td>
<td>PX1</td>
<td>2/4-2/8</td>
<td>HD-Disc-A</td>
<td>PX- Disc-C</td>
</tr>
<tr>
<td>5</td>
<td>HD2</td>
<td>MP2*</td>
<td>PX2</td>
<td>2/11-2/15</td>
<td>Present-C</td>
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<tr>
<td>6</td>
<td>PX1</td>
<td>HD1</td>
<td>MP1*</td>
<td>2/18-2/22</td>
<td>HD- Disc-B</td>
<td>PX- Disc-A</td>
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<tr>
<td>7</td>
<td>PX2</td>
<td>HD2</td>
<td>MP2*</td>
<td>2/25-3/1</td>
<td>Present-A</td>
<td>Present-A</td>
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<td>8</td>
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<td>No lab†</td>
<td>3/4-3/8</td>
<td>Present-B</td>
<td>Present-B</td>
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<tr>
<td>9</td>
<td>PEC1</td>
<td>VI1</td>
<td>CR1</td>
<td>3/11-3/15</td>
<td>PEC-Disc-A</td>
<td>VI- Disc-B</td>
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<td>10</td>
<td>Spring break</td>
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<td>Spring break</td>
<td>3/18-3/22</td>
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<td>11</td>
<td>PEC2</td>
<td>VI2</td>
<td>CR2</td>
<td>3/25-3/29</td>
<td>CR- Disc-C</td>
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<td>12</td>
<td>VI1</td>
<td>CR1</td>
<td>PEC2</td>
<td>4/1-4/5</td>
<td>CR- Disc-B</td>
<td>PEC- Disc-C</td>
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<td>13</td>
<td>VI2</td>
<td>CR2</td>
<td>PEC2</td>
<td>4/8-4/12</td>
<td>VI- Disc-A</td>
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<tr>
<td>14</td>
<td>CR1</td>
<td>PEC1</td>
<td>VI1</td>
<td>4/15-4/19</td>
<td>VI- Disc-C</td>
<td>CR- Disc-A</td>
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<tr>
<td>15</td>
<td>CR2</td>
<td>PEC2</td>
<td>VI2</td>
<td>4/22-4/26</td>
<td>PEC- Disc-B</td>
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<tr>
<td>16</td>
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<td>No lab</td>
<td>No lab</td>
<td>4/29-5/3</td>
<td>No class</td>
<td>No class</td>
</tr>
</tbody>
</table>

* The Mechanical Property lab will take place in Talbot Laboratory, and will only last from 2-4pm (2 hours).

† Additional presentation slots are available during lab this week, but normal lab sections will not meet.

**Teaching Assistants:**

- Ben Hulbert bshulbe2@illinois.edu
- Sushant Mahat smahat2@illinois.edu
- Tooba Shoaib shoaib2@illinois.edu
- Andrew Steveson steveso2@illinois.edu

**Undergrad Assistant: Victoria Nahmod-Alvarez**

**Lab Manager:** Nicole Robards nroberds@illinois.edu 212 Ceramics (4-7498)
Grading Policies and Procedures:

1. Each student will submit five (5) individually written long reports during the course of the semester and will also make a group oral presentation during the semester.

2. Both a hard copy and an electronic version of each lab report are required. The hard copy should be submitted directly to the TA; all pages should be stapled together. The electronic version must be submitted in the MSWord or PDF format to the Compass2g course website. (Make sure to agree to the SafeAssign option.) Reports should be approximately 10-13 pages of text plus figures, tables, and references, although specific requirements may vary by experiment. Instructors reserve the right to deduct points for excessively long reports.

3. The reports are due exactly at 2:00 PM in the Lab, one week after the experiment is finished. Any extension requests must be presented to the instructor in writing before the due date of the report, and only then will the extension be considered.

4. No late reports will be accepted without penalty (10% per day).

5. Each report will be graded using a standard checklist for a total of 100 points.

   - 30% of which is allocated to the writing (organization, format, grammar, spelling, sentence construction, style and illustration).
   - 70% is allocated to the technical content (concepts, data analysis, interpretation and understanding).

6. Each student is required to maintain a lab notebook. The notebook must be signed and dated by the TA at the end of each lab to indicate that the student has completed the lab. The student then needs to photograph or scan the signed page and submit it to Compass to receive the credit for completing the lab. Completing all six labs will add 20% toward the final grade; however, missing lab will result in an incomplete grade until it is made up. All signatures must be submitted by the last day of class (before the start of the final exam period), or the participation credit will be reduced.

7. Everyone is required to make a 10-minute group presentation on the Heat Diffusion lab. The presentation will be followed by 5-minute questions and answers (Q&A). The presentation will be graded on completion of lab requirements (40%), data analysis (30%), clarity of presentation (15%) and Q&A (15%). The presentations will be held in 122 Kiln House during normal lecture/discussion times. Signup sheets will be posted online. Every member of the group needs to participate equally in the presentation.

8. Each lab will have a pre-lab quiz, which should be completed online (on the Compass course website) before the start of the lab. The quizzes will contribute 5% toward the final grade.

9. The final grade will be calculated as follows: 60% from the 5 lab reports, 20% for completing all six labs, 15% from the presentation, and 5% from the 6 pre-lab quizzes.

10. Final letter grades will be awarded depending on the class average and the relative performance of the individuals. A straight grading scale is most commonly used, but a curve may be applied if the class performance merits it. Overall scores less than 50% are considered a failing grade.
**Penalties:**

- **Copying or Sharing:** 25 - 50% penalty for copying or sharing any part of the individual report
- **Plagiarism:** As per the University Code of Policies and Regulations, the instructor may impose one or more of the following penalties depending on the severity of the infraction:
  - A reduced grade for the lab report
  - A "0" for the lab report
  - A reduced grade for the course
  - A failing grade for the course
  - Recommendation to the head of the department that the student be suspended or dismissed from the University

**Laboratory Rules and Regulations:**

**A) Safety:**

1) **Always use appropriate safety equipment and follow proper safety procedures**
2) **Always bring your own Safety Glasses and wear them during the lab period** *(Safety glasses will not be provided for you. No exceptions)*
3) **Always wear proper attire** *(shirt, long pants and closed shoes)*
4) **Long hair? Properly contain it** so that it will not be hazardous to you and to your fellow classmates and will not damage the very sensitive equipment in the labs
5) **Inside the labs, ABSOLUTELY NO:**
  - **Food** *(solid or liquid)*
  - **Roller Skates/Blades**
  - **Game playing** *(of any sort, particularly on the computers)*

Anyone caught violating the above laboratory rules:
- Will be expelled from the lab
- **No** compensating lab time will be given to complete the experiment(s) and
- Will **not** be allowed back into the labs **without** a letter from the Head of the Department of Materials Science and Engineering

6) **Online Lab Safety Training:** Everyone is required to complete the online lab safety training at the DRS website before starting the first lab. You can complete the training at the following website: [http://www.drs.illinois.edu/](http://www.drs.illinois.edu/). Click on “Training” and select “Laboratory Safety” from the dropdown menu.

After you finish the training, print out the completion certificate and bring it to your first lab to submit to the lab manager or TA.

*If you have taken 307 previously, you do not need to submit this again.*
B) General:

- Arrive at the lab a few minutes before the start of each lab; TA has the discretion to deduct 2% (out of total of 20% for 6 labs) from the completion grade for anyone who is more than 15 minutes late for a lab. Anyone who is more than 30 minutes late for a lab will not receive the credit for the lab and will automatically receive an incomplete grade if not made up.

- You are responsible for the clean-up of the common as well as the individual work areas at the end of your lab period

- After you are done with your experiment, you should not leave the lab premises without checking with your TA

- Pay particular attention to the proper use of equipment and experimental procedures. Use your down time wisely. No loud and excessive conversations

- You should not leave the area of your experimental set up in the middle of the experiment without a proper cause and/or permission from the lab supervisor

- Save your data on your own storage media immediately after the experiment is done.

University Policies to Note:

Accommodations: To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail disability@illinois.edu or go to the DRES website.

Emergency Situations: Emergencies can happen anywhere and at any time, so it’s important that we take a minute to prepare for a situation in which our safety could depend on our ability to react quickly. Take a moment to learn the different ways to leave this building. If there’s ever a fire alarm or something like that, you’ll know how to get out and you’ll be able to help others get out. Next, figure out the best place to go in case of severe weather – we’ll need to go to a low-level in the middle of the building, away from windows. And finally, if there’s ever someone trying to hurt us, our best option is to run out of the building. If we cannot do that safely, we’ll want to hide somewhere we can’t be seen, and we’ll have to lock or barricade the door if possible and be as quiet as we can. We will not leave that safe area until we get an Illini-Alert confirming that it’s safe to do so. If we can’t run or hide, we’ll fight back with whatever we can get our hands on. If you want to better prepare yourself for any of these situations, visit police.illinois.edu/safe. Remember you can sign up for emergency text messages at emergency.illinois.edu. (From the Division of Public Safety and Public Affairs)

Guidelines to Preparing Laboratory Reports

Department of Materials Science and Engineering
University of Illinois at Urbana-Champaign

The following guidelines are for writing formal laboratory reports for the MatSE-307 and 308 laboratory courses taught in the Department of Materials Science and Engineering at the University of Illinois at Urbana-Champaign.

All laboratory reports should contain the following in order:

Title Page:
The following information should be centered on the front page: (with no page number)

   Experiment Number
   Title of the Experiment
   Author
   (Lab Partners)
   Class_____, Section_______
   Date Due________
   Date Received________ (leave blank)

Abstract:
The abstract is to be placed on numbered Page 1, in block style with no paragraph indentation and in bold type. It should be no more than 150 to 200 words in length.

The abstract should be a concise summary of the experiment, containing general statements of the investigation, the methods used, materials tested, and the main results. It should not include procedural details.

The following sections of the report should start at the top of Page 2:

Introduction and Background:
The Introduction and Background section should include: (1) statements that clearly define the purpose of the experiment; (2) its significance; (3) background information necessary to understand the concepts, methods, and procedures presented in the subsequent sections. This section should not contain the details of the laboratory procedures and the data analyses.

The purpose of this section is to identify the reasons for performing the experiment. What are you measuring or determining and why? What is the significance of your observations? Say this in your own words. Do not copy the "objectives" from the laboratory manual or any handout that might be given to you. The goal is to supply the minimum supplementary information necessary to understand the methodology employed and the theoretical background of the experiment. When this section is properly written, the logic behind the experimental approach will be clear.
Experimental Procedure:
The Experimental Procedure section should give an explicit and concise account of the methods and procedures followed during the experiment without getting into the operational details of the equipment used. Do not simply copy the laboratory manual or a handout. A person with technical background should be able to carry out the experiment without any difficulty by reading this section and the appropriate equipment manuals.

This section should include, when applicable, raw materials, compositions, batch formulas, and specific processing and analytical procedures used to make, test, and analyze the samples. Brief descriptions of equipment, diagrams of apparatus, sketches of circuits, etc., should be included when needed for clarity.

Results and Discussion:
This section should be the majority of your report. All pertinent observations and the refined data should be presented and discussed in logical order. Whenever possible, data should be presented in graphical form to show any relationships between variables. Raw data should be tabulated and placed in an appendix.

The interpretations and significance of the results should be discussed, including whether the purpose of the experiment had been fulfilled. The results should be compared with those found in the literature and if possible, with theory. Any specific experimental conditions that may have affected the results and any sources of error should also be discussed.

Conclusions:
This section should be a brief summary of the important findings, preferably in itemized form. The conclusions should not simply be a copy and paste of the abstract. Conclusions are a distinct element within a technical report.

References:
References acknowledge the sources of non-original information, data, and ideas (i.e., not those of the author), and are used to support the author's point of view or observations.

References should be numbered consecutively in the order they appear in the text and listed in this section with the following information. The references should be listed in IEEE format as indicated by the following examples:

Journal:

Proceedings:

Books:
Patents:  

Appendices:  
The Appendices are used for placing material that is pertinent, but would cause a disruption to the flow of the text in the main body of the report. Raw data, sample calculations, and extensive derivations are typically included. Appendices should be lettered consecutively (e.g., Appendix A, Appendix B, etc.) and given a descriptive title.

General Guidelines:

Format:
All reports must be typewritten, double-spaced, with one-inch margins on all sides and the pages numbered. Reports must be either stapled at the upper left-hand corner or bound in a report cover. Any handwritten annotations, equations, etc. must be neat and legible.

A good laboratory report should be concise and comprehensive, and need not be long. The text of a typical laboratory report usually ranges from 10 to 13 pages in length (excluding tables and figures). Graders reserve the right to deduct points for excessively long reports.

Writing:

Always save your report file on a backup disk  
Use concise and economical wording of sentences and paragraphs without being choppy  
Particular attention should be given to proper word usage, correct spelling, proper punctuation, and the use of complete sentences  
Keep the tense consistent in a given section. Usually simple present tense is best. The main exception is the description of the experimental procedure where past tense is often more natural. Typically, sentences should be written in third person, but first person can be used where appropriate. Avoid a conversational style of writing.  
Avoid the use of absolute, unrestricted, or unqualified statements.  
Reports should be written based on the premise that the reader may not be well informed on the subject. Reports should be concise, but they must be sufficiently complete to supply the necessary information. If you have general comments which you care to make about the laboratory, this is not the place to make them. Such comments should be directed to the instructor or to a teaching assistant on a separate note.
Tables:

All tables should be numbered in the order they appear and placed successively in the text. Each table should have a descriptive caption above the table, and numbered as Table I, Table II, etc. as per the following example:

Table I. Mg and Fe Contents in the External Oxide Layer as a Function of Time and Temperature

<table>
<thead>
<tr>
<th>Sample no.</th>
<th>Oxidation temperature (°C)</th>
<th>Oxidation time (h)</th>
<th>Fe content (×10^{12}/cm²)</th>
<th>Mg Content (×10^{12}/cm²)</th>
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</thead>
<tbody>
<tr>
<td>4-1a</td>
<td>1000</td>
<td>0.5</td>
<td>120</td>
<td>160</td>
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<td>4-1b</td>
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<td>190</td>
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<td>4-1c</td>
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<td>4.0</td>
<td>320</td>
<td>340</td>
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<td>4-1d</td>
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<td>1200</td>
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<td>5-b1</td>
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<td>10.0</td>
<td>33</td>
<td>29</td>
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<td>5-b3</td>
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<td>10.0</td>
<td>100</td>
<td>100</td>
</tr>
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<td>2-1a</td>
<td>900</td>
<td>10.0</td>
<td>330</td>
<td>460</td>
</tr>
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<td>5-b2</td>
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<td>10.0</td>
<td>470</td>
<td>480</td>
</tr>
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<td>5-b5</td>
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<td>10.0</td>
<td>1100</td>
<td>770</td>
</tr>
<tr>
<td>10-b3b</td>
<td>700</td>
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<td>10-b4b</td>
<td>810</td>
<td>49.3</td>
<td>460</td>
<td>250</td>
</tr>
<tr>
<td>10-b5b</td>
<td>907</td>
<td>10.0</td>
<td>440</td>
<td>310</td>
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<tr>
<td>9-b3b</td>
<td>1100</td>
<td>1.0</td>
<td>350</td>
<td>160</td>
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</table>

Figures:

All figures should also be numbered in the order they appear and placed successively in the text. Each figure should have a descriptive caption below the figure, and numbered as Fig. 1, Fig. 2, etc. as per the following examples:

Fig. 1. Acceptable example of a graph.
When micrographs are to be included in the report, use scale bars as shown above and indicate the magnification in the caption, in parenthesis.

The axes of each graph must be labeled and their units clearly designated in parenthesis. Take error into account.

Mathematical Expressions:

Equations should be consecutively numbered and all variables identified. Decimal numbers less than one must have a leading zero such as 0.01, not .01. Every symbol must be defined, and avoid multiple meanings for the same symbol. In displaying equations with fractions (except superscripts), numerators should be stacked over denominators rather than placed on a single line and separated by a slash (/). Very large and very small numbers should be expressed in scientific notation, e.g., 4.53 x 10^8 and 2.98 x 10^-8.

Note:

If you choose to include tables and figures within the body of your report, always place them (along with the equations) after their point of reference. Otherwise, put your tables and figures at the end of the report (after References).

SI Units:

Use metric units of measurement, specifically SI units. English or non-metric units may appear in the report, but they should appear only in parenthesis following the SI units, e.g., 32 mm (1.25 in.).
Formal (Long) Reports

The long reports should contain the following sections in order:

1. Title Page
2. Abstract
3. Introduction and Background
4. Experimental Procedure
5. Results and Discussion
6. Conclusions
7. References
8. Appendices

Type of Reports / MSE-308

<table>
<thead>
<tr>
<th>Experiment</th>
<th># of weeks</th>
<th>Report Type</th>
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<tbody>
<tr>
<td>1. Heat Diffusion / (HD)</td>
<td>2 Wks</td>
<td>Presentation</td>
</tr>
<tr>
<td>2. Polymer Crystallization / (PX)</td>
<td>2 Wks</td>
<td>Long</td>
</tr>
<tr>
<td>3. Mechanical Properties / (MP)</td>
<td>2 Wk</td>
<td>Long</td>
</tr>
<tr>
<td>4. Photoelectric Energy Conversion / (PEC)</td>
<td>2 Wks</td>
<td>Long</td>
</tr>
<tr>
<td>7. Viscosity / (VI)</td>
<td>2 Wks</td>
<td>Long</td>
</tr>
<tr>
<td>8. Creep / (CR)</td>
<td>2 Wks</td>
<td>Long</td>
</tr>
</tbody>
</table>
Presentation Guidelines

Location: 122 Kiln House
Format: Electronic presentation in PowerPoint format
Duration: 10 minutes plus questions
Date: Tuesday and Thursday during lecture (1-2 pm), as indicated in the schedule.
Additional slots may be arranged as necessary during week 8 (equipment changeover)

Lab groups of 2-3 students should sign up for one 10-minute presentation slot. Sign-up link will be emailed at least one week prior to the first presentation slot.

Show up at Room 122 Kiln House at the start of lecture before your scheduled presentation time with an electronic version of the PowerPoint presentation on a USB memory stick or stored electronically (Drive, Box, Compass, email, etc). Students in a particular group (A, B, or C) will listen to all student presentations in their group, and provide peer feedback. Presentation grades will be based on instructor feedback, peer feedback, and participation in the peer feedback process (at least two sessions).

The presentation grade will be determined by the following four components:

1) completion of lab requirements (40%)
2) data analysis (30%)
3) clarity of presentation (15%)
4) Q&A (15%).