Syllabus
MSE 308: Materials Laboratory-II
Spring 2024

Instructor: Dr. Jessica TerBush, 207 Ceramics, 217-300-9924, jterbush@illinois.edu

Lecture: 1:00 PM – 1:50 PM Tuesday and Thursday, 2055 Sidney Lu (Week 1)

Starting week 2, all lectures will be held in 122 Kiln House

Office Hours: TBD

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

Course Objectives:

1) To practice the technical skills required to properly use materials science instruments;
2) To apply the principles of materials science and engineering through lab investigation;
3) To analyze lab results and organize them into logical, concise, and accurate reports;
4) To develop writing and communications skills for effective presentation of technical materials.

Text: Handouts for individual experiments (on Canvas website)

Website for course materials: *https://canvas.illinois.edu/courses/41788*

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 2024

(Students are assigned to group A, B, or C. See Canvas for group assignments.)

Week	Group A	Group B	Group C	Week	Tuesday	Thursday
1	No lab	No lab	No lab	1/15-1/19	Intro	MP - all
2	MP1*	PX1	HD1	1/22-1/26	HD- Disc-C	PX- Disc-B
3	MP2*	PX2	HD2	1/29-2/2	No lecture	No lecture
4	HD1	MP1*	PX1	2/5-2/9	HD-Disc-A	PX- Disc-C
5	HD2	MP2*	PX2	2/12-2/16	Present-C	Present-C
6	PX1	HD1	MP1*	2/19-2/23	HD- Disc-B	PX- Disc-A
7	PX2	HD2	MP2*	2/26-3/1	Present-A	Present-A
8	No lab**	No lab**	No lab**	3/4-3/8	Present-B	Present-B
9	Spring break	Spring break	Spring break	3/11-3/15	No class	No class
10	PEC1	VI1	CR1	3/18-3/22	PEC-Disc-A	VI- Disc-B
11	PEC2	VI2	CR2	3/25-3/29	CR- Disc-C	No lecture
12	VI1	CR1	PEC2	4/1-4/5	CR- Disc-B	PEC- Disc-C
13	VI2	CR2	PEC2	4/8-4/12	VI- Disc-A	No lecture
14	CR1	PEC1	VI1	4/15-4/19	VI- Disc-C	CR- Disc-A
15	CR2	PEC2	VI2	4/22-4/26	PEC- Disc-B	No lecture
16	No lab	No lab	No lab	4/29-5/1	No class	No class

* 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:

Ziqi Zhao (ziqiz7@illinois.edu) and *tbd*

Undergrad Assistants: Feyza Baysal, Michael Han, Andrew Hattoon, Kayla Huang, Lorraine Jamison, Kira Martin, and Gigi Yik

Lab Managers:	Nicole Robards	nrobards@illinois.edu	212 Ceramics (4-7498)
	Melissa Anderson		212 Ceramics

Grading Policies and Procedures:

1. Each student will submit **five (5) individually written long reports** during the course of the semester and also will make a **group oral presentation** during the semester.
2. An electronic version of each lab report must be submitted in the MSWord or PDF format to the Canvas course website. Reports should be approximately **10-13 pages** of text plus figures, tables, and references. **Instructors reserve the right to deduct points for excessively long reports.**
3. The reports are due **exactly at 2:00 PM**, **one week after** the experiment is finished. Any excuses must be presented to the instructor in writing before the due date of the report, and only then will the excuse be considered.
4. **No late reports will be accepted without penalty (typically 10% per day).**
5. Each report will be graded using a standard check list 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 scan the signed page and submit it to Canvas to receive the credit for completing the lab. Completing all 6 labs will add **20%** toward the final grade; however, missing one lab will result in an **incomplete** grade until made up.
7. **Please follow the current COVID-19 policy in place for the University**, including all mask, social distancing, and testing requirements. If you are ill and cannot attend lab or lecture, please contact the instructor for a Zoom link to attend virtually or to reschedule to a later date.
8. 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.**
9. Each lab will have a pre-lab quiz, which must be completed online (on the Canvas course website) before the start of the lab. The quizzes will contribute **5%** toward the final grade.
10. The final grade will be calculated as follows: **60%** from the 5 lab reports, **20%** for completing all 6 labs, **15%** from the presentation, and **5%** from the 6 pre-lab quizzes. There will be no rewrite opportunity this semester.
11. Final letter grades will be awarded depending on the **class average** and the **relative performance** of the individuals. 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:*** Plagiarism is taken seriously. Please make sure you are submitting your own work for every report. Plagiarism and copying must be reported through the University-wide FAIR system. 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 were provided in 307. If you lose them, you will need to purchase a new pair.*)
3) Always **wear proper attire** (shirt, long pants and closed toe shoes, plus face mask if required by current COVID-19 policy.)
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
5) **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/. Click on "Training" and select "Laboratory Safety" from the dropdown menu. Certificates can be emailed to Dr. TerBush.

   If you have taken 307 previously, you do not need to submit this again unless it has expired.

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 that day and will need to schedule a make-up time.
- 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 that distract from the experiment or create a safety hazard for others.
- 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:

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.

Ceramics Kiln House: http://police.illinois.edu/dpsapp/wp-content/uploads/2016/02/u0011.pdf

Sexual Misconduct Reporting Obligation: The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.
Other information about resources and reporting is available here: wecare.illinois.edu.

Academic Integrity: The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://studentcode.illinois.edu/.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: https://studentcode.illinois.edu/article1/part4/1-401/. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances: Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at https://odos.illinois.edu/community-of-care/resources/students/religious-observances/ to request appropriate accommodations. This should be done in the first two weeks of classes.

Disability-Related 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 https://www.disability.illinois.edu. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting "Request an Academic Screening" at the bottom of the page.

Family Educational Rights and Privacy Act (FERPA): Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

Anti-Racism and Inclusivity Statement: The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs. The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community.

The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive

behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable. You can also report these behaviors to the Bias Assessment and Response Team (BART) (https://bart.illinois.edu/). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.

Mental Health: Significant stress, mood changes, excessive worry, substance/alcohol misuse or interferences in eating or sleep can have an impact on academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Student Health Fee. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

- Counseling Center (217) 333-3704
- McKinley Health Center (217) 333-2700
- National Suicide Prevention Lifeline (800) 273-8255
- Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)

This statement is approved by the University of Illinois Counseling Center.

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: (l) 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:

[1]R.W. Vest, "Materials Science of Thick Film Technology," *Am. Ceram. Soc. Bull*, vol. 65 [4], pp. 631-36, 1986.

Proceedings:

[2]R. A. Perecherla and R.C. Buchanan, "Copper Thick Film Adhesion on Glass Ceramic Substrates," in *Proceedings of the American Ceramic Society Symposium,* Indianapolis, IN, 1989, pp. 439-454.

Books:

[3]W. D. Kingery, H. K. Bowen, and D.R. Uhlmann, "Dielectric Properties" in *Introduction to Ceramics*, 2nd Ed., New York, NY, John Wiley and Sons, 1976, pp. 913-74.

Patents:

[4]M. J. Pryor and T. J. Gray, "Method of Preparing Molten Metal Filter," US Patent #4,056,586, Nov 1, 1977.

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 using gender-specific references.

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

Sample no.	Oxidation temperature (°C)	Oxidation time (h)	Fe content ($\times 10^{15}$/cm^2)	Mg Content ($\times 10^{15}$/cm^2)
4-1a	1000	0.5	120	160
4-1b	1000	1.0	210	190
4-1c	1000	4.0	320	340
4-1d	1000	10.0	480	550
4-1g	1000	40.0	960	1200
5-b1	700	10.0	33	29
5-b3	800	10.0	100	100
2-1a	900	10.0	330	460
5-b2	1000	10.0	470	480
5-b5	1100	10.0	1100	770
10-b3b	700	70.0	220	150
10-b4b	810	49.3	460	250
10-b5b	907	10.0	440	310
9-b5b	1100	1.0	350	160

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:

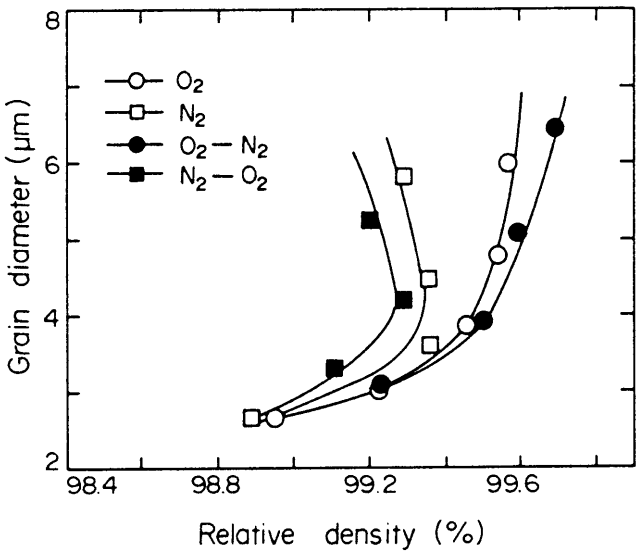

Fig. 1. Acceptable example of a graph.

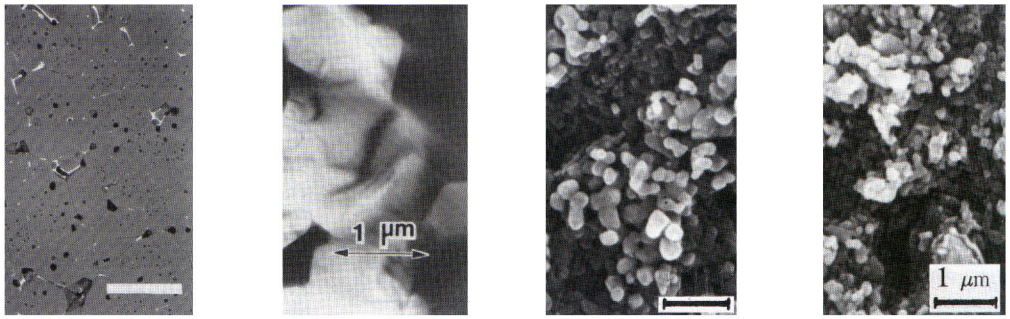

Fig. 2. Acceptable examples of scale bars.

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., 4.53×10^{8} and 2.98×10^{-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

	Experiment	# of weeks	Report Type
1.	Heat Diffusion / **(HD)**	2 Wks	**Presentation**
2.	Polymer Crystallization / **(PX)**	2 Wks	**Long**
3.	Mechanical Properties / **(MP)**	2 Wk	**Long**
4.	Photoelectric Energy Conversion / **(PEC)**	2 Wks	**Long**
7.	Viscosity / **(VI)**	2 Wks	**Long**
8.	Creep / **(CR)**	2 Wks	**Long**

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 sent electronically.

Show up at Room 122 Kiln House at the start of lecture before your scheduled presentation time with an electronic version of the presentation ready to go. Students in a particular group (A, B, or C) will listen to multiple student presentations from 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%).