 **Dept. of Materials Science & Engineering**

**Fall 2017**

**MTSE 3090**

**Materials Science and Engineering Laboratory I**

**Credits and contact hours**

1 Credit. Friday (9:30am-12:20pm), Other times available on request via e-mail

**Instructor’s or course coordinator’s name**

Dr. Zhenhai Xia, Guest Instructors: Dr. Witold Brostow, Dr. Jincheng Du, Dr. Samir Aouadi

**Text book, title, author, and year**

*Reporting Results – A Practical Guide for Engineers and Scientists*, by David C. Van Aken and William F. Hosford

1. *Other supplemental materials*

The instructor will provide the laboratory manual and references.

**Specific Course Information**

1. *Brief description of the content of the course (catalog description)*

Laboratory designed to introduce students to some of the most common materials testing, characterization and computational methods. Topics will include polymer, glasses, nanocomposites and computational materials.

1. *Prerequisites or co-requisites*

ENGR 2332 3450

1. *Indicate whether a required, elective, or selected elective course in the program*

Required

**Specific goals for the course**

*a. Specific outcomes of instruction*

1. Students will learn how to conduct module-specific processing or computational techniques (e.g., heat-treatments, sintering, thin films growth, finite element analysis)
2. Students will learn how to characterize materials using the different techniques specific to each of the modules (e.g., optical microscopy, TGA, DSC, X-Ray Diffraction, EDS, finite element analysis)
3. Students will collect, analyze, and interpret data in teams and will share data with other teams assigned to other roles within each lab module.
4. Students will learn materials structure-property relationships for each module
5. Students will analyze and interpret data related to each of the modules and present the data in the form of original laboratory reports conforming to research and academic standards
6. Students will learn to relate concepts learned in the lab modules involving modern engineering tools to solve practical engineering problems
7. *Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes that are addressed by the course.*

This course addresses ABET Criterion 3 Student Outcome(s): a, b, d, g, k and Program Outcomes 1, 2, 4, 5, 6, 7, 11.

**Brief list of topics to be covered**

1. Introduction (1 week)

2. Computational materials (3 weeks)

3. Polymer processing (3 weeks)

4. Ceramic processing – Glass melting (3 weeks)

5. Nanocomposite materials (3 weeks)

**Course Requirements:**  Mandatory attendance. No required text. Handouts will be provided.

**Grading:**  Class participation is required for each of the labs. Lab reports are due at the end of each session (e.g. polymer, electronic, etc …). Grading is based on class participation and the reports.

**Class participation**:10%, **computational materials**:22.5%, **polymers**:22.5%, **ceramic:**22.5%, **nanocomposite**:22.5%

**LAB Reports:** The lab includes four modules, in which class projects are signed. After the lab experiments are completed, the students are required to write project reports summarizing his or her work on their class lab modeling. This report must be typed, single spaced, 12 point Symbol and/or Times New Roman fonts, and with 1-inch margins around. The report will follow the style of a standard laboratory report and must include the following sections: Title, Author and affiliation, Abstract, Introduction (of the method used and properties calculated), Results, Discussions (comparing the results with corresponding experimental values, or theory), Conclusions, and References. You must include appropriate visual figures from the experiments/simulations (including charts and graphs, and material structures). All the legends and labels in the charts and graphs must be at least a 12-point font when scaled to fit to the report.

**LAB II Schedule (Room: D215)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Week | Date | **Polymer****TA**:Matthew Carl | **Glasses****TA**: Jingjing Gu | **Composites****TA**: Nathalie Hnatchuk | **Computational Materials****TAs**: Group 1: Matthew Carl Group 2: Jingjing Gu Group 3: Nathalie Hnatchuk |
| 1 | 9/2 | General introduction & Safety issues (Groups 1-3) |
| 2 | 9/9 |  |  |  | Groups 1-3 |
| 3 | 9/16 |  |  |  | Groups 1-3 |
| 4 | 9/23 |  |  |  | Groups 1-3 |
| 5 | 9/30 | Group 1 | Group 2 | Group 3 |  |
| 6 | 10/7 | Group 1 | Group 2 | Group 3 |  |
| 7 | 10/14 | Group 1 | Group 2 | Group 3 |  |
| 8 | 10/21 | Group 2 | Group 3 | Group 1 |  |
| 9 | 10/28 | Group 2 | Group 3 | Group 1 |  |
| 10 | 11/4 | Group 2 | Group 3 | Group 1 |  |
| 11 | 11/11 | Group 3 | Group 1 | Group 2 |  |
| 12 | 11/18 | Group 3 | Group 1 | Group 2 |  |
| 13 | 11/25 | Group 3 | Group 1 | Group 2 |  |

**TAs:**

**Polymer:** Matthew Carl

**Glass**: Jingjing Gu

**Composites**: Nathalie Hnatchuk

**Computational Materials**: Group 1: Matthew Carl

 Group 2:Jingjing Gu

 Group 3: Nathalie Hnatchuk