Course number and name

MTSE 3100 - Materials Science and Engineering Laboratory II

Credits and contact hours

1 Credit. Friday (9:00-11:50am), 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

a. Other supplemental materials

The instructor will provide the laboratory manual and references.

Specific Course Information

a. 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.

b. Prerequisites or co-requisites

ENGR 2332 3450

c. 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.

b. 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**

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MTSE 3100: Materials Science and Engineering Lab II
Course details

**Instructor:** Dr. Zhenhai Xia
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**Teaching Assistant:** Christopher Yannetta
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**Guest Instructors:** Dr. Witold Brostow
Dr. Jincheng Du
Dr. Samir Aouadi

**Time:** (Fr) 9:00-11:50 am,  **Room:** DP D215, Office hours: Open door policy

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

**Brief list of topics to be covered**

1. **General introduction and overview; Discovery Park D215 (Instructor: Dr. Xia)**
   - **Week 1:** Introduction (Jan. 22, 2015)

2. **Polymer processing (3 labs); Lab Room: Discovery Park E-146 (Instructor: Dr. Brostow)**
   - **Week 2:** Polymer forming methods (9:00am-9:30am, Room: DP-D215) (Jan. 29, 2015)
   - **Week 3:** Thermophysical analysis (DSC, TGA, DMA) (Feb. 5, 2015)
   - **Week 4:** Polymer-based nanocomposites (Feb. 12, 2015)

3. **Computational materials (3 labs); Lab Room: Discovery Park D215 (Instructor: Dr. Xia)**
   - **Week 5:** Finite element (FE) methods (Feb. 19, 2015)
   - **Week 6:** FE Simulation of tensile test-modeling (Feb. 26, 2015)
   - **Week 7:** FE Simulation of tensile test-data and post-processing (Mar. 4, 2015)

4. **Ceramic processing – glass melting (3 labs) Lab Room: Discovery Park E-135 (Instructor: Dr. Du)**
   - **Week 8:** Glass and glass formation methods (Mar. 18, 2015)
   - **Week 9:** Melting of soda lime silicate glasses (Mar. 25, 2015)
   - **Week 10:** Structure and composition characterization of glasses (April 1, 2015)

5. **Composite materials (3 labs); Lab room: Discovery Park D215 (Instructor: Dr. Aouadi)**
   - **Week 11:** TiO2 and TiO2/ZnO nanocomposite structures (April 8, 2015)
   - **Week 12:** Fabrication of dye-sensitized solar cells (April 15, 2015)
   - **Week 13:** Measurement of dye-sensitized solar cells (April 22, 2015)