# MSE1011: Structures and Properties Lab

## Course Syllabus (2023S)

Spring 2023

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## Course description

This laboratory will give the student practical experience of the experimental methods used in modern materials science and engineering (MSE). The set of experiments will introduce the common methods for analyzing material structure including: optical microscopy, and scanning electron microscopy (SEM). The second part of the course will concentrate on methods used to measure material properties such as the tensile test, hardness test. Technical writing, data collection and processing, and intellectual property will also be emphasized in the course.

**Schedule: Lecture Room 3-201, Laboratory Zone 3-118 (Flexible time)**

Thursday 8:15-11:00am

**Instructor: Prof. Ali Davoodi** ali.davoodi@scupi.cn

**Teaching Assistants**

Yujie Li, 15856397878, liyujie@stu.scu.edu.cn

**Lab Manager**

Yuna Tu, yuna.tu@scupi.cn, WeChat ID 15828581086

When emailing the instructors, include "MSE1011" in the subject field of your message. Use your university email account (student_ID_number@stu.scu.edu.cn); mail from other accounts might be stopped by the SCU spam filter.

## Textbook and Reference Book

*No textbook at this moment.*

**Reference book**:

*Handbook of Analytical Methods for Materials, Materials Engineering and Evaluation Inc., 2001, MEE HAMM (mee-inc.com)*

*W. D. Callister Jr. and D. G. Rethwisch, Materials Science and Engineering: An Introduction, 10th Edition, John Wiley, January 2018. ISBN: 978-1-119-40549-8. Wiley_Materials Science and Engineering: An Introduction, 10th Edition_978-1-119-72177-2.pdf.*

We will cover some basic metallographic methods and some advanced analytical techniques in materials science. Reading assignments will be posted to the class blackboard website. Read the assigned chapter BEFORE class.

- You *must* have taken:
  - Materials Structure and Properties (Or equivalent, or consent of instructor)

- You *should* have taken:
  - MEMS 040 – Materials and Manufacturing (But not strictly required)
  - ENGR0028 – Materials Science and Engineering – An Introduction
- It is assumed that the student has a basic working knowledge of:
  - **Phase diagrams:** reading and understanding the diagrams, identifying phases and eutectics, solubility and relative composition of phases
  - **Basic kinetics:** equilibrium cooling (i.e. through a phase boundary) and time-temperature-transformation diagrams
  - **Microstructure:** Phases, eutectics, lamellae, connection to phase diagrams and kinetics

## Software

We will use some software for quantitative image analysis.
Digital Micrograph download link：http://tem.zcjce.com/download, code：GMS@simr
EBSD for Oxford Instrument https://mtex-toolbox.github.io/Documentation.html

## Web Site

This course uses the Blackboard system; the web site is

**pibb.scu.edu.cn**

In the content area you will find the course syllabus, homework assignments, and other materials. All assignments will be uploaded through the Blackboard system. Please check the class page frequently.

## Class Format: Hands-on Lab and Lecture

For laboratory work and report, you will be divided into groups of 4 people. Each person in the group will take turn to be the leader and have a chance to be responsible for report writing.

The lecture is taught using a combined lecture, reading, review and discussion format. The class begins with two session lecture to review material in the literature and introduce new concepts. In the third session, the lecturer may ask questions to as many students as possible and encouraging critical reading of published papers in related field.

**It is imperative that you come to class prepared.** This will generally involve reading all posted literature and viewing tutorial videos, or hand in your pre-lab paperwork.

## Submitting Lab Reports and Homework

Lab work is done by group and the report should include names of group member, their roles in the lab work and writing. The filename of the lab report should be in the format Group1-MSE1011-Lab1Name. Both word and pdf formats are required.

You may work with other people on homework, but all writeups must be individual efforts. The homework filename should be in the format StuID1234-MSE1011-HW1.

All work should be submitted electronically through the Blackboard system.

**Individual lab report should be submitted two weeks after finishing each lab. Late homework will not be accepted**.

Unless specifically requested, emailed homework will not be accepted.

If you are sick or have a compelling emergency that prevents you from turning in the homework on time, contact the student advisor (administration office), our TA, and WeChat or email Prof. Ali Davoodi.

If you believe an error has been made in the grading of lab work or assignment, bring it to the attention of your TA or instructor within ONE WEEK of its return.

## Grading

There is NO exam for this course.
Your grade will be based on homework (20%), lab reports and presentation (60%) and class participation (20%).
Technical writing includes Literature, citations, plagiarism; writing lab reports; feedback from Labs activities

## Office Hours

If you do not understand something, and talking to your classmates doesn't help, then you should be seeking help from the instructor or teaching assistant.
Office hours are times we have specifically set aside to be available to students. During office hours, you can come to our office; you do not need an appointment. We are also available at other times; please email to schedule a time.

Current office (Zone 4-319A) hours

## Course Goals

1. Provide exposure to and familiarity with experimental techniques and data collection in materials science and engineering
2. Develop techniques and approaches for data analysis – and insight what has been measured and why it matters
3. Gain practice and mastery of scientific writing in the form of lab reports

## Syllabus

Each group has individual sample during the whole course and should design the experiment based on the samples that they have chosen as following:

1. Low carbon steel alloy
2. Medium carbon steel alloy
3. High carbon steel alloy
4. Cu70-Zn30 brass alloy
5. Al 1100, Al 2024, Al 7075 alloys
6. Cast Iron alloy

LAB experiment 1: Metallographic sample preparation, grinding, polishing and etching

LAB experiment 2: Hardness test

LAB experiment 3: Tensile test

LAB experiment 4: Heat treatment & metallographic sample preparation

Lab experiment 5: SEM