

## Catalog Description

The relationship between structure and properties is at the core of materials engineering and often defines it as a separate discipline. It is not possible to explore all the important structure-property relationships in a single laboratory class. Instead, the laboratory exercises will focus on important concepts for each material class and also emphasize experimental design and problem solving using some of the characterization methods introduced in MEMS 1010. 3 credit hours.

## Schedule - Thursday: 8:15-11:00am

Room 3-103, 3-118, home and/or online

## Instructor

Dr. Charles Hua, 17760422493, charleshua@scu.edu.cn

Office hours: Thursday: 2-5pm, Room 4-226 and/or online, WeChat group

When sending email to the instructor, 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. Try to use your real name and ID in your WeChat message, too.

## Laboratory Engineer/Manager

Liu Liu, Dong Liang and Senbao Lin

## Teaching Assistant

Zhe Chen: [874298978@qq.com](mailto:874298978@qq.com) 13389253129

Bohao Zhou: [BohaoZhou\\_clc@gmail.com](mailto:BohaoZhou_clc@gmail.com) 13648033517

## Textbook: *No formal textbook*

## Reference books:

1. Handbook of Analytical Methods for Materials, Materials Evaluation and Engineering, Inc., Plymouth, MN, 2001. **Uploaded to Blackboard**
2. Experiments in Materials Science and Engineering, T. A. Khraishi and M. S. Al-Haik, Cognella Academic Publishing, San Diego, CA. ©2011 by University Readers, Inc. ISBN: 978-1-60927-868-7, ISBN-10: 1609278682.

We will cover more basic metallographic methods and some advanced analytical techniques in materials science. Reading assignments will be posted to the class 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)
    - MEMS 1010 - Experimental Methods in Materials Science
  - 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
- If these terms are fuzzy to you, review your course notes. If they are totally unfamiliar, beware....

Web Site <https://learn.scupi.cn/>

**Class Format:** Combined lecture, reading, review and discussion, and more importantly, hands-on laboratory work and report writing.

For in-school laboratory work and report, you will be divided into groups of 4-8 classmates, except ceramics 2 (with two students per group). Each person in the group will take turn to be the leader for at least one of the labs. Each lab may score up to 10 points (pre-lab and hands-on 5, group report writing 5).

**It is imperative that you come to class prepared.** This will generally involve reading all posted literature and viewing tutorial videos.

**Approximate Schedule:** To be discussed, determined, or finalized

Week	Content	Points
1	Syllabus, MIT Video on HRTEM Images. Homework: Curiosity and Details	5
2	<b>Crystal: Hard Ball Spherical BCC Structure Model</b>	<b>10</b>
3	Assignment: Slip Systems, Stereographic Projection	5
4-5	<b>Ceramics 1: Dental Porcelain Process and Properties</b>	<b>10</b>
6-7	<b>Ceramics 2: Chemical synthesis of ceramic materials, Y<sub>2</sub>O<sub>3</sub> (Lab at Chemical Center)*</b>	<b>10</b>
8-9	<b>Polymer 1: Thermoset: Hot or cold mount for metallographic sample preparation</b>	<b>10</b>
10	Assignment: Glass transition temperature, TGA	5
11-12	<b>Polymer 2: Photo-Elastic 2D Stress-Strain Model</b>	<b>10</b>
13	Assignment: Optical Anisotropy	5
14	<b>Alloy: Bronze Mirror, or Composite Clad Steel (Improved from MSE1010)*</b>	<b>10</b>
15	Assignment: Heat Treating, Cold work and annealing	5
16-17	<b>Presentation</b>	<b>10</b>

\*Teams of 5 or more students will also give a team presentation

**5 more points** will come from lab safety and your lab topic suggestions

Homework assignment due Sunday 1:30 PM by each student, up to 500 words expected

### Pre-Lab, Lab Reports and Homework Assignments

Everyone is to read the pre-lab handout and sign the disclaimer. Each **group** has to complete a report for each experiment and the leader is to email the digital report to the instructor, [charleshua@scu.edu.cn](mailto:charleshua@scu.edu.cn) or WeChat @17760422493. For the experiments marked with (\*), teams of 5 or more students will also give a team presentation about a subject detailed in the description of the experiment and a group report.

Each homework assignment may score up to 5 points (300-500 words expected) and should be turned in electronically by Sunday 1:30 PM of the week. You may work with other people on homework, but all write-ups must be individual efforts.

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- Put your name, ID number (last four digits) at the top of the page.
  - List the names of other people you've worked with on the assignment or report.

All of the homework scores will be used in your grade computation. Unless otherwise indicated, you can work with your fellow classmates in the class, but you must submit a distinct and independent write-up to receive credit.

If you're sick, or have a compelling emergency that prevents you from turning in the homework on time, email or WeChat Prof. Charles Hua.

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

## **Grading**

There will be no exam for this course.

Your grade will be based on the homework (25%+5%), lab reports (10%×6 = 60%), and presentation (10%). If homework/report is submitted late, you/your group lose 10% of the credits per day past due, and have zero credit one week past due. You should participate actively in the class and practical in order to grasp the important concepts.

**Office Hours:** Thursday afternoon, 2-5pm, Room 226 Zone 4.

## **Attendance during laboratory classes and experiments:**

In a laboratory, presence is of most importance due to hands-on (or eyes-on) experiences, note taking, data recording and so on. Furthermore, delays of individual students will delay the entire class, since we are most of the time not in the class room. Therefore, students must be present during an experiment if they didn't get excused by the instructor (for example by having a doctor's note) prior to the experiment. If a student is not present during an experiment or part of it, he or she cannot include this part of or the entire experiment in his or her laboratory report and laboratory notebook, which will result in automatic deductions. To not delay the entire experiments, students have to be in class on time. If students are 5 min or more delayed without prior by the instructor approved notice, an automatic deduction of at least 10% of the individual lab report will be applied.

## **Academic Integrity:**

Students in this course will be expected to comply with the SCUPI and/or [University of Pittsburgh's Policy on Academic Integrity](#). Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators. To foster a high level of academic integrity, the **MEMS Department has recently established a coordinated and uniform approach** to dealing with violations of academic regulations against cheating and plagiarism.

## **Disabilities:**

If you have a disability or sickness that requires special testing accommodations or other classroom modifications, you need to notify the instructor, student counselor, and/or the [Disability Resources and Services](#) in a timely manner. You may be asked to provide documentation of your disability or sickness to determine the appropriateness of accommodations.

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**Statement on Classroom Recording**

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

**Statement on Distractions during lecture and laboratory**

To ensure a foremost safe but also productive and distraction free learning environment, cellphones, smartwatches, laptops, tablets and other electronic devices are in general not allowed. There will be exceptions from that rule after explicit permission, for example, if calculations are needed.

## Appendix: University Calendar

## 2020—2021 学年（春季学期）校历

周次	星 期							月份	备 注	
	日	一	二	三	四	五	六			
					25	26	27	2月		
1	教 学 周	28	1	2	3	4	5	6	3月	1. 2月25-26日为在校本科生报到注册时间。 2. 2月26-28日为本科生补缓考时间。 3. 第一周起正式行课。 4. 清明节4月4日。 5. 端午节6月14日。 6. 红色是节假日，停课一般不补。 7. 政治学习、党团组织生活统一安排，在双周星期五下午进行，上半段为政治学习时间，下半段为党团组织生活时间。 8. 实践及国际课程周安排劳动教育、实践环节、短期课程、国内外短期访学交流等。
2		7	8	9	10	11	12	13		
3		14	15	16	17	18	19	20		
4		21	22	23	24	25	26	27	4月	
5		28	29	30	31	1	2	3		
6		4	5	6	7	8	9	10		
7		11	12	13	14	15	16	17		
8		18	19	20	21	22	23	24		
9		25	26	27	28	29	30	1		
10		2	3	4	5	6	7	8		
11		9	10	11	12	13	14	15		
12		16	17	18	19	20	21	22	6月	
13		23	24	25	26	27	28	29		
14		30	31	1	2	3	4	5		
15		6	7	8	9	10	11	12		
16		13	14	15	16	17	18	19		
17		20	21	22	23	24	25	26		
18		27	28	29	30	1	2	3		
19	实 践 及 国 际 课 程 周	4	5	6	7	8	9	10		
20		11	12	13	14	15	16	17		
21	暑 假	18	19	20	21	22	23	24	8月	
22		25	26	27	28	29	30	31		
23		1	2	3	4	5	6	7		
24		8	9	10	11	12	13	14		
25		15	16	17	18	19	20	21		
26		22	23	24	25	26	27	28		