

## 课程详述

### COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 <b>Course Title</b>	材料科学与工程高等实验 I Experiments for Advanced Materials Science and Engineering I
2.	授课院系 <b>Originating Department</b>	材料科学与工程系 Department of Materials Science and Engineering
3.	课程编号 <b>Course Code</b>	MSE345
4.	课程学分 <b>Credit Value</b>	1
5.	课程类别 <b>Course Type</b>	专业基础课 Major Foundational Courses
6.	授课学期 <b>Semester</b>	秋季 Fall
7.	授课语言 <b>Teaching Language</b>	英语 English 和 中英双语 Bilingual
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	叶飞，材料科学与工程系，电子邮箱： <a href="mailto:yef3@sustech.edu.cn">yef3@sustech.edu.cn</a> 李艳艳，材料科学与工程系，电子邮箱： <a href="mailto:liy@ustech.edu.cn">liy@ustech.edu.cn</a> Fei Ye, Department of MSE, Email: <a href="mailto:yef3@sustech.edu.cn">yef3@sustech.edu.cn</a> Li Yanyan, Department of MSE, Email: <a href="mailto:liy@ustech.edu.cn">liy@ustech.edu.cn</a>
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	无 NA
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>	无 NA

11. 授课方式 Delivery Method	讲授	习题/辅导/讨论	实验/实习	其它(请具体注明)	总学时
	Lectures	Tutorials	Lab/Practical	Other (Please specify)	Total
学时数 Credit Hours			32		32
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MSE002 材料科学与工程基础实验 MSE002 Experiments for Fundamental of Materials Science and Engineering				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	MSE346 材料科学与工程高等实验 II MSE346 Experiments for Advanced Materials Science and Engineering II				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 NA				

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

材料科学与工程高等实验 I 是材料专业的必修实验课程，本实验课程主要是培养学生材料学相关基础实验操作技能，学习材料的合成与表征的常用方法，巩固学生材料学相关理论知识的理解，强化学生材料学理论与实践的结合应用，进而全面提升学生的综合素质和应用能力。

“Experiments for Advanced Materials Science and Engineering I” is a required experimental course for materials science. This course is mainly to cultivate students' basic experimental skills in materials science, to learn the methods of synthesis and characterization of materials, to consolidate the students' understanding of the theory of materials science, as well as to strengthen the combination of theory and practice of materials science, hence to improve the student' comprehensive quality and application ability.

#### 16. 预达学习成果 Learning Outcomes

1. 掌握常用材料学基本实验技术和设备操作方法，并了解设备局限性。
2. 掌握通用评价材料性质性能的基本技术。
3. 具备设计实验获取材料性质性能数据，并进行数据分析能力。
4. 能够在实验过程中，理解并遵守实验组织、安全、环保等相关规定。
5. 在分组实验中，能够有效地表达和交流，合作完成实验。
6. 能够熟练应用英语完成实验报告和数据分析。

1. To master the basic experimental technology and equipment operation methods for materials science, and to understand the limitations of equipment.
2. To master the basic techniques of universal evaluation of properties and properties of materials.
3. To design experiments to obtain properties and performance data of materials and conducting data analysis.
4. Be able to understand and comply with relevant regulations of experimental organization, safety and environmental protection during the experiment.
5. Be able to effectively express and communicate in the group experiment, and cooperate to complete the experiment.
6. To use English to complete the experimental report and data analysis.

#### 17. 课程内容及教学日历 (如授课语言以英文为主, 则课程内容介绍可以用英文; 如团队教学或模块教学, 教学日历须注明主讲人)

**Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)**

1. 第一讲：材料的合成与表征介绍以及低温固相合成变色材料（4 学时）
    - 1.1 介绍实验课程内容
    - 1.2 介绍合成方法及表征技术
    - 1.3 低温固相合成变色材料并进行表征
  2. 第二讲：钙钛矿结构磁制冷材料的合成与表征（8 学时）
    - 2.1 溶胶-凝胶法合成磁制冷材料
    - 2.2 使用扫描电镜进行材料的形貌表征
    - 2.3 使用 X-射线衍射仪表征材料的结构
  3. 第三讲：聚合物基金属涂层的合成（4 学时）
    - 3.1 掌握化学镀液的配制
    - 3.2 学习化学镀实验流程
    - 3.3 掌握金属涂层的表征
  4. 第四讲：有机玻璃“琥珀”的合成与表征（8 学时）
    - 4.1 掌握有机玻璃的制备方法并制备各种“琥珀”
    - 4.2 使用紫外分光光度计（UV-vis）测定有机玻璃透光率
    - 4.3 使用差示扫描量热仪（DSC）测定玻璃转化温度
  5. 第五讲：纳米氧化铈材料的合成与表征（8 学时）
    - 5.1 自主设计氧化铈纳米材料的合成方案
    - 5.2 对于合成的氧化铈材料利用所学手段进行表征
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1. Lecture 1: Synthesis and characterization of materials introduction and synthesis chromic materials (4 hours)
    - 1.1 Introduce the content of the experiment course.
    - 1.2 Introduce the methods of synthesis and characterization.
    - 1.3 Synthesis and characterization of chromic materials.
  2. Lecture 2: Synthesis and characterization of magnetic refrigeration materials with perovskite structure (8 hours)
    - 2.1 Synthesis magnetic refrigeration materials with sol-gel method.
    - 2.2 Characterization of morphology with SEM.
    - 2.3 Characterization of structure with XRD.
  3. Lecture 3: Preparation of polymer-based metal coating(4 hours)
    - 3.1 Master the preparation of chemical plating solution.
    - 3.2 Learn the procedure of chemical plating.
    - 3.3 Master the characterization of metal coating.
  4. Lecture 4: Synthesis and characterization of PMMA (8 hours)
    - 4.1 Master the preparation of PMMA and make all kinds of “Amber”
    - 4.2 Learn the determination of light transmittance with UV-vis
    - 4.3 Measure the  $T_g$  with DSC.
  5. Lecture 5: Synthesis and characterization of cerium oxide nanoparticles(4 hours)
    - 5.1 Design the synthesis scheme of cerium oxide nanoparticles.
    - 5.2 Characterizing the cerium oxide nanoparticles by characterization methods what we have learned.

18. 教材及其它参考资料 Textbook and Supplementary Readings

自编讲义 Experimental manual

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
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出勤 Attendance		10		
课堂表现 Class Performance		40		
小测验 Quiz		0		
课程项目 Projects		40		实验报告
平时作业 Assignments		0		
期中考试 Mid-Term Test		0		
期末考试 Final Exam		0		
期末报告 Final Presentation		0		
其它（可根据需要 改写以上评估方式） Others (The above may be modified as necessary)		10		预习报告

20. 记分方式 GRADING SYSTEM

- A. 十三级等级制 Letter Grading  
 B. 二级记分制（通过/不通过） Pass/Fail Grading

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过  
This Course has been approved by the following person or committee of authority