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 Course Title**	光电信息材料与器件综合实验 II Comprehensive Experiments of Electronic and Photonic Materials and Devices II
2.	**授课院系** **Originating Department**	材料科学与工程系 Department of Materials Science and Engineering
3.	**课程编号** **Course Code**	MSE357
4.	**课程学分 Credit Value**	4
5.	**课程类别** **Course Type**	专业核心课 Major Core Courses
6.	**授课学期** **Semester**	春季 Spring
7.	**授课语言** **Teaching Language**	中英双语 English & Chinese
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）** **Instructor(s), Affiliation& Contact** **（For team teaching, please list all instructors）**	叶飞，教学教授，材料系，工学院北楼 206 yef3@sustech.edu.cn Ye Fei, Teaching Professor, Department of Materials Science and Engineering, Room 206, North Building, School of Engineering 廖成竹，教授级实验师，材料系，慧园二栋 406 Liaocz@sustech.edu.cn, Liao Chengzhu, Professor-level experimentalist, Department of Materials Science and Engineering, Room 406, Block 2, Wisdom Garden 章剑波，实验师，材料系，慧园二栋 406 zhangjb@sustech.edu.cn Zhang Jianbo, Lab Master, Department of Materials Science and Engineering, Room 406, Block 2, Wisdom Garden 王海鸥，实验师，材料系，慧园二栋 406 wangho@sustech.edu.cn Wang Haioui, Lab Master, Department of Materials Science and Engineering, Room 406, Block 2, Wisdom Garden

		李艳艳，实验师，材料系，慧园二栋 406 liyy@sustech.edu.cn Li Yanyan, Lab Master, Department of Materials Science and Engineering, Room 406, Block 2, Wisdom Garden 李慧丽，实验师，材料系，慧园二栋 406 LIhl@sustech.edu.cn Li Huili, Lab Master, Department of Materials Science and Engineering, Room 406, Block 2, Wisdom Garden
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	
10.	选课人数限额(可不填) Maximum Enrolment（Optional）	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
学时数 Credit Hours			128		128

12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	光电信息材料与器件综合实验 I Comprehensive Experiments of Electronic and Photonic Materials and Devices I
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite	
14.	其它要求修读本课程的学系 Cross-listing Dept.	

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程是《光电信息材料与器件综合实验Ⅰ》课程的进阶课程，由全流程项目实验组成，内容包含光电信息材料的合成、加工方法、分析与表征技术、以及器件制作与应用开发，在课程中实现“料成材，材成器，器好用”。主要目的是训练学生掌握各种电子信息材料的一般研究方法，体验“材料合成-分析表征-器件制作与开发”的全流程，培养学生实践能力、创新思维能力，使其能够将所学的综合实验知识灵活运用以解决复杂的实际问题。

It is the progressive course of “Comprehensive Experiments of Optoelectronic Information Materials and Devices I”. Project experiments cover the whole course. Its content includes the synthesis of photoelectric information materials, material processing methods, analysis and characterization technology, as well as device manufacturing and application development, so as to realize " raw materials can be processed to be materials, materials can be made into devices, and devices can be truly used". The main purpose is to train students to master the general research methods of various electronic information materials, experience the whole process of "Material synthesis - Analysis and characterization - Device preparation and development", and cultivate their practical ability and innovative thinking ability, so that they can flexibly apply the learned comprehensive experimental knowledge to solve complex practical problems.

16. 预达学习成果 Learning Outcomes

1. 理解材料选择和设计的基本原则。
2. 掌握光电信息材料的合成、表征的一般方法。
3. 能够以材料为中心，交叉运用多学科知识进行电路和产品设计。
4. 掌握不同电子信息器件的制备与应用。
5. 综合运用所学的实验研究方法去解决实际问题。

1. To understand the basic principles of material selection and design.
2. To master the general methods of material synthesis and characterization.
3. Be able to use materials as the center and cross-application of multi-disciplinary knowledge for circuit and product design.
4. To master the preparation and application of different electronic information devices.
5. Comprehensively use the learned experimental research methods to solve practical problems.

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.)

(一) 教学第 1-2 周 （16 学时）：Week 1~2 (16credit hours)

实验一：荧光显示器及液晶显示器的制作与控制

主要内容：

1. 了解显示器的工作原理。
2. 设计制作需要显示的图形。
3. 合成荧光层、介电层。
4. 制作图形电极。
5. 为显示器供电并搭建显示器的控制电路。
6. 设计制作液晶显示器。

Lab1: Fabrication and control of fluorescent display and liquid crystal display

Main contents:

1. Understand the working principle of the display.
2. Design and make graphics to be displayed.
3. Synthesis of fluorescent layer and dielectric layer.
4. Making graphic electrodes.
5. Build the control circuit of the display and power it.
6. Design and fabricate a liquid crystal display.

(二) 教学第 3 周 （8 学时）：Week 3 (8 credit hours)

实验二：常用热电材料塞贝克系数测试与应用

主要内容：

1. 了解热电材料基本工作原理。
2. 测试碲化铋等常用热电材料在不同温度下的塞贝克系数。
3. 焊接热电器件，测试其在不同温度差下的电压变化。
4. 采用不同冷源与热源，使用热电器件驱动小车，测试热电器件功率输出。

Lab 2: The properties and application of common thermoelectric materials

Main contents:

1. Understand the working principles of thermoelectric materials.
2. Test the Seebeck coefficient of common thermoelectric materials such as bismuth telluride at different temperatures.
3. Assemble thermoelectric devices and test their voltage changes under different temperature differences.
4. Using the thermoelectric devices with different cold and heat sources to drive the toy cars, test the power output of the thermoelectric devices.

(三) 教学第 4-5 周 （16 学时）：Week 4-5 (16 credit hours)

实验三：光纤加工方式对光纤测温性能的影响

主要内容：

1. 用采用熔接、拉拔等方式对常用光纤进行加工。
2. 通过光学显微镜观察光纤断面及侧面。
3. 测试加工前后光纤信号的损耗率变化，研究加工方式对光纤传输性能的影响。

4. 测试加工前后光纤测温准确度变化，研究光纤加工方式对光纤温度测量的影响。

Lab 3: The influence of processing methods on the temperature measurement performance of optical fiber
Main contents:
1. Process common optical fibers by means of welding and drawing.
2. Observe the cross section and sidewall of the optical fiber through an optical microscope.
3. Test the change of optical fiber signal loss rate before and after processing, and study the impact of processing methods on optical fiber transmission performance.
4. Test the change of optical fiber temperature measurement accuracy before and after processing, and study the influence of optical fiber processing methods on optical fiber temperature measurement.

(四) 教学第 6-7 周 （16 学时）：Week 6~7 (16 credit hours)

实验四：光纤性能与光纤通讯系统
主要内容：
1. 了解光纤通讯基本原理及通讯系统构造。
2. 解剖常用通讯光纤材料，了解通讯用光纤及其包层材料的基本性能参数。
3. 使用拉拔等方式进行光纤加工，通过光纤通讯系统测试光纤加工对通讯信号影响。
4. 测试温度、湿度等环境因素对光纤性能及光纤通讯的影响。

Lab 4: Optical fiber properties and optical fiber communication system
Main contents:
1. Understand the basic principles and structures of optical fiber communication system.
2. Dissect commonly used communication optical fiber to understand its basic performance parameters and the cladding materials.
3. Processing communication optical fibers and test the impact of processing on communication signals through the optical fiber communication system.
4. Test the impact of environmental factors such as temperature and humidity on the optical fiber performance and optical fiber communication.

(五) 教学第 8-10 周 （24 学时）：Week **8**-10 (24 credit hours)

实验五：光敏电阻的制备及其在浑浊度测试中的应用
主要内容：
1. 磁控溅射法制备不同膜厚的硅化镁薄膜（Mg_2Si）。
2. 用 SEM,台阶仪等进行材料表征。
3. 丝网印刷技术引入 Ag 电极。
4. 光敏电阻的光谱响应特性、I-V 特性，以及光响应特性研究。
5. 浊度测量的一般原理。
6. 将器件应用于浊度测试。

Lab **5**: Preparation of a photoresistor and Investigation of the application in turbidity measurement
Main contents:
1. Preparation of Mg_2Si thin film with different film thicknesses by magnetron sputtering.
2. Characterize the material by SEM and step tester.
3. Fabricate Ag electrode by screen printing method.
4. Investigate the spectral response characteristics, I-V characteristics and light response characteristics.
5. Understand the principle of turbidity measurement
6. Apply the photoresistor to do the turbidity test.

(六) 教学第 11-16 周 （48 学时）：Week 11-16 (48 credit hours)

实验五：项目实验----压电陶瓷材料与器件制备
主要内容：
1. 文献调研，实验方案制定。
2. 无铅压电陶瓷片制备，制备方法包括：固相法、水热法、溶胶凝胶法等（选其一）。
3. 通过 X 射线衍射分析仪、扫描电子显微镜、压电性能测试仪等仪器表征无铅压电陶瓷材料的晶体结构、微观形貌、元素组成、压电性能等。
4. 器件电路设计及程序控制。
5. 器件的支撑结构的设计与组装。
6. 展示及口头报告。

Lab 5: project experiment -- Preparation of piezoelectric ceramic materials and devices
Main contents:

1. Conduct literature survey and make the experimental scheme.
2. Choose one method to synthsis lead-free piezoelectric ceramics (solid phase method, hydrothermal method and sol-gel method).
3. Characterized the ceramics by XRD testing, SEM and piezoelectric performance tester.
4. Designthe circuits and control program of an electronic drum.
5. Insert the synthesised ceramics into the electronic drum.
6. Display the electronic drum with ceramics applied and give a report about this project expeiment.

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

自编实验讲义 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
出勤 Attendance		10		
课堂表现 Class Performance		10		
实验报告 Lab Report		40		
课程项目 Projects		40		
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation				
其它（可根据需要改写以上评估方式） Others (The above may be modified as necessary)				

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