

## 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.	<b>课程名称 Course Title</b>	工程电路与电子基础实验 Experiments for Fundamentals of Circuits and Electronics
2.	<b>授课院系 Originating Department</b>	材料科学与工程系 Department of Materials Science and Engineering
3.	<b>课程编号 Course Code</b>	MSE214
4.	<b>课程学分 Credit Value</b>	1
5.	<b>课程类别 Course Type</b>	专业基础课 Major Foundational Course
6.	<b>授课学期 Semester</b>	秋季 Fall
7.	<b>授课语言 Teaching Language</b>	中文 Chinese
8.	<b>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 &amp; Contact (For team teaching, please list all instructors)</b>	章剑波, 实验师, 材料系, 慧园二栋 406 zhangjb@sustech.edu.cn, 0755-88018764 Zang Jianbo, laboratory assistant, 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 Haiou, laboratory assistant, 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 <a href="mailto:Lihl@sustech.edu.cn">Lihl@sustech.edu.cn</a> Li Huili, laboratory assistant, Department of Materials Science and Engineering, Room 406, Block 2, Wisdom Garden
9.	<b>实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact</b>	

10. <b>Maximum Enrolment (Optional)</b>	选课人数限额(可不填)				
11. <b>Delivery Method</b>	讲授 <b>Lectures</b>	习题/辅导/讨论 <b>Tutorials</b>	实验/实习 <b>Lab/Practical</b>	其它(请具体注明) <b>Other (Please specify)</b>	总学时 <b>Total</b>
学时数 <b>Credit Hours</b>			32		32
12. <b>Pre-requisites or Other Academic Requirements</b>	先修课程、其它学习要求 MSE205 工程电路与电子基础 Fundamentals of Circuits and Electronics				
13. <b>Courses for which this course is a pre-requisite</b>	后续课程、其它学习规划				
14. <b>Cross-listing Dept.</b>	其它要求修读本课程的学系				

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

本实验课程主要目的是通过对学生模拟电路与系统设计的基本实验技能进行训练，巩固和加深所学到的电路和电子元器件相关的基础理论知识。培养运用基本理论分析、处理实际问题的工程实践能力和研究创新能力，训练学生掌握良好的科学实验方法，并进一步培养学生的研究、探索和创新意识。

The main purpose of this experimental course is to consolidate and deepen the basic theoretical knowledge of circuits and electronic components through the training of students' basic experimental skills of analog circuit and system design. Cultivate the engineering practice ability and research innovation ability of using basic theories to analyze and deal with practical problems, train students to master good scientific experiment methods, and further cultivate students' awareness of research, exploration and innovation.

#### 16. 预达学习成果 Learning Outcomes

1. 熟悉典型元器件的性能。
  2. 熟练掌握放大器电路的结构和工作原理。
  3. 掌握信号产生与处理电路的设计方法。
  4. 学会采用基本仪器测试电路参数及性能分析，培养基本的模拟电路与系统的调试、设计能力。
1. To understand the properties of typical components.
  2. To master the structure and working principle of amplifier circuit.
  3. To master the design methods of signal generation and circuits processing.
  4. To learn the methods of testing circuit parameters and analysing the performance by using instruments, and cultivate debugging and design capabilities of basic analog circuit and system.

#### 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) 第一讲 (4 学时): Lecture 1 (4 credit hours)

实验一: 电路基本规律实验 Basic circuit laws

主要内容:

- 1、基尔霍夫定律 (KVL&KCL) 以及叠加原理的实验验证。
- 2、戴维南定理以及诺顿定理的实验验证

Contents:

1. Verify Kirchhoff's Law (KVL&KCL) and Superposition theorem;
2. Verify Thevenin's theorem and Norton's theorem.

(二) 第二讲 (4 学时): Lecture 2 (4 credit hours)

实验二: 二极管及三极管的电学表征 Electrical characterization of diodes and triodes

主要内容:

- 1、实验验证二极管的单向导电性, 二极管在稳压、限幅和箝位电路中的应用。
- 2、共射放大电路的静态工作点的测量, 放大电路静态工作点对输出信号失真的影响, 放大器的电压放大倍数、输入电阻、输出电阻、动态范围以及通频带的测量。

Contents:

1. Verify the unidirectional conductivity of diodes, application of diodes in voltage regulator, limiter and clamping circuits.
2. Measure the static operating point of the common-emitter amplifier circuit, observe the influence of the static operating point of the amplifier circuit on the distortion of the output signal, measure the voltage magnification, input resistance, output resistance, dynamic range and passband of the amplifier.

(三) 第三讲 (4 学时): Lecture 3 (4 credit hours)

实验三: 负反馈放大电路及运算放大器实验 Experiment of negative feedback amplifier circuit and operational amplifier

主要内容:

- 1、负反馈放大电路静态工作点的测量, 负反馈对电压放大倍数的影响, 负反馈对电路输入电阻的影响, 负反馈对电路输出电阻的影响, 负反馈对输出波形失真的影响。

- 2、减法运算电路; 积分运算电路; 正弦波发生器; 窗口比较器; 方波发生器。

Contents:

1. Measure the static operating point of the negative feedback amplifier circuit, the influence of negative feedback on: (a) the voltage amplification factor, (b) the input and the output resistance, (c) the output waveform distortion.
2. Subtraction operation circuit; integral operation circuit; sine wave generator; window comparator; square wave generator.

(四) 第四讲 (4 学时): Lecture 4 (4 credit hours)

实验四: 差分放大电路与集成功率放大器实验 Experiment of the differential amplifier circuit and integrated power amplifier

主要内容:

- 1、典型差分放大电路以及具有恒流源的差动放大电路的搭建, 两种差分放大电路静态工作点的调整与测量, 两种差分放大电路的差模放大系数以及共模放大系数的测量, 共模抑制比的计算。

- 2、功率放大电路的搭建, 功放电路性能参数的测量计算。

Contents:

1. Construct typical differential amplifier circuit and differential amplifier circuit with constant current source, adjust and measure static operating point, measure differential mode amplification factor and common mode amplification factor, calculate the common mode rejection ratio.
2. Construct the integrated power amplifier circuit, measure and calculate the performance parameters.

(五) 第五讲 (4 学时): Lecture 5 (4 credit hours)

实验五: 门电路与运算电路实验 Experiment of Gate Circuits and Operational Circuits

主要内容:

- 1、门电路的逻辑功能及其测试方法
- 2、集电极开路门及三态门的工作特性和使用方法。
- 3、RS 触发器、D 触发器、JK 触发器的工作原理及使用方法。

Contents:

1. Master the logic function of gate circuit and its testing method
2. Master the working characteristics and usage of open-collector and tri-state gates.
3. Master the working principle and usage of RS flip-flop, D flip-flop and JK flip-flop.

(六) 第六讲 (12 学时): Lecture 6 (12 credit hours)

实验六：综合实验 Comprehensive experiment

1. 太阳能电池的电路设计与制作 Circuit design and fabrication of a solar cells
2. 金属探测器的电路设计及制作 Circuit design and fabrication of metal detector

主要内容：从上述主题中选一个，运用模拟电子技术所学知识，设计并制作相关器件，并撰写报告。  
Contents: Choose a topic and use the knowledge of analog electronic technology to design and manufacture related device, and write a report.

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		5		
课堂表现 Class Performance		5		
小测验 Quiz				
常规实验 Experiments		60		
课程项目 Projects		30		
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