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**	**模拟电路实验 Analog Circuits Laboratory**
2.	**授课院系 Originating Department**	电子与电气工程系 Department of Electrical & Electronic Engineering
3.	**课程编号 Course Code**	EE201-17L
4.	**课程学分 Credit Value**	1
5.	**课程类别 Course Type**	专业基础课 Major Foundational Courses
6.	**授课学期 Semester**	春季 Spring / 秋季 Fall
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）**	张利君 工程师 电子与电气工程系 邮箱：zhanglj@sustech.edu.cn 王小静 实验员 电子与电气工程系 邮箱：wangxj@sustech.edu.cn Lijun Zhang Department of Electrical & Electronic Engineering Email: zhanglj@sustech.edu.cn Xiaojing Wang Department of Electrical & Electronic Engineering Email: wangxj@sustech.edu.cn
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	无 NA
10.	**选课人数限额(可不填) Maximum Enrolment （Optional）**	

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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	8		24		32

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	需同时修读“EE201-17 模拟电路”理论课 Taking “Analog Circuits” (EE201-17) in the same semester
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	数字电路实验 EE202-17L
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

本实验课程的目标在于培养学生将理论运用于实际的能力，巩固模拟电路理论知识，学会具体电路的搭建及测试，提高解决实际工程问题的能力，通过设计性实验，使学生掌握电路设计的一般规律和电路测试、数据采集的一般方法，达到训练学生创造性思维、探究性学习的习惯。

Train students to consolidate the basic analog circuit theory, grasp the analysis method of the commonly used analog circuits module, build the basic circuit module like Common-emitter BJT Amplifiers, Differential Amplifiers, Negative Feedback Amplifiers, etc., learn how to use the basic experimental instruments like DC power supply, arbitrary waveform signal generator, digital storage oscilloscope and digital multi-meter to troubleshooting the circuits, apply the basic theory and analysis method to design, build and test more complicated functional circuits.

16. 预达学习成果 Learning Outcomes

本课程通过对常用电子元器件的运用、模拟电路几个经典的实验电路的搭建、电子实验四大件仪器的使用，使学生获得模拟电子技术方面的基础知识、基础理论和基本实验技能， 具有能够继续深入学习和接受电子技术创新发展的能力，通过 DIY Project 实践训练学生完成简单项目的能力，从项目规划到执行，从开题报告到 Final Presentation，培养团队精神，锻炼学生的分析问题解决问题的能力。

1) understand the basic principles of analog circuit theory and consolidate the analysis method of analog circuits,
2) grasp the circuit troubleshooting techniques by using the testing instruments,
3) apply the theory to design some commonly used analog circuit module,
4) learn how to apply the analog circuits theory to solve a real life problem by doing a DIY project,
5) Cooperation with others in the project.

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.)

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A. 常规实验部分：8 Labs (16 credit hours)

1. **绪论（2 学时）：**介绍本门课程的主要内容、实验构成、实验注意事项、课程评价方式、主要实验仪器的使用。

   Introduction (2 credit hours): an introduction of the course, 8 labs and one DIY project, grading policy and how to use the testing instruments in the lab.

2. **二极管电路的应用（2 学时）：**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和工作原理。

   Application Circuits of Diodes (2 credit hours): applications of diodes in voltage regulators, clipping circuits and clamping circuits.

3. **共射极单管放大电路研究（2 学时）：**分析共射极放大电路的性能，加深对共射极放大电路放大特性的理解；学习共射极放大电路静态工作点的调试方法，分析静态工作点对放大器性能的影响；掌握放大器电压放大倍数、输入电阻、输出电阻及最大不失真输出电压的测试方法。

   Common-emitter BJT Amplifiers (2 credit hours): analysis techniques of the common-emitter BJT amplifier circuits, the DC and AC equivalent circuits, Q-point and the dynamic performances of the amplifiers, adjusting methods of the Q-point, saturation and cutoff distortions, dynamic performance parameters of the amplifiers including voltage gain, input and output resistances, dynamic range and frequency response.

4. **差动放大电路研究（2 学时）：**加深对差动放大电路工作原理的理解，学习差动放大电路静态工作点的测试方法；了解差动放大电路零漂产生的原因及抑制零漂的方法；学习差动放大电路差模放大倍数、共模放大倍数和共模抑制比的测量方法。

   Differential Amplifiers (2 credit hours): Q-point Adjustment and Measurement, suppression methods of zero drift, differential mode gain, common mode gain and CMRR, long tail differential pairs.

5. **集成功率放大器（2 学时）：**熟悉集成功率放大器的性能特点，并学会应用集成低频功放器件；学会使用电烙铁、洞洞板焊接电路；掌握集成功放主要指标的测试方法。

   Integrated Power Amplifiers (2 credit hours): transformer coupled, OTL ,OCL and BTL power amplifiers, class A, class B and class AB power amplifiers, soldering techniques with soldering iron and pegboard, measuring of the power amplifiers' output rating, DC power supply consumption and efficiency of the system.

6. **负反馈放大电路研究（2 学时）：**掌握负反馈放大器性能指标的调节和测试方法；加深负反馈对放大器放大特性影响的理解。

   Negative Feedback Amplifiers (2 credit hours): negative feedback improves the performance, reduces sensitivity to the parameter variations, four feedback types including current-feedback, transresistance feedback, transconductance feedback and voltage-feedback, closed-loop gain, input and output resistances of the closed loop circuits.

7. **运算放大器的应用 I（2 学时）：**掌握用运算放大器组成比例、求和、积分、微分及波形产生电路的特点及性能；掌握各电路的工作原理、测试和分析方法。

   Op-Amp Application Circuits I (2 credit hours): summing, subtraction and inverting amplifiers, integrators and differentiators.

8. **运算放大器的应用 II（2 学时）：**掌握过零比较器、滞回比较器、窗口比较器、波形发生器等运放电路的性能特点及分析测试方法。

   Op-Amp Application Circuits II (2 credit hours): zero-level detector, Schmidt trigger and window comparator, Wien-Bridge Oscillator and square wave relaxation oscillator.

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B. DIY 实践部分（16 学时）：DIY Project (16 credit hours)

根据学生自己的兴趣，组成 3-8 人的 Project Team，小组成员围绕模拟电路主题共同拟定项目的题目，制定项目的技术路线、实现方案以及经济预算，实施项目的分工，控制项目的时间进度，在教师的协助和指导下自行采购所需的实验耗材，最终完成整个项目作品的设计和制作，并撰写项目报告。DIY 实践部分从作品的创新性、完整性、可靠性、团队协作及项目报告五个维度进行评价。

One project team consists of three to eight members, one student acts as team leader. Every team does a project related to circuits theory, they need to apply analog and digital circuit theory and experimental skills to design a little gadget like a road tracking car with obstacle avoidance ability, a DAC audio amplifier, an LED light cube, etc.. Under the direction of instructors, each team needs to do time schedule, cost evaluation and budget allocation. The projects are evaluated from five aspects: innovation, reliability, integrity, presentations and reports, teamwork.

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

授课教师印发的“模拟电路实验报告”

Analog circuits Laboratory hand-outs prepared by instructors.

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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				
课堂表现 Class Performance				
常规实验 Experiments		60%		
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

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