

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	数字电路实验 Digital 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	EE202-17L				
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)					
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

<p>12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements</p>	<p>需同时修读“EE202-17 数字电路”理论课 Taking “Digital Circuits” (EE202) in the same semester</p>
<p>13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite</p>	
<p>14. 其它要求修读本课程的学系 Cross-listing Dept.</p>	

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，学习使用常用的电子测量仪器调试数字电路的方法，学会各种常用的数字逻辑门电路是使用，会设计基本的数字逻辑电路，同时设计部分常用的模块，为电子设计大赛做准备，以做促学，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 digital circuit theory, grasp the applications of basic combinatorial logic gates like adders, comparators, decoders, encoders, multiplexers, de-multiplexers, and the commonly used sequential logic gates like basic memory elements, latches, flip-flops, counters and registers, 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**

本课程通过对常用数字逻辑门的运用、数字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，使学生获得数字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，通过练习制作常用的模块，学生可以基于此参加电子设计大赛，争取取得不错的成绩。

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

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, get familiar with the electronic components.

2. **门电路逻辑功能及测试 (2 学时)**：熟悉与门、非门、或门等逻辑门的使用方法；掌握数字示波器的使用。

TTL Logic Gates (2 credit hours): get familiar with some basic 74 series TTL logic gates like AND, OR, NAND, NOR, XOR and the conversions between them. Learn to use the digital storage oscilloscope.

3. **CMOS 门电路测试 (2 学时)**：掌握 CMOS 门的功能测试方法；学会外特性的测试；比较 CMOS 门与 TTL 门的差异。

CMOS Logic Gates (2 credit hours): test the functions and performances of CMOS logic gates, comparison between the TTL gates and CMOS gates.

4. **组合逻辑电路 (2 学时)**：掌握半加器、全加器、译码器、数据选择器等组合逻辑电路的原理及逻辑测试方法，了解它们的应用。

Combinatorial Logic Circuits (2 credit hours): the principles and applications of half-adders, adders, decoders, encoders, multiplexers, de-multiplexers.

5. **触发器 (R-S、D、J-K) (2 学时)**：熟悉并掌握 R-S、D、J-K 触发器的构成、工作原理和功能测试方法；学会正确使用触发器集成芯片；了解不同逻辑功能触发器相互转换的方法。

Flip-Flops (R-S, D, J-K) (2 credit hours): the principles and applications of all kinds of flip-flops and the conversions between them.

6. **组合逻辑电路的仿真 (2 学时)**：掌握全加器、译码器、数据选择器电路的特点及设计方法；学会应用全加器、译码器及数据选择器设计组合逻辑电路；掌握各种组合逻辑电路的仿真。

Simulation of the Combinatorial Logic Circuits (2 credit hours): design and simulation of some functional combinatorial logic circuits using adders, decoders, encoders, multiplexers and de-multiplexers.

7. **时序电路测试及研究 (2 学时)**：掌握常用时序电路分析、设计及测试方法；学会运用各类触发器设计各种常用的时序逻辑电路。

Sequential Logic Circuits (2 credit hours): synchronous and asynchronous counters, binary counters, decimal counters, shift registers, finite state machine.

8. **555 时基电路 (2 学时)**：掌握 555 时基电路的结构和工作原理、学会对此芯片的正确使用；学会分析和测试用 555 时基电路构成的多谐振荡器、单稳态触发器、R-S 触发器等三种典型电路。

Applications of 555 Timers (2 credit hours): the principles and applications of 555 timers used as multi-vibrators, mono-stable triggers and R-S flip-flops.

常用模块的设计制作 (16 学时)：DIY Project (16 credit hours)

围绕电子设计大赛题目的要求，设计各种应用电路里面的常用模块，包括电源模块、控制模块、各种常用仪器如信号发生器、示波器等电路模块，将这些任务分布于各组的 DIY Project 里面。

One project team consists of three to eight members, one student acts as team leader. Every team does a project related to circuit theory, they need to apply analog and digital circuit theory and experimental skills to finish a project, most of the projects are based on the problems in the past "National Undergraduate Electronics Design Contest". 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“数字电路实验报告”

Digital circuits Laboratory hand-outs prepared by instructors.

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)

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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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