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**	电路基础 Fundamentals of Electric Circuits
2.	**授课院系** **Originating Department**	深港微电子学院 School of Microelectronics
3.	**课程编号** **Course Code**	SME103
4.	**课程学分 Credit Value**	2
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）**	刘小龙，助理教授，深港微电子学院 Xiaolong LIU, Assistant Professor, School of Microelectronics Email: liuxl@sustech.edu.cn
9.	**实验员/助教、所属学系、联系方式** **Tutor/TA(s), Contact**	待公布 To be announced
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	32				32

12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA117 高等数学（上）A， MA117 Calculus I A
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite	本课程是微电子科学与工程等专业的先修课。主要后续课程包括模拟电子技术基础、数字电子技术基础、模拟集成电路设计等。 This is an elective general education course. It also serves as a prerequisite course for students who will major in Microelectronics Science and Engineering. The subsequent courses include *Fundamentals of Analog Electronics*, *Fundamentals of Digital Electronics*, and *Design of Integrated Circuits*.
14.	其它要求修读本课程的学系 Cross-listing Dept.	无 None

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程主要介绍电子电路的基本概念、基本定律、分析方法，和电阻，电容，电感，运算放大器，独立电源和受控电源等基本电路元件的特性。掌握直流电路，交流一阶电路和二阶电路对正弦信号和一般信号的响应的分析方法，以及电路的频率响应的概念。熟悉交流电的功率计算方法、磁偶合电路的分析方法。了解拉普拉斯变换，傅里叶变换、二端口网络及其在电路分析中的应用。

This course mainly introduces the basic concepts, basic laws and analysis methods of electric circuits. To apply those theorems and laws for the analysis of DC circuits, first-order and second-order AC circuits, and magnetically coupled circuits. Familiar to concept and analysis method in frequency domain and Laplace transform, Fourier transform, two-port networks and their application in circuit's analysis.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生将系统地理解电路的概念和规律，并掌握直流、交流电路的分析方法。具体将掌握以下技能：

1) 将数学、科学和工程知识应用于电路分析和设计的能力。

2) 能够识别、制定和解决电路领域的工程问题。

3) 在现实的约束条件下设计系统、组件或过程以满足所需需求的能力。

After completing this course, students will comprehend the basic concepts and principles related to electric circuits, and also learn the methods of analysing both the DC and AC circuits. the students will be able to

1) An ability to apply knowledge of mathematics, science, and engineering to the analysis and design of electric circuits

2) An ability to identify, formulate, and solve engineering problems in the area of circuits.

3) An ability to design a system, components or process to meet desired needs within realistic constraints

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.)

本课程的教学日历如下：

课程内容	学时分配
1 电路的基本概念 介绍生活中常见的若干电路系统，介绍电荷、电压、电流、功率、能量等基本概念和电路元件	2
2 电路的基本定律 介绍欧姆定律、基尔霍夫电压和电流定律，推导串联电阻及其分压、并联电阻及其分流，介绍电阻网络的变换	2
3 电路分析方法 介绍节点分析法、网孔分析法，介绍含有电压源的节点分析法和含有电流源的网孔分析法	2
4 电路定理 介绍线性电路性质、叠加定理、电源变换，介绍戴维南定理和诺顿定理，推导最大功率传输定理	3
5 运算放大器 从实际运算放大器的简单介绍引入理想运算放大器模型，介绍反相放大器、同相放大器、加法放大器、差分放大器	2
6 电容与电感以及一阶电路 介绍电容、电容的串联和并联、电感、电感的串联和并联；介绍无源 RC 电路、无源 RL 电路；介绍单位阶跃、单位冲激、斜坡等奇异函数，介绍 RC 电路和 RL 电路的阶跃响应，介绍一阶运算放大器电路	3
7 二阶电路 电路响应的初值和终值计算，无源串联 RLC 电路及其阶跃响应，无源并联 RLC 电路及其阶跃响应，一般二阶电路，二阶运算放大器电路	3
8 正弦交流电的基本概念 相位、幅值、频率、阻抗、移相器、AC 电桥	2
9 交流稳态分析和功率分析 基尔霍夫定律，等效电路定律 瞬时功率，平均功率，最大平均功率变换，有效值，视在功率，功率因数	3
10 磁耦合电路 自感与互感，电路中能量存储，自耦变压器，三相变压器	2
11 电路的频率响应 频率响应的基本概念，波特图，滤波器，有源滤波器	3
12 电路的高级分析方法 拉普拉斯变换的定义及特性，拉普拉斯变换在电路分析中的应用，傅里叶级数，傅里叶变换，二端口网络	5

The teaching calendar of this course is as follows:

Course Content	Class Allocation

1 Circuit Basic Concepts Introduce some common circuit systems in life, introduce basic concepts and circuit components such as charge, voltage, current, power, energy	2
2 Circuit Basic Laws Introducing Ohm's law, Kirchhoff's law of voltage and current, deducing series resistance and its voltage divider, parallel resistance and shunt, introducing transformation of resistance network	2
3 Circuit Analysis Method Introduce node analysis method and mesh analysis method, introduce node analysis method with voltage source and mesh analysis method with current source	2
4 Circuit Theorem Introduce the properties of linear circuit, superposition theorem, power transformation, Thevenin theorem and Norton theorem, derive maximum power transmission theorem	3
5 Operational Amplifier Introduce the ideal operational amplifier model from the simple introduction of the actual operational amplifier, introduce the reverse amplifier, in-phase amplifier, additive amplifier, differential amplifier	2
6 Capacitance and Inductance as well as First-Order Circuit Introducing series and parallel connection of capacitance and capacitance, series and parallel connection of inductance and inductance, introducing passive RC circuit and passive RL circuit, introducing singular functions such as unit step, unit impulse and slope, introducing step response of RC circuit and RL circuit, introducing first-order operational amplifier circuit	3
7 Second-Order Circuit Initial and final value calculation of circuit response, passive series RLC circuit and its step response, passive parallel RLC circuit and its step response, general second-order circuit, second-order operational amplifier circuit	3
8 Basic Concepts of Sinusoidal AC Phase, amplitude, frequency, impedance, phase shifter	2
9 AC Steady-State Analysis and AC Power Analysis Nodal law, mesh law, superposition law, power conversion, Thevenin-Norton equivalent circuit, instantaneous power, average power, maximum average power conversion, RMS, apparent power, power factor	3
10 Magnetic Coupling Circuit Self-inductance and mutual inductance, energy storage in the circuit, autotransformer, three-phase transformer	2
11 Frequency Response of Circuit Basic Concept of Frequency Response, Baud Diagram, Filter, Active Filter	3
12 Advanced Circuit Analysis Methods The definition and characteristics of Laplace transform, the application of Laplace transform in circuit analysis, the Fourier series, the Fourier transform, two-port networks	5

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

1. Fundamentals of Electric Circuits, Charles Alexander and Matthew Sadiku, 5th Edition, McGraw-Hill Education, 2012
2. 电路原理，江缉光，清华大学出版社，2007

3. 电路，邱关源，高等教育出版社，2006

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				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20		
期中考试 Mid-Term Test		40		
期末考试 Final Exam		40		
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