

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	电源芯片设计基础 Fundamentals of Power IC Design				
2.	授课院系 Originating Department	深港微电子学院 School of Microelectronics				
3.	课程编号 Course Code	SMES203				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业选修课 Major Elective Courses				
6.	授课学期 Semester	夏季 Summer				
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)	路延, 模拟与混合型号超大规模集成电路国家重点实验室, 澳门大学 yanlu@um.edu.mo +8613028867679 LU Yan State Key Laboratory of Analog and Mixed-Signal VLSI, University of Macau				
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	42	2		4 (Midterm Presentations)	48

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	电路基础 (EE104) Fundamentals of Electric Circuits (EE104)
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**

1. To teach students the fundamentals of power integrated circuit design; 1. 让学生了解电源芯片设计的基础知识 2. To teach students to use commercial design tools for schematic entry, simulation; 2. 让学生具备使用集成电路设计工具和进行仿真的能力 3. To prepare students for higher-level courses in power management circuits. 3. 为学生进一步学习高阶模拟与电源电路课程做准备
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16. **预达学习成果 Learning Outcomes**

1. An ability to design and simulate amplifiers; 1. 设计和仿真放大器电路的能力 2. An ability to design an low-dropout regulator to meet full design constraints; 2. 在满足各项指标要求的情况下设计低压差稳压电源 3. An ability to analyze a DC-DC converter seen for the first time; 3. 分析没有见过的 DC-DC 转换器架构的能力 4. An ability to present design project results both orally and in IEEE-style reports. 4. 采用 IEEE 形式的演讲和书写设计报告的能力
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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.)

Introduction and background 背景介绍 (2 hours)
Review of analog basics 模拟电路基础回顾 (2 hours)
Analog low-dropout regulators 模拟低压差稳压电源 (6 hours)
- Feedback loops 反馈回路

- Super source follower 超级源跟随器
- Flipped-voltage follower 折叠电压跟随器
- PMOS/NMOS regulator PMOS/NMOS 稳压电源

Digital low-dropout regulators 数字低压差稳压电源 (6 hours)

- Digital control loop design 数字控制回路设计
- PID control PID 控制
- Analog-assisted digital control 模拟辅助数字控制

Inductor-based DC-DC converters 电感型 DC-DC 转换器 (8 hours)

- Switching power converter topologies 开关电源拓扑
- Converter analyses methods 功率转换器分析方法
- Loss analyses 损耗分析

Switched-capacitor DC-DC converters 开关电容 DC-DC 转换器 (6 hours)

- Charge redistribution loss 电荷重新分布损耗
- Switched-capacitor DC-DC topologies 开关电容 DC-DC 拓扑
- Loss analyses 损耗分析

Wireless power transfer circuits and systems 无线能量传输电路与系统 (8 hours)

- Wireless power transfer applications 无线能量传输应用
- System overview 系统概述
- Rectifier Design 整流器设计
- Output voltage/current regulation methods 输出电压/电流控制方法

layout and presentation skills 版图设计和演讲技能 (4 hours)

Tutorials 习题辅导 (2 hours)

Presentations 演讲报告 (4 hours)

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

Textbooks:

Robert W. Erickson, and Dragan Maksimovic, Fundamentals of Power Electronics, Springer

Razavi, Design of Analog CMOS Integrated Circuits, McGraw-Hill (中国大陆影印版)

Other References:

Willy M.C. Sansen, Analog design essentials, Springer, 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		10		
课堂表现 Class Performance				
小测验 Quiz		20		
课程项目 Projects				
平时作业 Assignments				
期中考试 Mid-Term Test		30		
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

