

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	高级模拟集成电路设计 Advanced Analog Integrated Circuit Design
2.	课程性质 Compulsory/Elective	专业核心课 Major Core Course
3.	开课单位 Offering Dept.	深港微电子学院 School of Microelectronics
4.	课程学分/学时 Course Credit/Hours	3 学分/48 学时 3 Credit/48 Hours
5.	授课语言 Teaching Language	英 English
6.	授课教师 Instructor(s)	刘小龙 Liu Xiaolong
7.	开课学期 Semester	秋季 Fall
8.	是否面向本科生开放 Open to undergraduates or not	否 No
9.	先修要求 Pre-requisites	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) 模拟电路 Analog Circuits
10.	教学目标 Course Objectives	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) 本课程主要讲授高级模拟集成电路设计的重要概念、基本模块与系统的分析与设计, 具体内容包括晶体管模型、噪声分析、模拟版图、运算放大器、偏置和带隙基准参考电路、连续与离散模拟滤波器、模数转换器和数模转换器。学生将学习现代模拟集成电路中的重要概念, 培养初步的分析和设计能力, 了解基本模块和系统的分析方法和设计流程。 This course provides a comprehensive introduction to various aspects of advanced analog integrated circuits design, including transistor models, noise analysis, analog layout, feedback, stability, operational amplifiers, and bias and bandgap voltage reference circuits. Specific topics will include analog filtering (continuous-time and discrete-time), analog-to-digital converters, and digital-to-analog converters. Students will learn to understand the concepts in modern analog integrated circuits, cultivate preliminary analysis and design capabilities, understand the analysis method and design process of the basic modules.
11.	教学方法 Teaching Methods	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) 理论教学 Theoretical teaching
12.	教学内容 Course Contents	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)
	Section 1	绪论及 MOS 晶体管模型

	Introduction & MOS Transistor Models (3 hours)
Section 2	基本放大器 Basic Amplifiers (3 hours)
Section 3	差分电压与电流放大器 Differential Voltage & Current Amplifiers (3 hours)
Section 4	基本晶体管级的噪声 Noise of Elementary Transistor Stages (3 hours)
Section 5	运算放大器的稳定性 Stability of Operational Amplifiers (3 hours)
Section 6	运算放大器的系统性设计 System Design of Operational Amplifiers (3 hours)
Section 7	重要的运算放大器结构 Important OPAMP Configuration (3 hours)
Section 8	全差分放大器 Fully-Differential Amplifiers (3 hours)
Section 9	随机性与系统性失调 Random and Systematic Offset (3 hours)
Section 10	带隙与电流基准电路 Bandgap and Current Reference Circuits (4 hours)
Section 11	模拟滤波器 Analog Filters (3 hours)
Section 12	数模转换器 Digital-to-Analog Converters (4 hours)
Section 13	模数转换器 Analog-to-Digital converters (4 hours)
Section 14	模拟版图 Analog Layout (3 hours)
Section 15	模数混合电路的耦合效应 Coupling Effects in Mixed Analog-Digital Circuits (3 hours)
13. 课程考核 Course Assessment	
	(① 考核形式 Form of examination; ②. 分数构成 grading policy; ③ 如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) 考核方式: 考查 Form of examination: examine 平时作业(25%) + 期中考试 (35%) + 课程项目 (40%) Assignments (25%) + Mid-Term Test (35%) + Projects (40%)
14. 教材及其它参考资料 Textbook and Supplementary Readings	
	教材 Textbooks: 1. W. Sansen, Analog Design Essentials, Springer, 2006.

2. P. R. Gray, P. J. Hurst, S. H. Lewis, R. G. Meyer, Analysis and Design of Analog Integrated Circuits , 5 th Edition, John Wiley & Sons, 2009.
3. B. Razavi , Design of Analog CMOS Integrated Circuits , 2nd Edition, McGraw Hill, 2017.
4. P. E. Allen, D. R. Holberg , CMOS Analog Circuit Design , 3rd Edition, Oxford University Press, 2012.

参考杂志和会议 Reference Journals and Conferences:

1. IEEE Journal of Solid-State Circuits (JSSC)
2. IEEE International Solid-State Circuits Conference (ISSCC)
3. IEEE Symposium on VLSI Technology and Circuits (VLSI)