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**	集成电路导论 Introduction to Integrated Circuit
2.	**授课院系 Originating Department**	深港微电子学院 School of Microelectronics
3.	**课程编号 Course Code**	SME101
4.	**课程学分 Credit Value**	1
5.	**课程类别 Course Type**	通识选修课程 General Education (GE) Elective Courses
6.	**授课学期 Semester**	秋季/春季 Fall/Spring
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）**	余浩 长聘教授，深港微电子学院 办公室：崇文智园 3 号楼 525 邮箱： yuh3@sustech.edu.cn 电话：0755-8801-0180 YU, Hao Professor (tenured) , School of Microelectronics Office : Room 525, Building3, Nanshan i Park Chongwen Email : yuh3@sustech.edu.cn Telephone : 0755-8801-0180
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	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	16				16

12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite	后续课程包括集成电路基础 I&II、微电 子基础 I&II、集成电路设计等。 It serves as a prerequisite course for students who will major in Microelectronics Engineering. The subsequent courses in Microelectronics include fundamentals of analog electronics, fundamentals of digital electronics, and integrated circuits design, etc.
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

本课主要介绍集成电路的基础知识，旨在培养本科生对集成电路的的兴趣与能力。本课程从集成电路发展史、集成电路器件与制造、EDA 和计算、通信、传感、AI 芯片设计等几个领域进行概括。通过该课程培养学生将掌握集成电路设计发展和趋势，培养其集成电路专业兴趣，引领其步入集成电路领域，帮助了解集成电路领域所涉及的基本思想、核心技术、专业范围和毕业后可能从事的工作，为学生的专 业发展提供认知和心理上的准备为今后从事芯片相关的科研及开发工作打下良好的专业基础。

This course aims to cultivate student the basic knowledge of integrated circuit, and aims to cultivate undergraduate students' interest and ability in integrated circuits. This course summarizes the history of integrated circuits, integrated circuit devices and manufacturing, EDA and computing, communications, sensers, AI chip design and other fields. Through this course, students will master the development and trend of integrated circuit design, cultivate their professional interest in integrated circuits design, lead them into the field of integrated circuits design, help understand the basic ideas, core technologies, professional scope and possible jobs involved in the field of integrated circuits design, and provide cognitive and psychological preparation for students' professional development to build a good professional foundation for future chip-related scientific research and development work.

16. 预达学习成果 Learning Outcomes

本课程将着眼于介绍集成电路设计的基础知识，致力于让学生们了解集成电路设计所面临的基本内容，理解集成电路核心技术和了解未来可能的职业发展，培养学生的兴趣，促进学生培养良好的自我认知，培养学生优秀的自驱学习能力，为今后从事集成电路设计科研及开发工作打下良好的专业基础。

This course will focus on introducing the basic knowledge of integrated circuit design, and committed to allowing students to understand the basic content in integrated circuit design, understand the core technology and understand possible career development in the future, cultivate students' interest in integrated circuit design, promote students to cultivate good self-awareness, cultivate students' excellent self-driven learning ability, and build a good professional foundation for future research and development of integrated circuit design.

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.)

理论课内容：

第 1 周：集成电路发展史

1.1 半导体物理

1.2 贝尔实验室

1.3 硅谷

1.4 国内集成电路发展史

第 2 周：集成电路器件与制造

2.1 摩尔定律

2.2 Intel 和 IBM

2.3 IMEC

2.4 TSMC

2.5 国内 Fab 发展史

第 3 周：EDA

3.1 Berkeley 与 Spice

3.2 CMU 与 BDD

3.3 EDA 三巨头

3.4 国内 EDA 发展史

第 4 周：计算机芯片

4.1 Berkeley、Stanford 和 RISC 指令集

4.2 Intel、AMD 和 x86

4.3 ARM、RISC-V

4.4 国内计算机芯片发展史

第 5 周：通信芯片

5.1 UCLA 和射频电路

5.2 Qualcomm、Broadcom 和 TI

5.3 国内通信芯片发展史

第 6 周：传感器芯片

6.1 图像传感器

6.2 MEMS 传感器

6.3 illumina 和 DNA 测序

6.4 国内传感器芯片发展史

第 7 周：人工智能芯片

7.1 Nvidia 和 GPU

7.2 Google 和 TPU

7.3 类脑芯片

7.4 边缘计算、机器人和元宇宙

7.5 国内人工智能芯片发展史

第 8 周：集成电路的未来

8.1 后摩尔材料器件

8.2 3D 集成

8.3 量子电路

8.4 国内集成电路未来布局

Theory lesson content：

Week 1：History of integrated circuits design

1.1 Foundation of semiconductor physics

1.2 Bell Labs

1.3 Silicon Valley

1.4 History of domestic integrated circuit design

Week 2：Integrated circuit devices and manufacturing

2.1 Moore's Law

2.2 Intel and IBM

2.3 IMEC

2.4 TSMC

2.5 History of domestic Fab development

Week 3：EDA

3.1 Berkeley and Spice

3.2 CMU and BDD

3.3 Top companies in EDA

3.4 History of domestic EDA

Week 4：Computing integrated circuit

4.1 Berkeley, Stanford and RISC

4.2 Intel, AMD and x86

4.3 ARM、RISC-V

4.4 History of domestic computing chips design

Week 5：Communication integrated circuit

5.1 UCLA and RF integrated circuit

5.2 Qualcomm, Broadcom and TI

5.4 History of domestic communication chips design

Week 6：Sensors

6.1 Imaging sensors

6.2 MEMS sensors

6.3 illumina and DNA sequenator

6.4 History of domestic sensor chip development

Week 7：Artificial intelligence integrated circuit

7.1 Nvidia and GPU

7.2 Google and TPU

7.3 Neuro-inspired computing

7.4 Edge computing, robotics, and metaverses

7.5 History of domestic AI chip development

Week 8：The future of integrated circuits design

8.1 Beyond CMOS devices

8.2 3D integration

8.3 Quantum integrated circuits

8.4 The future directions of domestic integrated circuits design

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

参考书目 Reference：

Introduction to Microelectronics and Integrated Circuit, YuMing Fang, Publishing House of Electronics Industry, 2020.

Digital Fundamentals, Tenth Edition, Thomas L.Floyd, Pearson, 2008.

Fundamentals of Microelectronics, 3rd Edition, Behzad Razavi, Wiley, 2021

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		20		
课堂表现 Class Performance		0		

小测验 **Quiz**		0		
课程项目 **Projects**		0		
平时作业 **Assignments**		30		
期中考试 **Mid-Term Test**		0		
期末考试 **Final Exam**		0		
期末报告 **Final Presentation**		50		
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