南方科技大学 SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

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	半导体材料与器件 Introduction to Semiconducting Materials, Devices and Technology
2.	授课院系 Originating Department	材料科学与工程 Department of Materials Science and Engineering
3.	课程编号 Course Code	MSE310
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业核心课 Major Core Courses
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	英文 English
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）	程鑫 教授 Prof. Xing Cheng 材料科学与工程系 Department of Materials Science and Engineering chengx@sustc.edu.cn 0755-88018989
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）	

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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	48	0	0	0	48

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MSE001 材料科学与工程基础 Fundamentals of Materials Science and Engineering
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	N/A
14. 其它要求修读本课程的学系 Cross-listing Dept.	N/A

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

This course is an introductory course for semiconductor materials, devices and processing technologies. The objective is to provide students in materials science and engineering major with a broad overview of the most important areas in semiconductor technology. Topics to be covered include properties of semiconductors, representative silicon and compound semiconductor devices and microelectronic processing (fabrication) techniques. Due to the large amount of materials to be covered, this course will put emphasis on the basic principles of the device operations and the processing technologies. This course is open to all students who work with semiconductors or wish to learn about semiconductor technologies.

16. 预达学习成果 Learning Outcomes

The goal of this course is to establish a basic understanding of the physical principles involved in semiconductor materials, devices and processing technology. The knowledge acquired in this course will allow the student to understand the fundamental electronic and optical properties of semiconducting materials, the principals involved in the operation of typical semiconductor devices such as diodes, bipolar transistors, and MOS devices, and the processing techniques used in modern day VLSI technology. Upon completion of this course, students will acquire a general understanding of the semiconductor industry and understand the key concepts related to semiconductor devices and microelectronic processing technology. Students will also be able to describe device operation and optimize processing technology through mathematical modelling.

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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.)

Lecture 1 (3 Credit hours): Introduction to semiconducting materials, basic properties of semiconductors

Lecture 2 (3 Credit hours): Transport phenomena in semiconductors - drifting, diffusion, recombination and generation

Lecture 3 (3 Credit hours): Transport phenomena in semiconductors - continuity equations

Lecture 4 (3 Credit hours): Diodes

Lecture 5 (3 Credit hours): Bipolar transistors

Lecture 6 (3 Credit hours): Metal-oxide-semiconductor capacitors

Lecture 7 (3 Credit hours): MOSFET devices

Lecture 8 (3 Credit hours): Modern MOSFET devices

Lecture 9 (3 Credit hours): Solid-state sensors

Lecture 10 (3 Credit hours): Thin-film transistors and liquid crystal display

Lecture 11 (3 Credit hours): Crystal growth and oxidation

Lecture 12 (3 Credit hours): Doping: diffusion and ion implantation

Lecture 13 (3 Credit hours): Lithographic techniques

Lecture 14 (3 Credit hours): Thin-film deposition: CVD and PVD

Lecture 15 (3 Credit hours): Etching: wet and dry

Lecture 16 (3 Credit hours): Process integration

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

Textbook

"Semiconductor Devices: Physics and Technology", 3rd edition, Simon M. Sze and Ming-Kwei Lee, Wiley, 2012.

References

1. "Devices for Integrated Circuits: Silicon and III-V Compound Semiconductors", H. Craig Casey, Jr., Wiley, 1999.
2. "Silicon VLSI Technology: Fundamentals, Practice, and Modelling", James D. Plummer, Michael Deal, and Peter D. Griffin, Prentice Hall, 2001.

Lecture notes will be provided.

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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		4		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		10		
平时作业		21		

Assignments				
期中考试 Mid-Term Test		25		
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

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