

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	生物传感基础及 DNA 测序应用 Biosensor Basics and DNA Sequencing Application
2.	授课院系 Originating Department	深港微电子学院 School of Microelectronics
3.	课程编号 Course Code	SME314
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	春季 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)	李毅 Yi Li 助理教授 深港微电子学院 Assistant Professor School of Microelectronics liy37@sustech.edu.cn
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	33	15			48

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	EE205 信号与系统或 CH101B 化学原理 B
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

本课程旨在培养本科生在与生物医学/药物化学相关应用对接中芯片设计的兴趣与能力，主要分为三部分实施：1. 讲授芯片界面的生化过程和互作机制；2. 讲授纳米技术对于芯片中电子运输的影响；3. 学生分组展示近年生物芯片的应用进展和新机理。

This course aims to motivate the interests of students and foster their capability on designing biochips for biomedical applications as well as medicines. It can be divided into the following three items: 1) Biochemical process and interactions at the biochip interfaces, 2) Electronic transport with nanostructures and nanotechnology and 3) Group presentation of recent processes on biochips.

16. 预达学习成果 Learning Outcomes

- 1、知悉生物芯片在个人医疗，分布式诊断和监护，对社会的影响力以及对于半导体芯片设计的需求
- 2、掌握生物化学过程在半导体界面相互作用的规律
- 3、掌握纳米技术对于电子运输的调制
- 4、学会设计和运用不同条件下的生物 CMOS 界面

- 1、 Learn the basics of the influences of biochips on personal medicine, distributed diagnosis as well as monitoring; Understand the design requirements for the semiconductor chips
- 2、 Master the rules of liquid/semiconductor interfaces upon biochemical processes
- 3、 Master the modulation of electron transport upon nanotechnology
- 4、 Learn to apply the knowledge onto the designs of Bio-CMOS interfaces under variant conditions

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.)

Section 1-2	生物芯片概述 Introduction. 1) Personal Bioelectronics; 2) Distributed Diagnostics and Personalized Therapy; 3) Impact in Society 4) Need for New CMOS systems and 5) Aim of the course (4 学时)
Section 3	案例分析: DNA 测序芯片 Case Study - DNA sequencing chips (2 学时)
Section 4-5	电解质化学 Chemistry of Conductive solutions (4 学时)
Section 6	被测物和探针的生物化学过程 Biochemistry of Targets and Probes (1) (2 学时)
Section 7-8	被测物和探针的生物化学过程 Biochemistry of Targets and Probes (2) (4 学时)
Section 9	被测物与探针的相互作用 (1) Target/Probe interactions (1) (2 学时)
Section 10-11	被测物与探针的相互作用 (2) Target/Probe interactions (2) (4 学时)
Section 12	探针在界面的固定 Surface Immobilization of Probes (1) (2 学时)
Section 13-14	探针在界面的固定 Surface Immobilization of Probes (2) (4 学时)
Section 15	生物 CMOS 界面的无标记电容式检测 Bio/CMOS Interfaces for Label-free Capacitance Sensing (2 学时)
Section 16-17	纳米技术用于阻挡电子输运 Nanotechnology to Prevent Electron Transfer (4 学时)
Section 18	恒压下的生物 CMOS 界面 Bio/CMOS Interfaces in Constant Bias (2 学时)
Section 19-20	纳米技术用于增强电子输运 Nanotechnology to Enhance Electron Transfer (4 学时)
Section 21	电压扫描下的生物 CMOS 界面 Bio/CMOS Interfaces in Voltage Scan (2 学时)
Section 22-23	学生分组展示 (1) Group Presentation 1/2 (4 学时)
Section 24	学生分组展示 (2) Group Presentation 2/2 (2 学时)

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

参考资料 Reference:
Bio/CMOS Interfaces and Co-design, Sandro Carrara, Springer 2013], ISBN: 9781461446897

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		30		

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

