

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	纳米生物医学概论 Introduction to Nano-Biomedicine
2.	授课院系 Originating Department	生物医学工程系 Department of Biomedical Engineering
3.	课程编号 Course Code	BMEB211
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	2 / 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)	蒋兴宇, 生物医学工程系, 讲席教授 jiang@sustc.edu.cn Xingyu Jiang, Biomedical Engineering, Chair Professor
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	钟乐霓, 生物医学工程系 11849027@mail.sustc.edu.cn 18682210049 Leni Zhong, Biomedical Engineering
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	

11. 授课方式 Delivery Method	讲授	习题/辅导/讨论	实验/实习	其它(请具体注明)	总学时
	Lectures	Tutorials	Lab/Practical	Other (Please specify)	Total
学时数 Credit Hours	48				48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 None				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 None				
14. 其它要求修读本课程的学系 Cross-listing Dept.	生物医学工程系、生物系、化学系、材料科学与工程系、物理系、电子与电气工程系、计算机科学与工程系				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

通过课程内容的讲授和纳米生物技术研究方法及应用的介绍，使学生从纳米技术的研究方法到纳米技术在生物领域的应用来透彻的了解纳米生物技术的重要作用。
By the introduction of nano-biotechnology research methods and applications, students can thoroughly understand the important role of nano-biotechnology.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，使学生了解和掌握纳米生物技术研究内容、研究方法以及怎样利用纳米的技术手段来解决生物领域的问题，熟悉和掌握纳米生物技术和传统的生物技术一些基本概念，为以后在研究生物医疗等领域提供一个新的有力的武器。
Students will 1) understand and master the knowledge, research methods and how to use nanotechnology to solve problems in the biomedicine; 2) understand some basic concepts in both nano-biotechnology and traditional biotechnology. This course will provide a new set of tools for biomedicine.

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 纳米材料简介 (3 学时)

从纳米材料的起源、定义、类型以及工具进行综合性的介绍。

Section 1 Introduction

Introduction to nanomaterials, including origin, definition, types, and tools of nanotechnology.

Section 2 纳米生物表征 (3 学时)

常用的几种生物表征手段。

Section 2 Biological Characterization of nanomaterials

Methods for biological characterization of nanomaterials.

Section 3 纳米材料合成 (3 学时)

简单介绍不同纳米材料的合成方法。

Section 3 Fabrication methods

Introductions to different synthetic methods of nanomaterials.

Section 4 纳米生物分析 (3 学时)

主要介绍纳米技术在生物蛋白质检测与核酸检测方面的应用。

Section 4 Nanomaterials for biochemical assays

Introductions to applications of nanotechnology in protein and DNA detection.

Section 5 纳米材料表面修饰 (3 学时)

介绍几种纳米材料表面修饰, 通过不同表面修饰的纳米材料具有不同生物活性说明其应用价值。

Section 5 Modification of nanomaterials

Introductions to surface modification of nanomaterials and applications to adjusting the surface modification of nanoparticles to regulate its biological properties.

Section 6 纳米生物 MEMS/NEMS (3 学时)

从原理、制作工艺、应该简单介绍纳米生物 MEMS/NEMS。

Section 6 BioMEMS/BioNEMS

Introduction to BioMEMS/BioNEMS, including design, fabrications, and applications.

Section 7 微流控芯片简介 (3 学时)

从原理、制作工艺、应用简单介绍微流控芯片。

Section 7 Introductions to microfluidics.

Introduction to microfluidics chip, including design, fabrications, and applications.

Section 8 构建组织的体外模型/组织工程 (3 学时)

基于微流控芯片的体外模型构建, 以及一些应用实例。

Section 8 Construction of in vitro models of tissues based on microfluidic.

In vitro models for tissues and tissue engineering based on microfluidics with some examples.

期中小组汇报 (3 学时)

以小组为单位, 组内讨论并选择与课堂内容相关的课题, 在课堂中进行展示。

Mid-term presentation

In groups, students discuss and select topics related to the content of the class and present it in the classroom.

Section 9 基于微流芯片的纳米材料合成 (3 学时)

着重于利用微流控技术合成纳米材料。

Section 9 Synthesis of nanomaterials based on microfluidic chip.

Design of microfluidic channels for the synthesis of nanomaterials with unique features.

Section 10 纳米毒理学 (3 学时)

简单介绍纳米材料的毒理学分析方法。

Section 10 Toxicology of nanomaterials

Introductions to toxicology of nanomaterials.

Section 11 纳米电子与生物医学 (3 学时)

纳米电子技术应用与生物医学领域, 如 MPC 在可拉伸穿戴设备上的应用。

Section 11 Nanoelectronics and biomedicine

Nanoelectronics in biomedicine, such as nanoscale/microscale materials for highly stretchable bio-devices.

Section 12 几个典型纳米生物医学问题 (3 学时)

简单从几个纳米生物医学问题, 联系到未来纳米生物医学的发展。

Section 12 Typical problems in biomedicine

Introduction of a few typical problems as examples for the future development of nanomedicine.

Section 13 纳米药物 (3 学时)

从定义、作用机制、制备以及应用几个方面介绍纳米药物。

Section 13 Nano-drugs

Introduction to Nano-drug, including definition, mechanism, fabrications, and applications.

Section 14 纳米递送体系 (3 学时)

纳米技术在药物递送中的应用, 如靶向药物、CRISPR/Cas9 技术用于肿瘤治疗。

Section 14 Nanotechnology in drug delivery systems

Applications of nanotechnology in drug delivery, such as delivery of targeted therapy, and CRISPR/Cas9 for tumor .

期末汇报 (3 学时)

学生根据该学期学习到的纳米生物知识, 选择相关课题, 在课堂上进行交流。

Final presentation

According to the nano-biological knowledge learned in this semester, students choose related topics and communicate in class.

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

1. Introduction to Nanoscience, Gabor L. Hornyak ... [et al.]. Boca Raton : CRC Press, c2008
2. 纳米生物检测, 庞代文, 蒋兴宇, 黄卫华主编, 北京 : 科学出版社, 2014
3. 纳米技术在药物递送中的应用, 金义光主编, 北京 : 化学工业出版社, 2015

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				
课堂表现 Class Performance				
小测验 Quiz		10		实时反馈学生课堂学习情况; Give feedbacks of the course study in the classroom.
课程项目 Projects		30		以小组汇报的形式完成课程项目, 目的培养学生小组合作能力; Finish a team project via presentation and help students to learn about teamwork.
平时作业 Assignments		20		通过期中、期末总结, 让学生回顾并总结近半学习的学习内容以及学习收获; Through mid-term and final revision, help students to summarize the whole course and their results.
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		40		通过期末报告形式, 培养学生独立汇报能力; 汇报内容与课堂学习内容相关, 考察学生对课程知识理解程度; Help students to learn how to give individual presentations through a presentation test in the final exam, of which contents will be highly related to the course.
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