

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	生物材料与组织工程实验 Biomaterials and Tissue Engineering Laboratory
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	BMEB334
4.	课程学分 Credit Value	2
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	秋季 Fall
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 Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	杨用, 生物医学工程系, yangy9@sustech.edu.cn Yong Yang, Department of Biomedical Engineering, yangy9@sustech.edu.cn
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)	

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			64		64
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	None				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	None				
14. 其它要求修读本课程的学系 Cross-listing Dept.	None				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

生物材料与组织工程实验将围绕生物材料与组织工程两个方向，培养学生们在 3D 细胞培养、细胞染色、细胞工程化、生物支架制备与表征、生物相容性测定、组织染色等方面的动手能力及实践能力，使学生们深入理解相应理论知识，并为未来从事生物医学研究或产业开发打下基础。

The objective of the course is to cultivate the hands-on skills of students in 3D cell culture, cell staining, cell engineering, fabrication and characterization of bioscaffolds, biocompatibility testing, tissue staining, etc. This course may help the students to gain in-depth understanding about biomaterials and tissue engineering, and lay a solid foundation for biomedical research or industrial development in the future.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，熟练掌握生物材料与组织工程方向的基础知识和技能，在动手能力及实践操作能力上有显著提升，为未来开展生物医学相关的科学研究或产业开发奠定坚实基础。

Through the study of this course, students will be familiar to biomaterials and tissue engineering with their hands-on skill significantly improved. The obtained skills will lay a solid foundation for biomedical research or industrial development in the future.

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.)

第 1 课（4 学时）显微镜基础知识学习 Introduction to microscopy

讲解显微镜的硬件以及相机成像所使用的软件，完成标尺的设定。To introduce the main components of the microscope, as well as the software to control the camera; Set scale bar of different objectives.

第 2 课（4 学时）显微成像 Microscopy imaging techniques

讲解明场成像、相差成像以及荧光成像的基本原理，并练习进行细胞成像。To introduce the principle of bright-field imaging, phase-contrast imaging, and fluorescence imaging. Learn to perform imaging in the lab.

第 3 课（4 学时）细胞培养 Cell culture

学习贴壁细胞的传代、计数等操作，以及台盼蓝染色来计算细胞活力。To learn the basic operation of cell trypsinization, cell counting, and trypan blue staining.

第 4 课（4 学时）细胞转染 Cell transfection

学习基于阳离子脂质体的细胞转染策略，并定量计算转染效率。To learn how to transfect exogenous genes into the cells using Lipofectamine™ 2000.

第 5 课（4 学时）细胞染色 Cell staining

学习利用不同染料对细胞亚结构或细胞器进行染色。To learn how to stain cellular organelles and structures using different kinds of dyes.

第 6 课（4 学时）细胞代谢标记-1 Metabolic labeling of cells-1

学习细胞代谢标记的基本原理和代谢标记过程。To learn the principle and basic operation about metabolic labeling of cells.

第 7 课（4 学时）细胞代谢标记-2 Metabolic labeling of cells-2

利用点击化学进行荧光标记，标记细胞的荧光成像。Labeling of cells via click-chemistry, and fluorescence imaging of labelled cells.

第 8 课（4 学时）静电纺丝制备纳米纤维 Fabrication of electrospun nanofibers

学习静电纺丝技术的基本原理，利用静电纺丝技术制备纳米纤维。To learn the principle of electrospinning and try to produce nanofibers in the lab via electrospinning.

第 9 课（4 学时）皮肤去细胞化 Decellularization of skin tissue

学习皮肤去细胞化的基本操作步骤，去细胞化皮肤的表征分析。To learn the basic operation of decellularization and try to characterize decellularized skin tissue.

第 10 课（4 学时）利用可降解水凝胶来包封细胞 Cell encapsulation in a degradable hydrogel

利用海藻酸钠微球/胶囊来包封细胞，学习包封的基本原理并进行操作。Encapsulation of cells in an alginate-based hydrogel.

第 11 课（4 学时）利用不可降解凝胶来包封细胞 Encapsulation of cells in a covalently cross-linked gel

利用紫外交联的 PEGDA gel 来包封细胞，学习包封的基本原理并进行操作。Encapsulation of cells with UV-crosslinked

PEGDA hydrogel.

第 12 课 (4 学时) 肿瘤微球的体外制备 Generation of multicellular spheroid *in vitro*

利用低吸附球形微孔板来制备、培养肿瘤微球。Generation of multicellular tumor spheroids within low attachment cell culture plate.

第 13 课 (4 学时) 体外制备组织工程骨 Fabrication of artificial bone *in vitro*

人工骨的体外制备, 细胞活/死染色。Fabrication of artificial bone *in vitro*. Carry out live/dead fluorescence staining of bone cells.

第 14 课 (4 学时) 体外制备组织工程血管 Fabrication of artificial blood vessel *in vitro*

人工血管的体外制备, 细胞活/死染色。Fabrication of artificial blood vessel *in vitro*. Carry out live/dead fluorescence staining of HUVEC cells.

第 15 课 (4 学时) HE 染色 Hematoxylin and Eosin (H&E) staining

学习 HE 染色的基本原理; 练习进行 HE 染色, 并在显微镜下观察不同组织的染色结果。To learn the principle of H&E staining and capture images of different kinds of tissue using microscope.

第 16 课 (4 学时) 生物材料与组织工程前沿专题, Final presentation

Literature review, Final presentation.

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

教材采用教研组自编实验手册

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 Performance		10%		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		60%		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		10%		
其它 (可根据需要 改写以上评估方		10%		

式)
**Others (The
above may be
modified as
necessary)**

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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

生物医学工程系教学委员会

