

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	生物医学工程实验（二）Biomedical Engineering Laboratory II				
2.	授课院系 Originating Department	生物医学工程系 Biomedical Engineering				
3.	课程编号 Course Code	BMEB322				
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	3 春				
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)	彭诚，教学工程师， pengc@sustc.edu.cn PENG Cheng, Engineer, pengc@sustc.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)	20				
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			96		96

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	生物医学工程实验（一）Biomedical Engineering Laboratory I
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.	无

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程中的实验内容将更加接近生物医学科研实验室。在生物医学工程实验 I (BMEB321)中, 已经对科学实验基本原理和方法、软硬件工具进行了介绍和练习; 本课程的内容将给予学生更多自由度, 学生将通过自己的分析和实践, 来决定部分实验的方案和分析方法。

This is the second of a two-semester course sequence. In this course, you will learn to conduct experiments as you would in a biomedical research laboratory. Since in BME Lab I (BMEB321) you were introduced to the principles of experimentation and the scientific method, and the hardware/software tools used for data acquisition/analysis, the laboratory procedures in this course will be moving from the experiments with detailed instructions, to ones which give you more freedom to determine your own approach.

16. 预达学习成果 Learning Outcomes

完成本课程之后, 学生将:

1. 能够设计和实施实验
2. 能够根据问题对生命体进行测量并分析和解释数据
3. 能够应用高级数学方法、科学方法和工程方法解决生物医学工程问题
4. 能够在多学科背景的团队内的合作
5. 能够有效的对实验发现进行表达和交流

Upon completion of this course the students should be:

1. Design and conduct experiments
2. Make measurements and interpret data from living systems
3. Apply advanced mathematics, science, and engineering to solve problems at the interface of engineering and biology
4. Collaboratively interact with a multi-disciplinary team
5. Effectively communicate experimental findings

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.)

Lab 1. (12 学时) 超声成像和超声心动图; Ultrasound Imaging and Echocardiography

- (1). Procedure 0: 超声成像系统基本操作; Introduction to ultrasound imaging system and its basic operations
- (2). Procedure 1: 超声成像的两个基本技术; Two Basic Techniques in Ultrasound Imaging
- (3). Procedure 2: 二维超声体积测量; 2-D Ultrasound Volume Measurement
- (4). Procedure 3: 超声成像用于人体心脏功能评价; Evaluation of Cardiac Function Using Ultrasound

Lab 2. (12 学时) 生物医学图像处理; Biomedical Image Processing

- (1). Procedure 1: 图像的采样; Fundamental Concepts of Sampling Theory
- (2). Procedure 2: 数字图像滤波 - 去噪; Digital Image Filtering- Principles of De-Noising
- (3). Procedure 3: 数字图像滤波 - 高通滤波 (空域); Digital Image Filtering- High Pass Filtering (Spatial Domain)
- (4). Procedure 4: 数字图像滤波 - 低通滤波 (频域); Digital Image Filtering- Low Pass Filtering (Frequency Domain)
- (5). Procedure 5: 定量计算器官运动; Quantification of Organ Activity

Lab 3. (16 学时) 微流控技术; Microfluidics

- (1). Procedure 1: 软光刻方法加工微流道; Lithographic Fabrication of Microfluidic Channels
- (2). Procedure 2: 组装微流体器件; Assembling a Microfluidic Device
- (3). Procedure 3: 微流控芯片上的层流; Testing Laminar Flow in a Microfluidic Chip
- (4). Procedure 4: 微流控芯片用于模拟微血管网络; Modeling a Microvascular Network on a Microfluidic Chip

Lab 4. (16 学时) 流体剪切力对细胞的影响; Fluid Shear Effects on Cells

- (1). Procedure 1: 泵流速校准; Pump Calibration
- (2). Procedure 2: 液体粘度测量; Measurement of Fluid Viscosity
- (3). Procedure 3: 实验系统组装和测试; Assembling and testing experiment setup
- (4). Procedure 4: 细胞剪切实验; Cell Shear Experiments
- (5). Procedure 5: 实验数据处理; Data Analysis

Lab 5. (16 学时) 渗透压对细胞的影响; Osmotic Loading of Cells


- (1). Procedure 1: 溶液准备渗透压的测量
- (2). Procedure 2: 细胞渗透压实验; Osmotic Loading of Cells
- (3). Procedure 3: 实验数据处理; Data Analysis

Lab 6. (20 学时) 神经电生理 Electro-Neurophysiology

- (1). Procedure 1: 实验系统组装和测试; Assembling and testing experiment setup
- (2). Procedure 2: 细胞外自发电位测量; Spontaneous Extracellular Measurements
- (3). Procedure 3: 细胞外诱发电位测量; Evoked Extracellular Measurements
- (4). Procedure 4: 神经活性化合物对动作电位的影响; Effects of a Neuroactive Compound on Action Potentials
- (5). Procedure 5: 实验数据处理; Data Analysis
- (6). Procedure 6: 蜚蠊腹部神经解剖; Ventral Nerve Dissection
- (7). Procedure 7: 腹神经索电位及神经传导速度测量; Potentials from the Ventral Nerve Cord and Nerve Conduction Velocity
- (8). Procedure 8: 腹神经索电诱发电位及神经传导速度测量; Electrically Evoked Potentials and Nerve Conduction Velocity

Final Presentation (4 学时) 期末报告; Final Presentation

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



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		5		
课堂表现 Class		10		

Performance			
小测验 Quiz	10		
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 式） Others (The above may be modified as necessary)	5 (peer assessment)		

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

