

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 Biomaterials and Tissue Engineering
2.	授课院系 Originating Department	生物医学工程系 Biomedical Engineering
3.	课程编号 Course Code	BMEB319
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)	李凯, 生物医学工程系, 副教授 Kai Li, Biomedical Engineering, Associate Professor, lik@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	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.	无 None				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程将为学生介绍经典和现代生物材料在功能性组织工程领域中的应用研究，并为学生介绍该涵盖了多学科交叉的研究领域，以培养其解决实践问题的能力。

To introduce students to classical and modern biomaterials as well as their applications in functional tissue engineering. To attain a holistic appreciation of the various disciplines within biomaterials and tissue engineering and to develop the ability to apply concepts to various problems.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生可以了解多方面的知识，包括理解如何设计具有良好生物兼容性的材料体系，如植入支架等；利用现代加工技术制备多功能的生物材料；设计用于疾病诊断与治疗的体系。

Through this course, the students should be able to understand the biological requirement for designed tissue engineering systems (e.g., scaffold); fabricate multicomponent biomaterials using advanced manufacturing technologies; design diagnostic and therapeutic materials systems.

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: 生物材料导论 Introduction to Modern Biomaterials (3 学时)

介绍生物材料的历史与发展进程，包括各种生物材料的特性及优缺点

To introduce the history and milestones in the development of biomaterials, including unique properties and strengths of different biomaterials.

Lecture 2: 聚合物生物材料 Polymeric Biomaterials (3 学时)

聚合物生物材料的种类与性能

To introduce the types and properties of polymeric biomaterials, and their synthetic approaches

Lecture 3: 可生物降解聚合物：化学、降解和应用 Biodegradable Polymers: Chemistry, Degradation and Applications (3 学时)

聚合物生物材料的生物降解性、结构设计及在生物医学中的应用

To introduce the biodegradability of polymeric biomaterials and the mechanism of degradation, as well as their applications in biomedical engineering

Lecture 4: 弹性体在心脏病学中的应用 Elastomers and Applications in Cardiology (3 学时)

弹性体在医用导管中的应用

To introduce the elastomers as catheters, connectors, etc.

Lecture 5: 中空纤维、水凝胶及其应用 Hollow Fibers, Hydrogels, and their Applications (3 学时)

中空纤维在肾脏病学以及水凝胶在眼科学中的应用

To introduce hollow fibers and hydrogels, as well as their applications in nephrology and ophthalmology

Lecture 6: 金属材料与骨移植 Metal Materials and Bone Grafting (3 学时)

医用金属材料及其在骨科医学（人工关节置换）中的应用

To introduce metal-based biomaterials and their applications in orthopaedics (e.g., artificial joint replacement)

Lecture 7: 玻璃、陶瓷、医用粘合剂和密封剂 Glasses, Ceramics, Medical Adhesives and Sealants (3 学时)

玻璃陶瓷以及医用粘合剂和密封剂的制备以及应用

To introduce the preparation and applications of glass metal, sealants in biomedical engineering

Lecture 8: 从生物材料到医疗器械 From Biomaterials to Medical Devices (3 学时)

医疗器械的种类与原理，以及生物材料在医疗器械中的作用

To introduce different types and design principles of biomedical devices, and the use of biomaterials in these devices

Lecture 9: 药物递送 Drug Delivery (3 学时)

药物递送体系的构建，包括纳米递送系统的制备和表征、多功能药物递送系统等

To introduce the design of drug delivery systems (DDS), including the synthesis and characterization of nanocarriers and multifunctional DDS.

Lecture 10: 组织工程导论 Introduction to Tissue Engineering (3 学时)

介绍组织工程的概念与发展进程，以及现代组织工程前沿

To introduce the history and milestones in the development of tissue engineering, and frontier of this research topic

Lecture 11: 细胞培养 Cell Culture (3 学时)

学习各种细胞培养（原代细胞，细胞株等）的基本操作与注意事项

To introduce operation and basic principles of cell culture (primary cells and cell lines)

Lecture 12: 细胞和组织冻存 Cryopreservation (3 学时)

细胞与组织冻存的基本操作，包括各种冻存方式的优缺点

To introduce the basic principles of cryopreservation of cells and tissues, including a review of various cryopreservation approaches

Lecture 13: 骨组织工程 Tissue Engineering for Orthopaedics (3 学时)

组织工程在骨医学中的应用，包括选用的材料、支架构建与细胞源

Applications of tissue engineering in orthopaedics, and the choices of scaffold and cell resources

Lecture 14: 皮肤和血管组织工程 Tissue Engineering for Skin and Blood Vessels (3 学时)

介绍新型生物材料及其在不同疾病模型中皮肤及血管再生中的应用

To introduce new materials and their functions in reconstruction of skin and blood vessels in different disease models

Lecture 15: 功能化组织工程 Functional Tissue Engineering for Biomedical Applications (4 学时)

介绍组织工程前沿进展，文献综述

Literature review, to introduce the frontier in tissue engineering for therapeutic treatment

Lecture 16: 复习 Review (2 学时)

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

Introduction to Biomedical Engineering (3rd Ed.), Enderle JD, Bronzino J (eds.), Academic Press, 2011.

Biomaterials for Tissue Engineering: Methods and Protocols (Methods in Molecular Biology), (1st Ed.), Humana Press 2018.

Introduction to Biomaterials: Basic Theory with Engineering Applications (1st Ed.), 2013, Cambridge University Press 2013.

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		20		
课堂表现 Class Performance		10		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20		
期中考试 Mid-Term Test				
期末考试 Final Exam		50		
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

生物医学工程系教学委员会