

## 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 <b>Course Title</b>	生物材料 Biomaterials				
2.	授课院系 <b>Originating Department</b>	材料科学与工程系 Department of Materials Science and Engineering				
3.	课程编号 <b>Course Code</b>	MSE338				
4.	课程学分 <b>Credit Value</b>	2				
5.	课程类别 <b>Course Type</b>	专业核心课 Major Core Courses				
6.	授课学期 <b>Semester</b>	春季 Spring				
7.	授课语言 <b>Teaching Language</b>	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) <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	田颜清, 教授, 材料科学与工程系 <a href="mailto:tianyq@sustc.edu.cn">tianyq@sustc.edu.cn</a> Yanqing Tian, Ph. D., Professor Department of Materials Science and Engineering <a href="mailto:tianyq@sustc.edu.cn">tianyq@sustc.edu.cn</a>				
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	待公布 To be announced				
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>					
11.	授课方式 <b>Delivery Method</b>	讲授 <b>Lectures</b>	习题/辅导/讨论 <b>Tutorials</b>	实验/实习 <b>Lab/Practical</b>	其它(请具体注明) <b>Other (Please specify)</b>	总学时 <b>Total</b>
	学时数 <b>Credit Hours</b>	32				32

12. 先修课程、其它学习要求 <b>Pre-requisites or Other Academic Requirements</b>	MSE001 材料科学与工程基础 Fundamentals of Materials Science and Engineering
13. 后续课程、其它学习规划 <b>Courses for which this course is a pre-requisite</b>	
14. 其它要求修读本课程的学系 <b>Cross-listing Dept.</b>	

教学大纲及教学日历 SYLLABUS

15. 教学目标 **Course Objectives**

生物材料是一门讲授用于诊断，修复和增强人体组织和器官功能的材料的课程。该课程主要介绍了多种常见生物材料的结构、性质、制备、应用以及生物材料研究的最新进展等。

Biomaterials are a class of high technology materials for diagnosis, repairing and the enhancement of the functions of human tissues and organs. This course is an elective major course. It mainly introduces the principle, preparation, properties, and applications of various common biomaterials, as well as the latest development of biomaterials research.

16. 预达学习成果 **Learning Outcomes**

了解生物材料的背景知识以及制备组装常用生物材料的技术；掌握通用评价生物材料的基本技术；理解设计生物材料的基础知识和原理。

Understand the background knowledge of biomaterials  
 Routine techniques or methods to fabricated commonly used materials in medicine  
 Master the commonly used techniques to evaluate the performance of Biomaterials.  
 Understand the fundamental knowledge and principles for the design of biomaterials

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: Properties of Materials(3 credit hours): Common applications of biomaterials; Biomaterials research in industry; Bulk and surface properties of materials; A few characterization techniques for biomaterials.

第一讲： 生物材料基本性质（3 学时）： 生物材料一般应用；生物材料在工业方面研究； 材料的本体及表面性质； 几种生物材料表征手段。

Lecture 2: Introduction of various types of biomedical materials I(1 credit hours): metal and ceramic based biomaterials;

第二讲： 生物医用材料介绍 I（1 学时）： 金属及陶瓷相关生物材料。

Lecture 3: Introduction of various types of biomedical materials II(2 credit hours): Polymeric materials-Synthetic polymers, Nature polymers; Polymer architecture (linear polymers, star polymers, dendrimers, cross-linking polymers, elastomers, polyelectrolytes, hydrogels).

第三讲： 生物医用材料介绍 II（2 学时）： 高分子相关生物材料：合成高分子，天然高分子；高分子艺术（线性高分子，星型高分子，树枝状高分子，交联高分子，弹性体，高分子电解质，水溶胶）。

Lecture 4: Nature Biomaterials(2 credit hours); General properties, Proteins, Extracellular matrix (ECM), Collagen.

第四讲： 天然生物材料（2 学时）： 一般性质，蛋白，细胞外介质，胶原蛋白。

Lecture 5: Surface Modification of Biomaterials(2 credit hours): Plasma discharge, Chemical vapor deposition, Chemical modifications, Self-assembled monolayer, surface modification through biological compounds' interactions.

第五讲：生物材料表面修饰（2 学时）：等离子放电，化学气相沉积，多种化学修饰，自组装单层膜，利用生物化合物的相互作用进行修饰。

Lecture 6 : Introduction of background knowledge and concepts in biology and medicine (4 credit hours): Biocompatibility, Structures and properties of amino-acid chains, Cell structures, Common material in membranes, mitochondria, and nucleus.

第六讲：生物和药物的背景知识和概念（4 学时）：生物相容性，氨基酸的结构和性质，细胞结构，在细胞膜，线粒体以及细胞核中的共同生物物质。

Lecture 7: Host actions of biomaterials and their evaluations I(2 credit hours): Host Response to Material Implantation, Types of Immunity, Innate Immune response, Host Defense, Role of Macrophages and Neutrophils, Role of other Leukocytes.

第七讲：生物材料的行为及其评价手段 I（2 学时）：主体对材料植入的反应，免疫类型，先天免疫反应，宿主防御，巨噬细胞和中性粒细胞的功用，其他白细胞的功用。

Lecture 8: Host actions of biomaterials and their evaluations II(2 credit hours): Foreign Body Reaction, Fibrosis and Fibrous Encapsulation, Immune Response to Biomaterials, Wound Healing and the Presence of Biomaterials, Repair vs. Regeneration.

第八讲：生物材料的行为及其评价手段 II（2 学时）：异物反应，纤维化和纤维包覆，对生物材料的免疫反

应，伤口愈合和生物材料的存在，修复与再生。

Lecture 9: Testing biomaterials' biocompatibility (2 credit hours): Introduction, In vitro assessment of tissue compatibility, In vivo assessment of tissue compatibility, Testing of blood-materials interactions.

第九讲：生物材料生物相容性测试（2学时）：一般介绍，组织相容性的体外评估，组织相容性的体内评估，血液 - 材料相互作用的测试。

Lecture 10: Degradation of Materials in the Biological Environment (2 credit hours) : Introduction, Chemical and biochemical degradation of polymers, Degradative effects of the biological environment on metals and ceramics, Pathological calcification of biomaterials.

第十讲：在生物环境的材料降解（2学时）。一般介绍，高分子材料的化学以生物化学降解，金属和陶瓷在生物环境下的降解效应，生物材料的生理钙化效应。

Lecture 11: Students' presentation (4 credit hours) .

第十一讲：学生关于生物材料的口头报告（4学时）

Lecture 12: Introducing the general design principle of drug delivery materials (4 credit hours).

第十二讲：以药物载体为例讲授生物材料设计原理和实例（4小时）。

Lecture 13 Review(2 credit hours);

第十三讲：复习（2学时）

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

Text Book: Biomaterials Science, 3rd Edition, ISBN: 9780123746269, 2012.

References: Notes handed out by lectures

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				
小测验 Quiz		20		
课程项目 Projects		20		
平时作业 Assignments		20		

期中考试 Mid-Term Test				
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**

<input checked="" type="checkbox"/> A. 十三级等级制 <b>Letter Grading</b> <input type="checkbox"/> B. 二级记分制（通过/不通过） <b>Pass/Fail Grading</b>
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**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

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