

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	工程力学基础 Fundamentals of Engineering Mechanics
2.	授课院系 Originating Department	生物医学工程系 Biomedical Engineering
3.	课程编号 Course Code	BMEB217
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业基础课 Major Foundational Courses
6.	授课学期 Semester	秋季 Fall
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)	张明明, 生物医学工程系, zhangmm@sustech.edu.cn Mingming Zhang, Biomedical Engineering, zhangmm@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	MA117				
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

通过课程内容的讲授和对力学基础概念、分析方法及其应用的介绍，使学生掌握力学关键概念及其在生物医学工程领域的分析方法，提高学生解决实际力学及相关生物力学问题的能力。

By the introduction of the basic concepts, analytical methods and applications of mechanics, students can thoroughly understand the key concepts of mechanics and how to use them in the field of biomedical engineering, and they will be able to solve some general problems in mechanics especially in biomechanics.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，使学生 1、了解和掌握质点、质点系和刚体运动的基本规律和研究方法，为后续相关课程的学习奠定理论基础；2、初步学会应用理论力学的理论和方法分析、解决一些简单的工程实际问题；3、初步理解运动生物力学的理论和方法；4、培养学生在生物医学工程领域内，用力学的方法提出问题、分析问题、解决问题的能力。

By completing this course, students will 1) understand the basic laws and research methods of particle, particle system and rigid body motion, lay a theoretical foundation for the subsequent study of relevant courses; 2) preliminarily analyze and solve some simple engineering problems applying theoretical mechanics; 3) basically understand the theory and methods of sports biomechanics; and 4) cultivate the ability to raise, analyze and solve problems by means of mechanics in the field of biomechanics.

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 (2 学时)

力学基本原理（基本概念、单位、数值计算）、力向量（向量运算、位置向量、力向量）、质点平衡（受力分析图、质点平衡条件）

General principles (fundamental concepts, units of measurement, numerical calculation), Force vectors (vector operation, position vector, force vector), Equilibrium of a particle (free body diagram, condition for the equilibrium of a particle)

Section 2 (2 学时)

力矩（力矩的标量和向量表达、关于某轴的力矩、力矩原理）、力系的合成及其等效力（力的简化）

Moment (moment scalar and vector formulation, moment about a specified axis, principle of moments), Force system resultants and equivalent system (simplification of the force and couple system)

Section 3 (2 学时)

刚体的平衡（刚体的平衡条件、平衡方程、二力杆和三力杆）

Equilibrium of rigid bodies (condition and equations for the equilibrium of the rigid body, two force member, three force member)

Section 4 (2 学时)

桁架分析（关节法、零力杆、截面法）

Truss analysis (method of joints, zero-force member, method of sections),

Section 5 (2 学时)

摩擦力及相关静力学问题（三种静摩擦力问题及平衡方程和摩擦力方程）

Friction and relevant static problems (equations of equilibrium and frictional equations of three dry friction problems)

Section 6 (2 学时)

虚功原理及应用（虚功原理的概念以及面对静力学问题的应用）

Virtual work and its application (concepts of the principle of virtual work, and how it can be used to solve static problems)

Section 7 (2 学时)

静力学在生物医学工程领域的应用

Applications of statics in the field of biomedical engineering

Section 8 (2 学时)

习题/辅导/讨论

Tutorials

Section 9 (4 学时)

质点运动学（直线运动、曲线运动、三种坐标系运动描述方法、二质点绝对运动分析和相对运动分析）

Kinematics of a particle (rectilinear kinematics, curvilinear motion, motion analysis using three coordinate frames, absolute motion analysis of two particles, and relative-motion of two particles using translating axes)

Section 10 (4 学时)

质点动力学：力和加速度、功和能（牛顿第二定律、运动方程、不同坐标系的运动方程、质点功能原理、质点能量守恒）

Kinetics of a particle: force and acceleration, work and energy (Newton's second law, equations of motion, motion equations using three different coordinate frames, the principle of work and energy of a particle, conservation of energy of a particle)

Section 11 (4 学时)

质点动力学：冲量和动量（质点的线冲量和动量原理、动量守恒、冲击、角冲量和动量原理、力矩和角

动量的关系)

Kinetics of a particle: impulse and momentum (the principle of linear impulse and momentum, conservation of the linear momentum for a system of particles, impact, angular momentum, relation between moment of a force and angular momentum, the principle of angular impulse and momentum)

Section 12 (4 学时)

刚体运动学 (一般平面运动、绝对运动分析、相对运动分析、零速度点、相对加速度方程, 基于旋转轴的相对加速度方程)

Kinematics of a rigid body (general plane motion, absolute motion analysis, relative motion analysis, instantaneous center of zero velocity, relative-motion acceleration, relative-motion analysis using rotating axes)

Section 13 (4 学时)

刚体动力学: 力和加速度、功和能 (转动惯量、平面运动方程、平移运动方程、定轴转动运动方程、一般平面运动运动方程、功能原理、能量守恒原理)

Kinetics of a rigid body: force and acceleration, work and energy (mass moment of inertia, planar kinetic equations of motion, equations of translational motion, equations of motion for general plane motion)

Section 14 (4 学时)

刚体动力学: 冲量和动量 (线冲量和动量定理、角冲量和动量定理、刚体动量平衡)

Kinetics of a rigid body: impulse and momentum (the principle of linear impulse and momentum, the principle of angular impulse and momentum, conservation of momentum for the rigid body)

Section 15 (4 学时)

运动学、动力学在生物医学工程领域的应用

Applications of kinematics and dynamics in the field of biomedical engineering

Section 16 (4 学时)

习题/辅导/讨论

Tutorials

Final examination

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

1. R.C.Hibbeler, Engineering Mechanics: Statics 12e
2. R.C.Hibbeler, Engineering Mechanics: Dynamics 12e

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		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				
平时作业		20		让学生回顾并总结学习的学习

Assignments			内容以及学习收获; Ask students to summarize the course and their results.
期中考试 Mid-Term Test			
期末考试 Final Exam	60		通过期末考试形式, 考试内容与课堂学习内容相关, 考察学生对课程知识理解程度; Test the students' understanding of the course knowledge through a final exam, of which contents will be highly related to the course.
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