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**	生物医学工程设计（二） Biomedical Engineering Design II
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**	BMEB423
4.	**课程学分 Credit Value**	4
5.	**课程类别 Course Type**	专业必修课 Major Required Courses
6.	**授课学期 Semester**	春季 Spring
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）**	责任教师：彭诚，教学工程师，pengc@sustc.edu.cn PENG Cheng, Engineer, pengc@sustc.edu.cn 学术导师：生物医学工程系所有老师均参与指导
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	32		64		96

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	生物医学工程设计（一） Biomedical Engineering Design 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.	

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

生物医学工程设计是生物医学工程专业学生的“顶点”设计课程，共两学期。在本课程中，学生们设计有创新性的生物医学器件、系统或产品，能够满足一系列预设的标准。学生需要考虑设计的各个方面并将其推向市场。本学期是第二个学期，学生将继续上个学期的设计，更加侧重于工程设计和样机研发和测试。在学期结束时，学生可以完成原型机制作和相应的验证。
在完成设计过程中，学生将

1.具有清晰的思维、表达和写作的能力
2.具有敢于创新的能力
3.具有以批评的方式系统地推理的能力
4.具有与他人合作的能力
5.具有分析和解决复杂工程问题的能力
6.针对以上 1-5 项，提交书面文件和口头报告
7.理解现实世界中伦理的含义
8.明白知识产权在现代竞争社会中的重要性

Biomedical Engineering Design is the "Capstone" project experience of biomedical engineering students. The overarching goal of this two-semester class sequence is for you to design a novel biomedical device/system/product that satisfies a set of pre-defined criteria. This semester is a continuation of the work the students started during the first semester, with more emphasis on engineering design, prototype development and testing. By the end of the semester, the students will have produced multiple prototypes, and conduct the verification of their design.
During this course, the students will design and build a novel biomedical device/system/product and consider all issues of bringing such a device/system/product to market, so as to

1. Think clearly and write clearly
2. Innovate
3. Reason systematically in a critical manner
4. Work in cooperation with others
5. Analyze and solve complex engineering problems
6. Deliver written documentation and oral presentations of items 1-5
7. Understand the ethical implications of engineering in real world
8. Understand importance of intellectual property in the modern competitive world

16. 预达学习成果 Learning Outcomes

完成本课程后，学生将可以：
1. 在现实约束条件下（如经济、环境、社会、政治、伦理、健康和安全性、可制造性及可持续发展性）设计系统、原件或流程，以满足预定需求；
2. （研究）能够基于科学原理并采用科学方法对复杂工程问题进行研究，包括设计实验、分析与解释数据、

并通过信息综合得到合理有效的结论。
3. （使用现代工具）能够针对复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。
4. （工程与社会）能够基于工程相关背景知识进行合理分析，评价专业工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。
5. （沟通）能够就复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。
6. （项目管理）理解并掌握工程管理原理与经济决策方法，并能在多学科环境中应用。
7. （终身学习）具有自主学习和终身学习的意识，有不断学习和适应发展的能力。

Upon completion of this course, the students should be able to:
1. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Carry on the reasonable analysis based on the engineering background knowledge, evaluate the influence of solutions to professional engineering practice and complex engineering on social, health, safety, law and culture, and understand the responsibility.
5. Communicate effectively.
6. Understand and master engineering management principles and economic decision-making methods, and be applied in a multidisciplinary environment.
7. Have the recognition of the need for and engage in life-long learning.

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.)

学生选择本系一位教授为学术导师，每周需要与学术导师进行 30-60 分钟的项目进展讨论、交流，并且做好记录。在期中和期末进行项目口头汇报，在期末提交项目中期研究报告/论文。

在本学期末，学生应当完成设计，并提供交付内容；交付内容可以是产品、模型、软件和设计图纸等；并完整最终报告和展示。

学术还需要参加工学院组织的综合设计讲座，内容包含学生在进行产品设计可能碰到的各种实际问题，如生产管理与供应链、Business Principles and Key Trend、知识产权、工程伦理与专业素质培养等。

Every student needs to find a faculty advisor. Throughout the term, students need to have a design review meeting with their faculty advisors per week. During the meetings students need to present their project work to that time as well as the plans moving forward. All the presentation and discussion in the design review meetings should be well recorded by students. All students need to give mid-term and final presentations by the midpoint and the final of the semester.

At the end of this semester, students should complete their design and provide deliverables, which could be products, prototypes, software or design drawing etc., as well as final report and presentation.

A series of lectures will be provided to the students by College of Engineering, aiming to introduce the common information in product design and commercialization, such as production management and supply chain, business principles and key trend, intellectual property, engineering ethics and professional quality training etc.

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

教材为各老师课件 No fixed textbook. The professors' lecture slides will be used as references.

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				
课堂表现 Class Performance				
小测验 Quiz		20		
课程项目 Projects				
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
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)		项目汇报（20%） 专业表现（20%） 技术表现（10%） 研究报告和展示（30%）		

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

具体评分标准：

序号	项目	内容	分数	参评人员
1	项目汇报	期中与期末 PPT 口头汇报	20	导师、责任教师、学生参加评分，导师+责任教师+占 50%，学生占 50%
2	课堂测验	参加系列讲座以及 系列讲座课堂测验	20	责任教师（课堂测验与出勤各占 12 分，特殊情况可以补考）
3	专业表现	参加每周项目汇报 项目交流与讨论	20	学术导师
4	技术表现	创造力，分析能力，设计能力和综合能力	10	学术导师、责任教师
5	研究报告和展示	项目结题研究报告/论文，展示/讲解/演示	30	学术导师、责任教师
	总分		100	