

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	智能医学工程导论 Introduction to Intelligent Medical Engineering
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	BMEB112
4.	课程学分 Credit Value	2
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	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)	蒋兴宇, 讲席教授, 生物医学工程系 Xingyu Jiang, Chair Professor jiang@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
	32				32
学时数 Credit Hours					
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

本课程是智能医学工程专业的导论课程，旨在向学生介绍智能医学工程专业的学业内容、基本理论和技术，以及相关的应用领域，目的是使学生了解和掌握智能医学工程的基本概念和方法，为今后的更高级课程的学习奠定良好的基础。

This course is for the introduction of the major of Intelligent Medical Engineering, aiming to introduce students the contents of this major, the study plan, basic principles, medical techniques, and representative applications. The students will learn and master the basic concepts and methodologies of the major after finishing this course. It serves as the basis for future higher level courses in this major.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生将了解智能医学工程专业的学习、研究内容，掌握各个学习模块的基本原理及其与应用实践的关系。具体的，学生将掌握以下知识点：基本的医学知识、现代医学技术、计算机数据分析方法在医学上的应用、人工智能的基本概念、以及智能医学的伦理道德。

After completing this course, students will get an idea of the contents of the major of Intelligent Medical Engineering, and learn the basic principles of different modules that going to learn in this major. Briefly, the students will learn the basic knowledges of : basic medical knowledge, modern medical techniques, computer-based data processing and its application in medicine, basics of artificial intelligent, and ethics of intelligent medicine.

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.)

本课程按照本专业的培养方案，计划从 4 个模块进行介绍，包括：现代医学技术模块、计算机数据分析模块、人工智能模块、以及智能医学人文模块。

1. 智能医学工程的基本概念：介绍智能医学工程的基础知识和内涵扩展，包括智能医学工程的历史沿革、发展现状、应用领域、基于的技术、代表性产品及发展趋势；2 学时

2. 现代医疗技术：10 学时

3.1 介绍现代医疗诊断设备：介绍 MRI, CT, 超声等现代医疗设备；4 学时。

- 3.2 介绍现代医疗治疗手段，包括血管再通、放疗、化疗、电疗、微创/无创手术等；4 学时。
- 3.3 医疗机器人，介绍机器人技术在现代医学的应用；2 学时。
- 3. 计算机技术应用于智能医学：6 学时
 - 4.1 介绍计算机技术的起源及其在医学应用的历史；2 学时。
 - 4.2 计算机医学图像处理；包括图像与模式识别、医学影像辅助决策等；2 学时。
 - 4.3 计算机大数据分析概述与案例；介绍医疗大数据对疾病早发现、诊断、及治疗的作用；2 学时。
- 4. 人工智能概述：12 学时
 - 5.1 人工智能的基础理论，介绍其历史、研究方法与应用领域；2 学时。
 - 5.2 人工智能临床辅助诊断；2 学时。
 - 5.3 人工智能与药物研发；4 学时。
 - 5.4 智能基因测序；2 学时
 - 5.5 人机交互；2 学时
- 5. 智能医学工程人文概述：介绍相关医学伦理，人工智能+医疗的产业化及未来发展趋势分析，2 学时

This course will introduce the basics about basic medics, computer-based medical data analysis, artificial intelligent and its application in medicine, and the ethics of intelligent medical engineering.

- 1. Introduction of intelligent medical engineering: the basic principle of intelligent medical engineering, including its history, state-of-art, application fields, the technologies, representative application and its future. 2 hours.
- 2. modern medical technologies: 10 hours
 - 2.1 modern diagnosis devices: introduce MRI, CT, ultrasound imaging, et-al; 4 hours.
 - 2.2 Introduce the modern therapeutic techniques, including vascular stent, radiology therapy, chemical therapy, electrical therapy, and minimal invasive surgery, et-al. 4 hours.
 - 2.3 medical robotics: overview the development of medical robots and its typical application. 2 hours.
- 3. computer technologies and applications in intelligent medicine, 6 hours
 - 3.1 introduce the basics of computer technology and its application in medicine, 2 hours.
 - 3.2 computer-based medical image processing, including image segmentation, feature extraction, and computer-aided diagnosis. 2 hours.
 - 3.3 introduction to big data, the application of big data in intelligent medicine, including early diagnosis, and therapy. 2 hours.
- 4. Overview of artificial intelligent (AI), 12 hours
 - 4.1 basic principles of artificial intelligent, its history, methodology and application. 2 hours.
 - 4.2 AI for clinical diagnosis, 2 hours
 - 4.3 AI for drug development, 4 hours.
 - 4.4 AI for gene sequencing, 2 hours.
 - 4.5 Human-machine interaction, 2 hours.
- 5. Ethics and the future of intelligent medical engineering, the industry of intelligent medical engineering. 2 hours.

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

Frontiers of Intelligent Medical Engineering, Editors: Dong Ming, Feng He, Zhe Liu. ISBN 978-981-15-8147-2, First Edition, 2021.

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		10		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		40		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		40		
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