课程大纲

COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**医疗机器人技术/ Medical Robotics Technology**
2.	**课程性质** **Compulsory/Elective**	选修课/Elective
3.	**开课单位** **Offering Dept.**	电子及电气工程系 Electrical and Electronic Engineering
4.	**课程学分/学时** **Course Credit/Hours**	3 学分/48 学时 3 Credit/48 Hours
5.	**授课语言** **Teaching Language**	中 CN
6.	**授课教师** **Instructor(s)**	郭书祥/ Shuxiang GUO
7.	**开课学期** **Semester**	春季/Spring **Semester**
8.	**是否面向本科生开放** **Open to undergraduates or not**	**否/No**
9.	**先修要求** **Pre-requisites**	无/No
10.	**教学目标** **Course Objectives**	
	本课程以临床需求为导向，主要介绍多种医疗机器人的研究现状、关键技术、典型应用和发展前景，具体包括医疗机器人的定义和分类、基本原理和关键技术、工程研究和临床应用等。通过本课程的学习使学生能够掌握医疗机器人的基础知识，能够熟悉、使用、研究和设计医疗机器人。通过课程学习对本学科医疗机器人的基础知识、机构组成、控制方法、应用前景的介绍，可以使学生了解本学科的发展动态和技术前沿，可以提高学生对医疗机器人开发技术的认识，为学生走上工作岗位从事医疗器械设计、研发奠定必要的基础，使学生对医学电子工程相关工作的适应能力得以增强。 （1）本课程体系化地介绍多种医疗机器人研究和应用的主要难题以及解决办法。 （2）详细介绍血管介入手术机器人、消化道胶囊机器人、上肢康复机器人的整体设计、控制系统、特性评价等，从临床需求、系统结构、控制策略、性能评价和验证多个方面完成对三种机器人系统的研究。 （3）简要介绍腹腔镜手术机器人、骨科手术机器人、神经外科手术机器人、专科机器人的研究现状和相关技术	

his course is guided by clinical needs and mainly introduces the research status, key technologies, typical applications, and development prospects of various medical robots, including the definition and classification of medical robots, basic principles and key technologies, engineering research, and clinical applications. Through the study of this course, students can master the basic knowledge of medical robots and become familiar with, use, research, and design medical robots. By introducing the basic knowledge, institutional composition, control methods, and application prospects of medical robots in this discipline through course learning, students can understand the development trends and technological frontiers of this discipline. Through the study of this course, students' understanding of the development technology of medical robots can be improved, laying a necessary foundation for them to embark on work positions and engage in medical device design and research and development, and enhancing their adaptability to medical electronic engineering related work.

(1) This course systematically introduces the main challenges and solutions in the research and application of various medical robots.

(2) Provide a detailed introduction to the overall design, control system, and characteristic evaluation of vascular intervention surgery robots, gastrointestinal capsule robots, and upper limb rehabilitation robots. Conduct research on the three robot systems from multiple aspects such as clinical requirements, system structure, control strategies, performance evaluation, and validation.

(3) Briefly introduce the research status and related technologies of laparoscopic surgical robots, orthopedic surgical robots, neurosurgical surgical robots, and specialized robots.

11. 教学方法
Teaching Methods

讲课/报告/项目 Lecture/Report/Project

12. 教学内容
Course Contents

Section 1 - Section 3	医疗机器人的概况和基础知识 1-3 Overview and Basic Knowledge of Medical Robotics 1-3
Section 4 - Section 5	医疗机器人的历史与发展现状 1-2 The History and Development Status of Medical Robots 1-2
Section 6 - Section 7	医学机器人的理论基础 1-2 Theoretical Foundations of Medical Robotics 1-2
Section 8 - Section 9	医疗机器人的控制技术和研究课题 1-2 Control Technology and Research Topics for Medical Robots 1-2
Section 10	血管介入手术机器人的整体设计、控制系统、特性评价 The overall design, control system, and characteristic evaluation of vascular intervention surgical robots
Section 11	血管介入手术机器人的控制策略、安全性能评价和临床验证

		Control Strategy, Safety Performance Evaluation, and Clinical Validation of Vascular Interventional Surgery Robot
	Section 12	消化道胶囊机器人的整体设计、控制系统、特性评价 The overall design, control system, and characteristic evaluation of the digestive tract capsule robots
	Section 13	康复机器人的整体设计、控制系统、特性评价方法和课题 The overall design, control system, characteristic evaluation methods and topics of rehabilitation robots
	Section 14	上肢康复机器人的远程控制策略、安全性能评价和技术挑战 Remote control strategy, safety performance evaluation, and technical challenges of upper limb rehabilitation robots
	Section 15	腹腔镜手术机器人、骨科手术机器人、神经外科手术机器人、专科机器人的研究现状和相关技术 Research status and related technologies of laparoscopic surgical robots, orthopedic surgical robots, neurosurgical surgical robots, and specialized robots
	Section 16	Final report 课程期末结题报告
13.	**课程考核** **Course Assessment**	
	课程报告+项目 Report+Project	
14.	**教材及其它参考资料** **Textbook and Supplementary Readings**	
	主要参考书 Main Textbook 作者：郭书祥，石立伟．书名：医疗机器人技术[M]．ISB: 9787122433787, 出版地：北京：出版社：化学工业出版社，出版年 2023. 作者：郭书祥，石立伟．书名：血管介入手术机器人[M]．ISB: 9787122421845,出版地：北京：出版社：化学工业出版社，出版年 2022. **其他参考资料 Supplementary Readings** 作者：特罗卡思，翻译：段星光．书名：医疗机器人[M]．出版地：北京：出版社：北京理工大学出版社发行社，出版年 2015. 作者：福田敏男．书名：微纳机器人操控系统及其应用-纳米科学与技术[M]．出版地：北京：出版社：科学出版社发行部，出版年 2014.	