**《医学超声基础》课程教学大纲（2020版）**

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| 课程基本信息（Course Information） | | | | | | | | | | |
| 课程代码（Course Code） | BI268 | | | \*学时（Credit Hours） | | 32 | | \*学分（Credits） | | 2 |
| \*课程名称（Course Name） | （中文）医学超声基础 | | | | | | | | | |
| （英文）The Fundamental of Medical Ultrasound | | | | | | | | | |
| 课程类型 (Course Type) | 专业选修课 | | | | | | | | | |
| 授课对象（Target Audience） | 生物医学工程专业本科二年级、三年级学生 | | | | | | | | | |
| 授课语言 (Language of Instruction) | 全中文 | | | | | | | | | |
| \*开课院系（School） | 生物医学工程学院 | | | | | | | | | |
| 先修课程（Prerequisite） | 大学物理，数字电路 | | | | 后续课程 (post） | 无 | | | | |
| \*课程负责人（Instructor） | 牛金海 | | | | 课程网址 (Course Webpage) |  | | | | |
| \*课程简介（中文）（Description） | （中文300-500字，含课程性质、主要教学内容、课程教学目标等）  医学超声基础是一门结合理学，工程技术，医学，生物科学等的交叉学科，是生物医学工程的一个重要研究领域。本课程主要介绍超声基础方面的理论知识，其中包括声波的反射、透射、衍射、散射、生物效应等基础知识。为适应近年来超声学在生物医学领域的发展与应用，课程中将包括压电效应以及超声换能器，声场计算，超声诊断，超声成像，超声多普勒，超声治疗，高强度聚焦超声，超声无损测温，高频超声等内容以及医学超声的最新进展等内容。  通过本课程的学习，学生将掌握医学超声的基础知识，掌握医学超声设备的工作原理，具备将医学超声应用到科研，临床，工业界的能力，并具开展医学超声新应用，开发新型设备的潜质。 | | | | | | | | | |
| \*课程简介（英文）（Description） | （英文300-500字）  Biomedical Ultrasound is a cross subject, include physics, engineering, medicine and biology et al. It is a very important research field in biomedical engineering. In this education, the basic knowledge of acoustic is introduced, which includes reflection, scattering, transmit et al. In addition, Piezoelectricity, ultrasound transducer, Ultrasound diagnostic, Doppler，ultrasound therapy, High Intensity Focused Ultrasound, ultrasound imaging and high frequency ultrasound are introduced here. Recent progress in biomedical ultrasound field is also included in this course.  With this course，students will have the basic knowledge of biomedical ultrasound, will have the ability to apply it to research ,clinical,and industrial ,they also will have the ability to develop new application and instruments. | | | | | | | | | |
| 课程目标与内容（Course objectives and contents） | | | | | | | | | | |
| \*课程目标 (Course Object) | LO1. To teach students the basic conceptions of medical ultrasonic wave （A3，B2，C5，D1）  LO2. To teach students the key principles and technology of ultrasound in medical diagnosis and therapy（A3，B2，C5，D1）  LO3.To provide hands-on experience with a digital B-ultrasonic diagnostic instrument（A3，B2，C2，D1）  LO4. To develop ability to apply math，physics，digital/analog circuit etc in biomedical ultrasound （A3，B3，C5，D1）  LO5. To have potential ability for future education or job in biomedical ultrasound field（A3，B2，C5，D2）  Student Outcome 1  Performance Indicator 1-1will be addressed by LO1, LO2, LO4;  Student Outcome 2  Performance Indicator 2-2will be addressed by LO3,LO4 and LO5;  LO1 is assessed by homework and exam;  LO2 is assessed by homework and exam.  LO3is assessed by experiment and exam;  LO4is assessed by experiment and exam.  LO5is assessed by homework,experiment and exam.  Notes:  SO1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics  SO2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors  上海交通大学本科人才培养目标：http://jwc.sjtu.edu.cn/web/sjtu/198052-1980000007282.htm | | | | | | | | | |
| 毕业要求指标点与课程目标的对应关系 | 课程目标 | | | | | 毕业要求指标点 | | | | |
| 课程目标1 | | | | | 毕业要求1，3，5，11 | | | | |
| 课程目标2 | | | | | 毕业要求1，3，5，11 | | | | |
| 课程目标3 | | | | | 毕业要求1, 2, 3, 4, 5, 7, 11 | | | | |
| 课程目标4 | | | | | 毕业要求1, 2, 3, 4, 5, 7, 11 | | | | |
| 课程目标5 | | | | | 毕业要求1, 2, 3, 4, 5, 7, 11 | | | | |
| \*教学内容进度安排及对应课程目标 (Class Schedule & Requirements & Course Objectives) | 章节 | 教学内容（要点） | 教学目标 | | 学时 | 教学形式 | 作业及考核要求 | | 课程思政融入点 | 对应课程目标 |
| 1绪论 | 医学超声介绍 | 了解本课程的基本内容和基本概念 | | 4 | 课堂 | 书面作业，参见word文档 | | 培养学生广阔视野 | LO1 |
| 2医学超声物理基础 | 折射，反射，聚焦等 | 掌握医学超声的物理基础 | | 6 | 课堂 | 书面作业，参见word文档 | | 培养学生一丝不苟、认真严谨的工作作风 | LO2 |
| 3医学超声诊断原理 | A超，B超，M超，D超 | 掌握医学超声成像诊断仪的额原理 | | 10 | 课堂 | 书面作业，参见word文档 | | 培养学生一丝不苟、认真严谨的工作作风 | LO2,LO3 |
| 4医学超声治疗原理 | HIFU，相控聚焦，超声碎石机等 | 掌握医学超声治疗的原理 | | 6 | 课堂 | 书面作业，参见word文档 | | 培养学生一丝不苟、认真严谨的工作作风 | LO3,LO4 |
| 5成像实验 | B超测量，伪像等 | 实践医学超声工作原理以及伪差的形成机制 | | 4 | 实验室 | 实验报告 | | 培养学生一丝不苟、认真严谨的工作作风 | LO4,LO5 |
| 6复习考试 | 总复习 | 融会贯通本学期课程 | | 2 | 闭卷笔试 | 闭卷笔试 | | 培养诚信 | LO4,LO5 |
| 注1：建议按照教学周周学时编排，以便自动生成教学日历。  注2：相应章节的课程思政融入点根据实际情况填写。 | | | | | | | | | |
| 课程目标达成度评价 | 课程目标  考核方式 | | | | 平时作业(20分) | 课程项目 (30分) | 期末考试（50分） | | 课程目标权重 | 课程目标达成度 |
| 见附表 | | | |  |  |  | |  |  |
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| \*考核方式 (Grading) | 1. 平时成绩占55%：包括   1）平时作业完成质量，作业交流15%，  2）文献阅读，资料调研，课程建设参与度15%，  3）大作业20%；  4）课堂表现，出勤率等5%；   1. 期末闭卷笔试占30%； 2. 实验及报告占15%：实验的设计，参与度，报告质量等； | | | | | | | | | |
| \*教材或参考资料 (Textbooks & Other Materials) | 教材：  超声原理以及生物医学工程应用，牛金海，上海交通大学出版社，2017年1月，ISBN978-7-313-16087-4，使用3届，中文教材，非国家规划。  参考资料：   1. 声学及医学超声，王鸿樟，上海交通大学出版社，1991 2. 超声诊断设备原理与设计，冯若，中国医药科技出版社，1993   2. 超声医学基础教程，马琳孙冬梅，原子能出版社，1995  3. 医学超声成象机理，白净，清华大学出版社,1998  4. Ultrasound in Medicine Medical Science Series，Duck, Francis A.Bristol ; Philadelphia, Pa. Institute of Physics Publishing, 1998.  5. Medical Imaging Physics，Hendee, William R.; Ritenour, E. Russell,New York John Wiley & Sons, Inc. (US), 2002. | | | | | | | | | |
| 其它（More） |  | | | | | | | | | |
| 备注（Notes） |  | | | | | | | | | |
| 备注说明：  1．带\*内容为必填项。  2．课程简介字数为300-500字；课程大纲以表述清楚教学安排为宜，字数不限。 | | | | | | | | | | |

附表：课程目标达成度评价

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| **Summary of the Attainment of LOs** | | | | | | |
| Learning Outcomes     Assignments Weight | | LO1 | LO2 | LO3 | LO4 | LO5 |
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| Homeworks | 30% | 94.7% | 94.7% | 94.7% | 94.7% | 94.7% |
| Lab and Report | 20% | 94.7% | 94.7% | 94.7% | 94.7% | 94.7% |
| Attendance & class participation |  |  |  |  |  |  |
| Final Exam | 50% | 68.4% | 68.4% | 68.4% | 68.4% | 68.4% |
| Total | 100% |  |  |  |  |  |
| Weighted averages | | 81.6% | 81.6% | 81.6% | 81.6% | 81.6% |