中南民族大学
SOUTH-CENTRAL MINZU UNIVERSITY

适用于生物医学工程学院2025级本科生

生物医学工程学院

本科专业人才培养方案

（生物医学工程专业生物材料与组织工程实验班）

2025 年 5 月

目 录

生物医学工程学院简介

生物医学工程学院成立于2009年，前身可追溯至上世纪八十年代初期成立的生物磁学研究所。经过三十多年的建设，生物医学工程学科建成为国家民委重点学科，培养了大量的本科生、研究生，其中65%以上来自少数民族地区，为民族地区社会经济发展做出了重要贡献。

通过长期的建设，学院形成了符合生物医学工程学科特点——“交叉性和综合性”的师资队伍。现有来自于7个不同一级学科的专任教师39名，其中教授10人，副教授13人，硕士生导师30人，专任教师中95%具有博士学位。入选“湖北省名师工作室”1个、中科院“百人计划”1人、湖北省 “百人计划”1人、楚天英才计划1人、国家民委中青年英才计划2人、湖北省优秀青年骨干计划1人、“3551”光谷创业人才计划1人。设有生物医学基础部、医疗电子系和医学信息系3个系部，1个实践教学与创新活动中心。

学院有生物医学工程、医学信息工程和智能医学工程3个本科专业，1个生物医学工程一级学科硕士点（含工学、理学），在校本科生近1200人，硕士研究生200余人。生物医学工程专业为国家级一流专业建设点、省级品牌专业，并入选省级“战略性新兴产业”培养计划和“荆楚卓越工程师” 培养计划，医学信息工程为省级一流专业建设点。学院现有湖北省生物医学工程虚拟仿真实验中心、湖北省服务外包人才培养（训）基地，以及医学传感器、生物医学信号检测、医疗仪器、虚拟仪器、课程设计、学生创新设计等专业实验室；建有东湖高新区高科医疗器械园、湖北省肿瘤医院、解放军中部战区总医院等实践教学基地。学院与东湖高新区高科医疗器械园合作培养卓越工程人才，与美国佛罗里达理工大学合作，按“2+2”模式培养国际创新人才。近5年来，学院学生在“全国大学生生物医学电子创新设计竞赛”、“全国大学生电子竞赛”、“全国大学生数学建模竞赛”、“蓝桥杯全国计算机软件大赛”等学科竞赛中获国家级、省（部）级奖励200余项；获得国家级和省级大学生创新科研项目立项10余项。

学院现有医学信息处理与肿瘤诊疗湖北省重点实验室和认知科学国家民委重点实验室2个省部级重点实验室；形成了膜离子通道结构、功能及生理建模、生物医学信号检测与处理、视觉认知计算与医学图像处理、生物医学传感与仪器

等 4 个具有学科特色的研究方向。实验室购置了 128 导脑功能成像系统、激光共聚焦显微镜、双通道膜片钳系统等先进设备。

学院以神经工程为核心，从微观到宏观，从分子、细胞和整体水平，探索神经系统活动的基本规律。在离子通道功能和神经递质释放、脑电和肌电信息检测与解析、医学成像和医学图像处理、医学人工智能、生物医学传感与医学仪器等方面的研究上形成了自己的特色。先后承担国家自然基金重大研究计划项目、面上项目、青年项目，以及省部级项目 60 余项，在国内外重要学术期刊上发表 SCI、EI 收录学术论文 160 余篇，获专利授权和软件著作权 80 余项，获省部级奖励 3 项。

学院秉承“医工融合、志惠民生”的办学理念，致力于学生创新能力和自我素质的提高，以学风院风建设为重点，通过完善课程体系，革新教学内容，强化工程实践，充分调动学生学习的积极性、主动性和创造性，提高了人才培养质量。多年来，学院就业率和就业质量稳居学校前列，连续 3 年被评为学校就业标兵单位，本科生升学率连续 3 年超过 35%。

Introduction to the College of Biomedical Engineering

The College of Biomedical Engineering was established in 2009, with its origins tracing back to the Institute of Biomagnetics founded in the early 1980s. After over three decades of development, the discipline of Biomedical Engineering has grown into a key discipline under the State Ethnic Affairs Commission. The college has cultivated a large number of undergraduate and graduate students, over 65% of whom come from ethnic minority regions, making significant contributions to the socioeconomic development of these areas.

Through long-term development, the college has built a faculty team that reflects the interdisciplinary and comprehensive nature of Biomedical Engineering. Currently, there are 39 full-time faculty members from seven different primary disciplines, including 10 professors, 13 associate professors, and 30 master's supervisors. Among them, 95% hold doctoral degrees. The faculty includes one "Hubei Provincial Famous Teacher Studio," one member of the Chinese Academy of Sciences' "Hundred Talents Program," one member of Hubei Province's "Hundred Talents Program," one member of the "Chutian Scholar Program," two members of the State Ethnic Affairs Commission's "Young and Middle-Aged Talents Program," one member of Hubei Province's "Outstanding Young Backbone Program," and one member of the "3551 Optics Valley Entrepreneurship Talent Program." The college consists of three departments: the Department of Biomedical Fundamentals, the Department of Medical Electronics, and the Department of Medical Information Engineering, as well as a Practical Teaching and Innovation Center.

The college offers three undergraduate programs—Biomedical Engineering, Intelligent Medical Engineering, and Medical Information Engineering—and one master's program in Biomedical Engineering (covering both engineering and science disciplines). It currently enrolls nearly 1,200 undergraduate students and over 200 graduate students. The Biomedical Engineering program is a national first-class undergraduate program and a provincial brand program, selected for the provincial

"Strategic Emerging Industries" training plan and the "Jingchu Outstanding Engineer" training plan. The Medical Information Engineering program is a provincial first-class undergraduate program. The college houses the Hubei Provincial Virtual Simulation Experimental Center for Biomedical Engineering and the Hubei Provincial Service Outsourcing Talent Training Base, along with specialized laboratories for medical sensors, biomedical signal detection, medical instruments, virtual instruments, course design, and student innovation projects. It has established practical training bases in the East Lake High-Tech Development Zone Medical Device Park, Hubei Cancer Hospital, and the Central Theater General Hospital of the PLA. The college collaborates with the East Lake High-Tech Medical Device Park to cultivate outstanding engineering talents and partners with the Florida Institute of Technology in the U.S. to train international innovative talents under a "2+2" dual-degree program. Over the past five years, students have won over 200 national and provincial awards in competitions such as the National Biomedical Electronic Innovation Design Competition, the National Electronic Design Contest, the National Mathematical Modeling Contest, and the "Blue Bridge Cup" National Software and Information Technology Competition. Additionally, they have secured more than 10 national and provincial-level innovation research projects.

The college has two provincial and ministerial-level key laboratories: the Hubei Provincial Key Laboratory of Medical Information Processing and Tumor Diagnosis & Treatment, and the State Ethnic Affairs Commission Key Laboratory of Cognitive Science. It has developed four distinctive research directions: structure, function, and physiological modeling of membrane ion channels; biomedical signal detection and processing; visual cognitive computing and medical image processing; and biomedical sensors and instruments. The laboratories are equipped with advanced instruments such as a 128-channel brain imaging system, a laser confocal microscope, and a dual-channel patch-clamp system.

With a focus on neural engineering, the college explores the fundamental mechanisms of neural system activity from microscopic to macroscopic levels, encompassing molecular, cellular, and holistic perspectives. It has established

research strengths in ion channel function and neurotransmitter release, EEG and EMG signal detection and analysis, medical imaging and image processing, medical artificial intelligence, and biomedical sensors and instruments. The college has undertaken over 60 national and provincial research projects, including major research initiatives, general projects, and youth projects under the National Natural Science Foundation of China. Faculty members have published more than 160 SCI/EI-indexed papers in prestigious academic journals, obtained over 80 patents and software copyrights, and received three provincial and ministerial-level awards.

Adhering to the educational philosophy of "Integrating Medicine and Engineering, Serving the People's Well-being," the college is committed to enhancing students' innovation capabilities and self-development. Emphasizing academic excellence and a positive learning environment, it continuously refines its curriculum, updates teaching content, and strengthens engineering practice to fully mobilize students' enthusiasm, initiative, and creativity, thereby improving the quality of talent cultivation. Over the years, the college has maintained a leading position in employment rates and job quality within the university, being recognized as an "Employment Model Unit" for three consecutive years. The undergraduate enrollment rate for further studies has exceeded 35% for three years running.

专业简介

生物医学工程专业

生物医学工程是综合生物学、医学和工程学的理论和方法而发展起来的交叉性学科，其基本任务是运用工程技术手段，研究和解决生物学和医学中的有关问题。本专业主要学习基础医学、生物学、电子技术、计算机技术、生物医学信息检测与信号处理、以及医疗仪器设计原理等专业基础理论和基本知识。重视电子技术、信号检测与处理、计算机技术、生物技术应用于医学领域的基本训练，培养能从事医学仪器研究、开发、管理、临床应用、以及其它电子信息技术行业工作的高级技术人才。本科，学制四年，招理科生，毕业生授予工学学士学位。

Program Introduction

Biomedical Engineering Program

Biomedical Engineering is an interdisciplinary field that integrates theories and methods from biology, medicine, and engineering. Its primary mission is to apply engineering techniques to study and solve problems in biology and medicine. This program focuses on foundational knowledge in basic medicine, biology, electronics, computer technology, biomedical signal detection and processing, and the principles of medical instrument design. Students receive training in applying electronic technology, signal processing, computer technology, and biotechnology to the medical field. The program aims to cultivate high-level technical professionals capable of engaging in the research, development, management, and clinical application of medical devices, as well as careers in other electronics and information technology industries.

Degree: Bachelor of Engineering Duration: 4 years Admission: Science students

生物医学工程专业“生物材料与组织工程”实验班本科人才培养方案

Undergraduate Program for Specialty of Biomedical Engineering Direction of "Biomaterials and Tissue Engineering"

一、培养规格

I Cultivation Standards

I）学制

Length of Schooling

修业年限：4 年

Duration: 4 years

II）学位

Degree

授予学位：工学学士学位

Degrees conferred: Bachelor of Engineering degree

二、培养目标

II Education Objectives

生物材料与组织工程实验班的培养目标：面向“健康中国”国家战略需求和大健康产业发展需求，铸牢中华民族共同体意识，培养掌握生命科学、生物材料学、医学电子学等相关的基础理论知识，具备一定的科学研究能力，具有家国情怀、中华民族共同体意识、人文关怀意识、大健康观和国际视野的高素质复合型人才。学生毕业后能从事生物材料与组织工程领域相关教育、科研、开发、管理与服务工作。

毕业生应掌握化学、生物学、医学等基础理论和医学电子学、生物材料学、组织工程学等专业知识，并综合应用于生物材料设计开发、人工器官设计与制备、生物医学传感器和体外诊断仪器研发等领域。具备扎实的专业基

础、批判性思维、探索精神和创新意识，以及自主学习与终身学习能力。同时，毕业生应具备较强的沟通交流能力和团队合作精神，能够在多学科、多文化背景的团队中发挥重要作用，解决生物材料与组织工程领域的复杂工程问题。

期待学生毕业后 5 年左右达到以下目标：

1（人文素养）：铸牢中华民族共同体意识，具有高度社会责任感和职业操守，良好的人文科学素养、工程和医学伦理道德，在工程实践中充分考虑社会、健康、安全、法律及文化的影响，履行工程师责任，能为国家、区域和民族地区的健康事业服务；

2（专业知识）：在解决生物医学工程及相关领域复杂工程问题时，能够基于数学、自然科学原理，应用生物医学工程专业知识、电子技术、计算机技术和现代工程工具，针对生物材料设计开发、组织工程和生物医学传感器研发等领域的工程问题进行分析和研究，并设计出可行的解决方案。

3（工程能力）：具备生物材料设计开发、组织工程和生物医学传感器研发等领域的工程技术研究、开发和管理能力，能够解决生物材料与组织工程领域的实际问题，并具备跨学科协作的能力。

4（沟通协作）：具备良好的沟通、表达能力和团队协作能力，能在多民族、多学科、跨文化环境和团队中发挥作用；

5（发展潜能）：具有终身学习和快速自我提升的能力，能跟踪生物材料与组织工程领域的最新理论、技术及前沿动态，适应科技和社会的快速发展。

The training objectives of Biomaterials and Tissue Engineering: To meet the national strategic needs of "Healthy China" and the development needs of the big health industry, cultivate high-quality composite talents who master the basic theoretical knowledge related to life sciences, biomaterials, medical electronics, etc., have certain scientific research abilities, possess patriotism, Chinese national community consciousness, humanistic care consciousness, big health concept, and international vision. After graduation, students can engage in education, research, development, management, and service related work in the fields of biomaterials and tissue engineering.

Graduates should master basic theories in chemistry, biology, medicine, as well as professional knowledge in medical electronics, biomaterials science and tissue engineering, and apply them comprehensively to fields such as the design and development of biomaterials, tissue engineering, together with the research and development of biomedical sensors. Having a solid professional foundation, critical thinking, exploratory spirit, and innovative consciousness, as well as the ability for self-directed and lifelong learning. At the same time, graduates should possess strong communication skills and teamwork spirit, and be able to play an important role in multidisciplinary and multicultural teams to solve complex engineering problems in the fields of biomaterials and tissue engineering.

Expected Achievements within 5 Years after Graduation:

1 (Humanistic Qualities): Graduates will foster a strong sense of the Chinese national community, exhibit a high level of social responsibility and professional ethics, and demonstrate sound humanistic and scientific literacy, as well as engineering and medical ethics. They will consider the impacts of social, health, safety, legal, and cultural factors in engineering practices, fulfill their responsibilities as engineers, and contribute to the health initiatives of the nation, regions, and ethnic areas.

2 (Professional Knowledge): When solving complex engineering problems in biomedical engineering and related fields, based on mathematical and natural science principles, applying biomedical engineering expertise, electronic technology, computer technology, and modern engineering tools, analyzing and researching engineering problems in the fields of the design and development of biomaterials, tissue engineering, together with the research and development of biomedical sensors, and designing feasible solutions.

3 (Engineering Competence): Capable of engineering technology research, development, and management in the fields of the design and development of biomaterials, tissue engineering, together with the research and development of biomedical sensors, able to solve practical problems in biomaterials and tissue engineering, and possessing interdisciplinary collaboration capabilities.

4 (Communication and Collaboration): Graduates will exhibit excellent communication and teamwork skills, enabling them to contribute effectively in multicultural, multidisciplinary, and cross-cultural environments and teams.

5 (**Development Potential**): Graduates will have the ability for lifelong learning and rapid self-improvement, enabling them to stay abreast of the latest theories, technologies, and advancements in biomaterials and tissue engineering and adapt to the rapid development of science, technology, and society.

三、毕业要求

III Basic requirements for Cultivation

学生应掌握化学、生物学、医学、电子技术、计算机科学等知识，在学习医用化学、生物化学、生物医学电子学、解剖生理学、生物材料学与组织工程等基础上，能够综合运用多种技能解决生物医学领域的复杂工程问题，开发出有效的生物医用材料、生物医学传感器或组织工程解决方案，帮助提升医疗服务的效率和质量，增强人类在生物医学领域的能力。毕业生应掌握的知识、具备的能力和素质：

1、工程知识：能够将数学、自然科学、医学和工程基础等专业知识用于解决生物医学工程领域的复杂工程问题，包括生物材料设计开发、组织工程和生物医学传感器研发等。

2、问题分析：能够应用数学、自然科学、医学和工程科学的基本原理，识别、表达并通过文献研究分析生物材料设计开发、组织工程和生物医学传感器研发等过程中出现的复杂工程问题，综合考虑可持续发展的要求，以获得有效结论。

3、设计/开发解决方案：能够设计针对生物材料与组织工程领域复杂工程问题的解决方案，开发满足特定需求的生物医用材料，体现创新性，并从健康、安全、环境、全生命周期成本、法律与伦理、社会与文化等角度考虑可行性。

4、研究：能够基于科学原理并采用科学方法对生物材料与组织工程领域的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。

5、使用现代工具：能够针对生物材料与组织工程领域的复杂工程问题，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。

6、工程与可持续发展：在解决生物材料与组织工程领域相关复杂工程问题时，能够基于相关背景知识，分析和评价工程实践对健康、安全、环境、法律以及经济和社会可持续发展的影响，并理解应承担的责任。

7、工程伦理和职业规范：有工程报国、为民造福的意识，具有人文社会科学素养和社会责任感，能够理解和践行工程伦理，在工程实践中遵守工程职业道德、规范和相关法律，履行责任。

8、个人和团队：能够在多样化、多学科背景下的团队中承担个体、团队成员以及负责人的角色。

9、沟通：能够就生物材料与组织工程领域的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；能够在跨文化背景下进行沟通和交流，理解、尊重语言和文化差异。

10、项目管理：理解并掌握与工程项目相关的管理原理与经济决策方法，并能在多学科环境中应用。

11、终身学习：具有自主学习、终身学习和批判性思维的意识和能力，能够理解广泛的技术变革对工程和社会的影响，适应新技术变革。

Students should master knowledge in chemistry, biology, medicine, electronic technology, computer science, and other fields. Based on studying medical chemistry, biochemistry, biomedical electronics, anatomical physiology, biomaterials and tissue engineering, they should be able to comprehensively apply various skills to solve complex engineering problems in the field of biomedicine, develop effective biomedical materials, biomedical sensors, or tissue engineering solutions, help improve the efficiency and quality of medical services, and enhance human capabilities in the biomedical field. The knowledge, abilities, and qualities that graduates should master:

1、Engineering Knowledge: Ability to apply mathematics, natural sciences, medicine, and engineering fundamentals to solve complex engineering problems in biomedical engineering, including the design and development of biomaterials, tissue engineering, and research and development of biomedical sensors.

2、Problem Analysis: Ability to identify, formulate, and analyze complex engineering problems in the design and development of biomaterials, tissue

engineering, and research and development of biomedical sensors using principles of mathematics, natural sciences, and engineering sciences. This includes considering sustainable development requirements to draw valid conclusions.

3、 Design/Development of Solutions: Ability to design solutions to complex engineering problems in the fields of biomaterials and tissue engineering, developing biomedical materials that meet specific needs, demonstrating innovation, and considering feasibility from the perspectives of health, safety, environment, life-cycle cost, legal and ethical, social and cultural factors.

4、Research: Ability to conduct research on complex engineering problems in biomaterials and tissue engineering based on scientific principles and methods, including designing experiments, analyzing and interpreting data, and synthesizing information to draw reasonable and effective conclusions.

5、 Use of Modern Tools: Ability to develop, select, and apply appropriate techniques, resources, modern engineering tools, and information technology tools for complex engineering problems in biomaterials and tissue engineering, including prediction and simulation, while understanding their limitations.

6、Engineering and Sustainable Development: Ability to analyze and evaluate the impact of engineering practices on health, safety, environment, legal, economic, and social sustainable development when addressing complex engineering problems in biomaterials and tissue engineering, and to understand the associated responsibilities.

7、 Engineering Ethics and Professional Standards: Possess a sense of contributing to the nation and society through engineering, demonstrate humanistic and social science literacy, and uphold social responsibility. Ability to understand and practice engineering ethics, adhere to professional standards and relevant laws in engineering practice, and fulfill responsibilities.

8、Individual and Teamwork: Ability to function effectively as an individual, team member, or leader in diverse, multidisciplinary teams.

9、Communication: Ability to communicate effectively with industry peers and the public on complex engineering problems in biomaterials and tissue engineering, including writing reports and design documents, delivering presentations, and expressing or responding to instructions clearly. Ability to communicate and collaborate in cross-cultural contexts, understanding and respecting linguistic and cultural differences.

10、 Project Management: Understand and apply management principles and economic decision-making methods related to engineering projects, and utilize them in multidisciplinary environments.

11、 Lifelong Learning: Possess the awareness and ability for self-directed learning, lifelong learning, and critical thinking. Ability to understand the impact of technological changes on engineering and society and adapt to new technological advancements.

四、毕业要求与培养目标对应矩阵

IV Matrices of graduation requirements and cultivation objectives

培养目标及毕业要求 Cultivation Objectives & Graduation Requirements	1 （人文素养） Humanistic Qualities	2 （专业知识） Professional Knowledge	3 （工程能力） Engineering Competence	4 （沟通协作） Communication and Collaboration	5 （发展潜能） Development Potential
毕业要求 1 工程知识 Graduation Requirement I		√			√
毕业要求 2 问题分析 Graduation Requirement II		√			
毕业要求 3 设计/开发解决方案 Graduation Requirement III		√	√	√	
毕业要求 4 研究 Graduation Requirement IV		√	√		
毕业要求 5 使用现代工具 Graduation Requirement V			√		√
毕业要求 6 工程与可持续发展 Graduation Requirement VI	√		√		
毕业要求 7 工程伦理和职业规范 Graduation Requirement VII	√				
毕业要求 8 个人和团队 Graduation Requirement VIII				√	
毕业要求 9 沟通 Graduation Requirement IX				√	
毕业要求 10 项目管理 Graduation Requirement X			√	√	√
毕业要求 11 终身学习 Graduation Requirement XI					√

五、毕业要求实现矩阵（提示：1.每门课程支撑 1-3 个毕业要求；2.表IV和表V的毕业要求内容和数量是否一致。）

V Matrices of Realization of Graduation Requirements

课程及毕业要求 Course & Graduation Requirements	毕业要求 Graduation requirement										
	1 工程知识 Engineering Knowledge	2 问题分析 Problem Analysis	3 设计开发/解决方案 Design/Development Solutions	4 研究 Research	5 使用现代工具 Using Modern Tools	6 工程与可持续发展 Engineering and Sustainable Development	7 工程伦理与职业规范 Engineering ethics and Professional norms	8 个人和团队 Individual and team	9 沟通 Communication	10 项目管理 Project management	11 终身学习 Lifelong learning
思想道德与法治 Moral Education and Rule of Law							H				
中国近现代史纲要 Essentials of China Modern and Contemporary History							M				
毛泽东思想和中国特色社会主义理论体系概论 Introduction to MAO Zedong Thought and Socialist Theoretical System with Chinese Characteristics							M				
马克思主义基本原理 Basis Principles of Maxism							M				
习近平新时代中国特色社会主义思想概论 Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era											H
形势与政策 Situation and Policy											H
英语 English									H		
劳动教育 Labor Education								H			

课程及毕业要求 Course & Graduation Requirements	毕业要求 Graduation requirement										
	1 工程知识 Engineering Knowledge	2 问题分析 Problem Analysis	3 设计开发/解决方案 Design/Development Solutions	4 研究 Research	5 使用现代工具 Using Modern Tools	6 工程与可持续发展 Engineering and Sustainable Development	7 工程伦理与职业规范 Engineering ethics and Professional norms	8 个人和团队 Individual and team	9 沟通 Communication	10 项目管理 Project management	11 终身学习 Lifelong learning
大学英语扩展课程 University English Extension Program								H			
中华民族共同体概论 Education of Chinese Minzu Community Consciousness						L			H		
就业指导 Employment Guidance						M	H				L
工程项目管理与经济决策 Engineering Project Management and Economic Decision Analysis						M		M		H	
军事技能训练 Military Skill Training							L	M			
高等数学 Advanced Mathematics	H										
线性代数 Linear Algebra	M										
概率论与数理统计 Probability Theory and Mathematic Statistics	M										
复变函数（B） Complex Function（B）	L										
大学物理 College Physics	H										
大学物理实验 College Physics Experiments				M					L		
人工智能与 Python 程序设计 Artificial Intelligence and Python Programming	L				H						
电路分析 Circuit Analysis	H	M									
生物医学电子学 I Biomedical Electronics I	M	H	M								

课程及毕业要求 Course & Graduation Requirements	毕业要求 Graduation requirement										
	1 工程知识 Engineering Knowledge	2 问题分析 Problem Analysis	3 设计开发/解决方案 Design/Development Solutions	4 研究 Research	5 使用现代工具 Using Modern Tools	6 工程与可持续发展 Engineering and Sustainable Development	7 工程伦理与职业规范 Engineering ethics and Professional norms	8 个人和团队 Individual and team	9 沟通 Communication	10 项目管理 Project management	11 终身学习 Lifelong learning
生物医学电子学实验 I Biomedical Electronics Experiments I		M	L		M						
生物医学电子学 II Biomedical Electronics II	M	H									
生物医学电子学实验 II Biomedical Electronics Experiments II		M	L		M						
信号与系统 Signals and Systems	M	H		H							
生物医学工程导论 Introduction to Biomedical Engineering				L		H	M				
解剖生理学 Anatomy and Physiology		M		M			H				
解剖生理学实验 Anatomy and Physiology Experiments		M					M		L		
生物医学数字信号处理 Biomedical Digital Signal Processing	M	H		H							
模式识别与深度学习 Biomedical Digital Signal Processing	M	H		H							
工程制图 Engineering Drafting					L						
生物医学工程前沿 Frontiers in Biomedical Engineering											H
医用基础化学 Medical Foundation Chemistry		M									
临床医学概论 Introduction to Clinical				L			M				

课程及毕业要求 Course & Graduation Requirements	毕业要求 Graduation requirement										
	1 工程知识 Engineering Knowledge	2 问题分析 Problem Analysis	3 设计开发/解决方案 Design/Development Solutions	4 研究 Research	5 使用现代工具 Using Modern Tools	6 工程与可持续发展 Engineering and Sustainable Development	7 工程伦理与职业规范 Engineering ethics and Professional norms	8 个人和团队 Individual and team	9 沟通 Communication	10 项目管理 Project management	11 终身学习 Lifelong learning
Medicine											
生物医学工程伦理 Ethics and Professional Norms of Biomedical Engineering							H				
生物化学 Biochemistry		M									
生物材料（B）Biomaterials（B）		M		M							
单片机 C 程序设计 C Programming for Microcontrollers	M		M		M				M		
虚拟仪器 Virtual Instrument			M		M						
生物材料的生物学评价 Biological Evaluation of Biomaterials		M		M							
分子生物学 Molecular Biology		M									
医学细胞生物学 Medical Cell Biology		M									
组织工程 Tissue Engineering		M		M							
人工智能数学基础 Mathematical Foundations of Artificial Intelligence	H										
嵌入式系统设计 Embedded Systems Design			M		M						
医学大数据分析 Big Data Analytics for Healthcare	M			M	M						
医学图像处理与计算机视觉 Medical Image Processing and Computer Vision		M			M						
自然语言处理 Natural Language Processing	M				M						
生物医学传感与测量仪器 Biomedical Sensors and		M		M							

课程及毕业要求 Course & Graduation Requirements	毕业要求 Graduation requirement											
	1 工程知识 Engineering Knowledge	2 问题分析 Problem Analysis	3 设计开发/解决方案 Design/Development Solutions	4 研究 Research	5 使用现代工具 Using Modern Tools	6 工程与可持续发展 Engineering and Sustainable Development	7 工程伦理与职业规范 Engineering ethics and Professional norms	8 个人和团队 Individual and team	9 沟通 Communication	10 项目管理 Project management	11 终身学习 Lifelong learning
Measurement Instruments											
医学成像技术与设备 Medical Imaging Technology and Equipment			H	M							
数据库技术与应用 Database Technology and Applications			M		M						
电子实训 Electronics Training		H						M	L		
生物材料与组织工程综合实践 Comprehensive Practice of Biomaterials and Tissue Engineering		H	H	M	H			H	M	M	
生物材料与组织工程科学实训 Science Training of Biomaterials and Tissue Engineering		H	H	M	H			H	M	M	
专家辅助诊断课程设计 Expert-Assisted Diagnostic System Course Design		H	H	M	H			H	M	M	
工程训练 A Engineering training A			M			M		M			
专业实习 Professional practice					M				M		M
毕业论文 Undergraduate Thesis		H	H	H	M		M	L	M	L	H

V Graduation requirement realization matrix

注① 不同学期的同一门课程只需填写一次；

②所有的课程和教学活动都要列入表格，包括集中实践性环节；

③表格要清晰展示每门课程与“毕业要求”中每项具体要求达成的关联度情况，关联度强的用“H” 表示，关联度中等的用“M” 表示，关联度弱的用“L” 表示。

六、核心课程

VI Core Courses

生物材料与组织工程导论 Introduction to Biomaterials and Tissue Engineering、解剖生理学 Anatomy and Physiology、电路分析 Circuit Analysis、电子电工学 Electronic and Electrical Engineering、生物材料（B） Biomaterials（B） 、生物材料的生物学评价 Biological Evaluation of Biomaterials、组织工程 Tissue Engineering、信号与系统 Signal and System、生物医学数字信号处理 Biomedical Digital Signal Processing、人工智能与 Python 程序设计 Artificial Intelligence and Python Programming

七、主要实践性教学环节

VII Main Internship and Practical Training

解剖生理学实验 Anatomy and Physiology Experiment、电子电工学实验 Electronic and Electrical Engineering Experiment、医学细胞与分子检测实验 Medical Cell and Molecular Detection Experiment、生物材料与组织工程综合实践 Comprehensive Practice of Biomaterials and Tissue Engineering、生物材料与组织工程科学实训 Science Training of Biomaterials and Tissue Engineering、创新创业活动 Innovation and Entrepreneurship、专业实习 Professional Practice、毕业实习 Practice of Graduation、毕业论文（设计）Undergraduate Thesis (Project)

八、学时与学分

VIII Hours/Credits

学时学分构成表

Table of Hours and Credits

<table>
<tr><td colspan="3" rowspan="2">课程类别
Courses Classified</td><td rowspan="2">学时/周数
Period/Weeks</td><td colspan="2">学分
Credits</td><td rowspan="2">学分比例
Proportion of Credits</td></tr>
<tr><td>理论
Theory</td><td>实验（实践）
Practice</td></tr>
<tr><td colspan="2" rowspan="2">通识课程平台
General Courses Platform</td><td>必修
Compulsory</td><td>512</td><td>26</td><td>3</td><td>19.3%</td></tr>
<tr><td>选修
Elective</td><td>112</td><td>7</td><td>/</td><td>4.7%</td></tr>
<tr><td colspan="2">学科基础课程平台 Basic Courses Platform</td><td>必修
Compulsory</td><td>604</td><td>32</td><td>3</td><td>23.3%</td></tr>
<tr><td colspan="2" rowspan="2">专业课程平台
Major Courses Platform</td><td>必修
Compulsory</td><td>304</td><td>14.5</td><td>3</td><td>9.67%</td></tr>
<tr><td>选修
Elective</td><td>564</td><td>24</td><td>7.5</td><td>23%</td></tr>
<tr><td colspan="2" rowspan="2">集中性实践课程平台
Practical Teaching Platform</td><td>必修
Compulsory</td><td>22W</td><td>/</td><td>22.5</td><td rowspan="2">15%</td></tr>
<tr><td>选修
Elective</td><td>0</td><td>/</td><td>0</td></tr>
<tr><td rowspan="2">素质拓展平台
Quality Development Platform</td><td>双创学分
Innovation & Entrepreneurship Credits</td><td rowspan="2">必修
Compulsory</td><td>32</td><td>2</td><td>/</td><td>1.33%</td></tr>
<tr><td>其他学分
Other Credits</td><td>80+1W</td><td>5</td><td>1</td><td>4%</td></tr>
<tr><td rowspan="2">小计
Amount</td><td colspan="2">必修学分总数
Compulsory Credits</td><td>112</td><td>选修学分总数
Elective Credits</td><td>38</td><td colspan="2">选修学分比例
Proportion of Elective Credits</td><td>25.3%</td></tr>
<tr><td colspan="2">理论学分总数
Theory Credits</td><td>110</td><td>实践学分总数
Practice Credits</td><td>40</td><td colspan="2">实践教学环节比例
Proportion of Internship and Practical Training</td><td>26.67%</td></tr>
<tr><td colspan="3">最低毕业学分
The Lowest Graduate Credits</td><td colspan="6">150</td></tr>
</table>

注：①学分比例：各教学平台或教学环节占最低毕业学分的比例。

②实践教学环节，包括集中性实践教学环节和实验教学（不含体育）。集中性实践教学环节，包括培养方案内集中实施的实践、实习、课程设计、毕业设计、毕业论文、社会调查等；实验教学，包括课内实验和独立开设实验。

③必修学分总数=通必学分+学科基础学分+专必学分+实践必修学分+素质拓展学分；

选修学分总数=通选学分+专选学分+实践（选修）学分；

理论学分总数=所有平台理论学分之和（不包括双创学分）；

实践学分总数=所有平台实践学分之和（不包括双创学分）；

最低毕业学分=必修学分+选修学分=理论学分+实践学分+双创学分。

九、教学进程计划表

IX Teaching Schedule Form

表一：通识课程平台 / Form I: General Course Platform

表一（A）：通识必修课程/Form I (A):General Compulsory Courses (General Required)

课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb	
20W100000613	英语 1 English 1	2	32	32				1
218110000313	体育 1 Physical Education 1	0/1	26			26		1
217100014918	思想道德与法治 Moral Education and Rule of Law	2.5/0.5	52	40		12		2
217100015218	形势与政策 Situation and Policy	2	32	32				1-8
225100000118	中华民族共同体概论 The Introduction to Community for the Chinese Nation	1.5/ 0.5	36	24		12		2 铸牢类
20W100000713	英语 2 English 2	2	32	32				2
218110000213	体育 2 Physical Education 2	0/1	32			32		2
2171000122	中国近现代史纲要 Essentials of China Modern and Contemporary History	2.5/ 0.5	52	40		12		1
20W100002623	跨文化交际 Intercultural Communication	2	32	32				3/4
20W100002523	中外文化比较 Comparison of Chinese and Western Cultures	2	32	32				3/4
20W100001618	中华文化导论（英文） Introduction to Chinese Culture	2	32	32				3/4
20W100001518	英语国家社会与文化 Society and Culture of English Speaking Countries	2	32	32				3/4
20W100001318	高级媒体英语视听说 Advanced Media English: Watching, Listening and Speaking	2	32	32				3/4
20W100001018	学术英语阅读与写作 Academic Reading and Writing	2	32	32				3/4
218110015018	体育 3 Physical Education 3	0/0.5	16			16		3
217100012318	马克思主义基本原理 Basis Principles of Maxism	2.5/0.5	52	40		12		4

217100015818	毛泽东思想和中国特色社会主义理论体系概论 Introduction to MAO Zedong Thought and Socialist Theoretical System with Chinese Characteristics	2.5/0.5	52	40		12		3
217100015918	习近平新时代中国特色社会主义思想概论 Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	2.5/0.5	52	40		12		5 铸牢类
218110014718	体育 4 Physical Education 4	0/0.5	16			16		4
218110014018	体育 5 Physical Education 5	0/0.5	16			16		5
218110015318	体育 6 Physical Education 6	0/0.5	16			16		6
学分要求：必修学分 29 Demand of Credits: Required 29								

注：大学英语扩展课程包括学术英语阅读与写作、高级媒体英语视听说、英语国家社会与文化、中华文化导论（英文）、跨文化交际（英文）、中外文化比较，要求在第 3,4 学期完成 4 学分即可。

表一（B）：通识选修课程（通选课）/Form I (B): General Elective Courses

模块 Module	学分 Crs.
心理健康与安全 Psychological Health and Safety	7 **注：** 1. 必修**心理健康教育**、**大学生生命与财物防护实务**和**美育**相关课程； 2. 必修文科类课程 1 门。
人文素养与写作 Humanistic Accomplishment and Writing	
科学技术与工程 Science and Technology & Engineering	
艺术体验与审美 Art Appreciation and Aesthetics	
国际视野与世界 Contemporary China and the World	
中华文化与文明（铸牢类） Chinese Culture and Civilization	
创业素养与实践	
学分要求：选修学分 7 Demand of Credits: Elective 7	

表二：学科基础课程平台

Form II. Basic Course Platform

课程类别 Course Classified	课程编号 Courses Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
学科基础必修 Basic CoursesRequired	2101000113	高等数学 A(1) Advanced Mathematics A(1)	4	80	64			16	1	
	2101000118	线性代数 Linear Algebra	2	48	32			16	1	
	212100023923	电路分析 Circuit Analysis	2/0.5	52	32	12		8	2	
	210100025623	高等数学 A(2) Advanced Mathematics A(2)	4.5	96	72			24	2	
	209100064918	人工智能与 Python 程序设计 Artificial Intelligence and Python Programming	1.5/1	56	24	32			2	AI 类
	211100010918	大学物理 A(1) College Physics A(1)	3	56	48			8	2	
	211112003313	大学物理 A(1)实验 College Physics Experiments A(1)	0/0.5	16	0	16			2	
	212100010318	电子电工学 Electronic and Electrical Engineering	2.5	40	40				3	
	212110027323	电子电工学实验 Electronic and Electrical Engineering Experiment	0/0.5	12	0	12			3	
	211100011018	大学物理 A(2) College Physics A(2)	3	56	48			8	3	
	211112003413	大学物理 A(2)实验 College Physics Experiments A(2)	0/0.5	16	0	16			3	
	2101000112	概率论与数理统计 Probability and mathematical statistics	2.5	56	40			16	3	
	210100025423	复变函数（B） Functions of Complex Variable（B）	2	48	32			16	3	
	212103003613	信号与系统 Signal and System	3.5	64	56			8	4	
	212100029123	工程项目管理与经济决策 Engineering Project Management and Economic Decision-Making	1	16	16				5	
学分要求：必修学分 34.5 Demand of Credits: Required 34.5										

表三：专业课程平台

Form III: Major Courses Platform

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
专业必修 Required Courses	212100025623	生物材料与组织工程导论 Introduction to Biomaterials and Tissue Engineering	1	16	16				3	铸牢类
	212100027523	生物材料（B） Biomaterials（B）	3/1	72	48	24			3	
	212100028123	生物材料的生物学评价 Biological Evaluation of Biomaterials	2	32	32				4	
	212103006213	解剖生理学 Anatomy and Physiology	3.5	64	56			8	5	铸牢类 AI 类
	212110023423	解剖生理学实验 Anatomy and Physiology Experiment	0/1.5	36	0	36			5	
	212100027123	组织工程 Tissue Engineering	2	32	32				5	
专业选修 Elective courses	212100022623	工程制图 Engineering Drafting	2/0.5	44	32	12			1	需注明选修学分要求和学生在某一学期最少选修学分
	212100022823	生物医学工程前沿 Frontiers in Biomedical Engineering	1	16	16				1	
	212100023123	医用基础化学 Medical Foundation Chemistry	2/0.5	44	32	12			1	
	212103001113	临床医学概论 Introduction to Clinical Medicine	2	32	32				1	第 1 学期不少于选 3.5 学分
	212100023023	生物医学工程伦理 Ethics and Professional Norms of Biomedical Engineering	2	32	32				2	
	212100024623	生物化学 Biochemistry	2/0.5	44	32	12			2	
	212100024123	单片机 C 程序设计 C Programming for Microcontrollers	2/1	56	32	24			3	
	212100011218	虚拟仪器 Virtual Instrument	1/0.5	28	16	12			3	第 2 学期最少选 2 学分
	212100008913	分子生物学 Molecular Biology	2	32	32				3	
	212100009113	医学细胞生物学 Medical Cell Biology	2	32	32				3	
	212100024223	程序设计（C/C++) Programming C/C++	3/1	72	48	24			3	
	212100025523	面向对象程序设计（JAVA） Object Oriented Programming（JAVA）	2/0.5	44	32	12			3	

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	212100024723	数据结构 Data Structure	2	32	32				4	
	212100011718	嵌入式系统设计 Embedded System Design	2/1	56	32	24			4	
	212110025423	医学细胞与分子检测实验 Medical Cell and Molecular Detection Experiment	0/1	24	0	24			4	
	212103004313	医学成像技术与设备 Medical Imaging Technology and Equipment	2.5	40	40				5	第 3 学期最少选 9 学分
	210100027023	人工智能数学基础 Mathematical Foundations of Artificial Intelligence	2	32	32				4	AI 类
	212100028523	移动医疗 APP 开发与应用 Mobile Medical APP Development and Application	2/0.5	44	32	12			5	第 4 学期最少选 7 学分
	212100024823	可编程数字系统 Programmable Digital System	1.5/0.5	36	24	12			5	第 5 学期最少选 4.5 学分
	212100025223	模式识别与深度学习 Pattern Recognition and Deep Learning	3.5/0.5	68	56	12			5	AI 类
	212100030223	数据库技术与应用 Database Technology and Applications	2/0.5	44	32	12			5	第 6 学期最少选 6 学分
	212100030423	自然语言处理 Natural Language Processing	2/0.5	44	32	12			5	AI 类
	212100030123	医学检验与体外诊断仪器 Medical laboratory and analytical instruments	2/0.5	44	32	12			6	
	212100025123	医学图像处理与计算机视觉 Medical image Processing and Computer Vision Technology	3.5/0.5	68	56	12			6	
	212100024423	生物医学传感与测量仪器 Biomedical Sensors and Measurement Instruments	3.5/0.5	68	56	12			5	
	212100019218	生物芯片 Biochip	2	32	32				6	
	212100025723	生物医学信息检索（双语） Biomedical Information Retrieval (Bilingual)	1	16	16				6	
	212103000813	生物医学信息学（双语） Biomedical Information (Bilingual)	2	32	32				6	
	212110025023	医学仪器综合实验 Comprehensive Experiment of Medical Instruments	/0.5	12		12			6	
	212103001713	生物医学光子学导论 Introduction to biomedical photonics	2	32	32				7	

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	212103002713	生物物理学 Biophysics	2	32	32				7	
	212100023623	生物医学数字信号处理 Biomedical Digital Signal Processing	3/0.5	60	48	12			5	
	212103006513	生物统计学 Biostatistics	2	32	32				4	
	212100024323	医疗器械管理与法规 Medical Device Management and Regulations	2	32	32				7	
学分要求: 49（其中必修学分 14，选修学分 35） Demand of Credits: 49（ Required：14, Elective：35 ）										

表四：集中性实践课程平台

Form IV: Practical Teaching Platform

课程类别 CourseClassified			课程编号 CourseCode	实践教学名称 Course Name	学分 Crs.	周数/学时数 Total Period/Hrs.	学时类型 Period Classified		开课学期 Semester
							实践 Exp.	实习 Pra.	
实践 TeachingPractice	实践 Teaching Practice	必修 Compulsory Courses	112110010718	劳动教育 Labor Education	1	32	√		1-7
			109110000318	军事技能训练 Military Skill Training	/2	36	√		1
			212110026123	电子实训 Electrical Engineering Training	0/1	1W		√	2
		选修 Elective Courses	212110026023	医学临床工程实践 Medical Clinical Engineering Practice	2	12W	√		7
			212110027023	医疗器械工程实践 Medical Device Engineering Practice	2	12W	√		7
	课程设计 Project Design	必修 Compulsory Course	212110030023	生物材料与组织工程综合实践 Biomaterials and Tissue Engineering Comprehensive Practice	2	2W	√		5
			212110030323	生物材料与组织工程科学实训 Biomaterials and Tissue Engineering Science Training	2.5	2W	√		6
		选修 Elective Courses	212110027823	人机协同课程设计 Human-Machine Collaboration Course Design	2	2W	√		6
			212110026823	智能视觉课程设计 Intelligent Vision Course Design	2	2W	√		6 AI 类
	小计 Amount		必修学分 8.5，选修学分 8						
实习 Teaching Exercitation	专业实习 Teaching Exercitation	必修 Compulsory Course	212110019018	专业认知实习 Professional recognizing practice	1	1W		√	2
			701110000118	工程训练 A Engineering training A	1	24		√	5
			212110020918	专业实习 Professional Practice	2	2W		√	5
	毕业论文（设计） Graduation Thesis (Project)	必修 Compulsory Course	01845010	毕业论文 Undergraduate Thesis	10	12W			8
	小计 Amount		必修学分 14，选修学分 0						
学分要求： 22.5（必修学分 22.5，选修学分 0） Demand of Credits: 22.5（Required：22.5, Elective：0）									

表五：素质拓展平台

Form V: Quality Development Platform

课程编号 Course Code	课程/模块名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb	
109100000418	军事理论 Military Theory	2	36	36				1
109100000818	国家安全教育 National Security Education	1	16	16				2
	美育实践	1	/			/		1-7
/	创新教育 Innovation Education	2	/					
115100000213	大学生职业生涯与发展规划 Career and Development Planning of University Students	1	16	16				1
115100000113	就业指导 Employment Guidance	1	16	16				6
学分要求：必修学分 8 Demand of Credits: Required 8								

执笔人:　　审核人:

学院盖章:　　完成日期: