PROGRAM SELF-ASSESSMENT REPORT

For the Bachelor Degree of

BIOMEDICAL ENGINEERING PROGRAM

and

For the Bachelor Degree of

CLINICAL ENGINEERING PROGRAM

Prepared by

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About the SAR: A Brief Overview

Dear ASIIN Team,

Thank you for giving us the opportunity to participate in the International ASIIN Program Accreditation. We are very pleased to submit the Self-Assessment Report (SAR) for the Bachelor's Degree Programs in Biomedical Engineering (BME) and Clinical Engineering (CE) for International ASIIN Program Accreditation. Below is a brief overview of our university, college, and programs.

Shanghai University of Medicine & Health Sciences (SUMHS) is one of Chinese leading higher education institutions (HEIs), integrating and coordinating disciplines such as medicine, pharmacy, engineering, and more. SUMHS is the first high-level, application-oriented, technology-driven medical university named after "health" in China. SUMHS adheres to the orientation of "application-oriented, characteristic and international", focuses on the full life cycle, and aims at the whole health process. At present, SUMHS has 20 undergraduate majors including Clinical Medicine, Medical Imaging Technology, Biomedical Engineering, Clinical Engineering, etc. The detailed introduction of SUMHS can be found on the Chinese website: http://www.sumhs.edu.cn/.

The College of Medical Instrumentation (CMI) at SUMHS was founded in 2015. Its main context originates from the Shanghai Medical Instrumentation College founded by the Central Ministry of Health in 1960. The college is characterized by the integration of industry and education, the combination of medicine and engineering, and international cooperation. It focuses on the biopharmaceutical industry and is committed to cultivating high-level applied talents in fields such as research and development of medical devices, clinical applications, medical product administration, and medical big data. At present, the college has four majors, namely Biomedical Engineering, Clinical Engineering, Data Science and Big Data, and Medical Product Administration. The college has about 2,000 enrolled students. The detailed introduction of CMI can be found on the English website: https://cmi.sumhs.edu.cn/FacultyIntroduction/list.htm.

The program of BME began enrolling 4-year undergraduate students in 2015 and is qualified to award a Bachelor of Engineering degree. Leveraging the distinctive disciplines of medical and industrial combination at SUMHS, the program emphasizes both "specialization" and "broad-based" professional skills development. BME students have a solid foundation in mathematics, natural sciences, humanities, and social sciences. They systematically master a

wide range of basic knowledge, receive training in relevant engineering practice fields of BME, and master professional knowledge in solving complex engineering problems, especially in medical, electronic, and information technology closely related to medical devices. Students should possess computer application and English communication skills, teamwork spirit, team organization and management abilities, as well as innovative thinking. They should also possess excellent self-learning abilities and personal development prospects. The core courses of the program focus on the knowledge and practical skills of BME, especially theoretical and practical courses related to principles and design of biomedical electronics, signal processing, and medical instruments. The program is student-centered and has always emphasized a training model that combines production, learning, research, and application.

The program of CE was founded in 2017, and aims to cultivate high-level, application-oriented talent with strong ideological and moral qualities, humanistic literacy, and adherence to the core socialist values. Graduates are expected to possess a solid foundation in engineering theory and clinical medical knowledge, equipping them with the ability to identify and address practical issues in clinical engineering. After 4 years of full-time study, students are expected to develop computer application and English communication skills. They should be capable of applying their knowledge and skills to evaluate, operate, conduct preventive maintenance, manage risks, and train healthcare staff on the clinical use of relevant medical devices and systems. Graduates are also expected to have a spirit of innovation, creativity, adaptability, and critical thinking, enabling them to tackle complex clinical engineering problems. Furthermore, they should be able to work effectively in multidisciplinary teams, communicate effectively with medical staff and patients, make ethically and socially responsible decisions, and demonstrate a commitment to lifelong learning. Graduates are well-prepared to assume clinical engineering positions in hospitals, as well as in medical device companies and associated industries.

BME and CE have established good cooperative relationships with many well-known domestic and international companies, tertiary hospitals, and related institutions like Siemens Healthineers, Shanghai Chest Hospital.

We have tried our best to prepare the SAR based on the SUBJECT-SPECIFIC CRITERIA (SSC) OF TC02 and the related guidelines. Through this preparation process, we gained the ASIIN Program Accreditation, and it is very helpful for us to improve our professional teaching level and talent training quality.

Thank you very much.

Kind regards,
College of Medical Instrumentation

ASIIN Program Self-Assessment Report

Section A includes tables in which basic data concerning the accreditation procedure is given.

Section B contains basic data concerning the submitted study programs.

Section C contains the Self-Assessment section, organized according to the ASIIN criteria.

A: About the Accreditation Procedure

General Data

Website of the Higher Education Institution	https://www.sumhs.edu.cn/
Faculty/Department offering the Degree	College of Medical Instrumentation
Program 1	Biomedical Engineering Program
Program 2	Clinical Engineering Program

Seals applied for

Name of the degree program (in original language)	**(Official) English translation of the name**	**Labels Applied for**	**Previous Accreditation (issuing agency, validity)**	**Involved Technical Committees (TC)**
生物医学工程	Biomedical Engineering	ASIIN Seal for a bachelor's degree program	/	TC 02
临床工程技术	Clinical Engineering	ASIIN Seal for a bachelor's degree program	/	TC 02

B: Characteristics of the Degree Programs

Name of the program (Chinese)	生物医学工程	临床工程技术
Name of the program (English)	Biomedical Engineering	Clinical Engineering
Final degree	Bachelor of Engineering	Bachelor of Engineering
Standard period of study **Average time required to complete studies**	Four-year studying	Four-year studying
Credit points (according to ECTS)	200	199
Type (several can be indicated) **Mode of Study**	Full time residential learning intensive program	Full time residential learning intensive program
Website of the Higher Education Institution	https://www.sumhs.edu.cn/	https://www.sumhs.edu.cn/
(First time) program start date within the academic year	September 1st, 2015	September 1st, 2017
Intake rhythm	Fall semester	Fall semester
Expected intake number of students	90-110 per academic year	120 per academic year
Amount and type of fees/charges	6,000 RMB per academic year	6,000 RMB per academic year
Faculty/Department	College of Medical Instrumentation	College of Medical Instrumentation
Website of the Department	https://cmi.sumhs.edu.cn/	https://cmi.sumhs.edu.cn/
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C: Self-assessment for the ASIIN Seal

1. The Degree Program: Concept, Content & Implementation

1.1 Objectives and Learning Outcomes of the Degree Program

Medical devices are currently one of the fastest-growing industries worldwide. The Chinese medical device industry market scale has grown from a scale of 300 billion in 2015 to 1.2 trillion in 2024, with a compound annual growth rate of about 20%. The "Made in China 2025" and "Healthy China 2030" planning outlines both propose to vigorously develop high-performance medical devices and accelerate the alignment of medical device standard with international standard. With the advancement of the construction of a healthy China, the demand for professional talents in medical device research and development, production, maintenance, and other fields will significantly increase, providing broad employment opportunities. Based on the strong demand for talent due to the rapid development of the medical device industry and the national development plan for the development of the medical device industry, and SUMHS's own educational orientation of "application-oriented, characteristic, and international" and educational characteristics of "combination of medicine with engineering, medical care, and medical insurance", SUMHS established BME in 2015 and CE in 2017. The establishment and construction of these programs aligns with the CMI's development plan. (see **Appendix 04**)

Training objectives and learning outcomes are important components of cultivation program, i.e., study plan. The training objectives and learning outcomes for both BME and CE programs are jointly formulated by the students, teaching staff, industry and enterprise experts, and are approved by the University Teaching Committee. They are annually reviewed and updated based on the suggestions and surveys from industrial employers, alumni, students, and the teaching staff, etc. The revision criteria and procedures are described in detail in Section 5.1 of Chapter 5.

1.1.1 Training Objectives

1.1.1.1 Training Objectives of BME

The program of BME is designed to meet the development needs of the "Healthy China" initiative. It is committed to cultivating well-rounded professionals with moral integrity, intellectual competence, physical fitness, aesthetic appreciation, and a strong work ethic. Graduates are expected to possess a strong sense of social responsibility, humanistic literacy, and professional ethics; a solid foundation in mathematics, natural sciences, and biomedical engineering theories and skills; as well as capabilities in engineering design and practice, teamwork, international perspective, innovative thinking, and lifelong learning. They will be equipped to become high-level applied professionals in the field of BME, particularly in the

medical device industry, engaged in product research and design, application development, engineering management, technical support, and market promotion.

In about 5 years after graduation, students of this program are expected to achieve the following objectives through industry practice and self-directed learning:

Objective 1: To be able to consciously and effectively integrate non-technical factors such as social, health, safety, environmental, and cultural into the solution of complex engineering problems in biomedical software, hardware, and systems; understand and adhere to laws, regulations, and professional ethical standards, and possess values of sustainable development and a sense of social responsibility.

Objective 2: To be able to comprehensively apply knowledge of mathematics, natural sciences, and professional knowledge to analyze engineering problems in the principles, structures, and other engineering aspects of biomedical software, hardware, and systems.

Objective 3: To be able to comprehensively apply professional knowledge and modern tools, possess engineering innovation capabilities, and solve complex engineering problems in the design, development, testing, operation, maintenance and management of biomedical software, hardware, and systems; and be competent in undertaking work in biomedical product research and design, application development, engineering management, technical support, and market promotion.

Objective 4: Possess strong professional ethics, a solid foundation in humanities and sciences, effective communication skills, and a spirit of collaboration; to be able to work as a team member or to organize and lead team collaboration and adapt to different roles.

Objective 5: Possess the ability to adapt to constantly changing domestic and international environments and circumstances; be capable of continuously improving professional competence through continuous learning and self-improvement, and competitiveness in the field of BME, especially in the medical device industry.

1.1.1.2 Training Objectives of CE

The bachelor program in CE primarily serves the strategic needs for high-quality, efficient medical services and medical safety as part of the “Healthy China”. It aims to cultivate high-level applied talents with strong ideological and political integrity, a solid foundation in the humanities and sciences, and a firm grounding in the core values of socialism. The program emphasizes all-round development in moral, intellectual, physical, aesthetic, and labor education. Graduates are expected to possess a solid foundation in engineering technology and theory, fundamentals of clinical medicine, as well as the ability to identify and solve practical problems in clinical engineering. These professionals are expected to be capable of working in clinical engineering positions in hospitals or other healthcare institutions, engaging in clinical application, functional development, technical management, maintenance, and training of medical equipment. Additionally, they can work in medical device companies or organizations, focusing on technical research and development and technical support, ensuring the safety and effectiveness of medical instruments during clinical use. The training objectives of BME and CE are published and accessible on the homepage of the College of Medical Instrumentation: https://cmi.sumhs.edu.cn/5d/3e/c11941a286014/page.htm.

1.1.2 Learning Outcomes

Table 1-1 and **Table 1-2** outline the learning outcomes and the corresponding modules of BME and CE according to Subject-specific criteria of the Technical Committee 02 (TC02's SSC) with five individual qualification goals. Module specifications are detailed in Section 1.3.1.

Table 1-1 Objective Matrix of BME

ASIIN Subject-Specific Criteria (SSC)	Learning Outcomes of the Study Program	Corresponding Modules
Knowledge, understanding and application Graduates have in particular …		
acquired a broad and well-founded basic knowledge of mathematics, natural sciences and engineering, which enables them to understand and analyse complex phenomena occurring in electrical engineering, information technology or computer science and to independently develop and apply practice-oriented or theory-oriented solutions	Be able to apply mathematics, natural sciences, engineering fundamentals, and professional knowledge to solve complex biomedical engineering problems.	Advanced Mathematics, Linear Algebra, Probability Theory and Mathematical Statistics, College Physics, Medical Chemistry (Organic), Medical Chemistry (Inorganic), Preclinical Medicine Theories, Principal of Clinical Medicine, Medical Statistics, Circuit Theory, Engineering Mechanics, Analog Electronic Technology, Digital Electronic Technology, Signals and Systems, Application Technique of Single Chip Microcomputer, Artificial Intelligence and Medical Applications, Digital Signal Processing, Biomedical Electronics, Intelligent Medical Control Technology
acquired an understanding of the broader ethical and multidisciplinary context of engineering.	Be able to conduct reasonable analysis based on relevant background knowledge of biomedical engineering to evaluate the impact of biomedical engineering practices and solutions to complex engineering problems on society, health, safety, law, and culture, and to understand the responsibilities that should be assumed.	Introduction to Engineering, Introduction to Biomedical Engineering, Professional Internship, Morality and Law, Situation and Policy,
	Be able to understand and evaluate the impact of engineering practices addressing complex biomedical engineering problems on the environment and on the sustainable development of society.	Introduction to Engineering, Biomedical Engineering Research Norms and Ethics, Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Public Electives
Interdisciplinary competences Graduates ...		
can analyse and present technical contexts from their own and related fields in a comprehensible way,	Be able to apply the basic principles of mathematics, natural sciences, and engineering sciences, and conduct literature research to identify, articulate and analyze complex biomedical engineering problems to obtain effective conclusions.	Advanced Mathematics, Linear Algebra, Probability Theory and Mathematical Statistics, College Physics, Medical Chemistry (Organic), Medical Chemistry (Inorganic), Medical Statistics, Circuit Theory, Engineering Mechanics, Analog Electronic Technology, Digital Electronic Technology, Signals and Systems, Application Technique of Single Chip Microcomputer,

		Digital Signal Processing, Biomedical Electronics, Principle and Application of Medical Instruments, Intelligent Medical Control Technology
are able to work on technical tasks in a team and, if necessary, take over the coordination of the team,	Be able to assume the roles of individual, team member, and leader in a multidisciplinary team.	Comprehensive Design of Electronics, Integrated Biomedical Engineering Design, Innovation and Entrepreneurship, Professional Internship, Military Theory & Training, Physical Education
know and understand the methods of project management and economic methods such as risk and change management as well as their limits,	Understand and master the principles of engineering management and methods of economic decision-making, and be able to apply them in a multidisciplinary environment	Introduction to Engineering, Comprehensive Design of Electronics, Integrated Biomedical Engineering Design, Innovation and Entrepreneurship
recognise the need for independent, lifelong learning and are able to pursue it,	Possess the awareness of self-directed and lifelong learning, and have the ability to continuously learn and adapt to development	Introduction to Biomedical Engineering, Integrated Biomedical Engineering Design, Innovation and Entrepreneurship, Bachelor Thesis
have knowledge of foreign languages relevant to professional practice,	Be able to effectively communicate and exchange ideas with industry professionals and the general public on complex biomedical engineering issues, including writing reports and documents, delivering presentations and clearly expressing or responding to instructions. Possess a certain degree of international perspective and be capable of communication and exchange in cross-cultural contexts.	Bachelor Thesis, College English (I-IV)
are able to identify problems and solve them using various research and working techniques,	Be able to conduct research on complex biomedical engineering problems based on scientific principles and methods, including designing experiments, analyzing and interpreting data, and drawing rational and effective conclusions through information synthesis.	Signals and Systems, Intelligent Medical Control Technology, Digital Signal Processing, Biomedical Electronics, Integrated Biomedical Engineering Design, Innovation and Entrepreneurship, Bachelor Thesis
can work in an interdisciplinary environment,	Be able to assume the roles of individual, team member, and leader in a multidisciplinary team.	Innovation and Entrepreneurship, Professional Internship, Military Theory & Training, Physical Education
possess social and professional ethical competences and are able to shape social processes critically, reflectively and with a sense of responsibility and in a democratic spirit.	Possess a foundation in the humanities and social science as well as a strong sense of social responsibility; to understand and adhere to professional ethics and standards in biomedical engineering practice, and fulfill corresponding responsibilities.	Introduction to Engineering, Biomedical Engineering Research Norms and Ethics, Professional Internship, Morality and Law, Outline of Modern Chinese History, Basic Principles of Marxism, Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Mental Health Education for University Students, Career Planning and Employment Guidance, Social Practice, Labor Education, Public Electives
Engineering methodology Graduates are qualified to...		
select and apply the current modelling, calculation, design and test methods for their	Be able to design solutions for complex biomedical engineering problems including the design of systems, units (components), or process flows that	Circuit Theory, Analog Electronic Technology, Digital Electronic Technology, Mechanical Drawing, Signals and

specialization,	meet specific requirements while demonstrating innovation and taking into account factors such as society, health, safety, law, culture, and environment.	Systems，Biomedical Engineering Research Norms and Ethics, Biomedical Sensors, Application Technique of Single Chip Microcomputer, Artificial Intelligence and Medical Applications, Digital Signal Processing, Biomedical Electronics, Principle and Application of Medical Instruments, Intelligent Medical Control Technology
	Be able to develop, select, and use appropriate technologies, resources, modern engineering tools, and information technology tools for complex biomedical engineering problems, including prediction and simulation, and be able to understand their limitations	Circuit Theory, Fundamentals and Applications of MATLAB, Comprehensive Experiment of Analog Electronic Technology, Comprehensive Experiment of Digital Electronic, Comprehensive Design of Electronics,
research technical literature and other sources of information on problems posed,	Be able to apply the basic principles of mathematics, natural sciences, and engineering sciences, and conduct literature research to identify, articulate and analyze complex biomedical engineering problems to obtain effective conclusions.	Circuit Theory, Analog Electronic Technology, Digital Electronic Technology, Digital Signal Processing, Biomedical Electronics, Principle and Application of Medical Instruments, Intelligent Medical Control Technology
design and conduct experiments and computer simulations and interpret the data obtained,	Be able to conduct research on complex biomedical engineering problems based on scientific principles and methods, including designing experiments, analyzing and interpreting data, and drawing rational and effective conclusions through information synthesis.	College Physics Experiment, Medical Statistics, C Program Design, Python Program Design, Analog Electronic Technology, Comprehensive Experiment of Digital Electronic Technology
use databases, standards, codes of good practice and safety regulations.	Be able to conduct reasonable analysis based on relevant background knowledge of biomedical engineering to evaluate the impact of biomedical engineering practices and solutions to complex engineering problems on society, health, safety, law, and culture, and to understand the responsibilities that should be assumed.	Introduction to Engineering, Introduction to Biomedical Engineering, Morality and Law, Situation and Policy,
Engineering development Graduates…		
have special skills in the development of analogue and digital, electrical and electronic circuits, systems and products,	Be able to design solutions for complex biomedical engineering problems including the design of systems, units (components), or process flows that meet specific requirements while demonstrating innovation and taking into account factors such as society, health, safety, law, culture, and environment.	Circuit Theory, Analog Electronic Technology, Digital Electronic Technology, Signals and Systems， Biomedical Sensors, Application Technique of Single Chip Microcomputer, Artificial Intelligence and Medical Applications, Digital Signal Processing, Biomedical Electronics, Principle and Application of Medical Instruments, Intelligent Medical Control Technology
are proficient in the use of the process elements modelling, simulation and testing in a problem-oriented way as well as their integration during development,	Be able to develop, select, and use appropriate technologies, resources, modern engineering tools, and information technology tools for complex biomedical engineering problems, including prediction and simulation, and be able to understand their limitations	Circuit Theory, Fundamentals and Applications of MATLAB, Comprehensive Experiment of Analog Electronic Technology, Comprehensive Experiment of Digital Electronic, Comprehensive Design of Electronics, Medical Statistics, C Program Design, Python Program Design, Application Technique of Single Chip Microcomputer
are capable of developing saleable products	Be able to effectively communicate and exchange ideas with industry	College English (I-IV), College Chinese

for the global market.	professionals and the general public on complex biomedical engineering issues, including writing reports and documents, delivering presentations and clearly expressing or responding to instructions. Possess a certain degree of international perspective and be capable of communication and exchange in cross-cultural contexts.	
Engineering practice and product development Graduates…		
can apply their knowledge and understanding to gain practical skills for solving problems, carrying out investigations and developing systems and processes,	Be able to design solutions for complex biomedical engineering problems including the design of systems, units (components), or process flows that meet specific requirements while demonstrating innovation and taking into account factors such as society, health, safety, law, culture, and environment.	Biomedical Optics, Principles of Medical Imaging, Biomedical Ultrasound Technology, Mathematical Modeling, Medical Image Processing and Analysis, Medical Laboratory Instruments and Technology, Biomedical Materials, Human body Function Replacement Device, Introduction to Brain Science, Digital Signal Processing Course Design, Biomedical Electronics Course Design, Integrated Biomedical Engineering Design
can draw on experience of the possibilities and limitations of the application of materials, computer-aided model designs, systems, processes and tools when solving complex problems,	Be able to develop, select, and use appropriate technologies, resources, modern engineering tools, and information technology tools for complex biomedical engineering problems, including prediction and simulation, and be able to understand their limitations.	Fundamentals and Applications of MATLAB, Virtual Medical Instrument Design, Principle and Application of Embedded System, Microcomputer Principle and Application, Biomedical Detection Technology, Comprehensive Design of Electronics, Digital Signal Processing Course Design, Biomedical Electronics Course Design, Integrated Biomedical Engineering Design
know the practice and requirements in production operations,	Be able to conduct reasonable analysis based on relevant background knowledge of biomedical engineering to evaluate the impact of biomedical engineering practices and solutions to complex engineering problems on society, health, safety, law, and culture, and to understand the responsibilities that should be assumed.	Professional Internship, Introduction to Engineering, Medicine and Humanities, Medical Device Regulatory Science
are able to research technical literature and other sources of information,	Be able to conduct research on complex biomedical engineering problems based on scientific principles and methods, including designing experiments, analyzing and interpreting data, and drawing rational and effective conclusions through information synthesis.	Digital Signal Processing Course Design, Biomedical Electronics Course Design, Integrated Biomedical Engineering Design, Innovation and Entrepreneurship, Professional Internship, Bachelor Thesis
demonstrate an understanding of the health, safety and legal implications of engineering practice and the impact of engineering solutions in a social and environmental context,	Be able to understand and evaluate the impact of engineering practices addressing complex biomedical engineering problems on the environment and on the sustainable development of society.	Introduction to Engineering, Biomedical Engineering Research Norms and Ethics, Medical Device Regulatory Science
undertake to act in accordance with the professional principles and standards of engineering practice,	Possess a foundation in the humanities and social science as well as a strong sense of social responsibility; to understand and adhere to professional ethics and standards in biomedical engineering practice, and fulfill corresponding responsibilities	Professional Internship, Social Practice, Labor Education, Medical Device Regulatory Science
to transfer new results of engineering and	Be able to design solutions for complex biomedical engineering problems	Biomedical Engineering Research Norms and Ethics, Innovation

natural sciences into industrial and commercial production, taking into account sustainability, environmental compatibility as well as economic and safety requirements,	including the design of systems, units (components), or process flows that meet specific requirements while demonstrating innovation and taking into account factors such as society, health, safety, law, culture, and environment.	and Entrepreneurship, Integrated Biomedical Engineering Design, Bachelor Thesis
to deepen the acquired knowledge independently,	Possess the awareness of self-directed and lifelong learning and have the ability to continuously learn and adapt to development.	Integrated Biomedical Engineering Design, Innovation and Entrepreneurship, Bachelor Thesis
are aware of the non-technical implications of engineering,	Be able to understand and evaluate the impact of engineering practices addressing complex biomedical engineering problems on the environment and on the sustainable development of society.	Introduction to Engineering, Biomedical Engineering Research Norms and Ethics
are capable of developing saleable products for the global market.	Be able to effectively communicate and exchange ideas with industry professionals and the general public on complex biomedical engineering issues, including writing reports and documents, delivering presentations and clearly expressing or responding to instructions. Possess a certain degree of international perspective and be capable of communication and exchange in cross-cultural contexts.	Bachelor Thesis

Table 1-2 Objective matrix of CE

ASIIN Subject-Specific Criteria (SSC)	Learning Outcomes of the Study Program	Corresponding Modules
Knowledge, understanding and application Graduates have in particular…		
acquired a broad and well-founded basic knowledge of mathematics, natural sciences and engineering, which enables them to understand and analyse complex phenomena occurring in electrical engineering, information technology or computer science and to independently develop and apply practice-oriented or theory-oriented solutions.	Master basic knowledge in mathematics, physics, biomedical sciences and engineering fundamentals such as optics, mechanics, electronics, computer science, and information technology required to understand and analyse complex phenomena in clinical engineering field. Be able to propose reasonable solutions to solve specific and complex clinical engineering problems.	Advanced Mathematics (1, 2), Probability Theory and Mathematical Statistics, Linear Algebra, College Physics, College Physics Experiment, Normal Anatomy and Physiology, Foundation of Disease, Principles and Applications of Medical Statistics, Circuit Theory, Mechanical Drawing, Engineering Mechanics, Foundation of Mechanical Designing, Analog Electronic Technology, Digital Electronic Technology, Microcontroller Principles and Applications
acquired an understanding of the broader ethical and multidisciplinary context of engineering.	Analyze and evaluate the impact of engineering practices in clinical engineering on environmental and social sustainable development; propose corresponding solutions and improvement measures. Explain how non-engineering factors (economic, legal, social) shape engineering problems and solutions, and articulate the value of cross-disciplinary collaboration.	Clinical Engineering Introduction, Ethics and Rule of Law, Outline of Modern Chinese History, Basic Principles of Marxism, Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Situation and Policy, Military Theory, Medicine and Humanity, Public Elective Courses
Interdisciplinary competences		

Graduates ...		
can analyse and present technical contexts from their own and related fields in a comprehensible way,	Be able to apply fundamental principles of mathematics, natural sciences, and engineering science to identify, formulate, and analyze complex engineering problems through literature research, under consideration of sustainable development requirements, in order to arrive at valid conclusions.	Medical Electrical Safety Engineering, Medical Electrical Safety Training, Clinical Engineering Creativity, Biomedical Materials, Therapeutic Equipment Technology, Principle and Applications of Life Support Equipment, Biomedical Detection Technology, Introduction to Big Data, Intelligent Medical Robot, Medical Imaging Equipment, Advanced Clinical Engineering, Biomedical Optics, Principles of Medical Imaging, Hydraulic and Pneumatic Technology
are able to work on technical tasks in a team and, if necessary, take over the coordination of the team,	capable of fulfilling the roles of individual contributor, team member, and leader within diverse, multidisciplinary teams.	Mental Health Education for University Students, Career Planning and Employment Guidance, Labor Education ,Medical Internship, Social Practice
know and understand the methods of project management and economic methods such as risk and change management as well as their limits,	Understand and apply engineering management principles and economic decision-making methods related to engineering projects in a multidisciplinary environment.	Medical Ethics, Innovation and Entrepreneurship, Introduction to Medical Device Regulation Science
recognise the need for independent, lifelong learning and are able to pursue it,	possess the awareness and capability for self-directed learning, lifelong learning, and critical thinking, enabling them to understand the impact of broad technological transformations on engineering and society, and to actively adapt to new technological changes.	Social Practice, Career Planning and Employment Guidance, Advanced Clinical Engineering
have knowledge of foreign languages relevant to professional practice,	Be able to read professional literature in English; be able to communicate and discuss professional issues with others in English.	College English (I-IV), Technical English for Clinical Engineering
are able to identify problems and solve them using various research and working techniques,	Select and use correctly the tools and methods required for the installation, commissioning, repair, and maintenance of various clinical medical equipment, recognizing their limitations. Utilize modern information technology and software tools during the installation, operation, repair, maintenance, and management processes of clinical medical equipment; propose reasonable solutions based on big data statistical analysis.	Introduction to Big Data, Internet and Information Security, Fundamentals and Applications of MATLAB, Innovation and Entrepreneurship, Mechanical Drawing, Microcontroller Principles and Applications, Comprehensive Experiment of Analog Electronic Technology, Comprehensive Experiment of Digital Electronic Technology, Literature Retrieval Course, Mathematical Modeling
can work in an interdisciplinary environment,	Can maintain effective communication with clinical teams, hospital administrators, and manufacturers.	Introduction to Big Data, Intelligent Medical Robot , Internet and Information Security
possess social and professional ethical competences and are able to shape social processes critically, reflectively and with a sense of responsibility and in a democratic spirit.	Analyze and evaluate the impact of new medical technologies, devices, and products on patient safety, health, law, and culture; understand and assume the social responsibilities of a clinical engineer.	Medical Ethics, Ethics and Rule of Law, Medicine and Humanity
Engineering methodology Graduates are qualified to...		
select and apply the current modelling,	evaluate and justify the selection of modeling, calculation, design, and	Medical Electrical Safety Engineering, Biomedical Materials,

calculation, design and test methods for their specialization,	testing methods for medical devices/processes by analyzing clinical risk, regulatory constraints, and clinical workflow requirements.	Therapeutic Equipment Technology, Principle and Applications of Life Support Equipment, Biomedical Detection Technology, Advanced Clinical Engineering, Bachelor Thesis, Mathematical Modeling, Fundamentals and Applications of MATLAB
research technical literature and other sources of information on problems posed,	formulate research approaches and plans for complex engineering problems within clinical engineering technology (e.g., medical device improvement, functional development) based on scientific principles, methodologies and literature review/analysis.	Clinical Engineering Creativity, Innovation and Entrepreneurship, Clinical Engineering Introduction, Advanced Clinical Engineering
design and conduct experiments and computer simulations and interpret the data obtained,	design overall experimental protocols, construct experimental setups, and select appropriate methodologies to collect and process experimental data, analyzing and interpreting experimental results.	Principles and Applications of Medical Statistics, Comprehensive Practice of Mechanical Drawing, Comprehensive Experiment of Analog Electronic Technology, Comprehensive Experiment of Digital Electronic Technology
use databases, standards, codes of good practice and safety regulations.	locate and accurately interpret relevant medical device standards, safety regulations, and clinical practice guidelines for specific healthcare technology scenarios.	Introduction to Medical Device Regulation Science, Medical Electrical Safety Engineering, Literature Retrieval Course
Engineering development Graduates…		
have special skills in the development of analogue and digital, electrical and electronic circuits, systems and products,	are able to design, simulate, and validate analogue front-end circuits for biomedical signals meeting medical safety standards; demonstrate proficiency in PCB design/fabrication and master fundamental techniques for electronic and electrical equipment maintenance.	Analog Electronic Technology, Digital Electronic Technology, Microcontroller Principles and Applications, Comprehensive Experiment of Analog Electronic Technology, Comprehensive Experiment of Digital Electronic Technology
are proficient in the use of the process elements modelling, simulation and testing in a problem-oriented way as well as their integration during development,	can establish bidirectional traceability between simulation models and physical test results through a closed-loop workflow that documents model credibility evidence, test-to-model deviation analysis and residual risk mitigation.	Bachelor Thesis, Comprehensive Practice of Mechanical Drawing, Comprehensive Experiment of Analog Electronic Technology, Comprehensive Experiment of Digital Electronic Technology, Innovation and Entrepreneurship
are capable of developing saleable products for the global market.	are able to design, prototype, and validate clinical engineering products that integrate user-centered design principles, clinical need validation.	Medical Electrical Safety Engineering, Therapeutic Equipment Technology, Principle and Applications of Life Support Equipment, Biomedical Detection Technology
Engineering practice and product development Graduates…		
can apply their knowledge and understanding to gain practical skills for solving problems, carrying out investigations and developing systems and processes,	can apply engineering methodologies to design, evaluate, improve, and manage clinical engineering systems and processes including equipment lifecycle management, risk assessment, technology integration, workflow optimization, and quality assurance programs within healthcare settings to	Innovation and Entrepreneurship, Bachelor Thesis, Medical Internship

	enhance safety, efficiency, and effectiveness.	
can draw on experience of the possibilities and limitations of the application of materials, computer-aided model designs, systems, processes and tools when solving complex problems,	can critically assess the functional possibilities, biocompatibility constraints, failure modes, and regulatory implications of engineering materials and integrated medical systems when designing solutions or troubleshooting; can recognize modeling assumptions, calibration requirements, computational constraints, and validating outputs against real-world clinical performance and regulatory standards.	Biomedical Materials, Fundamentals and Applications of MATLAB, Medical Electrical Safety Engineering, Medical Electrical Safety Training, Introduction to Medical Device Regulation Science
know the practice and requirements in production operations,	are able to systematically explain the principles, practices, and regulatory requirements governing medical device production operations ensure safety, efficacy, and compliance throughout the product lifecycle.	Medical Internship, Medical Electrical Safety Engineering, Medical Electrical Safety Training, Clinical Skills, Introduction to Medical Device Regulation Science
are able to research technical literature and other sources of information,	can identify, retrieve, and critically evaluate technical literature (e.g., peer-reviewed journals, regulatory guidelines, device standards, manufacturer documentation) and other information sources to validate their relevance, credibility, and applicability to clinical engineering problems.	Literature Retrieval Course, Bachelor Thesis, Innovation and Entrepreneurship, Clinical Engineering Creativity
demonstrate an understanding of the health, safety and legal implications of engineering practice and the impact of engineering solutions in a social and environmental context,	able to identify, analyze, and address interconnected risks—spanning patient safety, regulatory compliance, legal liability, societal equity, and environmental sustainability—inherent in clinical engineering solutions.	Medical Electrical Safety Engineering, Medical Electrical Safety Training, Introduction to Medical Device Regulation Science, Medical Ethics, Medicine and Humanity
undertake to act in accordance with the professional principles and standards of engineering practice,	demonstrate consistent commitment to ethical principles, patient safety imperatives, and regulatory standards when designing, implementing, or managing medical technology.	Introduction to Medical Device Regulation Science, Medical Ethics, Medicine and Humanity
to transfer new results of engineering and natural sciences into industrial and commercial production, taking into account sustainability, environmental compatibility as well as economic and safety requirements,	to develop and execute structured pathways to translate emerging engineering innovations (e.g., AI diagnostics, biomaterials, IoT devices) into scalable, commercially viable medical products — integrating lifecycle sustainability, environmental impact assessments, rigorous safety validation, and economic feasibility from prototype to production.	Biomedical Materials, Therapeutic Equipment Technology, Principle and Applications of Life Support Equipment, Biomedical Detection Technology, Introduction to Medical Device Regulation Science, Advanced Clinical Engineering, Medical Internship, Bachelor Thesis
to deepen the acquired knowledge independently,	to independently identify gaps in clinical engineering practice, synthesize evidence from multidisciplinary sources, and translate insights into actionable solutions while continuously updating their professional expertise.	Bachelor Thesis, Advanced Clinical Engineering, Career Planning and Employment Guidance, Literature Retrieval Course
are aware of the non-technical implications of engineering,	are able to analyze the ethical, legal, socio-economic, and systemic implications of clinical engineering solutions including patient safety equity, data privacy, environmental sustainability, and healthcare accessibility.	Introduction to Medical Device Regulation Science, Medical Ethics, Medicine and Humanity, Ethics and Rule of Law
are capable of developing saleable products for the global market.	are able to integrate international regulatory frameworks, quality standards, and risk management into product development lifecycle.	Principle and Applications of Life Support Equipment, Biomedical Detection Technology, Therapeutic Equipment Technology, Medical Electrical Safety Engineering

1.1.3 Assessment and Demand

(1) Program Evaluation

The BME and CE programs successfully passed the qualification assessment for bachelor's degree granting authority organized by the Shanghai Education Commission in 2019 and 2021, respectively. Both BME and CE programs also passed the qualification assessment for undergraduate teaching in ordinary HEIs organized by the Chinese Ministry of Education in 2023.

(2) Market Demand and Employment

According to relevant statistics, the size of Chinese medical device market was approximately 1.2 trillion RMB in 2024, with projections to grow to 1.7 trillion RMB in 2026 and 2.5 trillion RMB in 2030. The rapid expansion in this field has created an urgent need for biomedical engineering and clinical engineering professionals, providing strong job prospects for BME and CE graduates.

Students from the BME and CE programs graduate with a solid foundation of professional knowledge, robust practical skills, and strong job adaptability, along with innovation awareness and high comprehensive abilities. Therefore, the graduates are widely accepted in the job market. The employment rates of both programs have always maintained a high level, and the employment situation in the past five years is shown in **Table 1-3** and **Table 1-4**, respectively. The data shows that despite the challenging economic environment in recent years, the employment rate of the graduates of BME and CE remain high.

In the past five years, more than 700 students have graduated from the BME program. They mainly engaged in positions such as medical device research & development, production and manufacturing, quality testing, maintenance management, after-sales service, and market sales. Most graduates have become technical backbones in enterprises or public institutions.

In the past five years, 431 graduates from the CE program have entered the healthcare industry, participating roles in clinical engineering and equipment management across hospitals, medical institutions, medical device companies, and regulatory agencies. Some graduates have become key technical and management personnel within their organizations.

Table 1-3 Employment Situation of BME in the Past Five Years

Year	2020	2021	2022	2023	2024
Number of graduates	168	188	145	118	119
Employment rate	94.04%	98.37%	91.72%	93.22%	96.64%

Table 1-4 Employment Situation of CE in the Past Five Years

Year	2020	2021	2022	2023	2024
Number of graduates	/	59	137	115	120
Employment rate	/	100%	99.27%	98.26%	98.33%

(3) Graduate Survey

Both BME and CE programs have established a graduate tracking system to comprehensively track and analyze the post-graduation status of the students. The tracking analysis result shows that the program graduates are widely distributed across China, with a high professional matching rate of around 80%. Graduates report a high level of confidence and recognition in the industry they work in, with over 90% expressing satisfaction.

For the graduates from BME program, about 10% have entered the hospital workforce, primarily in the equipment department, while 77% work in medical device-related enterprises. Around 30% of the graduates are employed at prestigious tertiary hospitals. Approximately 13% of graduates continue their studies at the master level.

Employers widely recognize BME and CE graduates for their strong professional foundation, practical abilities, adaptability, and innovation consciousness. The level of employer satisfaction with graduates from the 2020-2023 cohort is shown in **Table 1-5**. MyCOS evaluation report on the academic achievement of senior students over the years and the survey results of graduates also indicate that the curriculum is reasonable and closely related to the demand of the job market. Graduates have strong adaptability after graduation and their academic performance has fully achieved the expected goals.

Table 1-5 Employer Satisfaction of Graduates from 2020-2023 (MyCOS)

Satisfaction Level	Year			
	2023	2022	2021	2020
Very Satisfied	40.46%	37%	38%	39%
Satisfied	58.78%	62%	60%	57%
Dissatisfied	0.76%	1%	2%	4%

The graduate and employer satisfaction surveys of CMI, which can be found in **Appendix 21**, further emphasize the program's success in training the students for the workforce.

1.2 Name of the Degree Program

The name of the BME program is derived from the "Catalogue of Undergraduate Majors in Ordinary Higher Education Institutions" formulated by the Ministry of Education of the People's Republic of China. It is classified as a biomedical engineering major under engineering, with a major code of 082601. The program lasts for four years and grants the bachelor degree of engineering. The BME program was approved in 2015 by the Ministry of Education of the People's Republic of China. (see **Appendix 06** for the approval document)

The CE program has evolved alongside the development of science and technology and the advancement of medical technology. As a result, a large number of advanced medical devices have entered various stages of clinical use in hospitals. The professional name of Clinical Engineering (four-year program) reflects the interdisciplinary nature of medical engineering integration, which is the defining characteristic of the fusion of medicine and engineering technology. The CE program was approved in 2016 by the Ministry of Education of the People's Republic of China. (see **Appendix 06** for the approval document)

1.3 Curriculum

1.3.1 Content

According to the study plan, the courses of the BME and the CE programs both cover 9 competency areas, see Appendices 8.2 and 8.4. For clearness purpose, the curricula have been rearranged to a semester-by-semester structure and are listed in **Table 1-6** and **Table 1-7**.

Table 1-6 Curriculum of BME Program

Semester	Course	Contact Hour	Self-study Hour	Total Hour	ECTS
1	Advanced Mathematics (1)	80	70	150	5
	College Physics	64	86	150	5
	College English (1)	64	26	90	3
	C Program Design	48	72	120	4
	Introduction to Biomedical Engineering	32	43	45	2.5
	Outline of Modern Chinese History	48	12	60	2
	Situation and Policy	32	13	45	1.5
	Physical Education (1)	30	0	30	1
	College Chinese	32	13	45	1.5
	Public Electives-1	16	14	30	1
		Total 1st Semester		**795**	**26.5**
2	College Physics Experiment	16	14	30	1
	Advanced Mathematics (2)	80	70	150	
	Medical Chemistry (Organic)	16	14	30	1
	Medical Chemistry (Inorganic)	16	14	30	1
	College English (2)	64	26	90	3
	Python Program Design	32	43	75	2.5
	Introduction to Engineering	32	28	60	2
	Circuit Theory	48	27	75	2.5
	Morality and Law	48	12	60	2
	Military Theory & Training	64	11	75	2.5
	Mental health education for university students	32	13	45	1.5
	Fundamentals and Applications of MATLAB	64	11	75	2.5
	Physical Education (2)	30	0	30	1
	Public Electives-2	16	14	30	1
		Total 2nd Semester		**855**	**28.5**
3	Linear Algebra	32	58	90	3
	Probability Theory and Mathematical Statistics	48	57	105	3.5
	Preclinical Medicine Theories	128	52	180	6
	College English (3)	64	26	90	3
	Engineering Mechanics	48	72	120	4
	Analog Electronic Technology	64	56	120	4
	Basic Principles of Marxism	48	12	60	2
	Career Planning and Employment Guidance	16	14	30	1
	Physical Education (3)	30	0	30	1
	Public Electives-3	16	14	30	1
		Total 3rd Semester		**855**	**28.5**
4	Medical Statistics	32	58	90	3
	College English (4)	64	26	90	3
	Digital Electronic Technology	48	72	120	4
	Mechanical Drawing	64	71	135	4.5
	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	48	12	60	2
	Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	32	13	45	1.5

Semester	Course	Contact Hour	Self-study Hour	Total Hour	ECTS
	Comprehensive Experiment of Analog Electronic Technology	32	43	75	2.5
	Comprehensive Experiment of Digital Electronic Technology	32	43	75	2.5
	Comprehensive Design of Electronics	64	56	120	4
	Physical Education (4)	30	0	30	1
	Public Electives-4	16	14	30	1
		Total 4th Semester		**870**	**29**
5	Principal of Clinical Medicine	32	73	105	3.5
	Signals and Systems	48	102	150	5
	Biomedical Engineering Research Norms and Ethics	16	44	60	2
	Biomedical Sensors	32	58	90	3
	Application Technique of Single Chip Microcomputer	48	72	120	4
	Artificial Intelligence and Medical Applications	32	88	120	4
	Biomedical Optics*	32	28	60	2
	Principles of Medical Imaging*	32	28	60	2
	Medicine and Humanities*	32	28	60	2
	Medical Device Regulatory Science*	32	28	60	2
	Biomedical Materials*	32	28	60	2
	Biomedical Detection Technology*	32	28	60	2
	Public Electives-5	16	14	30	1
		Total 5th Semester		**1035****	**34.5****
6	Digital Signal Processing	32	58	90	3
	Biomedical Electronics	32	58	90	3
	Principle and Application of Medical Instruments	32	58	90	3
	Intelligent Medical Control Technology	48	57	105	3.5
	Biomechanics*	32	28	60	2
	Biomedical Ultrasound Technology*	32	28	60	2
	Virtual Medical Instrument Design*	32	28	60	2
	Mathematical Modeling*	32	28	60	2
	Human body Function Replacement Device*	32	28	60	2
	Introduction to Brain Science*	32	28	60	2
	Microcomputer Principle and Application*	64	26	90	3
	Digital Signal Processing Course Design	32	13	45	1.5
	Biomedical Electronics Course Design	32	13	45	1.5
	Professional Internship	64	26	90	3
	Public Electives-6	16	14	30	1
		Total 6th Semester		**1035****	**34.5****
7	Principle and Application of Embedded System*	32	28	60	2
	Medical Image Processing and Analysis*	32	28	60	2
	Medical Laboratory Instruments and Technology*	32	28	60	2
	Integrated Biomedical Engineering Design	64	56	120	4
	Physical Education (5)	30	0	30	1
	Social Practice	128	22	150	5
	Labor Education	32	13	45	1.5
	Innovation and Entrepreneurship	64	56	120	4
		Total 7th Semester		**645****	**21.5****
8	Bachelor Thesis	0	480	480	16
		Total 8th Semester		**480**	**16**
		OFFERED		**6570****	**219****
		REQUIREMENT		**6000**	**200**

*Professional electives. Each student should achieve 14 ECTS in this category before graduation.

**Contains ECTS for all available electives

Table 1-7 Curriculum of CE Program

Semester	Course	Contact Hour	Self-study Hour	Total Hour	ECTS
1	Advanced Mathematics	160	35	195	6.5
	College English (1)	64	26	90	3
	Mechanical Drawing	64	71	135	4.5
	Engineering Mechanics	32	58	90	3
	Medical Ethics*	32	28	60	2
	Outline of Modern Chinese History	48	12	60	2
	Situation and Policy	32	13	45	1.5
	Physical Education	144	6	150	5
	Public Electives-1	16	14	30	1
		Total 1st Semester		**855****	**28.5****
2	College Physics	32	43	75	2.5
	College Physics Experiment	16	14	30	1
	College English (2)	64	26	90	3
	C Program Design	48	72	120	4
	Circuit Theory	48	27	75	2.5
	Clinical Engineering Introduction	32	58	90	3
	Ethics and Rule of Law	48	12	60	2
	Military Theory	36	9	45	1.5
	Military Skill	64	11	75	2.5
	Mental Health Education for University Students	32	13	45	1.5
	Comprehensive Practice of Mechanical Drawing	32	43	75	2.5
	Public Electives-2	16	14	30	1
		Total 2nd Semester		**790**	**27**
3	Probability Theory and Mathematical Statistics	32	58	90	3
	Normal Anatomy and Physiology	64	71	135	4.5
	College English (3)	64	26	90	3
	Foundation of Mechanical Designing	48	72	120	4
	Analog Electronic Technology	64	56	120	4
	Introduction to Big Data*	32	28	60	2
	Basic Principles of Marxism	48	12	60	2
	Career Planning and Employment Guidance	16	14	30	1
	Public Electives-3	16	14	30	1
		Total 3rd Semester		**735****	**24.5****
4	Linear Algebra	48	72	120	4
	Foundation of Disease	32	58	90	3
	College English (4)	64	26	90	3
	Literature Retrieval Course	32	43	75	2.5
	Digital Electronic Technology	48	72	120	4
	Medical Electrical Safety Engineering	48	87	135	4.5
	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	48	12	60	2
	Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	32	13	45	1.5
	Comprehensive Experiment of Analog Electronic Technology	32	43	75	2.5
	Comprehensive Experiment of Digital Electronic Technology	32	43	75	2.5
	Medical Electrical Safety Training	32	43	75	2.5
	Clinical Engineering Creativity	32	43	75	2.5
	Public Electives-4	16	14	30	1
		Total 4th Semester		**1065**	**35.5**
5	Principles and Applications of Medical Statistics	48	72	120	4
	Microcontroller Principles and Applications	48	72	120	4
	Biomedical Materials	32	58	90	3
	Biomedical Detection Technology	48	87	135	4.5

Semester	Course	Contact Hour	Self-study Hour	Total Hour	ECTS
	Hydraulic and Pneumatic Technology	32	58	90	3
	Introduction to Medical Device Regulation Science	32	58	90	3
	Medical Imaging Equipment	32	58	90	3
	Advanced Clinical Engineering	32	58	90	3
	Medicine and Humanity	32	13	45	1.5
	Public Electives-5	16	14	30	1
		Total 5th Semester		**900**	**30**
6	Therapeutic Equipment Technology	48	87	135	4.5
	Principle and Applications of Life Support Equipment	48	87	135	4.5
	Biomedical Optics*	32	28	60	2
	Principles of Medical Imaging*	32	28	60	2
	Mathematical Modeling*	32	28	60	2
	Clinical Skills	48	72	120	4
	Medical Internship	64	26	90	3
	Public Electives-6	16	14	30	1
		Total 6th semester		**690****	**23****
7	Fundamentals and Applications of MATLAB*	32	28	60	2
	Technical English for Clinical Engineering*	32	28	60	2
	Intelligent Medical Robot*	32	28	60	2
	Internet and Information Security*	32	28	60	2
	Social Practice	128	22	150	5
	Labor Education	32	13	45	1.5
	Innovation and Entrepreneurship	64	56	120	4
		Total 7th Semester		**555****	**18.5****
8	Bachelor Thesis	0	480	480	16
		Total 8th Semester		**480**	**16**
		OFFERED		**6090****	**203****
		REQUIREMENT		**5970**	**199**

*Professional electives. Each student should achieve 14 ECTS in this category before graduation.

**Contains ECTS for all available electives

1.3.2 Structure of the Program

Both the BME and CE undergraduate programs are four years (8 semesters). Overall, the curriculum system is organized into 9 competence areas, the content of which is chronologically interrelated. In terms of credit and competency allocation, language courses and public basic courses are arranged in semesters 1-4, including English, Philosophy (Humanities and Ideological Education), Physical education, etc., which can help students familiarize themselves with relevant English, humanities, and law, thus improving their cross-cultural communication skills and humanistic literacy.

Mathematics, Natural Sciences (including Physics, Chemistry, and Medicine), and Information Technology courses are arranged in semesters 1-4 to familiarize students with the basic knowledge and skills as well as to lay a foundation for the subsequent specialized courses. For example, Advanced Mathematics is scheduled in semesters 1-2, Linear Algebra, Probability Theory and Mathematical Statistics in semester 3, University Physics and Medical Chemistry semesters 1 and 2, and Information Technology in semesters 1-2 to equip students with the knowledge and skills of computer science and information technology. Preclinical Medicine Theories is scheduled in semesters 3-4 to equip students with the basic medical knowledge required for the integrated medical and engineering courses.

The basic engineering courses are mainly arranged in semesters 1-4, including subjects related to engineering knowledge and skills, such as Mechanical Drawing, Engineering Mechanics, Circuit Principles, Analog Electronic Technology, Digital Electronic Technology, Signals and Systems, etc., laying the foundation for the subsequent study of engineering applications and professional courses. The engineering application courses are mainly arranged in semesters 5-6, which include the core courses of both programs. For BME, they are Digital Signal Processing, Biomedical Electronics, Artificial Intelligence and Medical Applications, Intelligent Medical Control Technology, etc. For CE, they are Medical Electrical Safety, Biomedical Materials, Medical Treatment Equipment Technology, Principles and Applications of Life Support Equipment, and Biomedical Detection Technology. These courses are crucial in the entire curriculum system, as they are used to deepen and expand professional knowledge and applications. Electives include art, social practice, innovation and entrepreneurship, professional and interdisciplinary extension courses (e.g., Biomedical Optics, Principles of Medical Imaging, Mathematical Modeling, Biomedical Materials, etc.), which strategically contribute to the achievement of the intended competence profile. These courses are arranged mainly in semesters 5-7 and can be selected by students based on their own personal and professional interests to expand their interdisciplinary knowledge and skills. The practical training courses and undergraduate graduation project (thesis) are mainly arranged in semesters 4-8. The topics of undergraduate graduation projects mostly come from the research projects of the supervisors or the engineering projects of the enterprises. Practical training courses and undergraduate graduation projects can help students accumulate a large amount of practical engineering experience and improve their employment competitiveness. According to the curriculum, BME and CE students will eventually earn 200 and 199 ECTS credits in 8 semesters.

1.3.3 Professional Practice Ability Training Curriculum System

1.3.3.1 Practice Training of BME

The curriculum system for cultivating practical abilities in BME program includes experiments, course design, professional internships, comprehensive design and undergraduate graduation design, and scientific research and innovation practice.

(1) Experiment

Experiments of BME program include two types: subject-based experiments and professional comprehensive experiments. The BME program currently offers four independent experimental courses, namely College Physics Experiment, Fundamentals and Applications of MATLAB，Comprehensive Experiment of Analog Electronic Technology and Comprehensive Experiment of Digital Electronic Technology. All subject-based experiments and professional comprehensive experiments are completed in professional laboratories, university practical teaching centers, and computer rooms of the university computing center.

Through the study of experimental courses, students acquire preliminary abilities in software and hardware design, implementation and testing, laying a solid foundation for subsequent practice training in terms of platform environment, tool application, and engineering thinking.

(2) Course Design

The course design for BME includes Digital Signal Processing and Biomedical Electronics. The course design of Biomedical Electronics is mainly based on hardware, i.e., common electronic medical instrument systems, to strengthen students' understanding of biomedical measurement systems, including system design schemes and key technologies. The course design of Digital Signal Processing is mainly based on signal processing and analysis systems, which strengthens students' understanding of biomedical signal processing and analysis algorithms, including signal sampling, representation and filter.

Through the course design, students develop the ability to design, implement, and analyze biomedical electronics and signal processing methods and solutions relevant to BME, laying a solid foundation for the subsequent comprehensive design and graduation design.

(3) Comprehensive Design and Graduation Design

The BME program offers two comprehensive design courses, namely Comprehensive Design of Electronics and Integrated Biomedical Engineering Design. The former is scheduled in semester 4, which mainly enhances students' understanding of circuit principles, analog and digital electronic technology related knowledge, reinforces students' comprehensive design and application abilities of electronic circuit, and lays a good foundation for the subsequent study of biomedical electronic related technologies. Integrated Biomedical Engineering Design is in the 7th semester, mainly to strengthen the students' professional comprehensive design and application abilities and prepare for graduation design work.

The graduation design topics of BME program are all from research projects of professional lecturers, practical application problems in medical institutions, and enterprise engineering applications. The entire process emphasizes comprehensive design ability training, focusing on cultivating students' engineering awareness, independent problem-solving ability, and collaborative spirit, especially their innovative consciousness and ability. Graduation projects also hire external mentors with engineering and practical backgrounds to participate in guidance. The entire process of graduation design goes through the stages of topic review, student topic selection, task book issuance, proposal defense, mid-term inspection, defense qualification review, evaluation by lecturers, random inspection and blind review, graduation defense. The content and quality of the graduation design are strictly controlled to ensure that it meets the expected quality.

(4) Professional Internship

Professional internships enable students to understand industry demands, be familiar with common medical instrument application environments and operating procedures. Students are required to complete their internship at an external internship base and submit an internship report under the joint guidance of both on-campus and off-campus mentors. The internship process will be evaluated by the mentor at the internship base, and the internship report will be evaluated by the on-campus mentor. The outline and related requirements can be found in the module description of professional internship (see P146 of **Appendix 9.1)**.

(5) Research and Innovation Practice

Students of the BME program are encouraged to participate in innovation and entrepreneurship practice activities. They can also engage in extracurricular scientific research and innovation practice activities. The BME program relies on faculty teams and the research platform of the college to actively build a communication and exchange platform between undergraduate students and faculty advisors. Using the college's innovation studio as a hub, it actively promotes various student-led innovation and entrepreneurship projects for college students and has achieved numerous high-level results. The list of student innovation and entrepreneurship projects can be found in **Appendix 5.1.** The list of municipal and national awards can be found in **Appendix 5.3**.

Through scientific research and innovative practice, students develop a strong sense of innovation and the ability for independent and lifelong learning.

1.3.3.2 Practice Training of CE

(1) Experiment

The experimental courses of CE program are categorized into three types: disciplinary foundation experiments, comprehensive specialized experiments, and open innovation experiments. Currently, a total of 5 experimental courses have been established, comprising 40 experimental projects.

(2) Internship in the medical industry

Internship in the medical industry is primarily conducted in clinical departments closely related to the responsibilities of clinical engineers, including hospital hemodialysis centers, operating rooms, intensive care units (ICUs), and medical equipment departments (engineering support divisions). Key activities involve clinical operation, routine maintenance, equipment asset management and functional development of life-support equipment (e.g., hemodialysis machines, cardiopulmonary bypass machines, ventilators, and anesthesia machines) and medical therapeutic devices (e.g., high-frequency electrosurgical units, pacemakers, and defibrillators). Optional internship placements at manufacturing facilities producing the aforementioned life-support equipment to observe the full lifecycle of R&D, production, quality control, and commissioning. The internship report is completed under the joint guidance of university supervisors and hospital/corporate mentors, with a comprehensive evaluation based on assessments from all supervising instructors. The internship description is detailed in P106 of **Appendix 9.2**.

(3) Clinical Engineering Innovation Design

CE innovation design is divided into innovation practice and entrepreneurship practice. Innovation practice involves transforming creative ideas into functional prototypes through market research, literature review, case analysis, patent research, product design, technical refinement, project roadshows, and promotional exchanges. Entrepreneurship practice focuses

on converting ideas into marketable products through creative ideation, financing strategies, and commercialization processes. CE program leverages the teaching faculty and university research platforms to foster collaboration between students and professionals. Through the undergraduate innovation studio, the program actively promotes diverse innovation and entrepreneurship projects, yielding high-level outcomes (see **Appendix 5.2** for project listings). Student-led innovation projects have earned multiple municipal and national awards (details in **Appendix 5.4**).

(4) Graduation Design

For the graduation design of CE program, the course objective, implementation process, requirements, etc., are same with that of BME program.

1.3.4 Student Mobility

At present, the student mobility of both BME and CE programs can be reflected in the following way:

Change of major: To implement the student-centered education concept, meet the students' personalized development needs, fully mobilize and give full play to the enthusiasm and effectiveness of students' learning, and allow students to have greater autonomy in learning and the right to choose, SUMHS provides certain opportunities for students to change programs. In accordance with the relevant provisions of the Regulations on the Administration of Students in Ordinary Institutions of Higher Learning (Order No. 41 of the Ministry of Education), the Regulations on the Administration of Student Status of Full time Undergraduate Students in SUMHS (SUMHS AA [2019] No. 28), and the Implementation Measures of SUMHS for the Major Transfer of Full time Undergraduate Students (SUMHS AA [2020] No. 7), new students in SUMHS can apply for the transfer of major in the 2nd semester. The documents related to student enrollment management and major transfer can be found in **Appendix 22**.

Each secondary college has a leadership group and a working group for the transfer of majors, responsible for leading the college's transfer of majors, formulating and publishing relevant measures, organizing interviews, and other related work.

The statistics on student mobility can be found in **Appendix 10**.

Joint study program: BME has just initiated a joint articulation program with the Monash University in Australia. This is a 2+2 program. Applicants must have successfully completed the first two years of the SUMHS course and obtained an average percentage of 70% or equivalent GPA. Monash University will use the entire academic record, including failed & repeated units, as part of its selection considerations. The accepted students will finish their third and fourth year for the study program at Monash University. The detailed articulation agreement can be found in **Appendix 13.2**.

For the last several years, our internal and external cooperations have faced challenges due to multiple factors such as the COVID pandemic, changing political environment, and the initial

development phase. SUMHS including the programs BME and CE are always actively seeking and establishing other forms of student mobility such as temporary studies, internships and project works at other higher education institutions and companies domestically and abroad.

1.3.5 Periodic Review of the Curriculum

Curriculum review refers to checking whether and to what extent the objectives, formulation, and implementation of a course have been achieved according to the training objectives, determining the teaching effectiveness of the course, and making decisions to improve the course construction accordingly. It also provides the basis for revising the study plan.

In accordance with the relevant provisions of the Measures for Curriculum Construction and Management of SUMHS (Trial) (SUMHS AA [2020] No. 8**)** (see **Appendix 23** for details), to ensure that the curriculum content and teaching quality meet the training objectives and meet the needs of disciplinary development and technological progress, both BME and CE programs conduct regular reviews of the curriculum every year. The review follows the principles of educational value, scientific rigor, and objectivity and the evaluation process must ensure comprehensive coverage of all aspects of the curriculum and be fair and reasonable.

Guided by the principle of "student-centered", the course evaluation includes aspects such as clarity of course objectives, timeliness of teaching content, effectiveness of teaching methods, richness of teaching resources, practicality of student feedback, and adaptability to industry demands. The evaluation process includes six steps: evaluation preparation, data collection, expert review, analysis and summary, revision suggestions, and revision implementation. The evaluation team extensively collected opinions and suggestions from lecturers, students, industry experts, and other parties through surveys, discussions, and classroom lectures. The expert review team conducts in-depth analysis of the collected data, identifies the strengths and weaknesses of the course, and proposes constructive revision suggestions. These suggestions will be implemented in the course to promote continuous optimization of the curriculum.

For example, for the program BME over five years, based on the feedback from the students and teaching staff, the courses related to the forefront of technological development in the artificial intelligence industry, i.e., Python Program Design and Artificial Intelligence and Medical Applications were included in the curriculum. Based on the feedback from the Professional Teaching Guidance Committee, professional comprehensive practical courses, i.e., Comprehensive Design of Electronics and Integrated Biomedical Engineering Design were included in the curriculum. Similarly, for the program CE, the courses Introduction to Big Data, Intelligent Medical Robotics, Comprehensive Design of Electronics and Comprehensive Mechanical Drawing Practice were included in the curriculum.

1.4 Admission Requirements

1.4.1 Admission Requirements

For domestic candidates who plan to be admitted to SUMHS for undergraduate and

bachelor's degree must participate in the unified entrance examination for colleges and universities of the People's Republic of China, or the unified entrance examination held by provinces and cities. Only those who meet the following conditions can participate in the exam registration: (1) Comply with the provisions of the constitution and laws of the People's Republic of China; (2) Having graduated from a senior secondary education school or an equivalent degree. For international candidates, detailed admission requirements can be found in the English website: https://ieceng.sumhs.edu.cn/AdmissionRequirements/list.htm.

1.4.2 Enrollment and Enrollment Process

The enrollment of Chinese universities is determined by each province (municipality directly under the central government) based on the number of candidates and exam results. In the enrollment stage, the enrollment department of SUMHS, based on the predetermined enrollment plan, comprehensively measures the morality, intelligence and physique of the candidates, and mainly selects the best candidates according to their scores. The typical admission process includes application, review, pre-admission, admission inspection, and issuance of admission notices. When new students enter SUMHS, they need to provide the admission notice and identity documents and then register in the corresponding departments according to the suggestions in the registration instructions. The typical enrollment registration process is as follows: confirmation of enrollment, payment of tuition fees, registration of student status, and receipt of supplies, etc.

1.4.3 Enrollment Transparency

The admission and enrollment process of new students in SUMHS is strictly in accordance with the relevant procedures and documents, with a high degree of transparency. According to the education law of the People's Republic of China, the enrollment and admission work of ordinary HEIs in China adopts a "university responsible, recruitment office supervised" admission mechanism. Here, the "recruitment office" refers to the provincial-level recruitment office where the candidates are located, not the recruitment office of the university. In other words, for candidates who pass the ideological, political, and moral assessment, abide by the laws and regulations, pass the physical examination, and achieve the same batch admission control score line in the unified examination, and meet the university's transfer requirements, whether to admit them and the programs they admit will be strictly determined by the HEIs in accordance with relevant enrollment and admission regulations. HEIs are responsible for providing explanations and handling other special issues regarding unaccredited candidates. The provincial recruitment offices where candidates are located organize and implement the release of qualified student electronic files to HEIs, and supervise the implementation of national enrollment policies, enrollment plan adjustments, and execution by HEIs, correcting behaviors that violate national enrollment policies and regulations. The university has promulgated and implemented the Regulations on Enrollment and Admission of SUMHS (see **Appendix 11** for details) to standardize enrollment procedures and improve publicity channels. The university also uses the enrollment information website (https://zs.sumhs.edu.cn) to disclose enrollment information and accept supervision.

The admission rate statistics can be found in **Appendix 12**.

1.5 Workload and Credit

At SUMHS, 16 contact hours in the theoretical course module translate to 1 Chinese credit (excluding language and non-engineering general education courses). 32 contact hours in the practical module are equivalent to 1 Chinese credit (excluding graduation design, i.e., thesis). Chinese credits do not include self-study hours, only contact hours are counted. And ECTS (European Credit Transfer System) credits not only include contact hours but also self-study hours. The sum of contact hours and self-study hours is the workload of student learning. In general, a 30-hour workload corresponds to 1 ECTS credit.

1.5.1 Study Time (Required Workload)/Contact hours, Credit, and Independent Study

The hours and credits of each module in both BME and CE programs can be found in **Appendixes 8.2 and 8.4**. The syllabus for each module can be found in **Appendix 09**. Statistics of students' study time for different categories over four years are shown in **Table 1-8**.

Table 1-8 Statistics of Four-Year Course Hours for BME and CE programs

Classifications	BME			CE		
	Contact Hours	Self-study Hours	Total Study Hours	Contact Hours	Self-study Hours	Total Study Hours
Mathematics and Natural Sciences	544	566	1110	432	423	855
Informatics	80	115	195	80	115	195
Engineering Fundamentals	384	471	855	384	486	870
Engineering Application	272	493	765	352	638	990
Electives	224	196	420	224	196	420
Foreign Languages	256	104	360	256	104	360
General Courses	870	300	1170	900	315	1215
Experiments and Practice	384	261	645	272	313	585
Graduation Design (Thesis)	0	480	480	0	480	480
Total Study Hours	**3014**	**2986**	**6000**	**2900**	**3070**	**5970**

1.5.2 Credit System

Students' learning outcomes are mainly reflected in the form of credits. Each undergraduate student majoring in BME must obtain 200 ECTS credits after completing four years of study. In the first three academic years, the required credits for students are roughly equal, approximately 55 ECTS for each year. The credits for the fourth academic year are intentionally kept low, about 35 ECTS credits, mainly for two reasons: (1) After three years of study, students have acquired high level of professional abilities and are encouraged to participate in higher-level subject competitions; (2) To allow time for students to prepare for graduate entrance exams, job applications, and so on.

For the CE program, each undergraduate student must obtain 199 ECTS credits after completing four years of study. The credit distribution of four academic years of the CE program is similar to that of the BME program.

Overall, the amount of time students invest in learning in each academic year is relatively balanced, and it does not cause structural pressure on students' learning outcomes or lecturers' teaching quality. The exam results are analyzed by the teaching staff, and the students' study time is collected via surveys from the student to obtain the actual learning workload of the students, ensuring that the actual workload is consistent with the planned workload.

The samples of students' workload (homework, test paper, thesis) can be found in **Appendix 14.**

1.6 Didactic and Teaching Methods

For the programs BME and CE, the commonly used didactic method is lectures. Other methods such as group work, project-based learning, case studies, and flipped classroom are also employed as needed. There is no certain institutional guideline for the teaching staff to follow in terms of didactic methods. All teaching staff are able and equipped to apply didactical methods according to their preferences or needs. The university also provides training on their teaching skills. In general, all teaching activities are carried out on-site.

Basic theoretical courses and general courses are mostly taught in large classes (about 60 people), while professional courses are usually taught in small classes (about 30 people). In addition to theoretical knowledge learning, some courses also include in-class experiments. In-class experimental courses are usually conducted in batches and groups. Elective courses can be chosen by students according to their interests and development needs.

In addition to classroom teaching, practical exercise is also an important component of undergraduate education. Part of the practical courses is completed at the university's computing center. Most professional practice courses are completed in the circuit laboratory, electronic technology laboratory, mechanical foundation laboratory and other professional laboratories set up by the CMI. The college has established more than ten off-campus practical teaching bases with some long-term cooperative enterprises, which can provide sufficient practical opportunities every year. At the same time, students can also choose professional lecturers' research projects on campus for practical learning. Each student must participate in professional comprehensive experiments, course design, innovation and entrepreneurship training, professional internships, and graduation design.

Online teaching is widely used in certified professional education and teaching. Most courses have corresponding course websites on the online teaching platform of SUMHS. The established teaching management information system and open online teaching website provide students with rich learning resources, which can stimulate students to engage in self-directed learning and improve their self-learning ability.

To cultivate students' practical and innovative abilities, the major has established an

innovation and entrepreneurship practice module. Under the guidance of the lecturer, students can complete the training of this module and earn corresponding credits by participating in subject competitions, completing corporate projects, or participating in the lecturer's scientific research projects and publishing academic papers or applying for patents.

1.7 Teaching Related Satisfaction

According to a survey conducted by the third-party company, MyCOS, the teaching satisfaction of graduates has shown a steady upward trend in the past four years. The trends of teaching satisfaction among graduates from 2020 to 2023 are shown in **Figure 1.1**. **Tables 1-9**, **1-10**, **1-11**, and **1-12**, respectively, presenting the satisfaction level of different aspects related to teaching in recent years, including satisfaction with various practical activities, importance and satisfaction of core courses, multi-faceted evaluation of innovation and entrepreneurship education, and satisfaction with lecturer guidance.

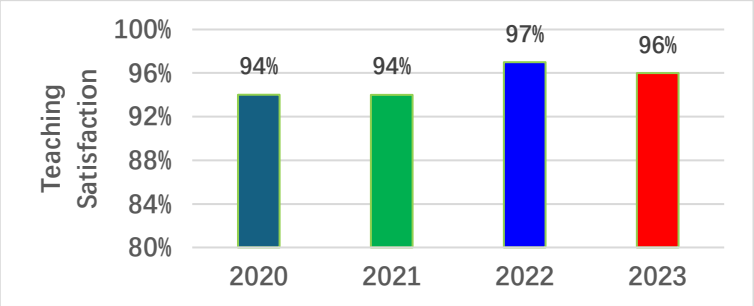

Figure 1.1 Trends in Teaching Satisfaction of Graduates from 2020 to 2023

Table 1-9 Satisfaction of Practical Activities in the Past Four Years

Practical Activity	2023	2022	2021	2020
Course Experiment	96%	94%	93%	84%
Curriculum design	91%	92%	93%	84%
Graduation Design (Thesis)	96%	94%	94%	83%
Subject Competition	93%	94%	89%	/
Industry Internship (internship)	89%	92%	83%	75%

Table 1-10 Importance and Satisfaction of Core Courses in the Past Four Years

Category	2023	2022	2021	2020
Importance of core courses	86%	90%	89%	86%
Satisfaction with core courses	91%	93%	87%	89%

Table 1-11 Satisfaction of Innovation and Entrepreneurship Education in the Past Four Years

Evaluation Items	2023	2022	2021	2020
The guiding lecturer has solid theoretical knowledge and rich practical experience	95%	94%	/	/
Courses, activities, competitions, and other forms are diverse and innovative in content	93%	93%	/	/
Improve entrepreneurship and innovation	92%	91%	/	/

services (guidance on innovation and entrepreneurship, policy release, etc.)				

Table 1-12 Satisfaction of Lecturer Guidance in the Past Four Years

Evaluation Items	2023	2022	2021	2020
Satisfaction level of learning guidance	95%	96%	90%	94%
Career planning satisfaction	89%	91%	82%	84%
Satisfaction level of employment guidance	89%	91%	84%	82%
Overall satisfaction with lecturers	93%	95%	95%	89%

2. Exams: System, Concept & Organization

2.1 Methods of Exams

Course examination is an important part of checking students' learning status, measuring teaching effectiveness, and is an important component of teaching activities. The course examination is conducted according to the Regulations on Examination Management of SUMHS (SUMHS AA [2022] No. 21) (see **Appendix 16** for details). The course assessment methods include examination and inspection. The definition of examination and inspection courses depends on the study plan. The exam content must cover the expected learning outcomes specified in the course syllabus (see **Appendix 09** for details).

The forms of course assessment include written exams, comprehensive exercises, course design or experimental operations, course reports or assignments, etc. The assessment results are based on a percentage system or a 5-grade (A, B, C, D, F) or a 10-level (A, A -, B+, B -, C+, C -, D, F) system. See the Regulations on the Administration of Student Status of Full Time Undergraduate Students of SUMHS (SUMHS AA [2019] No. 28) (see **Appendix 22**) for the conversion standard between the percentage system, the 5-grade, and the 10-level system.

The assessment of both BME and CE programs is mainly based on written exams, with a test time of 90 minutes and graded on a percentage scale. Regular grades can be evaluated based on homework, experiments, attendance, and other teaching activities designed by the lecturer. The specific content and proportion are determined by the teaching and research office or course team. After approval by the university, students are notified through the "Course syllabus". The assessment of social practice, internship, experimental courses, comprehensive design, and course design generally includes attendance rate, daily performance, and final report, and does not require written exams. The graduation design (thesis) grade is evaluated by the supervising lecturer, reviewing lecturer, and defense team according to the corresponding grading criteria. Then the grade is obtained on a percentage scale by synthesizing the coefficients. The transcript of the course assessment can be found in **Appendix 20** which provides the transcripts of course examinations and make-up examinations respectively. Regulations on the Administration of

Student Status of Full Time Undergraduate Students of SUMHS (SUMHS AA [2019] No. 28) (see **Appendix 22**) also provides the conversion methods between grade points, credit grade points and average credit grade points.

In the 8th semester, a 16-week graduation design is scheduled. Students are required to complete the graduation design task independently and write the thesis under the guidance of the supervisor. The graduation design is carried out according to the Measures for the Management of the Graduation Design (Thesis) of Full Time Undergraduate Students of SUMHS (SUMHS AA [2019] No. 31) (see **Appendix 24** for details). The topic of the graduation design, the tasks that students need to complete, and the schedule are all detailed in the graduation design (thesis) task sheet (see **Appendix 24** for details). After selecting the graduation design topic and receiving the task assignment from the supervisor, students can obtain all the information through the task sheet. During the process of graduation design, students are required to maintain contact with their supervisors, and report on the progress of the project and the main issues that need to be addressed on a weekly basis. At the same time, the supervisor is required to provide progress evaluation and answer or guide questions based on the content of the student's report to ensure that the student completes the thesis on time. The grade of a bachelor's thesis will be determined through a combination of defense and thesis evaluation. The thesis evaluation is completed by the supervisor and the reviewer, who will grade the thesis independently. The Graduation Design Grade Evaluation Form can be found in **Appendix 24**. The samples of students' thesis can be found in **Appendix 14.**

Lecturers need to mark the test paper according to Regulations on Test Paper Management of SUMHS (Trial) (SUMHS AA [2022] No. 18) (see **Appendix 16.2** for details). According to the learning outcomes specified in the syllabus and the specific assessment content of this round, the lecturer team should review the test results and write the "test paper analysis" and be able to put forward suggestions for continuous improvement of the teaching content, methods and means of the course. All course assessment results can be viewed by students in the teaching information management system of SUMHS（https://ids.sumhs.edu.cn/ids/login） with their IDs and passwords.

2.2 Exam Organization

2.2.1 Regular Exam

In order to ensure sufficient time for the students for the preparation of the exams, two measures are implemented. Firstly, the test paper should be ready, and the exam date should be announced to the student at least two weeks before the exam. Secondly, to avoid workload peaks across the semester, only the exams of the centralized courses will be scheduled during the exam week at the end of each semester (17th week). For other courses such as electives, the exam date will be arranged by the lecturers and placed before the exam week. The date of the exams need to be checked the approved by the Academic Affairs Office in order to avoid negative effects such as exam peaks, insufficient preparation time, etc. The syllabus for each course clearly specifies the examination format, so students can understand the examination

format of the course and prepare accordingly in advance when selecting courses. The examination time and location will be published in the teaching management system. The examination shall be organized in accordance with the Regulations on Examination Management of SUMHS (SUMHS AA [2022] No. 21). Other management measures are as follows, and detailed rules can be found in **Appendix 16.3**.

- Academic Integrity Code for Students of SUMHS (SUMHS AA [2019] No. 32)
- Regulations on the Management of Full Time Undergraduate Study of SUMHS (SUMHS AA [2022] No. 4)
- Regulations on the Administration of Student Experiments in SUMHS (SUMHS AA [2019] No. 20)
- Regulations on Student Internship Management of SUMHS (SUMHS AA [2019] No. 21)
- Measures for Awarding Bachelor's Degree to Full Time Undergraduate Graduates of SUMHS (SUMHS AA [2023] No. 2)
- Several Provisions of SUMHS on Practical Courses (SUMHS AA [2019] No. 17)
- Measures for Credit Management of Innovation and Entrepreneurship Education for College Students of SUMHS (SUMHS AA [2022] No. 13)
- Management Measures for Graduation Design of Full Time Undergraduate Students of SUMHS (SUMHS AA [2023] No. 8)

2.2.2 Make-up Exam

The make-up examination work is arranged by the Academic Affairs Office in conjunction with relevant departments/centers, and the make-up examination time is scheduled at the beginning of the next semester. According to the Regulations on the Administration of Full Time Undergraduate Course Study of SUMHS (SUMHS AA [2022] No. 4) (see **Appendix 16.3** for details), all students whose total grade in the normal examination has not reached 60 points and who cannot take the examination due to illness are allowed to take the make-up examination after providing the necessary doctor note and being reviewed and confirmed by the university. Students who failed to take the regular final exams without valid reasons are not allowed to take make-up exams. However, they are allowed to re-attend the same lecture and the corresponding test next year. If a student's make-up exam grade does not reach 60 points, he or she may re-attend the course in the following academic year. According to regulations, the number of re-attends for each course shall not exceed 2 before graduation.

2.3 Certain Regulations of the Exams

The students can access their final grades in the teaching information management system. However, if they would like to access individual performance on the exam or if they have objections to the grade, the student should submit a written application to the Academic Affairs Office and follow the corresponding procedure. All test papers are stored in the college archives and will not be uploaded to the teaching information management system.

In the case of students with disabilities, additional examination time will be granted according to their actual needs.

2.4 Quality Assurance of the Exams

Regular and systematic checks are carried out by the Academic Affairs Office of the university on a semester basis to check the suitability of the tests in relation to the achievement of learning outcomes. The following aspects are considered: the content and the difficulty of the exam, the type of questions, the distribution of the grade, etc. The Academic Affairs Office directly provides feedback to the corresponding lecturers and their college. The former are responsible for developing improvement measures.

3. Resources

3.1 Staff and Staff Development

3.1.1 Staff

The CMI is a faculty with reasonable age and academic structure, as well as high comprehensive quality. The college currently has a total of 87 faculty members, including 74 full-time lecturers. Among them, there are 18 full-time lecturers with more than 1 year of overseas work or study experience (see **Appendix 18.3**), accounting for 24.3%. The composition and structure of the staff for CMI, BME and CE programs are listed in **Table 3-1**.

Both BME and CE programs have established a faculty team with a high academic level, diverse academic backgrounds, and a reasonable age structure. The lecturers come from CMI, and other departments such as the Teaching Department of Arts and Sciences, the Teaching Department of Foreign Language, the College of Basic Medical Sciences, and the College of Clinical Medicine.

Currently, BME and CE programs have 15 and 16 full-time lecturers, respectively. The academic backgrounds of these lecturers cover fields such as BME, electronic and information engineering, measurement and control engineering, optical engineering, biomechanics, etc., and can meet the teaching needs of BME and CE programs.

Overall, the ratio of students to lecturers in the field is approximately 15:1. The resumes of lecturers can be found in **Appendixes 18.1 and 18.2**.

Table 3-1 Composition and Structure of the Staff for CMI, BME Program and CE Program

Categories	CMI		BME		CE	
	Number	Percentage	Number	Percentage	Number	Percentage
Full-time lecturer	74	/	15	/	16	/
Doctoral degree	43	58.1%	14	93.3%	9	56.3%
Senior professional title	16	21.6%	7	46.7%	3	18.8%
Aged 40 and below	19	25.7%	8	53.3%	6	37.5%

Dual-qualified lecturer	53	71.6%	15	100%	16	100%
With more than 1 year of overseas work or study experience	18	24.3%	6	40.0%	6	37.5%

3.1.2 Staff Teaching and Research

3.1.2.1 Staff Teaching and Research of BME

In the past five years, the BME has undertaken more than 20 teaching reform and curriculum construction projects centering on BME and other related disciplines, including one national first-class undergraduate course ("SCM Application Technology"), three Shanghai first-class undergraduate courses ("Digital Signal Processing", "Signals and Systems" and "Virtual Simulation Experiment of Full Process Safety Control for High Intensity Focused Ultrasound Ablation of Malignant Liver Tumor"), one Shanghai key undergraduate course ("Intelligent Medical Control Technology"), one Shanghai boutique course ("Circuit Principles"). The department has also received one second prize for provincial and ministerial level teaching achievements, published over 50 papers on educational reform, and authored 5 textbooks and monographs.

BME lecturers have completed 21 scientific research projects, including 5 national and provincial-level vertical research projects, 5 department-level vertical research projects, and 11 enterprise cooperative horizontal research projects, with total research funding of approximately 4.3 million RMB. They have published over 70 scientific research papers, including 30 SCI & EI cited papers and 7 authorized invention patents.

3.1.2.2 Staff Teaching and Research of CE

In the past five years, the CE has undertaken more than 20 teaching reform and curriculum construction projects centered on CE and other related disciplines, including two first-class undergraduate courses (Virtual Simulation Experiment of Full Process Safety Control for High Intensity Ultrasound Ablation of Malignant Liver Tumor and Virtual Simulation Experiment of Ventilator Failure and Emergency Treatment under Epidemic Control), two key undergraduate courses of Shanghai (Principles and Applications of Life Support Equipment and Intelligent Medical Control Technology). Received one second prize for provincial and ministerial level teaching achievements, published over 20 papers on educational reform, and authored seven textbooks and monographs.

CE lecturers have completed 25 scientific research projects, including 7 national and provincial-level vertical research projects, 1 department-level research project, and 17 enterprise cooperative research projects, with total research funding of approximately 4.74 million RMB. They have published over 50 scientific research papers, including more than 20 SCI & EI cited papers, and authorized over 20 invention patents.

Representative research results, national and provincial scientific research projects (see **Appendix 5.7**), and awards for scientific and technological achievements can be found in **Appendix 5.6**. The details of published professional textbooks can be found in **Appendix 5.5.**

3.1.3 Staff Workload

The rated workload of each professional lecturer is 324 class hours per year, of which 162 class hours are required to teach students entering the classroom, and the rest can be converted by teaching activities such as guiding graduation design, subject competitions, etc. Serving as an academic mentor and providing scientific innovation guidance to students in certified projects is an important reference for lecturer promotions. These measures ensure that every student can receive sufficient guidance on courses and extracurricular assignments, help students complete the required course learning tasks and achieve the training objectives specified in the study plan.

3.1.4 Staff Development

(1) Related Training

The university has established a Lecturer Development Center, which mainly carries out work in teaching research, teaching resource construction, teaching competitions, teaching evaluation, lecturer development, and other aspects. The center is under the supervision of the Academic Affairs Office. The center provides services for improving lecturers' teaching abilities, promoting teaching reform and innovation, and promoting the continuous improvement of teaching quality. At the same time, multiple education and teaching experts and renowned lecturers from both inside and outside the university have been invited to give lectures.

The training includes pre-service training for new lecturers, tutorial system for young lecturers, personal career planning for lecturers, temporary training and overseas study visits. The center is open and provides services for all lecturers. The details of training can be found in **Appendix 19**.

For monitoring the teaching quality and identifying the need for professional development of individual lecturers, regular teaching inspection will be implemented. For the lecturers who need to improve their teaching skills and related professional aspects, the Lecturer Development Center will organize relevant training. The center also provides training to all lecturers on new teaching strategies, skills, and methods regardless of the results of inspection.

(2) Related Funding

The Shanghai Municipal Commission of Education and SUMHS provide professional lecturers with multi-level and multiple forms of funding support, such as domestic and foreign study visits, industry-university-research cooperation, and experimental team building plans, to enhance their professional academic research and teaching capabilities. Among these, the Shanghai Municipal Education Commission has implemented the "Shanghai University Youth Lecturer Training Funding Program", providing funding for young lecturers to carry out scientific research activities, with a funding amount of 50,000 RMB per project. Additionally, funding is provided for professionals to study abroad, with an annual subsidy of approximately 150,000 RMB per person.

According to the Funding Plan for Young Lecturers Training (Trial) (SUMHS HR [2016]

No. 5) (see **Appendix 19.3** for details)**,** SUMHS provides research start-up funds for newly recruited lecturers, supporting young lecturers with doctoral degrees of 30,000 to 50,000 RMB per person.

3.2 Student Support and Student Services

3.2.1 Academic Affairs Office

The daily management and support of undergraduate teaching and training in SUMHS are the main responsibility of the Academic Affairs Office, which consists of the Teaching Affairs Section, Specialty Construction Section, Quality Control Section, Practice and Innovation Education Section, Admission Office and other sections.

The website of the teaching management information system of SUMHS is: https://ids.sumhs.edu.cn/ids/login. The faculty, staff, and students can log in to the website with their accounts and passwords.

Each college of the university has a dedicated teaching office, which is responsible for the teaching operation and management of the college under the guidance of the vice dean of teaching.

3.2.2 Student Affairs Office

The Student Affairs Office is responsible for guiding and supporting the student work groups of various departments to carry out ideological and political education and management work for students. It mainly includes comprehensively promoting quality education, improving students' comprehensive quality, maintaining the normal educational and teaching order of the university, and creating a good academic atmosphere. The office also develops a student management system, guides, coordinates, and assesses the student management work of various departments, and is responsible for various rewards, loans, and subsidies for students. Additionally, it is responsible for employment guidance, service work, the management of student dormitories, and the education of students' mental health.

3.2.3 Student Counselor System

Each program has full-time student counselors, who are responsible for life guidance and psychological counseling for students. They are also responsible for communication between the university and students' families, organizing various cultural and sports activities for students, and providing the students with a healthy, safe, and vibrant learning and living environment. Counselors help new students establish reasonable career goals and plans as early as possible by introducing them to the status of professional development and future career directions. For second- and third-year students, counselors will help them adjust their career plans, laying a solid foundation for them to enhance their competitiveness in future jobs. For fourth-year graduates, counselors will provide them with the latest employment information, improve their interview skills, and provide comprehensive guidance and services.

3.2.4 Academic Advisor

Every new student has a designated academic advisor to guide their academic, professional, and career development. Academic advisors guide students in mastering learning knowledge and problem-solving methods, help them establish personalized academic and life goals, and stimulate their internal motivation to learn and succeed. Academic advisors encourage students to actively participate in scientific research projects and apply for research projects, innovation and entrepreneurship projects, and conduct relevant subject competitions. All full-time lecturers can serve as academic advisors, determining students' learning needs and developing effective learning strategies based on their interests, guiding students to carry out relevant academic research work, and providing constructive suggestions for students in career planning.

3.2.5 Enterprise Mentor

The university implements an industry mentorship system, focusing on the cultivation of students' professional ethics. Students are encouraged to perform internships in enterprises, hospitals, or related institutions. This helps to cultivate innovation and entrepreneurship abilities. Industry mentors are managers and senior engineers of relevant enterprises recognized by SUMHS. Students can choose their own industry mentors based on their interests and professional strengths through a two-way selection process. Industry mentors are responsible for guiding students in their industry internships, maintaining communication with academic mentors, and collaborating on educational and teaching work.

3.2.6 Course Website

Online teaching has been widely used in teaching. Most of the courses have corresponding course websites on the online teaching platform of SUMHS at http://goldclass.sumhs.edu.cn. The website course content includes course introduction, teaching content, course progress, course syllabi, course discussion area, and exercises. Students can find information related to the course on the website and communicate with the course instructor online.

According to the tracking survey of SUMHS's undergraduate graduates in various majors conducted by MyCOS, (the 2023 SUMHS Graduate Training Quality Evaluation Report), the satisfaction evaluation of undergraduate graduates on student work has stabilized at about 95% in the past four years (shown in **Figure 3.1**).

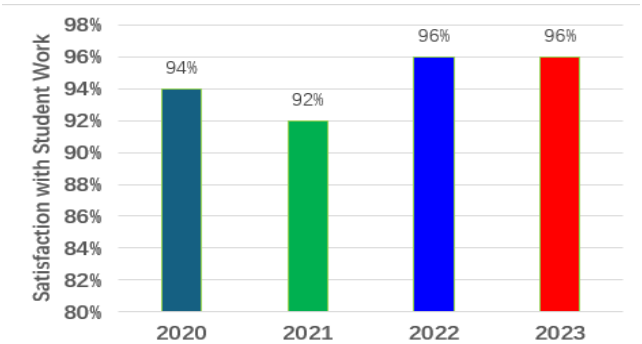

Figure 3.1 Trend of Satisfaction with Student Work among Undergraduate Graduates in the Past Four Years

3.3 Funds and Equipment

3.3.1 University Introduction

SUMHS is located at the International Medical Park in Pudong, Shanghai, with over 11000 full-time students currently enrolled. The university adheres to its 75-year history of education, insists on the historical inheritance of "the Messenger of Health Promotion, the Cradle of White Angels" and "the Whampoa Military Academy of Medical Device Engineers", practices the "practice + humanities" DNA double helix talent cultivation concept, integrates value shaping, knowledge imparting, and ability cultivation, and cultivates human health promoters with sound personality and psychology, the ability to solve practical problems, and the potential to lead the industry.

SUMHS has key provincial and ministerial level platforms such as the Shanghai Key Laboratory of Molecular Imaging, the first $5G^{+}$ Smart Medical Innovation Laboratory in Shanghai, and the Shanghai Collaborative Innovation Center for Intelligent Medical Devices and Active Health.

SUMHS currently has over 800 faculty members and four affiliated hospitals, namely Chongming Hospital, Zhoupu Hospital, Jiading District Central Hospital, and Shanghai Sixth People's Hospital Lingang Branch. The university actively carries out international cooperation and exchanges, conducts all-round, multi-perspective and in-depth cooperation with 17 countries and regions such as France, Finland, Japan and the United Kingdom, establishes a long-term and stable talent training cooperation mechanism, and actively expands cooperation and exchanges between universities and scientific research institutions in countries and regions along the "the Belt and Road".

3.3.2 Overview of the College of Medical Instrumentation

The CMI was founded in 2015 and is known as the "Whampoa Military Academy of Medical Device Engineers". It focuses on the biopharmaceutical industry and is committed to cultivating high-quality applied talents in fields like medical device research and development and maintenance, clinical applications, and medical product administration. The college encompasses 5 teaching and research sections and 1 experimental training center. Currently, it offers 4 undergraduate majors: BME, CE, Data Science and Big Data Technology, and Medical Product Administration. The college has 24 teaching laboratories and 13 scientific research laboratories. Organizational structure of CMI is shown in **Figure 3.2**.

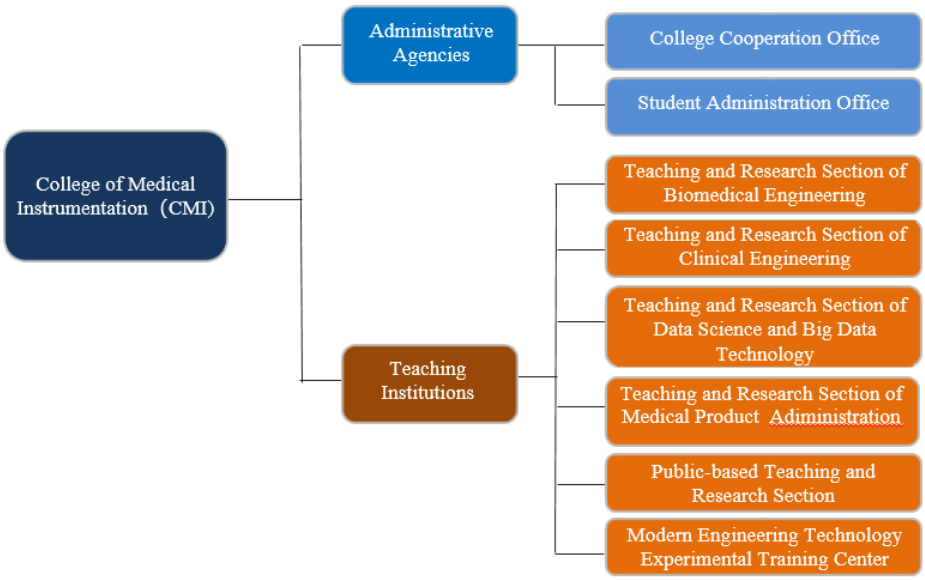

Figure 3.2 Organizational structure of CMI

3.3.3 Laboratory

The Experimental Training Center (ETC) of CMI has a total construction area of more than 25000 m^2 and a total equipment asset of 160 million RMB. To ensure the normal and efficient conduct of experimental teaching, the CMI has established laboratory management regulations and categorized the laboratory functions.

(1) Laboratory Management Regulations

The relevant laboratory management regulation documents can be found in **Appendix 25.1**. The main contents of these documents include management organization, management responsibility, security management and device management.

To strengthen the construction and management of the laboratory of the CMI, the laboratory management is carried out at four levels, namely, the asset management office of the university, the vice dean of the college in charge of the laboratory, the director of the ETC, and the laboratory administrator. The asset management office of the university implements a macro coordinated and unified management plan, and the management personnel at all levels have a clear scope of responsibility to ensure the normal progress of experimental teaching.

The college has formulated detailed administrative measures for the daily use of the laboratory to strengthen the education and practice of students' experimental safety and ensure the normal development of experimental work. In addition to establishing rules and regulations such as students' computer rules and laboratory safety systems in the laboratory, the college also provides necessary safety reminders to students to ensure the safe operation of students' experiments. Before entering the relevant laboratory, students are required to participate in laboratory safety education, understand the relevant regulations on laboratory safety operations, sign a safety responsibility agreement, and complete laboratory safety education training and exams. Those who failed the safety test are not allowed to enter the relevant laboratory. The university security office and college security officers carry out various forms of security

training with the goal of strengthening students' safety awareness. The training content includes watching safety education videos, conducting fire safety knowledge questionnaires, and on-site learning on the use of fire extinguishers. All lecturers and students conduct two fire safety evacuation drills in the laboratory building annually.

(2) Subject Specific Laboratory

The students from the BME and CE programs complete medical related experiments in the laboratories of the College of Basic Medicine and the College of Clinical Medicine, physics experiments in the physics laboratory, and medical chemistry experiments in the laboratory of the College of Pharmacy. Other professional experiments are completed in the professional laboratory of CMI. The CMI has 24 specialized laboratories with a total area of more than 5000 square meters. These laboratories are divided into three functional areas: disciplinary foundation, comprehensive application, and innovative research. The total value of teaching and research equipment is about 30 million RMB, and the experimental center has 14 experimental management personnel and 1 director. The names and areas of these specialized laboratories can be found in **Appendix 25.2**.

(3) Discipline Research Platform

The CMI has 13 scientific research laboratories, which provide a solid foundation for the scientific research work. The names and areas of scientific research laboratories can be found in **Appendix 25.2**. At present, the specific research directions of BME disciplines include biomedical detection technology, big data and artificial intelligence, biomedical optics, biomedical signal and image processing, medical robots, biomedical materials, etc.

3.3.4 International Exchange and Collaboration Platform

In recent years, the CMI has attached great importance to the implementation of the "internationalized school-running" strategy, expanding the international vision of students and lecturers. It has established cooperative relationships with universities in countries and regions such as Osaka Ziqing Academy in Japan, Royal Melbourne Institute of Technology (RMIT) and Monash University in Australia, and Basspa University in the UK. International cooperative education programs can be found in **Appendix 13**.

The CMI has cooperated with top international enterprises and built two on-campus training bases: Japan NIPRO Hemodialysis Training Center and the United States Stryker Surgical Emergency Engineering Center. Through the construction of joint laboratories, students can have access to the latest international medical equipment and technologies in the fields of hemodialysis and surgical emergency care.

In the past five years, a total of 17 students majoring in BME and 11 students majoring in CE have been admitted to graduate programs at foreign universities. The specific universities and numbers can be found in **Appendix 5.8**.

In the past five years, the BME program has admitted a total of 8 international students shown in **Appendix 5.8**.

3.3.5 Enterprise Practice Platform

There are over 10 off-campus internships and practical teaching bases for both the BME program and the CE program. The main bases can be found in **Appendix 03.**

Both the universities and enterprises jointly develop an internship syllabus, compile an internship instruction manual, and formulate corresponding safeguard measures based on the training objectives and requirements of the study plan. Each base is equipped with stable enterprise internship guidance lecturers, who work together with on-campus lecturers to guide and manage student internship work. The on-campus guidance lecturer is responsible for clarifying the internship content, tasks, planned progress, schedule arrangement, and internship management regulations to students; Enterprise guidance lecturers should carry out education on enterprise safety production, rules and regulations, confidentiality system, etc., based on university requirements and the actual production situation of the enterprise. These off-campus practice bases can meet the practical teaching tasks such as professional internships for students majoring in BME and CE, enabling them to fully receive good professional practice and training, deepen their understanding of the industry, improve their ability to handle practical problems, and improve their ability to handle practical problems, thus achieving the teaching goal of developing comprehensive abilities.

3.3.6 Library and Information Resource Platform

（1）Library

The library has abundant reference materials such as research papers, electronic books, and journals, etc., with standardized management and a high degree of sharing, which can meet the learning needs of students and the daily teaching and research needs of lecturers. There are sufficient computers and information resource platforms. Students can access the internet and use network resources through computer rooms, classrooms, campus wireless networks, etc.

The library has a total construction area is over 20000 m^2, with 2183 reading seats. The library has a rich collection of resources, including various printed documents and digital resources from both domestic and foreign sources. The subject scope of the collection of literature covers humanities, natural sciences, and applied technology, with a particular focus on nursing, pharmacy, rehabilitation therapy, medical equipment, and other key subject areas of the university. As of June 30, 2024, the total number of books is 1.1376 million, with 323 Chinese journals and 46 newspapers. The library implements full open shelf borrowing, with wireless internet access and VPN remote access outside the library. To ensure the full utilization of the book resources, the library provides the following services: literature borrowing, interlibrary borrowing of literature, literature transmission, electronic reading, audio-visual materials, subject navigation, scientific and technological achievement novelty search, topic-based search, literature data proxy search, literature citation search, information retrieval teaching and training, etc.

In recent years, the library has stepped up its efforts in digital resource construction. It has 45 various types of digital resource libraries, 1.5454 million accessible e-books, 29185 million

electronic journals, 6.722647 million dissertations, and 12160 hours of audio and video. Chinese databases include CNKI, Wanfang Data, VIP Chinese Biomedical Journal Database, etc. Foreign databases include WOS, Science Direct, IEEE, Springer, etc. The rich collection resources provide effective literature resources, which guarantees for all lecturers and students in teaching, scientific research, subject construction, and management.

(2) Computer Resources

The university has sufficient computer resources, among which the computer resources closely related to this major are in the university's computing center. The computing center has 9 computer rooms with a total of 681 computers. The center is responsible for teaching and practicing courses closely related to programming or software, such as "Fundamentals of Computer Applications," "C Program Design," "Fundamentals and Applications of MATLAB," and "Python Program Design," which can meet the needs of teaching related to programming and software in this major.

(3) Information Resource Platform

The university has unified standards and plans from a global perspective, deployed as a whole, and implemented step by step. The university has established three basic platforms, including a data sharing platform, a comprehensive service portal for lecturers and students, and a unified identity authentication platform. The data sharing platform is a unified application service platform for sharing and exchanging data resources, which realizes public data sharing for five departments including personnel, scientific research, academic affairs, student engineering, and graduate students. The comprehensive service portal for lecturers and students provides students and lecturers with comprehensive information services including student affairs, academic affairs, finance, books, campus cards, and daily life. The unified identity authentication platform is one of the fundamental platforms for the construction of smart campus, providing a unified user management platform and identity authentication services for various network services and application systems of smart campus.

A. Online Teaching Platform

The university's online teaching platform is a new network assisted teaching platform that gathers numerous undergraduate teaching information resources. It is a creative teaching assistance platform for lecturers, a personalized self-learning assistance platform for students, as well as a teaching service information platform, a teaching achievement display platform, and a teaching management application platform. Through the course center, lecturers can manage courses and students can learn online. As of now, the number of courses on the course center website has reached over 2500, making it a high-quality teaching resource sharing platform. Almost all courses have established online courses on the university's online teaching platform, and all electronic teaching materials for the courses have been made available online.

B. Teaching Management Information System

The university has established a teaching management information system, which is the main platform for implementing teaching management and ensuring teaching operations. It is responsible for the allocation of resources for various teaching businesses and lecturer

arrangements, as well as for the recording of the entire process of students' academic performance. Students can select courses, evaluate teaching quality, and request course evaluation results through this platform. Through this platform, lecturers can publish teaching calendars, obtain student information, and manage exam grade.

C. Graduation Design Management Platform

The university has established an undergraduate thesis management system, also known as the Bachelor's Thesis Management Information Platform. Lecturers can use this platform to publish bachelor's thesis topics and requirements. Students can freely choose topics that interest them. This system can record and monitor the entire process of graduation design, achieving full-process management from thesis topic selection, task book issuance, guidance content recording, mid-term inspection, thesis plagiarism check, thesis review to graduation defense.

D. Accessibility Facilities

All offices, laboratories, lecture halls, and libraries on campus have achieved full wireless network coverage. The computers in the computing center are updated annually according to actual needs to meet the demands of development. Network and virtual reality technology can facilitate remote operation of high-end computer-aided devices. All newly built laboratories, classrooms, office buildings, etc., are equipped with accessible facilities, allowing disabled students to smoothly enter these teaching places.

In short, in order to meet the needs of educational informatization, the university has comprehensively built a safe, efficient, scalable, and open information-based campus infrastructure, achieved full coverage of wireless networks in public areas on campus, and realized functions such as online administrative office, teaching informatization management, and resource sharing, meeting the needs of students, lecturers, and scientific research work.

3.3.7 Teaching and Office Facilities

There are three main teaching venues: university teaching buildings, practical teaching centers, and college experimental training centers. The university teaching building consists of 30 small classrooms (each with a capacity of 60 or less students), 83 medium classrooms (each with a capacity of 60-120 students), 30 large classrooms (each with a capacity of 120 or more students), and two large hall classrooms (each with a capacity of 200 or more students). Among them, there are a total of 16 "smart classrooms", including 14 PBL (Problem Based Learning) classrooms, 1 immersive remote live interactive classroom, and 1 "72-person smart classroom". These classrooms are equipped with multiple interactive intelligent all-in-one tablet, smart classroom systems, and automatic recording and broadcasting systems. The "smart classroom" realized a new type of teaching environment composed of several subsystems, mainly used for specialized courses and lecturer-student flipped courses. The latter emphasizes the position of students in the classroom, which can boost collaborative learning and lecturer-student interactive discussions. Ordinary classrooms are equipped with multimedia computers and projectors. The Asset and Laboratory Management Department has set up multiple management duty rooms in the teaching building, responsible for managing, maintaining, and repairing teaching facilities to ensure their functions. To increase the openness of teaching

facilities and improve the utilization of resources, all multimedia classrooms in the university can be booked and arranged through the teaching management information system.

3.3.8 Teaching Investment in the Past Five Years

The teaching funds for BME and CE are sufficient and guaranteed. In addition to the general annual budget allocated by the government, in the past five years, for the BME program, the teaching investment is about 6.2 million RMB, including about 3.6 million RMB in laboratory construction, about 900,000 RMB in course construction, and about 150,000 RMB in student innovation and subject competition projects. For the CE program, the teaching investment is about 2.2 million RMB, including about 960,000 RMB in laboratory construction, about 610,000 RMB in course construction, and about 144,000 RMB in student innovation and subject competition projects. The main funds in the past five years are listed in **Table 3-2**. At the moment, there is no bottleneck in equipment and facilities. In case there is a lack in the equipment and facilities, the people responsible will either directly apply for the program construction budget or organize shared equipment with other departments.

Table 3-2 The Main Teaching Funds in the Past Five Years

Serial No.	Funds	Particular Year (BME/CE)					Total (unit:10,000 RMB)
		2020	2021	2022	2023	2024	
1	Applied undergraduate major construction project	250.0/0.0	250.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	**500.0**
2	First class program (high level local university construction project)	0.0/0.0	10.0/0.0	15.0/0.0	20.0 /20.0	30.0 /30.0	**125.0**
3	High level undergraduate teaching team construction project	0.0/0.0	0.0/0.0	10.0 /0.0	10.0 /0.0	10.0 /0.0	**30.0**
4	College student innovation and discipline competition project	2.1 /2.6	3.5 /2.4	2.0 /3.4	2.5/2.5	4.8 /3.5	**29.4**

3.3.9 Student Satisfaction with Various Facilities

MyCOS conducted a follow-up survey on the undergraduate graduates of SUMHS in various majors (the 2023 SUMHS Graduate Training Quality Evaluation Report), which shows that the university's facilities have well met the needs of students. The satisfaction level with various university facilities in the past three years is shown in **Table 3-3**.

Table 3-3 Satisfaction of Undergraduate Graduates with Various Facilities in the Past Three Years

Serial No.	Facilities	2023	2022	2021
1	Teaching and teaching equipment	96%	96%	95%
2	Library and library materials	97%	96%	94%
3	Sports fields and facilities	95%	95%	91%
4	Experiment, training and related equipment	95%	93%	90%
5	Information technology equipment such as computers and campus networks	93%	94%	89%
6	Cultural and artistic venues	93%	88%	82%

4. Transparency and Documentation

4.1 Module Descriptions

The detailed information on the personnel in charge of each module, teaching methods, workload, credits awarded, expected learning outcomes, applicability, admission and examination requirements, evaluation forms, and final grade calculation are all introduced in the university's information portal system and teaching management information system. All students and lecturers can enter this system with their student ID or employee ID through the information portal system. Students and lecturers can view the learning or teaching tasks of the current semester and all semesters, differentiating between the learning tasks and teaching tasks. Students can also view the information about courses they have taken and pending. Senior students and graduation design supervisors can log in to the graduation thesis management system to complete the submission and grading of graduation materials. Both module descriptions for BME and CE amended in the year of 2024 can be found in **Appendices 9.1** and **9.2**.

4.2 Diploma and Diploma Supplement Explanation

The samples of graduation certificates and bachelor's degree certificates of students majoring in BME and CE from SUMHS can be found in **Appendix 20**. All certificates become legally valid after being stamped with the official seal of SUMHS and signed by the president. The supplementary sample of diplomas can be found in **Appendix 20**. The sample of the student transcript can be found in **Appendix 20**.

4.3 Relevant Regulations and Rules

To ensure the smooth operation of teaching and protect the rights and interests of all stakeholders, i.e., staff and students, SUMHS has established a comprehensive set of regulations and rules. The most relevant regulations and rules are listed in **Table 4-1**. The detailed contents of the student handbook can be found in **Appendix 01**.

Table 4-1 Most Relevant Regulations and Rules

Categories	Documents	Where published
Cultivation program formation or revision	The Measures for the Management of Undergraduate Professional Talents Training Program of SUMHS (SUMHS AA [2021] No. 7)	Web of Academic Affairs Office
Teaching evaluation	• Undergraduate Teaching Regulations of SUMHS (SUMHS AA [2022] No. 19) • SUMHS Guidelines on Promoting the Implementation of Formative Assessment (Trial) (SUMHS AA [2019] No. 9)	Web of Academic Affairs Office
Quality management	• The Management of Two-level Teaching Quality Monitoring of SUMHS (SUMHS AA [2022] No. 11), • The Teaching Quality Monitoring System and Its Operation Methods of SUMHS (SUMHS AA [2022] No. 16) • The Quality Standards for the Main Links of Undergraduate Teaching of SUMHS (Trial) (SUMHS AA [2022] No. 20)	Web of Academic Affairs Office

Student status administration	• The Regulations on the Administration of Student Status of Full time Undergraduate Students in Shanghai University of Medicine & Health Sciences (SUMHS AA [2019] No. 28) • The Implementation Measures of Shanghai University of Medicine & Health Sciences for the Major Transfer of Full time Undergraduate Students (SUMHS AA [2020] No. 7)	Web of Academic Affairs Office and Student Handbook
Lecture information	• Module descriptions	Web of the CMI
Award selection and excellence recognition	• Scholarship Evaluation and Selection Procedures (Revised) • Outstanding Graduate Evaluation and Selection Procedures	Student Handbook
Financial aid system	• Implementation Rules for the National Student Loan Program • Implementation Measures for Tuition Reduction and Exemption for Students with Financial Difficulties	Student Handbook
Policies and regulations	• Student Code of Conduct for Higher Education Institutions	Student Handbook

5. Quality Management: Quality Assessment and Development

5.1 Quality Assessment

In order to ensure the quality of teaching and student training, the university has formulated various measures related to quality assurance management, including the Measures for the Management of Two-level Teaching Quality Monitoring of SUMHS (SUMHS AA [2022] No. 11), the Teaching Quality Monitoring System and Its Operation Methods of SUMHS (SUMHS AA [2022] No. 16), the Quality Standards for the Main Links of Undergraduate Teaching of SUMHS (Trial) (SUMHS AA [2022] No. 20), and the Measures for the Recognition and Handling of Teaching Errors and Teaching Accidents of SUMHS (SUMHS AA [2019] No. 38) (see **Appendixes 2.1-2.4** for details). Based on these measures, the CMI has established a closed-loop teaching quality management system (CL-TQMS), which is shown in **Figure 5.1**. From CL-TQMS, it's not difficult to see that the system has two major parts: (1) the cultivation program formation and revision; (2) the teaching quality monitoring and assessment.

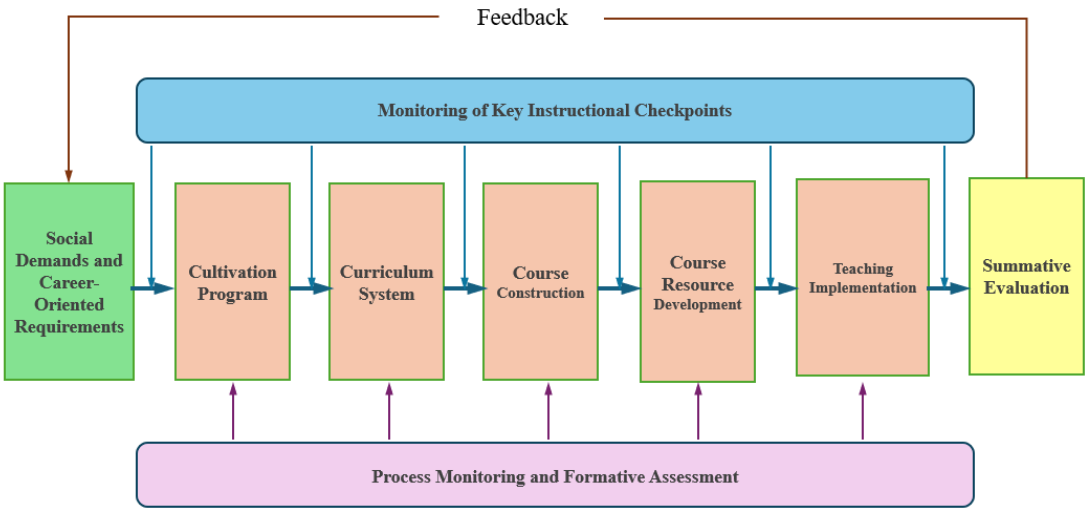

Figure 5.1 Illustration of closed-loop teaching quality management system

5.1.1 Process of the Cultivation Program Formulation and Revision

The study plan, i.e., the cultivation program, is the primary basis for organizing various teaching activities. In order to ensure the quality of the study plan formulation, standardize the university's process for developing study plans, ensure the realization of talent training objectives, and effectively optimize and improve the study plan, the university has formulated the Measures for the Management of Undergraduate Study Plan of SUMHS (SUMHS AA [2021] No. 7) (see **Appendix 2.5** for details), which clearly stipulates the formulation and revision of the study plan.

The study plans for both BME and CE programs are jointly formulated by the college, the major, industry, and enterprise experts. The dean in charge of teaching organizes the Professor Committee and the Professional Teaching Guidance Committee to conduct quality monitoring.

Both BME and CE programs revise their study plans annually, and the main criteria for revising the study plan include the following aspects:

1. The National Standards for Teaching Quality of BME in China
2. The demand for knowledge, abilities, and skills in industrial development
3. The needs for students' comprehensive qualities and future career development
4. The guiding principles for revising the study plan established by the university
5. Standards related to Engineering Education Accreditation

The basic process for revising the study plan is shown in **Figure 5.2**. Firstly, the work status of existing graduates is investigated, and the needs of industry enterprises and students are analyzed. Secondly, according to the results of the survey and analysis as well as the university's guiding principles for revising study plan, the program leader organizes professional lecturers and industry experts to discuss and revise the training objectives, expected learning outcomes, and the curriculum system. The training objectives and expected learning outcomes are determined based on industry competency needs, and then the curriculum system is determined. The revised draft of the study plan is written and submitted to the Professor Committee and the Professional Teaching Guidance Committee for discussion. Thirdly, the professional leader will make further modifications based on the opinions of the Professor Committee and the Professional Teaching Guidance Committee and submit the documents to the College Teaching Guidance Committee for review. After being approved by the joint meeting of the college's Party and administrative leadership, the draft will be submitted to the Academic Affairs Office. Finally, the draft will be submitted to the university for review and finalization.

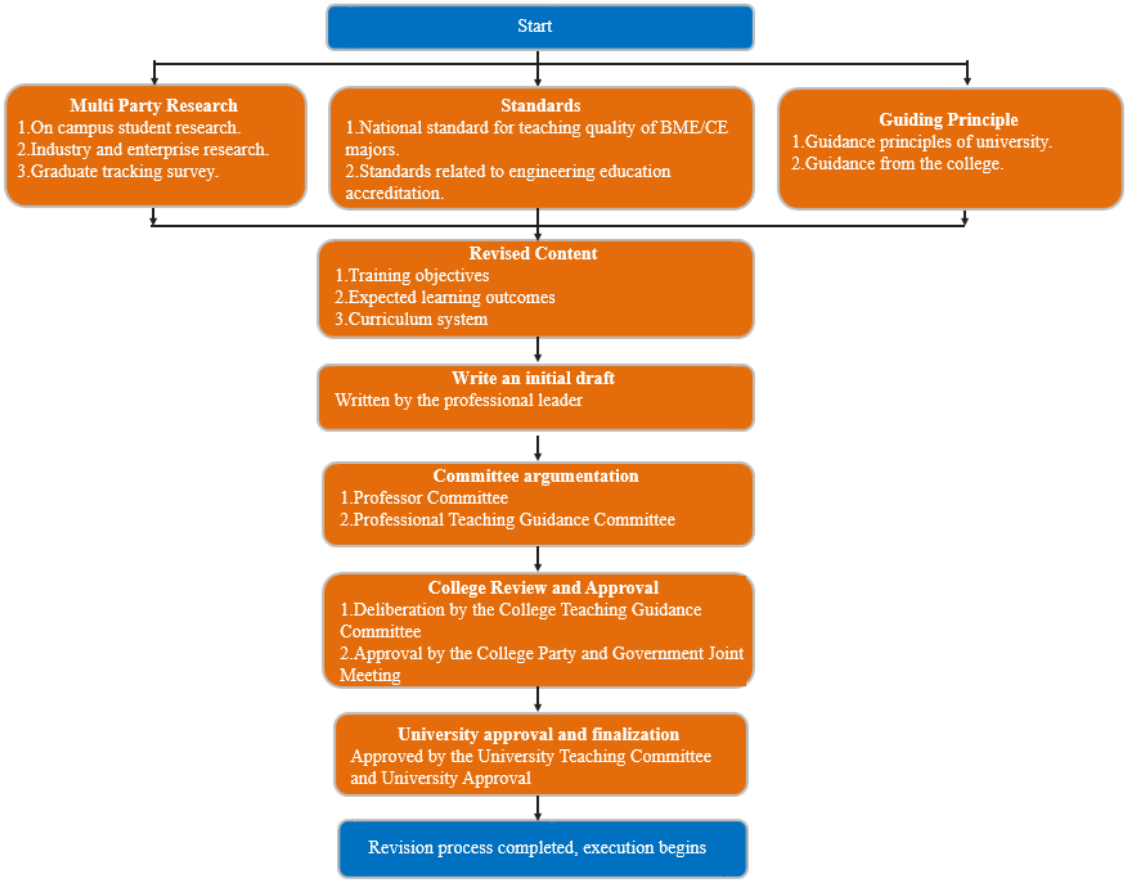

Figure 5.2 Basic Process of Study Plan Revision

5.1.2 Internal Quality Assessment

Lecturers, students, and different departments of the university are the participants in internal quality assessment. The forms of providing suggestions and feedback include online evaluation of the lectures as well as on-site meeting and discussion between student and lecturer. For example, every semester, under the unified arrangement of the university, each college and program will implement routine teaching inspections by students, lecturers and college inspectors to evaluate the teaching quality of lecturers. This includes the assessment of the following aspects: classroom teaching, practical activities, graduation design process, teaching order, teaching plans, and other teaching materials. The aim is to identify and solve possible problems in relation to any teaching activities for the continuous improvement of the programs. Another example is exam paper inspection. At the beginning of each semester, the Academic Affairs Office of SUMHS will check on-site the examination papers of the previous semester and evaluate them from three aspects: exam paper scores, exam paper analysis, and improvement measures to promote the standardization of exam papers. Every semester, the college analyzes the distribution of lecturers' performances, students' grades, and provides suggestions and requirements for lecturers to improve their teaching quality.

5.1.3 External Quality Assessment

Ministry of Education of China, employers, and external experts from other universities or enterprises are the participants in external quality assessment. External experts can play the

role of external supervisor, participating in the undergraduate teaching evaluation of HEIs initiated by the Ministry of Education of China and the excellent undergraduate course evaluation organized by the Shanghai Municipal Education Commission. In combination of the internal assessment, this forms a teaching quality evaluation mechanism with joint participation of higher-level departments, employers, lecturers, and students.

The university hopes to further enhance external teaching quality evaluation through internationally recognized third-party quality certification standards. At present, the third-party evaluation adopted by SUMHS is mainly the Evaluation Report on the Training Quality of SUMHS Graduates by MyCOS Data Co., Ltd. Among them, the teaching related evaluation mainly includes teaching satisfaction, satisfaction with various practical activities, importance and satisfaction of core courses, multi-dimensional evaluation of innovation and entrepreneurship education, lecturer guidance satisfaction.

5.2 Tools, Methods and Data

5.2.1 Assessment Methods

Internal assessment by students: Student teaching quality evaluation is an important component of the teaching evaluation system. Every student must submit a lecturer's teaching quality evaluation form before selecting courses each semester, otherwise, they cannot select courses. The teaching suggestions listed in the evaluation form will be analyzed and used to improve teaching methods. Student evaluation is also used to assess the teaching effectiveness of lecturers and is linked to their work performance. The form of lecturer teaching quality evaluation can be found in **Appendix 22**. All the related information is published on the teaching quality evaluation reports of SUMHS. Students are also welcome to provide feedback through other means such as meetings with the lecturers or direct communication with the person responsible. The teaching management department will react promptly to the feedback from the students by meeting and discussion.

Internal assessment by peers: The results of the teaching quality for each lecturer will be uploaded anonymously by the peers to the teaching quality monitoring system. The rated lecturer can read the comments and implement corresponding improvement measures.

5.2.2 Student Enrollment Situation and Graduation Rate

According to the length of undergraduate study stipulated by SUMHS, the normal length of study for students is 4 years, and not more than 6 years. Students who cannot graduate within 6 years will obtain a dropout or withdrawal certificate. The statistics of academic success can be found in **Appendix 15**. And the statistics on grade distribution can be found in **Appendix 17**.

5.3 Improvement Measures

In the last five years, for the improvement of the quality of the BME and CE, the college has implemented the following measures:

1. Introducing high-level talents from high-ranked universities worldwide with strong academic capabilities and teaching experience (over 10 new teaching staff)
2. Updating and constructing new teaching / research laboratories for student and staff
3. Undertaking more than 40 teaching reform and curriculum construction projects (see Section 3.1.2 for details)
4. Supporting student innovation and entrepreneurship projects as well as various forms of course competition (see Section 1.3.3 for details)
5. Seeking international cooperation to provide more exchange opportunities for students and staff (see Section 1.3.4 for details)

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