Biomedical Engineering

生物医学工程

(077700)

1. Overview of the Program

Biomedical Engineering, a comprehensive and high-tech engineering field, applies the principles and methods of modern natural science and engineering techniques to study the structure, functions, and relationships of the human body to reveal life phenomena and provide prevention and treatment of diseases by new technical means.

The areas of biomedical engineering include interdisciplinary science and technology for the purpose of disease prevention, diagnosis, treatment, rehabilitation, etc. Development and application of medical devices and other biomedical engineering products.

The First-level master's degree qualification of biomedical engineering in Beijing institute of technology was authorized in 2003. The First-level disciplines for granting doctoral degrees are authorized in 2011.In 2007, the distinctive direction “Space Biology and Medical Engineering” in biomedical engineering in Beijing institute of technology was approved as the special discipline of national defense. In 2013, the newly established interdisciplinary "integrated medical engineering" was approved as a key discipline of the Ministry of Industry and Information Technology.

So far, we have enrolled more than 200 master graduate students, and more than 200 have graduated. We have recruited nearly 90 Ph.D. students in this discipline and other related fields (bio-chemicals, life information engineering) with qualifications for Ph.D. awards, and nearly 40 have graduated.

There are 3 provincial and ministerial key laboratories, including Beijing Key Laboratory of Biomedical Separation and Analysis, Key Laboratory of Integrated Medical Systems and Health Engineering of the Ministry of Industry and Information Technology, and Beijing Biological Teaching Demonstration Center. The area of research laboratories is about 3,600 square meters. The total value of all equipment exceeds 40 million, including laser scanning confocal microscopy,

chromatography-mass spectrometry proteomics platform, microfluidic chip processing system, protein purification system, flow cytometry analyzer, physiological biochemical analysis system, barrier level Animal Laboratory, Space Biological Tank Ground Demonstration and Verification System, Ultrasound Imaging Equipment, 128-lead Brain-Energy Detection Equipment, Optoelectronic Synchronization Brain Function Detection Equipment, Eye Tracker, Multi-GPU High Performance Computing Platform, etc.

Based on our university's background of engineering, the biomedical engineering discipline includes six distinctive research directions:

1. Space Biology and Medical Engineering:

Research on major national needs such as manned space flight and deep space exploration, and this direction belongs to the special discipline of national defense. The research on the key technologies of the space bio-compartment, the space life sciences load technology, the molecular mechanism of the space environment bio-medical effects, the astronaut health monitoring and protection technology, and the celestial biology are characteristic and advanced.

2. Autonomous micro-biological medical system (integrated medical engineering):

Supported by major projects such as "Cerebral Vascular Surgery Assist System Technology", the autonomous micro-biological medical system has been developed. The academic echelon has been engaged in research on biomedical micro-system for many years and has achieved rich results.

3. Digital Health and Smart Medical:

Focus on advanced sensor technology, identification technology, mobile health equipment, advanced medical imaging systems, precision medical technology, the special studies include modern medical signal processing, functional imaging and molecular imaging, patient-centered mobile health information technology, and bioinformatics.

4. Medical biotechnology:

Focusing on new strategies, new methods, and new technologies for the diagnosis and treatment of major diseases, we mainly work on new technologies and methods for tumor-targeted diagnosis and treatment, neural circuit control, novel pathogen microbial classification, and innovative drug development. The distinctive research includes the construction of biological expression systems, the creation of new drugs for plant drugs (Dai drug), drug equivalence assessment techniques, new approaches to tumor immunotherapy, and the etiology of Alzheimer's disease.

5. Biomedical Detection Technology:

Based on the study of the etiology of major diseases, new clinical testing indicators and new detection technologies are developed. At the same time, for the country's needs, biological rapid inspection techniques for diseases and foods, especially microfluidic chip detection technologies, have been developed.

6. Bio-Aware Computing and Rehabilitation Engineering:

The main research includes computational theory and neural model of visual and auditory perception, non-invasive measurement techniques, formal expression of biological perception, interpersonal (human-computer)multi-channel information interaction technology and its application in rehabilitation engineering.

2. Training Target

This program is designed to cultivate students with good moral, intellectual, physical and good scientific quality who is very competitive in the emerging discipline of biomedical engineering-related, interdisciplinary, new technological field. They will to be high-level and applicable specialized persons with innovative spirit and practical ability in biomedical engineering basic research or high-tech research and development field. The requirements are:

1. Master the solid theoretical foundation and systematic professional knowledge of the biomedical engineering specialty, understand the frontier trends of this specialty. Master the experimental skills, testing methods and evaluation techniques in biomedical engineering and possess the ability of engaging in research, teaching and solving local problems in engineering. Possess the engineering consciousness, strong awareness of management and development and management and development.

2. Master a foreign language, can skillfully read professional foreign language materials and write papers. Proficiency in computer application technology.

3. Actively participate in physical exercise, maintain a good physical and mental health quality.

3. Length of Schooling

The basic length of schooling for master students is 2 years. In principle, students should complete the courses in the first academic year. Thesis work time should not be less than one year. The maximum length of study for master students is extended by 0.5 years on the basis of 2 years. The basic length of schooling for Ph.D. students is 4 years. In principle, students should complete the courses in the first academic year. Thesis work time should not be less than three years. The maximum length of study for Ph.D. students is extended by 2 years on the basis of 4 years.

4. Curriculum and Credit Requirements

Course Classification		Course Code	Course Name	Course Hours	Credits	Semester	Requirements	Master /Ph.D.	Credits Requirement
Public Course		3700001	Chinese Language 汉语	96	3+3	1+2	Compulsory	Master /Ph.D.	Master=6 Ph.D.=6
		3700002	Outline of China 中国概况	32	2	1/2	Compulsory	Master /Ph.D.	Master=2 Ph.D.=2
Major Basic Courses		1700001	numerical analysis 数值分析	32	2	1/2	Optional	Master /Ph.D.	Master≥2 Ph.D.≥2
		1700002	Matrix analysis; 矩阵分析	32	2	1/2	Optional	Master /Ph.D.	
Optional Course	Major Core Courses	1600026	Bioinstrument analysis technology 生物仪器分析技术	32	2	1	Compulsory	Master /Ph.D.	Master≥2 Ph.D.≥2
	Major Optional course	1600059	Advanced Biochemistry and Molecular Biology Experiments 高级生物化学与分子生物学实验	48	3	2	Optional	Master /Ph.D.	Master≥6 Ph.D.≥2
		1600005	Advanced pharmacology 高级药理学	32	2	1	Optional	Master /Ph.D.	

		1600023	Frontiers in Biomedical Engineering 生物医学工程前沿	32	2	1	Optional	Master /Ph.D.	
		1600018	Biomechanics and Simulation 生物力学与仿真	32	2	1	Optional	Master /Ph.D.	
		1600006	Space Medicine and Cosmobiology 航天医学与宇宙生物学	32	2	1	Optional	Master /Ph.D.	
		1601008	Human anatomy and physiology 人体解剖生理学	32	2	1	Optional	Master /Ph.D.	
Total Credits		Master≥18credits Ph.D.≥14credits							

Notes：

1. Public Course

(1)Chinese Language: Set by International Students Center of BIT. All international students must take this compulsory course.

(2)Outline of China: Set by International Students Center of BIT. All international students must take this compulsory course.

2. Major Basic Courses

Different Programs can set their own Major Basic Course.

3. Optional Course

(1)Major Core Courses

Different Programs can set their own Major Core Course.

(2)Major Optional course

Master international students must take two optional courses of their own Program. Under the guidance of the supervisor, Master international students can take undergraduate courses if needed. Ph.D. international students can take undergraduate courses if needed.

5. Practice Part

1. Academic Activity (1 credit)

International Graduate Students need to participate in academic activities, academic lectures and academic conferences of their own fields. Giving oral speeches on academic conferences, whether on or off campus, are highly recommended.

2. Innovative Practice (1 credit)

International Graduate Students should take scientific research training and social practices during their training period, which should be carried-out and evaluated by supervisors.

6. The Dissertation Related Work

1. Literature Review & Opening Report

Under the guidance of the supervisor, International Graduate Students should pick a research direction as well as reading certain amount reference books, both Chinese or foreign languages, at the same time.

Master students should write a literature review, no less than 4000 words, based on the reading of over 30 papers , both Chinese or foreign languages, of their own research field.

Ph.D. students should write a literature review, no less than 5000 words, based on the reading of over 50 papers , both Chinese or foreign languages, of their own research field.

On the basis of the Literature Review, the Opening Report should mainly introduce following factors: research target, research meaning, methods of research, technical route, implementary plan, arrangements and expected results.

2. Mid-Term Evaluation

Schools organize Mid-Term Evaluation for International Students, which includes the evaluations of course study, literature review, opening report and the research progress of publishing papers and

writing of Degree thesis.

3. Thesis Writing and Thesis Pre-Defense（for Ph.D. students）

International Graduate Students should complete a Degree thesis under the guidance of supervisors. Ph.D. students can take the Thesis Pre-Defense after finishing a supervisor-approved first draft.

4. Thesis Defense

After thesis approved and the Sub- Committee of Degree Assessment authorized, International Graduate Students can take the Thesis-Defense.

5. Degree Conferment

International students should acquire certain academic results as regulated when applying for a Master or Ph.D. Degree. Each program should clarify the categories of Master Degree and Ph.D. Degree.

Time nodes of relevant procedure

The Dissertation Related Work	**Master**	**Ph.D.**
Literature Review& Opening Report	Before week 1 of the 3rd semester	Before week 1 of the 5th semester
Mid-Term Evaluation	week 1-2 of the 4rd semester	Before week 1 of the 7th semester
Thesis Pre-Defense	——	Before Blind review
Thesis Defense	At least 9 months after the Opening Report	At least 18 months after the Opening Report
Degree Application	The application should be raised in a certain time after the Thesis Defense	

7. Course Syllabus

Course Code，Course Name，Class Hour，Credits，Course Description and Course Target，Teaching Method，Evaluation and Exams，Suitable Specialty，Prerequisites，Course Contents，Reference.