In the Name of God

Islamic Republic of Iran
Ministry of Health and Medical Education
Deputy for Education

Biomedical Engineering (Biomaterial)

Degree: Master of Science (MSc)

Total Course Credits

- Compensatory: 20
- Core: 14
- Non-core (Electives): 57
- Thesis (MSc): 6

Program Description

The field of Biomedical Engineering (Biomaterial) is a branch of Medical Engineering in which the graduate student study basic and applied Material Engineering and Medical Science courses to be able to take educational responsibilities, provide expert and consulting services related to the Biomaterial Engineering to medical staff in hospitals and health centers and perform advanced research in medical and engineering fields in order to develop new methods and techniques for design and production of prosthetics and assistive devices, medical diagnostic and therapeutic devices.

Definition:

The discipline of Biomedical Engineering (Biomaterial) is a branch of the integration of Engineering, Medicine and Basic Sciences, which activates in using engineering skills in medical science in order to protect and promote health systems scientifically.
This M.Sc. program combines the subcategories of Biomaterial Engineering (metals, ceramics, polymers, composites) with medical (physiology, biology and genetics, biochemistry) and special courses from Biomedical Engineering.

Aim:

The main objective of this program is to train smart specialists in Biomaterial Engineering field in order to promote the educational, research and health services according to standards and society needs and perform the following tasks successfully:
Educating smart specialists to fulfill the educational and research needs of the country
Promoting the scientific base of the country to the world levels
Innovation of scientific, practical, and low-cost methods to fulfill the needs of country in reconstructing damaged tissues
Cooperation in applied research projects
Scientific and technical consultations on ordering and purchase of medical materials

Admission Requirements

Besides to general qualifications of all of the candidates in accordance with adopted regulations by Supreme Council of Educational Planning, they should fulfill the following requirements:

a) **Degree requirements:**
The candidates should hold one of the following degrees awarded by one of the home Or foreign universities approved by Iran's Ministry of Health, Treatment and Medical Education:

- B.Sc. degree in Engineering and Technology (all branches), Basic sciences, Medical and Paramedical fields
- General Doctorate in medicine, pharmacy or dentistry

b) Entrance exam:

Acceptance in special entrance exam including the subjects in the following table:

No	Subject	Coefficient
1	General mathematics	3
2	Materials Science	2
3	Principles of Biology	2
4	Language	2
5	Anatomy and Physiology	1
6	Organic Chemistry	1
7	Biochemistry	1
	Total	12

Expected Competencies at the End of the Program

General Competencies*

Specific Competencies and Skills

Through precise and up to date knowledge of all theoretical and applied biomaterial engineering science and diagnostic, therapeutic assistive and investigative devices and techniques, the graduate should be able to:

- Manage and conduct biomedical engineering offices in hospitals and health centers
- Manage and perform theoretical and applied research in biomaterial engineering fields
- Design and develop new techniques, methods and devices in special areas of
- Biomaterial engineering technology
- Teach basic and new biomedical engineering technologies to medical, biomedical engineering and basic science students in engineering and medical schools and also
- Clinical and technical staff in hospitals

Educational Strategies, Methods and Techniques*

Student Assessment (Methods and Types)

a) **Methods of the assessment**

Students will be evaluated by: Written; verbal; OSLE and Logbook-based Assessment methods

b) **Types of the assessment**

Periodic, comprehensive midterm and final exam; monitoring the progress, Completion and defense of the thesis

Ethical Considerations*

*Note: The related document(s) can be found at http://hcmep.behdasht.gov.ir/.

Tables of the Courses

Complementary or Compensatory Courses:

Besides to the 12 core compulsory and 12 non-core optional courses, seminar and thesis, students should register and pass all or part of the following complementary or compensatory courses from table a as specified by Biomedical Engineering Department and approved by the Postgraduate Education Council.

Table 1: List of Complementary or Compensatory Courses

No	Course	Total Credits	Theory Hours	Applied Hours	Total Hours
01	Anatomy	2	34		34
02	Physiology	2	34		34
03	Engineering Materials (metals, polymers and ceramics)	3	51		51
04	Organic Chemistry	2	34		34
05	Biochemistry	2	34		34
06	Polymer Basic Science and Technology	2	34		34
07	Statics and Strength of Materials	2	34		34
08	Histology	2	34		34
09	Introduction to Biological Engineering	2	34		34
10	Medical informatics Systems*	1	9	17	26
	Total Credits	20			

*All students should pass this course as a complementary or compensatory course

Table 2) Core Compulsory Courses:

No	Course Title	Total Credits	Hours Theory	Hours Practical	Hours Total	Prerequisite, concurrent courses
11	biocompatibility	3	51		51	01, 02
12	Polymers and their application in biological engineering	3	51		51	03, 06
13	Tissue Engineering and Laboratory	3	34	34	68	03, 08
14	Ceramics and their Application in Biological Engineering	3	51		51	03
15	seminar	2		68	68	-
16	Thesis	6		-	-	-

Table 3) Non-Core Optional Courses:

No	Course Title	Total Credits	Hours Theory	Hours Practical	Hours Total	Prerequisite, concurrent courses
17	Methods for Characterization and Selection of Medical Materials	3	51		51	03
18	Gel and its Application in Biomedical Engineering	2	34		34	06
19	Biomaterials Degradation in Biological Environments	3	51		51	03, 05, 11
20	Implantable Materials in Body	3	51		51	03, 11
21	New Techniques in releasing Biological Substances in Body	3	51		51	11
22	Biological Tests and Sterilization Methods of Materials	2	34		34	05, 11
23	Metals and their Applications in Biological Engineering	3	51		51	03
24	Composites and their Applications in Biomedical Engineering	3	51		51	03, 11
25	General Biomechanics	2	34		34	07, 11
26	Laser and its Applications in Biomedical Engineering	2	34		34	03, 11
27	Novel Surface Analysis of Biocompatible Materials	3	51		51	03, 11
28	Modeling of Physiological Systems	2	34		34	01, 02
29	Dental Materials	2	34		34	03, 11
30	The Application of Nanomaterial's in Biomedical Engineering	2	34		34	11,12,14,23
31	Methods of Production and Characterization of Biomaterials	3	51		51	11,12,14,23
32	Special Topics in Biomaterial Engineering (1)	3	51		51	11
33	Special Topics in Biomaterial Engineering (2)	3	51		51	11
34	Bioreactors and their Applications in	2	34		34	11,12

	Tissue Engineering					
35	Cardiovascular System Tissue Engineering	2	34		34	08,11,12
36	Neural System Tissue Engineering	2	34		34	08,11,13
37	Design and Production of Scaffolds in Tissue Engineering	2	34		34	03,11,13
38	Musculoskeletal *Tissue Engineering*	2	34		34	08,11,13
39	Skin Tissue Engineering	2	34		34	08,11,13
40	Internship	1		51	51	-
	Total	57				

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