

**In the Name of God**

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

**Medical Biotechnology  
Doctor of Philosophy (PhD)**

**Total Course Credits**

Core: 17

Non-core: 4

Dissertation: 28

**Program Description**

As a historical fact, man has always been interested in exploring new things, and is eager to unravel the dark sides of any phenomenon. Human beings owe a lot to brilliant research studies done by known past and present researchers such as Ibn-i-Sina, Zakariya-yi-Razi, Louis Pasteur, Thomas Edison etc. These researchers have done a lot to explore the dark sides of natural phenomena and have tried to explain natural rules to benefit the public. The discovery of fermentation (i.e. the conversion of sugar into alcohol in a vacuum) by Muhammad Ibn Zakariya-yi Razi and the detailed explanation of this phenomenon by Louis Pasteur is the starting point of biotechnology field.

Nowadays, biotechnology is expanded to every aspect of human life with the help of engineering and recruiting novel tools, and has emerged as a multidisciplinary field. Medical biotechnology, as part of biotechnology, assists medicine and pharmacy in many aspects, and has revolutionized the health system through the diagnosis and therapy of diseases, genetics and drug-body interactions. The countries which possess medical biotechnology industry could gain more wealth and power internationally. With the introduction of biotechnology into pharmacy, current drugs are more effective and efficient through application of cutting-edge technologies for pushing the field ahead. Although medical biotechnology has been recently introduced in Iran, advancement of the field requires expert staff and researchers. The main aim of establishment of the medical biotechnology field is training and educating the expert personnel to contribute to the improvement of different medical and health fields and to the development of the country. To this end PhD of Medical Biotechnology uses the knowledge and techniques obtained from bioscience, exploiting living organisms and cell-derived materials, to develop the products required for treatment, diagnosis and prevention of human diseases. As such, the program primarily intends to:

- supply the required expert personnel in biotechnology for the related research centers
- supply the required expert personnel for the production sector
- expand the technology in the country as the basis for the expansion of advanced sciences

**Admission Requirements**

- Meeting the general requirements for admission to Ph. D program, introduced by Iran's Ministry of Health and Medical Education
- Holding an MSc degree on one of the following fields: Molecular medicine, bacteriology, biochemistry, hematology, medical nanotechnology, immunology, virology, genetics, human genetics, medical biotechnology, biomedicine, agricultural biotechnology, microbial

biotechnology, biology (all disciplines), parasitology, microbiology, mycology, medical entomology

- Having a doctoral degree on the following fields: MD, Pharm-D, DMD, veterinary medicine and medical laboratory sciences
- The subjects that are included in the Entrance Exam are indicated in the box below.

#### **Examination Subjects**

Name of course	weight
Biochemistry	2
Immunology	2
Bioinformatics	1
Cellular and molecular biology	5

### **Expected Competencies at the End of the Program**

#### **General Competencies\***

#### **Specific Competencies and Skills**

At the end of the program learners will be competent in the following skills:

##### **A. Education**

- Involvement in theoretical and practical education of biotechnology to medical biotechnology students and other related students
- Collaboration with health authorities in preparation of the related instructions
- Education of the host organization staff

##### **B. Research**

- Designing, establishment and publication of the related research projects
- Assisting in designing and establishment of national and organizational research projects in collaboration with research centers and the health system

##### **C. Consultation**

- Consultation with the production researchers in order to improve the production
- Consultation with treatment specialists
- Consultation with the health authorities in order to minimize patients' costs

##### **D. Diagnosis**

- Application of novel diagnostic methods for early detection of diseases

##### **E. Monitoring**

- Monitoring production systems of biological products

##### **F. Production**

- Contribution in designing and producing biological, diagnostic and disease preventive products
- Collaboration in development of facilities/equipment required in biotechnology industry

##### **G. Management**

- Involvement in management of any organizational systems related to the field
- Collaboration with the health system authorities in policymaking activities of the field

### **Educational Strategies, Methods and Techniques\* Student Assessment (Methods and Types)**

- Formative (Quizzes and Midterm Exam)

- Summative (Final Exam)
- Comprehensive exam
- Log book assessment
- Publication of articles
- Work confirmation letters

### Ethical Considerations\*

\*Note: The related document(s) can be found at <http://hcmeq.behdasht.gov.ir/>.

### Tables of the Courses

**Table 1. Compensatory Courses**

Code of the Course	Title of the Course	Number of Credits			Teaching Hours			Prerequisite or Corequisite Courses
		Total	Theoretical	Practical	Total	Theoretical	Practical	
01	Medical Informatics Systems	1	0.5	0.5	26	9	17	---
02	Cellular and Molecular Biology	2	2	---	34	34	---	Cell Culture (08)
03	Biosafety and Principles of Working in Laboratory	1	1	---	17	17	---	---
04	Research Methodology and Principles of Article Writing	1	1	---	17	17	---	---
05	Electrochemistry	1	1	---	17	17	---	---
06	Immunochemistry	1	0.5	0.5	26	9	17	---
07	Practical Microbiology	1	---	1	34	---	34	---
08	Cell Culture	1	0.5	0.5	26	9	17	---
09	Principles of Working with Laboratory Animals	1	0.5	0.5	26	9	17	---
<b>Total Number of Credits</b>		10						

**Table 2. Core Courses**

Code of the Course	Title of the Course	Number of Credits				Number of Hours				Prerequisite or Co-requisite Course
		Total	Theoretical	Practical	Internship	Total	Theoretical	practical	Internship	
10	Principles of Molecular Genetics and Genetic Engineering (Theory)	2	2	---	---	34	34	---	---	Cellular and Molecular Biology (02)
11	Bioethics	1	1	---	---	17	17	---	---	---
12	Seminar	1	---	1	---	34	---	34	---	---
13	Computational and Systems Biology	2	1	1	---	51	17	34	---	---
14	Genetic Engineering (Practice)	3	---	3	---	102	---	102	---	Principles of Molecular Genetics and Genetic Engineering (Theory) (10)
15	Protein Engineering	2	2	---	---	34	34	---	---	---
16	Principles and Applications of Engineering Processes in Biotechnology	2	1	1	---	51	17	34	---	Electrochemistry (05)
17	Applications of Vaccines and Anti-bodies in Medical Biotechnology	1	1	---	---	17	17	---	---	Immunochemistry (06), Cellular and Molecular Biology (02)
18	Nanobiotechnology	1	1	---	---	17	17	---	---	---
19	Principles of Standardization and Safety of Biological Products	2	1	---	1	68	17	---	51	Biosafety and Principles of Working in Laboratory (03)
20	Thesis	28								
<b>Total Number of Credits</b>		<b>45</b>								

**Table 3. Non-Core Courses (Elective)**

Code of the Course	Title of the Course	Number of Credits			Number of Hours			Prerequisite or Co-requisite Course
		Total	Theoretical	Practical	Total	Theoretical	Practical	
21	Applications of Stem Cells in Medical Biotechnology	2	1	1	51	17	34	Cell culture (08)
22	Applications of Microarrays and Microfluidics in Diagnosis	2	1	1	51	17	34	Electrochemistry (05) and Nanobiotechnology (18)
23	Economy, Innovation and Intellectual Property in Biotechnology	2	1	1	51	17	34	Principles of Standardization and Safety of Biological Products (19)
<b>Total Number of Credits</b>		<b>6</b>						

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