

## In the Name of God

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

## Medical Biotechnology Degree: Master of Science (MSc)

#### Total Course Credits

- Core: 19
- Non-Core: 2
- Thesis: 10

#### Program Description

The term biotechnology was initially used by Karl Ereky as the application of biosciences and their effect on man-made technologies in 1919. Briefly, biotechnology science includes any kind of man-made intelligent activity in the world which uses organisms, especially through manipulations at their molecular level, to develop various products and improve the environment, the food and people's health. As such, to deepen their knowledge of the field, researchers should implement more educational and research programs from the biotechnology field.

Those with a master's degree in Medical biotechnology, a field in basic biomedical sciences, are able to improve the environment, the food products, and the health indices by adopting and implementing new findings from different sciences including molecular and cellular biology, genetic engineering, tissue engineering and living organisms. The main duty of medical biotechnology is to resolve health problems of general community and to produce useful bio-products such as vaccines, diagnostic kits, recombinant antibodies, food products and drugs. Biotechnologists also serve in educational, research and commercial organizations in an attempt to further benefit the public. Their main objective is to:

- Supply the required expert personnel in biotechnology for the related research centers
- Train the necessary expert personnel for the production sector
- Expand the necessary technology in the country, to serve as a basis for further expansion of advanced sciences

#### Admission Requirements

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- Meeting the general requirements for admission to MSc level according to the rules of the Ministry of Health and Medical Education
- A bachelor's degree, in any field of medical sciences (biology, all fields), biotechnology, laboratory sciences, veterinary laboratory sciences and experimental sciences
- Holding an MD, Pharm-D or veterinary medicine

The following box illustrates the subjects that are included in the Entrance Exam

## Examination Subjects

Name of course	Weight
Biology (cellular-molecular)	4
biochemistry	1
microbiology	1
General English	2

## 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:

- Effective communication, interaction and effort in the work environment
- Efficient work with the specialized tools and equipment
- Calibration of the related equipment
- Proper handling of animal models
- Expert knowledge and skill in researching and writing scientific reports
- Proper understanding of the environmental impacts associated with the activity; knowing how to perform risk assessments; being well familiar with safety instructions in his/her subject area.

Graduates should also be competent in a number of procedural activities which are illustrated in a box as follows:

### Procedural skills (Tabulated)

Skill	The Minimum Number of Skill-enhancing Activities			
	Observation of the Activity	Assistance in Doing the Activity	Independent Performance of the Activity	Total Number of Activities
Preliminary cell culture techniques including cultivation, subculture and preparation of frozen stocks	3	3	3	9
Cell line development	1	1	---	2
Vaccine production	1	---	---	1
Artificial tissue production	1	1	---	2
Gene transfer to cells	1	1	---	2
Working with optical and fluorescent microscopes	3	3	3	9
Production of monoclonal antibodies	1	1	---	2
Cleaning and sterilization	2	2	2	6
Preparation of required buffers	2	2	2	6
Preparation of different cell culture media	2	2	2	6
Cell viability studies	1	1	1	3
Cloning and sub-cloning	3	2	1	6
Measurement of protein concentration	2	1	1	4
Electrophoresis and interpretation of the related results	2	2	2	6
Different types of PCR	3	2	2	7
Heterologous protein expression	2	1	---	3

Searching the macromolecule databanks	3	3	3	9
Primer designing	2	2	1	5
Different types of chromatography and filtration	1	1	---	2

## 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
- Encouragements and reminders

### Ethical Considerations\*

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

## Tables of the Courses

### Table 1. Compensatory Courses


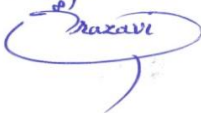
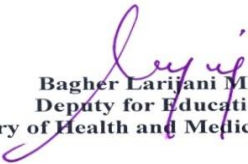
Code of the Course	Title of the Course	Credits			Teaching Hours			Prerequisite or Co-requisite Course
		Total	Theoretical	Practical	Total	Theoretical	Practical	
01	Medical Informatics Systems	1	0.5	0.5	26	9	17	-----
02	Pathobiology (Microbiology and Immunology)	3	3	-----	56	56	-----	-----
03	Special English	2	2	-----	34	34	-----	-----
04	Research Methodology	1	0.5	0.5	26	9	17	-----
05	Culture of Animal Cells	2	1	1	51	34	17	-----
<b>Total Number of Credits</b>		<b>9</b>						

### Table 2. Core Courses

Code of the Course	Title of the Course	Credits			Teaching Hours			Prerequisite or Co-requisite Courses
		Total	Theoretical	Practical	Total	Theoretical	Practical	
06	Cellular and Molecular Biology	2	2	-----	34	34	-----	-----
07	Medical Biochemistry	2	2	-----	34	34	-----	-----
08	Principles of Standardization and Safety of Biological Products	1	1	-----	17	17	-----	-----
09	Genetic Engineering (Theory)	2	2	-----	34	34	-----	-----
10	Genetic Engineering (Practice)	2	-----	2	34	-----	34	08 and 09
11	Principles of Working with Laboratory Animals	2	1	1	51	17	34	-----
12	Bioinformatics	2	1	1	51	17	34	-----
13	Immunochemistry and Analysis Methods	3	2	1	68	34	34	07
14	Seminar I	1	1	-----	17	17	-----	-----
15	Medical Genetics	2	2	-----	34	34	-----	-----
16	Thesis	10						
<b>Total Number of Credits</b>		<b>29</b>						

**Table 3. Non-Core Courses**

Code of the Credits	Title of Courses	Credits			Teaching Hours			Prerequisite or Co-requisite Courses	
		Total	Theoretical	Practical	Total	Theoretical	Practical		
17	Introductory Nanobiotechnology	1	1	-----	17	17	-----	-----	
18	Biosafety, Ethics and Law	1	1		17	17	-----	-----	
19	Principles of Economy and Intellectual Property	1	1		17	17	-----	-----	
20	Seminar II	1	1		17	17	-----	-----	
<b>Total Number of Credits</b>		4							

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