

**In the Name of God**  
**Islamic Republic of Iran**  
**Ministry of Health and Medical Education**  
**Deputy for Education**

**Pharmaceutical Biomaterials**  
**Degree: Doctorate of Philosophy (PhD)**

**Total Course Credits**

Core: 15

Non-core: 7

Thesis: 22

Total: 44

**Program Description**

Pharmaceutical Biomaterials is a multidisciplinary field of study combining Pharmaceutics and Biomaterials dealing with strategies related to the manipulation of bio-originated or bio-applicable materials. These approaches serve towards diagnosis, treatment and/or prevention of various diseases.

**Aims and Objectives**

The main aims include development of novel materials to enhance stability and biocompatibility of medical devices and advanced drug delivery systems, development of pharmaceutical biomaterials to pave the path for the production of novel intelligent drug delivery systems, as well as training of competent and well-educated scientists with spectacular expertise to design, discover, synthesize and develop novel biomaterials in order to prevent, diagnose and treat various diseases.

**Admission Requirements**

International applicants may apply directly to their corresponding departments, where their CVs, academic records, achievements, publications as well as enthusiasm, courage and talents will be considered and acted accordingly.

Due to interdisciplinary nature of the course, applicants having PharmD or MSc in different fields of studies including Pharmacy, Medicine, Dentistry, Chemistry, Physics, Biology and related fields are considered to sit for the entrance examination. Candidates must pass both written and oral entrance exam. They should also demonstrate proficiency in verbal and written English. Successful candidates will enter the program according to the PhD educational rules and regulations.\*

\*Important note: These general conditions do not necessarily exclude specific conditions of each institute or university.

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

### **General Competencies\***

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

The graduates will possess high levels of expertise and competency in the implication of the following techniques and skills:

- Design, preparation and modification of biomaterials for specific pharmaceutical applications.
- Identification and characterization of host-drug interaction at molecular and cellular levels.
- Kinetically real time monitoring and analysis of the interactions in bioreactors.
- Application of theoretical and modeling approaches to overcome experimental shortcomings to learn the targeting mechanisms involved and minimize the side effects.
- Optimization, manufacture, and standardization of the product up to the pilot level.
- Independent feasibility studies and management of the innovative and productive research and development protocols.
- Development and modernization of the industrial companies dealing with pharmaceutical biomaterials.
- Implementation of modern high-tech and state of the art approaches (NEMS, MEMS, etc) to the field of Pharmacy.

### **Educational Strategies, Methods and Techniques\***

#### **Student Assessment (Methods and Types)**

- The scientific progress of the students will be monitored during the course of study by all members of the academics in the department. Based on the nature of different courses, the students will sit for oral and/or written examination during and/or at the end of the semester. Furthermore, in some subjects students are required to give a seminar and presentation which will be evaluated by the tutor.
- Following the completion of the course and getting a minimum total score of 15 out of 20, the students will be directed to sit for the comprehensive exam. The successful students who pass the comprehensive exam will officially start their research project and pursue their studies towards PhD degree.
- Following the completion of the thesis research project and approval of the supervisor and assessment committee, the students will defend their thesis in an open session in front of the internal and external referees. Once the referees found the thesis, presentation and defend of the students satisfactory, they will approve awarding PhD degree. Otherwise, the student might be asked to conduct further research or be failed altogether being awarded a MPhil degree.

### **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			Hours			Prerequisite or Concurrent Courses
		Theoretical	Practical	Total	Theoretical	Practical	Total	
01	Medical Information Systems	0.5	0.5	1	9	17	26	
02	Physical Pharmacy	2		2	34		34	
03	Biopharmacy & Industrial Pharmacy	2		2	34		34	
04	Novel systems for Drug transport	3		3	51		51	
05	Metal-Based Biomaterials	2		2	34		34	
06	Ceramic-Based Biomaterials	2		2	34		34	
07	Biomaterials Interactions in vivo	2		2	34		34	
08	Solid & Liquid Biomaterials Rheology	1	1	2	17	34	51	
09	Tissue Sciences & Tissue Engineering	2		2	34		34	
10	Medical Physiology	3		3	51		51	
<b>Total</b>				<b>21</b>				

**Table 2. Core courses**

Code of the Course	Title of the Course	Number of Credits			Hours			Prerequisite or Concurrent Courses
		Theoretical	Practical	Total	Theoretical	Practical	Total	
11	Pharmaceutical Biomaterials	2		2	34		34	02,03,04
12	Advanced Cellular & Molecular Biology	2		2	34		34	
13	Cell Culture	1	1	2	17	34	51	
14	Compatibility in Pharmaceutical Biomaterials	2		2	34		34	12, 13
15	Degradability in Pharmaceutical Biomaterials	2		2	34		34	12, 13
16	Searching & Standardization Techniques in Pharmaceutical Biomaterials	2		2	34		34	
17	Synthesis & Processing in Pharmaceutical Biomaterials	2	1	3	34	34	68	
18	Thesis (dissertation)	22						
	<b>Total</b>			<b>37</b>				

**Table 3. Non-core Courses**

Code of the Course	Title of the Course	Number of Credits			Hours			Prerequisite or Concurrent Courses
		Theoretical	Practical	Total	Theoretical	Practical	Total	
19	Experimental Design	1	1	2	17	34	51	
20	Research, Development & Novelty Management	2		2	34		34	
21	Medical Ethics in Pharmaceutical Biomaterials	1		1	17		17	
22	Simulating & Modeling of Artificial Neural Matrices	2		2	34		34	
23	Biological products	2		2	34		34	
24	Advanced Determination Techniques & Instrumental Analysis	2		2	34		34	
25	Novel Techniques in Smart Drug Delivery	2	1	3	34	34	68	
	<b>Total</b>			<b>14</b>				

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