

## IN THE NAME OF GOD

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

### **Medical Nanotechnology**

**Degree: Doctor of Philosophy (PhD)**

#### **Total Course Credits**

- Core: 28
- Non-core (Electives): 6
- Dissertation: 24

#### **Program Description**

Nanomedicine, as an interdisciplinary and multidisciplinary field, is a combination of various sciences such as physics, chemistry, biology, pharmacy and medicine. Graduates of this field work on issues at the molecular and atomic basis (in sizes of 1 to 100 nm) to create methods for rapid and accurate diagnosis of diseases and to use intelligent delivery vehicles, artificial organs and medical devices such as nanorobots to improve the individual's life quality.

Outstanding features of nanotechnology are diagnosis, treatment and prevention of diseases using nanodevices and nanostructures, engineered at the nanoscale. Tools used in nanomedicine range from drug delivery systems and nanobiosensors to nanorobots and nanoscaffolds. Nanomedicine depends on a great number of disciplines, including physics, engineering, chemistry, biology, and aims to improve the quality of life through enormous developments in health-care sectors.

Due to the increasing growth rate of science and technology in nanomedicine and investments in this field, it is predicted that the quality of human life will be substantially improved in near future. As a result, universities and higher education institutions are required to plan and implement programs for training and developing required human resources in various fields of nanomedicine. Therefore, training and educating skilled human resources majored in nanomedicine at PhD level is considered as the main mission of our educational program.

#### **Admission Requirements**

- Having a master degree (M.Sc.) in one of the fields of nanomedicine (medical nanotechnology), biophysics, physics (all disciplines), chemistry (all disciplines), chemistry engineering, biology (all disciplines), Engineering (all disciplines), textile engineering, biotechnology (all disciplines), immunology, artificial limbs, parasitology, biochemistry, occupational health engineering, medical entomology and vector control, human genetics, nutrition science, food science and technology, health sciences, nutrition, physiology, physiotherapy, mycology, microbiology, virology, environmental health engineering, medical physics, toxicology, hematology, medical engineering or bio-medical technology, awarded by one of national or foreign universities approved by the Ministry of Health and Medical Education. Similarly, M.D. in medicine, Pharm.D. in pharmacy, D.D.S. in dentistry, D.V.M. in veterinary or equivalent degrees are also accepted.
- Succeeding in entrance examination
- Participating in the interview
- Offering a resume
- Presenting Recommendation letters
- Meeting admission criteria based on the regulations of universities

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

## 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:

- Keeping the physical, psychological, and occupational environment healthy
- Developing specific nanomedical skills including designing nano-delivery systems, lithography, cell and tissue culture, interpreting DLS, and STM, AFM, and electron microscopy results, and synthesizing metal and non-metal nanoparticles such as silver, gold, iron oxides, polymer nanofibers.
- Working with high-tech specialized equipment
- Acting professionally in nanomedical diagnostic
- Interpreting test results
- Conducting research at national and international levels
- Keeping up-to-date by self-education

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

- Formative (quizzes and midterm exam)
- Summative (final exam)
- Comprehensive exam
- Methods of assessment: oral, written, observation, clinical competence assessments □  
Portfolio assessment: Log book, test results, reports, articles, certificates, promotions, etc.

## Ethical Considerations

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

## Table of the Courses

Table 1. Introductory courses				
Code of the Course	Title of the Course	Total	Theoretical	Practical
1	Nanomaterials and Nanostructures	2	2	-
2	Methods of Nanostructure Fabrication	2	1	1
3	Characterization and Analysis Techniques of Nanostructures	2	1.5	0.5
4	Nanobiomedicine	3	3	-
5	Nanobiotechnology	2	2	-
6	Nanosafety	2	2	-

<b>7</b>	Medical Information Systems	1	0.5	0.5
<b>8</b>	Fundamentals of Physiopathology	2	2	-
	Total	16		

**Table 2. Core courses**

<b>Code</b>	<b>Title of the Course</b>	<b>Total</b>	<b>Theoretical</b>	<b>Practical</b>
<b>9</b>	Advanced nanobiotechnology	2	2	-
<b>10</b>	Advanced Nanobiomedicine	2	2	-
<b>11</b>	Designing Materials at Nanoscale	3	3	-
<b>12</b>	Drug Delivery Systems and Smart medicines	3	3	-
<b>13</b>	Methods of Research in Nano-Science and Technology	2	2	-
<b>Total</b>		12	-	-
<b>14</b>	Thesis	24		

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

<b>Code</b>	<b>Title of the Course</b>	<b>Total</b>	<b>Theoretical</b>	<b>Practical</b>
<b>15</b>	Virology and nanomedicine	2	2	-
<b>16</b>	Gene Therapy	2	2	-
<b>17</b>	Applications of Nanotechnology in Regenerative Medicine	3	2	1
<b>18</b>	Thin Films	3	3	-
<b>19</b>	Advanced Modeling at Nanoscale	2	1	1
<b>20</b>	Biological manipulation at Nanoscale	2	1.5	0.5
<b>21</b>	Pharmacokinetics of Nanoparticles	1	1	0
<b>Total</b>		15		

\*6 credits from elective courses must be taken by the student

**Jamshid Hajati PhD**  
**Secretariat of the Council for**  
**Education of Health and Basic**  
**Medical Sciences (Undergraduate**  
**and Postgraduate)**



**Seyed Mansour Razavi MD**  
**Secretary of the Supreme**  
**Council for Medical**  
**Sciences Planning**



**Bagher Larijani MD**  
**Deputy for Education**  
**Ministry of Health and Medical Education**

