



TEHRAN UNIVERSITY  
OF  
MEDICAL SCIENCES



## Department of Medical Physics and Biomedical Engineering

*Tehran University of Medical Sciences, School of Medicine*

## About the Department

The foundation of Tehran University of Medical Sciences in 1934 marked the beginning of teaching Physical Medicine by Mr. Mahmood Morshed-Zadeh. The Medical Physics Laboratory was founded by Dr. Farhad in the years 1939 and 1940, which was promoted to a department in 1966 headed by Dr. Manouchehrian. Then, Dr. Abolghassem Pezeshkian was appointed as the head of the department of Physiology and Medical Physics, and Dr. Azizi was appointed as the head of the section of Medical Physics. In 1971, the department of the “three Ph’s” was founded consisting of Physiology, Pharmacology, and Medical Physics majors. When the said department was dissolved in 1973, Medical Physics Laboratory turned into an independent department under the direction of Dr. Abolfazl Rasouli. Over the next years, the department has been headed by Dr. Ezzatollah Golban-Moghaddam, Dr. Ali-Akbar Khodadust and Dr. Gholamreza Rahbari, respectively. From 1996 to 2004, Dr. Saeed Sarkar was appointed as the head of the department for 4 consecutive terms; then, Dr. Hossein Gharaati, for one year; Dr. Mohammadali Oghabian, for two years; and Dr. Mohammad-Javad Abolhassani, for two years headed the department. In June 2010, Dr. Alireza Ahmadian undertook this position.

Over these years, other postgraduate programs were founded in addition to Medical Physics and Biomedical Engineering, such as a postgraduate program in Medical Physics and Biomedical Engineering. The number of faculty members in different branches, educational environment and research facilities has also grown considerably.

Currently, faculty members of the department are actively cooperating with the Institute for Advanced Medical Technologies, Iranian Association of Medical Physics, Cancer Institute of Imam Khomeini Hospital, Medical Imaging Center, Farabi Research Center of Ophthalmology, and Center of Nuclear Medicine Research in Shariati Hospital. They also have a close cooperation with the departments of Radiotherapy, Radiology and Nuclear Medicine, Biomedical Engineering, Medical Imaging, Molecular Imaging, Medical Nanotechnology, Robotic Surgery, Optics and Laser, and Therapeutic and Diagnostic Ultrasound, where they offer services in treatment, education and research. The faculty of this department are actively involved in different scientific areas of Medical Physics and Biomedical Engineering, participating in board meetings as well as other professional affairs.

## Department Profile

**Department:** Medical Physics and Biomedical Engineering

**Postal Address:** Department of Medical Physics and Biomedical Engineering – Faculty of Medicine – Tehran University of Medical Sciences

**Postal Code:** 14176-13151

**Website:** <http://medicine.tums.ac.ir/>

**Tel.:** (+98 21) 6646 6383, 6648 2655, 8897 3653

**Fax:** (+98 21) 6648 2654

- **Head of the Department:** Dr. Mohammad Reza Ay
- **Deputy for Postgraduate Studies in Medical Physics:** Dr. Alireza Shirazi
- **Deputy for Postgraduate Studies in Biomedical Engineering:** Dr. Amir-Homayoun Jafari
- **Deputy for Research in Medical Physics:** Dr. Nader Riyahi Alam
- **Deputy for Research in Biomedical Engineering:** Dr. Alireza Mirbaghery
- **Deputy for Undergraduate Studies:** Dr. Mohammad Ali Oghabian
- **Deputy for Laboratory and Industrial Relation :** Dr. Hossien Ghadiri
- **International Relations Officer:** Dr. Hamdireza Saligheh Rad
- **Technical Coordinator:** Mr. Reza Hadi (Ext.: 102)
- **Postgraduate Administrators:** Ms. Shohreh Gharib and Ms. Mehrangiz Shokri (Ext.: 101)
- **Undergraduate and Library Administrator:** Ms. Roghaye Rashidi (Ext.: 117)
- **Research and Laboratory Assistant:** Mr. Seyyed-Ahmad Shamsa (Ext.: 118)
- **Services:** Mr. Mahdi Taghi-Nezhad and Mr. Saber Alizadeh (Ext.: 121)

## Faculty Members

Name	Educational Degree	Research Interests
Dr. Mohammadreza Ay	Ph.D. in Medical Physics, Ph.D. in Medical Radiation	Multimodality Imaging PET/CT, PET/MRI, SPECT/CT, Monte Carlo Simulation, Molecular Imaging, Animal Imaging.
Dr. Mohammad Javad Abolhassani	Ph.D. in Biomedical Systems (Ultrasound)	Medical Instrumentation, Medical Ultrasound Instrumentation, Ultrasound Image Processing, Otoacoustic Emission Systems, Biological Signal Processing.
Dr. Alireza Ahmadian	Ph.D. in Biomedical Image Processing	Image-Guided Surgery, Image-Guided Intervention Systems, Image Registration.
Dr. Abbas Takavar	Ph.D. in Medical Physics (Nuclear Medicine)	Nuclear Medicine and Nuclear Medicine Dosimetry.
Dr. Hassan-Ali Nedaie	Ph.D. Degree in Medical Physics	Radiotherapy Physics, Dosimetry, Monte Carlo Modeling, IMRT, IGRT, VMAT, Radiobiology.
Dr. Ghazale Geraily	Ph.D. Degree in Medical Physics	Stereotactic Radiosurgery, External Radiotherapy, Dosimetry, Treatment Planning, Monte Carlo Simulation.
Dr. Hossein Ghadiri	Ph.D. in Medical Physics	Modeling/Simulation of Medical Imaging Systems, Imaging and Therapeutic Ultrasound Developments, Spectral CT and its Applications in PET and Multiple Targeted Contrast Agents Discrimination, Quantitative CT (QCT) and Quantitative Ultrasound (QUS), Bone Assessment Techniques (CT, Ultrasound, and DEXA).
Dr. Amir-Homayoun Jafari	Ph.D. in Biomedical Engineering	Neuromuscular Systems Control, Biological Systems, Fuzzy Systems Modeling, Nonlinear Processing of Biosignals, Fuzzy Systems, Chaos Systems.
Dr. Sedigheh Marjaneh Hejazi	Ph.D. in Medical Physics	Installation and Design of Optical Imaging, Optimal Systems Image Processing, Laser Application in Medicine, Molecular Fluorescent Imaging System, Photoacoustic Imaging System.
Dr. Nader Riyahi Aalam	Ph.D. in Medical Physics	Physical Principles of Medical imaging (MRI), Molecular Imaging and Nanoparticle Probe, Computer-Aided Diagnostic System (CAD) and Digital Mammography.
Dr. Saeed Sarkar	Ph.D. in Medical Physics	Nuclear Medicine, Protection against Ionizing Radiation (Optimizing parameters of Nuclear Medicine Systems, Dosimetry and calculation of the absorbed dose by the personnel and the patients in radiography centers).
Dr. Hamidreza Saligheh Rad	Ph.D. in Biomedical Engineering	Advanced MRI/MRS/DTI/fMRI/PWI/DWI Techniques in Diagnostic Radiology, Hybrid MRI/PET, Molecular Imaging, Preclinical Imaging.
Dr. Alireza Shirazi	Ph.D. in Medical Physics (Radiobiology)	Radiobiology, Ionizing radiation Protection and Application of Radiobiology in Radiotherapy (Biodosimetry, Radio-sensitivity, Accelerated Radiotherapy)

<b>Dr. Mohammadali Oghabian</b>	Ph.D. in Medical Physics	Imaging Systems, Functional Image Processing and Analysis, DTI, MRI, MRS, FMRI, Cellular and Molecular Imaging.
<b>Dr. Hossein Arabalibeik</b>	Ph.D. in Biomedical Engineering	Intelligent Systems and Adaptive Control, Fuzzy Neural Network Applications and Systems in Control System Identification and Signal Processing, Genetic Algorithms and their Applications, Medical Instrumentation courses, Neural and Fuzzy Networks.
<b>Dr. Hossein Ghadiri</b>	Ph.D. in Medical Physics	Imaging Systems, X-ray and Computed Tomography, Therapeutic and Diagnostic Ultrasound, Ultrasonic Neurostimulation and Brain Mapping.
<b>Dr. Bahador Makki-Abadi</b>	Ph.D. in Biomedical Signal Processing	Biomedical Signal Processing, Blind Source Separation of Biomedical Signals, Compressive Sensing for Ultrasound Imaging, Array Processing, Tensor Factorization, Hardware Based Signal Processing, Brain-Computer Interface, Computer Vision for Medical Applications.
<b>Dr. Alireza Mirbagheri</b>	Ph.D. in Mechanical Eng. (Applied Design)	Medical Robotics, Computer Aided and Robotic Surgery Systems, Haptics, Virtual and Physical Training Systems in Medicine.
<b>Dr. Mehdi M. Mirbagheri</b>	Ph.D. in Biomedical Engineering	Rehabilitation Engineering, Neural Engineering, Biomedical Engineering, Robotic Rehabilitation, Motor Control, System Identification, Human Movement Science, Modeling, Neuro-rehabilitation, Neuroimaging, Biological Signal Processing, Electrophysiology, Neurological Disorders.

## Department Curriculum for Post-Graduate Studies

### ❖ Post-Graduate Programs

- M.Sc. in Medical Physics
- M.Sc. in Biomedical Engineering – Bioelectronics
- Ph.D. in Medical Physics
- Ph.D. in Biomedical Engineering – Bioelectronics / Medical Robotics

### M.Sc. in Medical Physics

Title: M.Sc. in Medical Physics

Duration: Two years

- Qualifications required:

- Having a B.Sc. degree in Physics, Biophysics, Radiotherapy or Radiology;
- Acceptance in the entrance exam
- Graduation Conditions: Passing all theoretical subjects and thesis
- Duration of the entire program and the educational system:
  - The entire program and educational system conform to the educational code for graduate programs approved by the High Council of Education Planning.
- Total number of course credits:

The course credits for this program are as follows:

No.	Course Title	Number of Credits
1	Core courses	19
2	Non-core courses	7
3	Thesis	6
	<b>Total Number of Credits</b>	<b>32</b>

### **M.Sc. in Biomedical Engineering (Bioelectrics)**

Title: M.Sc. in Biomedical Engineering – Bioelectrics

Duration: Two years

- Qualifications required:
  - Having a B.Sc. degree in Engineering, Sciences, Ph.D. Specialty in Medicine, MDs in Medicine and Paramedics;
  - Acceptance in the entrance exam.
- Graduation Conditions: Completing theoretical courses and thesis
- Course Titles and Number of Credits:

**The course credits for this program are as follows:**

No.	Course Title	Number of Credits
1	Core courses	17
2	Non-core courses	9
3	Thesis	6
	Total Number of Credits	32

### **Ph.D. in Medical Physics**

Title of the program: Ph.D. in Medical Physics

Duration: Four years at two levels of education and research.

- Qualifications required:
  - Acceptance in the entrance exam from M.Sc. degree to Ph.D. degree, or having a degree in MDs.
- Graduation Conditions: Completing 24 courses for the education level and 24 credits for the research level

No.	Course Title	coefficient
1	Core courses	16 credits
2	Non-core courses	8 credits
3	Thesis	24 credits
	Total Number of Credits	48

### **Ph.D. in Biomedical Engineering (Bioelectronics)**

Title: Ph.D. in Biomedical Engineering (Bioelectronics)

- Duration: According to the code approved by the High Council of Education Planning, this Ph.D. program consists of two education and research stages.
- The total number of courses for this program consists of nine units for core courses, fifteen units for non-core courses, two units for the seminar and twenty units for the Thesis:

Course Title	Credits
<b>Core Courses</b>	9 units
<b>Non-Core Courses</b>	15 units
<b>Seminar</b>	2 units
<b>Thesis</b>	20 units
<b>Total number of Credits</b>	46 units

### **Education Stage:**

At this stage, students are required to pass 24 specialized credits as decided by the Education Department and confirmed by the Council of Graduate Studies of the university.

### **Research Stage and Thesis:**

Students who have passed the comprehensive exam will register for the thesis stage. The Ph.D. program will be over as soon as a student defends his thesis with a passing score.

### **✚ Ph.D. in Biomedical Engineering (Medical Robotics)**

Title: Ph.D. in Biomedical Engineering (Medical Robotics)

- Duration: According to the code approved by the High Council of Education Planning, this Ph.D. program consists of two education and research stages.
- The total number of courses for this program consists of eleven units for core courses, nine units for non-core courses and twenty-two units for the thesis:

Course Title	Credits
<b>Core courses</b>	11 units
<b>Non-core courses</b>	9 units
<b>Thesis</b>	22 units
<b>Total number of credits</b>	42 units

### **Education Stage:**

At this level, students are required to pass twenty specialized credits as decided by the Education Department and confirmed by the Council of Graduate Studies of the university.



## Research Stage and Thesis:

Students who have passed the comprehensive exam will register for the thesis writing stage. The Ph.D. program will be over as soon as a student defends his thesis with a passing score.

## List of Group's Facilities:

- Radiology Laboratories
- Optics and Ophthalmology
- Thermoluminescent Dosimetry
- Pharmacy Physics and Medical Physics
- Laboratories for Image Processing Engineering and Programming with MATLAB
- Laboratories for Registering and Processing BSP Bio-signals in Poursina Campus and Radiobiology
- Nanotechnology
- Cell Culture
- Diagnostic and Therapeutic Ultrasound
- Optic and Laser
  - Research Center for Modern Medical Technologies in Imam Khomeini Hospital which consists of eight research groups:
    - Biomedical Systems
    - Leading Systems for Surgery
    - Medical Imaging Systems
    - Molecular Imaging
    - Robotic Surgery
    - Nontechnical Medicine
    - Dental Materials
    - Optics and Laser
    - Radiobiology
    - Ultrasound

## **Department's Electronic Services**

Recently, the Department of Medical Physics and Biomedical Engineering has launched an E-Library through establishing its own specialized website so that the students can have an easy access to Persian and English books as well as the theses. This website is equipped with an automation system for collecting and searching theses and papers written by students of post-graduate studies. It also has an automation system for collecting educational records of students of post-graduate studies. A system for research evaluation of the department and another automation system for registering research records of the faculty members are also under construction.