

**Education program** **Radiation Technologies in Life Sciences**

**Education area** 14.03.02 Nuclear Physics and Technologies

**Degree** Bachelor's degree

**Duration** 4 years

**Graduate Department** Institute of Nuclear Physics and Engineering

**Program Leader** Doctor of Sci., Alla Oudalova

**ECTS** 240

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### **Description**

The Radiation Technologies in Life Science (RT) program was established to develop professional human resources for non-energetic application of nuclear and radiation technologies. RT program is an education program covering three main domains: (1) radiation protection, (2) radiation and nuclear technologies in agrosociences and (3) in healthcare. A unique advantage of this program is a balanced integration of the fundamental technical education with training modules in life sciences. Students receive comprehensive knowledge on many interconnected topics. The curriculum covers a variety of subjects including dosimetry and protection against radiation, radiation installations and nuclear research reactors, medical radiology, biological and medical fundamentals of radiation effect in living matter, radiation applications in agriculture and food production, radiation chemistry, radiation monitoring and radioactive waste management.

There is a rising demand in professional staff training for international research centers of nuclear science and technologies as well as for industrial utilization of high-tech non-energetic nuclear technologies both in Russia and in many other countries. Specialists with combined competencies in technical and natural sciences are especially appreciated by employers and have many promising perspectives for individual carrier and success. Their potential employment could be connected to any fields and industries where radiation is used, including scientific centers and universities, irradiation installations in medicine and food production, supervision bodies ensuring the radiation safety of man and the environment, etc. These opportunities will continue to grow with new achievements of nuclear science and a wide propagation of peaceful applications of nuclear and radiation technologies in all spheres of human life.

To advance and masterize the non-energetic use of nuclear and radiation technologies, students are involved in up-to-date research activities being realized under the supervision of highly qualified university staff as well as experienced professionals from nearby research institutes and enterprises specializing in these fields. The RT Program at the University MEPhI strives to attract and develop an outstanding and diverse faculty, student body and staff as well as to provide the best graduate education in nuclear physics and technologies.

**Courses, 1<sup>st</sup> year:**

<b>Course title</b>	<b>Semester 1 ECTS</b>	<b>Semester 2 ECTS</b>
General physics (mechanics)	6	
General physics (molecular physics and the foundations of statistical thermodynamics)		6
Mathematical analysis	4	4
Analytic geometry	5	
Linear algebra		5
History	3	
Philosophy		3
Foreign language (Russian)	3	3
Physical culture	1	
IT and computer technologies	2	2
Engineering and computer graphics	2	2
Basics of project management	1	1
Chemistry	3	4
	<b>30</b>	<b>30</b>

**Courses, 2<sup>nd</sup> year:**

<b>Course title</b>	<b>Semester 3 ECTS</b>	<b>Semester 4 ECTS</b>
General physics (electricity and magnetism)	7	
General physics (waves, optics and atomic physics)		6
Mathematical analysis	4	
Differential and integral equation	5	
Probability theory and mathematical statistics		3
Nuclear technologies	3	
Foreign language (Russian)	3	4
Numerical methods		2
Physical culture		1
Strength of materials	4	
Machine components and design principles		4
Electrical engineering		3
Ecology	3	
Basics of project management	1	1
<b>Training practice (Practice to obtain primary professional skills, including research activities)</b>		6
	<b>30</b>	<b>30</b>
Elective (optional)		1

**Courses, 3<sup>rd</sup> year:**

Course title	Semester 5 ECTS	Semester 6 ECTS
Management, organization and production planning	3	
Electronics	5	
Metrology, standardization and certification	3	
Technical thermodynamics	3	
Radiation biology (fundamentals of biology and physiology, human radiobiology)	3	
Radiation biology (radiobiology of plants and animals)		3
Mechanics of liquid and gas		3
Dosimetry and radiation protection		3
Irradiation installations		2
Nuclear Physics	5	
Physical-chemical analytical methods	5	
Fundamentals of nuclear fuel cycle technologies	3	
Basics of medical radiology and nuclear medicine		4
Ecological safety		4
Radiation ecology		3
Management of radioactive waste and nuclear spent fuel		2
<b>Training practice special (Practice to obtain professional skills and professional experience)</b>		6
	<b>30</b>	<b>30</b>
Elective (optional)		1

**Courses, 4<sup>th</sup> year:**

<b>Course title</b>	<b>Semester 7 ECTS</b>	<b>Semester 8 ECTS</b>
Medical-biological fundamentals of radiation safety	5	
Nuclear research reactors	3	
Radiation chemistry	4	
Radiation technologies in agriculture and food production	3	3
Radiation dosimetry and its applications	3	
Basics of radiation genetics	3	
Radiation monitoring	3	
Socio-political relations		2
Law (World nuclear legislation)		2
Basic Safety		2
Radiation hygiene		4
Special laboratory work		5
<b>Research work</b>	6	
<b>Prequalification training practice (Practice to obtain professional skills and professional experience)</b>		6
<b>Final project</b>		6
	<b>30</b>	<b>30</b>