LIFE AND CHEMICAL PHYSICS

Programme type	Master‘s studies
Field of study	Physical Sciences
Study area	Physics
Degree	Master in Physical Sciences
Duration	2 years
Workload	120 ECTS
Language of instruction	English
Location	Vilnius, Lithuania
Starting date	1st of September
Tuition fee EU students	
Tuition fee Non-EU students	3900 EUR/per year

PROGRAMME DESCRIPTION

- *The objective*

Using the latest theoretical and practical knowledge and a modern base of science and technologies in the environment of interdisciplinary studies, the Life and Chemical Physics studies programme is intended to educate the highly skilled specialists capable for the professional research activities aiming to seek and develop scientific and technological solutions applicable in the fields of environmental science, materials research science and biomedicine.

- *Career opportunities*

The graduates can harmoniously integrate into multidisciplinary research and production teams, practically participate in high-tech manufacturing process and in business, manage technological production processes that require interdisciplinary knowledge of physics, chemistry, medical physics and biophysics; work in state expert, control and management institutions requiring competence in intersection of natural sciences.

- *Access to further studies*

There is a possibility to continue a scientific career by entering third-level (doctoral) studies in many fields of natural sciences in the VU Institute of Chemical Physics, during which a part of studies can be spent in Partners

institutions abroad, or joining the scientific groups in the Center for Physical Sciences and Technology, the Life Sciences Center or National Cancer Institute.

KEY LEARNING OUTCOMES

- the deeper understanding of theoretical physical background of modern spectroscopic techniques and the awareness of contemporary tools and methods most widely used in interdisciplinary experimental research areas related to environmental science, materials science, chemical physics and biomedical physics;
- the knowledge of the operation principles of most advanced experimental equipment and techniques of mathematical processing of digital data as well as the practical skills of its application to conduct scientific research;
- the perception of the importance and of the methods of the solution to the contemporary global problems in the areas of environmental pollution, radiation safety and protection, biomedical diagnostics as well as the awareness of scientific and technological breakthroughs, which are applied now or will be applied soon in those areas;
- the abilities to plan and to perform a scientific study, to present scientific content to professional audience, to work individually and in a multidisciplinary team of specialists, to develop constantly the professional and general knowledge, to exploit creatively scientific and technical progress in the activities of scientific research, innovations and experimental development (SR&ED) in interdisciplinary areas of physics and life sciences,

COURSE INFORMATION

The programme has the following structure*:

Course Type	1st Semester	2nd Semester	3rd Semester	4th Semester
Compulsory Courses	Environmental physics	Experimental spectrometry (10 ECTS)	Chemical physics	Master thesis project (30 ECTS)
	Applied biophysics	Research project (10 ECTS)	Biophotonics	
	Physical kinetics		Research practice (10 ECTS)	
	Digital optics and imaging			
Elective Courses	Radiation ecology	Physics of surfaces and nanostructures	Life sinergetics	
	Mass spectrometry	Optical processes in irregular nanosystems	Modern spectroscopy of nanostructures	
	Molecular processes and kinetic spectroscopy	New systems of nuclear energetics	Physics of heat and mass exchange	
	Photophysics of biosystems and technological applications	Optical biosensors	Applied nuclear spectrometry	

- Most of courses are of 5 ECTS

During the first semester the students will have four compulsory courses during which they learn about physical principles of environmental processes, its role and importance for living ecosystems and the surroundings, obtain knowledge about physical effects and biological responses on molecular level, familiarize with the non-equilibrium statistical physics, especially with nonstationary kinetic processes, fluctuation theory and transport phenomenon, the mathematical foundation of stochastic processes and the methods of non-equilibrium kinetic theory for simple chaotic systems, will become aware of the advances in the areas of digital optics and computerised signal processing. In addition they will have opportunity to deepen the knowledge by choosing two of four elective courses.

The compulsory courses of the second semester will give students the theoretical background and operation principles of contemporary spectrometric devices (Fourier imaging infrared absorption, Raman scattering, luminescence, magnetic resonance, mass, nuclear, etc.), advanced knowledge about spectrometry methods and experimentally measured values. This knowledge will be tested and implemented during practical scientific activities performing a research project. Further specialization will be continued by provided opportunity to choose two other elective courses.

The compulsory courses of the third semester will provide students with the knowledge on major classes of organic substances and polymers, their electronic structure and physical behaviour, focusing on electronic processes and the interaction of electromagnetic radiation with chromophores. The students will learn about the mechanisms and regularities of photochemical processes, photoluminescence and variety of its biomedical applications. They will continue to accumulate practical experience working with different scientific techniques as well as extend the specific understanding by choosing the two elective courses.

The forth semester is devoted to the preparation of the final Master's Thesis project, during which the students will spend their time working in the scientific labs, studying relevant scientific literature, discussing and documenting the obtained results and preparing for the public presentation of the thesis.

GRADUATION REQUIREMENTS

All the subjects of the programme should be passed and the Master's Thesis public defence should receive positive assessment.

EXAMINATION AND ASSESSMENT REGULATIONS

The main form of assessment is an examination. Every course unit is concluded with either a written or written-oral examination or pass/fail assessment. Student's knowledge and general performance during the examination are assessed by using the grading scale from 1 (very poor) to 10 (excellent).

APPLICATION AND SELECTION REQUIREMENTS

- Bachelor degree or its equivalent in Physics, Engineering or Technologies;
- English language proficiency - the level not lower than B2 (following the Common European Framework of Reference for Languages (CEFR) (Internationally recognized certificate or Skype interview);
- The selection criterion is based on the weighted average of all grades recorded in the transcript of the academic report and grades of two predetermined exams. The additional points can be earned for relevant scientific activity.

Academic contact	Admission contact
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