University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

EDUCATIONAL OBJECTIVES AND OUTPUTS

Part A: Information on the study programme

Faculty/Institute	Faculty of Natural Sciences UCM in Trnava			
Field of study	Chemistry			
Study programme	Applied analytical and bioanalytical chemistry			
Level of study	Doctoral studies			
Academic degree	☐ Bc.	☐ Mgr.	☐ Ing.	☒ PhD.
Form of study	☐ full-time		☒ part-time	
Language	English			
Place of education	Faculty of Natural Sciences UCM in Trnava			

Part B: Defining the objectives and outcomes of education in relation to the profile subjects of the study programme

Educational objectives		**Educational objectives description**		
	Profile subject	**Educational outcomes**		
		Acquired knowledge*	**Acquired skills***	**Acquired competencies and transferable competencies***
Study and pedagogical-educational activities	**Independent Study of Literature according to the Recommendation of the Supervisor**		**x**	
	Theoretical Principles of Analytical Chemistry	**x**		
	Advanced Methods of Molecular Spectroscopy	**x**		
	Separation Methods	**x**		
	Advances in Bioanalytical Chemistry	**x**		
	Nuclear Analytical Methods	**x**		
	Magnetochemical Methods	**x**		
	Bioanalytical Procedures in Clinical Laboratories	**x**		
Creative activity	**Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 or O2 in JCF IF**			**x**

	Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 – O4 in JCF IF			**x**

* Knowledge, skills, competencies, and transferable competencies are mentioned only in those profile subjects that lead to their acquisition. It is not necessary to list all types of educational outcomes for each profile subject, and conversely, if we get all outcomes with a profile subject, they are listed in each column.

The aim of the study in the doctoral study program Applied Analytical and Bioanalytical Chemistry is the development of intellectual and creative abilities, practical skills of the student.

After successful completion of the subject **Independent Study of Literature according to the Recommendation of the Supervisor**, the student will obtain:

- the ability to search and process literature on the topic of the dissertation,
- the ability to use the studied literature sources in the design of experiments and also in the discussion within the results.

Upon successful completion of the course **Theoretical Principles of Analytical Chemistry** student:

- gain an overview and knowledge of the basic principles of analytical chemistry methods;
- masters the methods of characterization of protolytic, complexing, precipitation and redox equilibria and acquires knowledge of their influence on analytical determinations in aqueous solutions;
- acquires an overview and knowledge of sampling and treatment methods and can apply them in practice;
- can competently estimate the key factors of chemical processes for the optimization of the analytical method;
- can use the principles, procedures and techniques of analytical methods used in pharmaceutical, food and environmental analysis.

By completing the course **Advanced Methods of Molecular Spectroscopy**, the student will gain:

- knowledge of theoretical and experimental foundations of spectral methods;
- knowledge of the relationships between the structure and spectral properties of compounds;
- practical knowledge in the field of measurement, interpretation of measured spectra and use of acquired knowledge in solving the structure of organic, inorganic, organometallic and coordination compounds;
- overview and knowledge of modern methods of quantum chemistry, which can be used to model the spectral properties of molecules.

By completing the course **Separation Methods**, the student will gain:

- an extended overview of separation techniques as well as modern instrumental techniques and their use in practice;

- knowledge of the theory of techniques based on the use of physico-chemical properties of substances;
- knowledge of the nature of the relevant technique, its instrumentation, the use of the relevant technique in qualitative as well as quantitative analysis;
- knowledge necessary for the development of the analytical procedure for the analysis of selected substances and will master the methods of optimization of analytical determinations;
- knowledge of the issue, which will be used in experimental work in the study as well as in practice.

By completing the course **Advances in Bioanalytical Chemistry**, the student:

- acquire knowledge of modern methods of analysis of biochemical and biological samples in various application areas in practice, as well as advanced methods using biomolecules and biosystems as researchers;
- acquire knowledge of the theoretical principles of biosensors and other biochemical as well as biological methods, probes and detection systems and their applications in clinical biochemistry and medicine, food analysis, environmental monitoring and other areas;
- masters the theoretical principles of modern bioanalytical methods will be able to evaluate the applicability of individual bioanalytical methods and gain the competence to work in various areas of applications.

Upon successful completion of the course **Nuclear Analytical Methods**, the student will obtain:

- theoretical but also application view of Nuclear Analytical Methods and Analytical Chemistry of the Environment, as well as their instrumental principles;
- an overview of the most important techniques used in qualitative and quantitative nuclear analysis, including the application of nuclear methods in medicine and the analysis of environmental samples;
- information and competences in the field of function, methods and possibilities of environmental assessment by (nuclear) analytical methods;
- competence and skill in the design of the optimal analysis process to solve environmental problems.

Upon successful completion of the subject **Magnetochemical Methods**, the student will obtain:

- theoretical knowledge in the field of magnetochemistry and magnetometry;
- knowledge and skills in measuring the magnetic properties of compounds and evaluating the measured data;
- knowledge of the relationships between the structure and magnetic properties of molecular systems;
- knowledge and skills in the field of theoretical modeling of magnetic properties.

Upon successful completion of the course **Bioanalytical Procedures in Clinical Laboratories**, the student:

- are familiar with the principles of methods used in clinical laboratories but also in biological research;
- acquire the ability to communicate these aspects clearly to the scientific and lay public;
- acquire the ability to learn to interpret the results correctly, to recognize the limitations of the methods and to communicate the results correctly to the scientific and lay public;
- will be able to independently choose the appropriate method, if necessary, optimize it and adapt it to their own needs;
- will be able to evaluate the obtained results and interpret them correctly.

After completing the compulsory subjects of creative activity as **Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 or O2 in JCF IF**, as well as **Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 – O4 in JCF IF**, the graduate:

- has an overview of basic scientific methods;
- knows the problems and tendencies of the development of science in the field of the dissertation topic;
- has the ability to define specific problems and methods of their solution;
- is prepared to solve them;
- is involved in the scientific team of the training institute.

The result of individual subjects is a comprehensive dissertation within four years, or five years in the case of external study, elaborated in the scope defined in the Higher Education Act of the Ministry of Education, Science, Research and Sport of the Slovak Republic. The professional training in the acquisition of competences, the ability to

- identify a problem in order to find a scientific solution;
- to propose a scientific hypothesis, test it using an appropriately designed and constructed experiment or set of experiments;
- evaluate the results and produce them in the form of a dissertation;
- solve problems during experimental work on the dissertation;
- design appropriate procedures for modifying the experiment;
- work independently in the laboratory, but also in a team;
- interact with experts within the scope of their dissertation topic, but also on related topics;
- present their results to experts in the form of presentations and discussions;
- publish results in the form of publications in high quality and high impact scientific journals.

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