COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Mass Spectrometry	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: dr. Lukas Taujenis **Other(s):**	Faculty of Chemistry and Geosciences, Institute of Chemistry Naugardukas str. 24, LT-03225 Vilnius

Study cycle	Type of the course unit (module)
Second	Optional

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face to face	II (spring) semester	Lithuanian/English

Requirements for students	
Prerequisites: Main courses of analytical chemistry, inorganic chemistry, organic chemistry, polymer chemistry, physical chemistry and biochemistry.	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	135	48	87

Purpose of the course unit (module): program competences to be developed

The purpose of the course is to develop:

- knowledge and understanding in chromatographic and mass spectrometric techniques and their application in Pharma industry;
- ability to perform research work related to chromatographic analysis of pharmaceuticals;
- ability to analyze and interpret mass spectrometric data of proteins and nucleic acids;
- critical and analytical thinking.

Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
Students will be able to analyze, systematize and critically evaluate scientific information related to modern mass spectrometric techniques.	Lectures, seminars, literature review presentations, laboratory works and textbook reading.	Intermediate assessment. Assessment of presentation. All laboratory works must be done, laboratory reports must be compiled. Safe work in the laboratory. Final exam.
Students will be able to work in chemical laboratory safely.		
Students will be able to understand and explain the working principles of mass spectrometric techniques.		
Students will be able to choose the mass spectrometric technique for separation, identification and quantification of pharmaceuticals.		
Students will be able to analyze and evaluate the data obtained by mass spectrometric techniques.		
Students will get familiar with regulatory requirements applicable for LC-MS measurements for active pharmaceutical ingredients.		

Content: breakdown of the topics	Contact hours					Total contact hours	Self-study hours	Self-study work: time and assignments
	Lectures	Seminars	Exercises	Laboratory work	Internship/work placement			Assignments
1. Introduction to mass spectrometry. Ion sources, mass analyzers, detectors.	6					6	10	Textbook reading.
2. Identification methods of peptides, proteins and nucleic acids.	4	4				8	12	Experimental data analysis.
3. Post-translational modification (PTM) and mutations qualitative and quantitative analysis.	4					4	8	Textbook reading.
4. Quantitative proteomics.	4	4				8	12	Textbook reading. Getting ready for seminar presentation.
5. Structural proteomics.	4	4				8	12	Textbook reading. Getting ready for seminar presentation.
6. Mass spectrometric data analysis.	4	4				8	12	Textbook reading. Experimental data analysis.
7. Characterization and quality control of biological pharmaceuticals.	4					4	12	Textbook reading.
8. Regulatory perspective on biological cures.	2					2	9	Textbook reading.
Total	**32**	**16**				**48**	**87**	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Intermediate assessment	45	Twice in semester (under notice)	Test involves open answer questions (3-5 in total, max. mark 10).
Literature review	10	Presentation during seminars	Problem statement, coverage of content, critical analysis, clarity of writing, references (max. mark 10).
Final exam	45	June	Open answer questions (8-10 in total, max. mark. 10).

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsory reading				
E. de Hoffmann, V. Stroobant	2007	Mass Spectrometry, Principles and Applications		Chichester, John Wiley & Sons
D. Walls, S. T. Loughran	2011	Protein Chromatography: Methods and Protocols		New York , Humana Press
Optional reading				
D.G. Watson	2017	Pharmaceutical Analysis, 4th edition		Edinburgh, Elsevier
S. Salvatore	2007	Quantitative Proteomics by Mass Spectrometry		Totowa , Humana Press