COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Practical Polymer Chemistry	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Jūratė Jonikaitė-Švėgždienė **Other(s):**	Department of Polymer Chemistry, Vilnius University

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

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

Requirements for students	
Prerequisites: Physical Chemistry, Organic Chemistry	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	135	64	71

Purpose of the course unit (module): programme competences to be developed		
Students will apply theoretical knowledge for polymer synthesis and investigation; interpret the data of laboratory experiments and relate it with corresponding theory. Students will develop their independent, team working and problem solving skills.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
After successful completion of this course student should be able to: 1. Carry out experiments on polymer synthesis, modification and study of their properties in polymer chemistry laboratory; 2. Become familiar with various methods of polymer synthesis and investigation methods; 3. Explain relationship between polymer properties and type or nature of polymer; 4. Calculate and compare the main macromolecular or polymerization parameters (such as average molecular weight, conversion, rate of polymerization) and explain the influence of the reaction conditions on these parameters.	Discussions; Problem solving in groups and individually; Textbook reading; Laboratory work.	Assessment of laboratory exercises by conversation.

Content: breakdown of the topics	Contact hours	Self-study work: time and assignments

	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work	**Contact hours**	**Self-study hours**	**Assignments**
Mechanical properties of polymers*: Determination of tensile properties of polymers at break.*					4			**4**	Preparation for laboratory work and assessment.
Polyelectrolytes: *Determination of isoelectric or isoionic point of polyelectrolyte.*					4			**5**	Preparation for laboratory work and assessment.
Radical polymerization*: Radical polymerization of styrene, methyl methacrylate, butyl methacrylate or butyl acrylate in bulk or in solution.*					8			**8**	Preparation for laboratory work and assessment.
Radical copolymerization*: Radical copolymerization of butyl methacrylate with methacrylic acid. Determination of polymer composition and reactivity ratios of comonomers.*					8			**8**	Preparation for laboratory work and assessment.
Polycondensation: *Synthesis of linear polyester; or Investigation of acid-catalyzed polycondensation of azelaic, adipic or sebastic acid with (di) ethylene glycol.*					4			**7**	Preparation for laboratory work and assessment.
Chemical modification of polymers: *Synthesis of poly(vinyl alcohol); or Synthesis of cellulose triacetate by esterification of cellulose.*					8			**8**	Preparation for laboratory work and assessment.
Controlled polymerization. *RAFT polymerization of styrene or butyl acrylate*.					8			**8**	Preparation for laboratory work and assessment.
Polymer coatings. *Preparation of various type polymer films by spin-coating method and determination of water contact angle*.					4			**6**	Preparation for laboratory work and assessment.
Polymer identification. *Unknown polymer identification using FT-IR, ^{1}H NMR spectroscopies and chemical reactions.*					8			**10**	Preparation for laboratory work and assessment.
Thermal properties of polymers. *Determination of polymer melting point or glass transition by DSC method.*					8			**7**	Preparation for laboratory work and assessment.
Total					**64**		**64**	**71**	

Assessment strategy	**Weight,%**	**Deadline**	**Assessment criteria**
Laboratory exercises (10 tasks)	100	Till 31 May	Assessment of laboratory exercises by conversation. Relevance of description quality of laboratory work. 1 point for one work.

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsary reading				
Ch. E. Carraher, Jr.	2017	Introduction to Polymer Chemistry.	Fourth edition	CRC Press
S. Koltzenburg, M. Maskos, O. Nuyken	2017	Polymer chemistry		Springer
D. Braun, H. Cherdron, M. Rehahn, H, Ritter, B. Voit	2013	Polymer Synthesis: Theory and Practice. Fundamentals, Methods, Experiments.	Fifth edition	Springer
W. Hu	2013	Polymer Physics. A		Springer

		Molecular Approach.		
Ed. N. V. Tsarevsky, B. S. Sumerlin	2013	Fundamentals of Controlled/Living Radical Polymerization.		RCS Publishing
J. Jonikaitė-Švėgždienė	2018	Laboratory work descriptions.		
Optional reading				
Ed. E. Sald´ıvar-Guerra, E. Vivaldo-Lima	2013	Handbook of Polymer Synthesis, Characterization, and Processing.		A JOHN WILEY & SONS, INC., PUBLICATION
Ed. A. H. E. Müller, K. Matyjaszewski	2009	Controlled and Living Radical Polymerization. From Mechanisms to Applications.		Wiley-VCH