COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Basic Principles of Synthesis of Nanoparticles	

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

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

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face to face	7th semester	English and Lithuanian

Requirements for students	
Prerequisites: General Chemistry, Quantum Chemistry, Inorganic Chemistry, Organic Chemistry, Colloidal Chemistry	**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): programme competences to be developed		
After completion of the course, students will be acquainted with essential types of nanostructures, their properties, synthesis methods and principles, and applications.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
1. Students are able to apply appropriate terminology regarding nanostructures and classify them.	Lectures, literature individual study	Exam (written)
2. Students are able to describe chemical composition, physical and chemical properties of main nanostructures.	Lectures, literature individual study	Exam (written)
3. Students know basic synthesis, functionalization and stabilization methods and principles of nanostructures.	Lectures, literature individual study	Exam (written)
4. Students are able to analyze most recent scientific literature regarding application of nanostructures in English.	Study of selected scientific review articles	Presentation (oral)
5. Students are able to present analyzed scientific information in public.	Preparation of presentation of scientific review article.	Presentation (oral)

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
Introduction to the chemistry of nanostructures	3					3		
Characterization methods of nanostructures	3					3		
Intermolecular interactions and nanoparticle stability in solution	4					5	**8**	Reading of course material and literature
Energy carriers and size effects in nanostructures	3					4	**8**	Reading of course material and literature
Synthesis, properties and functionalization of carbon nanotubes	3	1				4	**8**	Reading of course material and literature
Synthesis, properties and functionalization of graphene	3	1				4	**8**	Reading of course material and literature
Synthesis, properties and application of metal nanostructures	3	1				4	**8**	Reading of course material and literature
Synthesis, properties and application of semiconducting nanoparticles	3	1				4	**8**	Reading of course material and literature
Synthesis, properties and application of Up-conversion nanoparticles	3	1				4	**8**	Reading of course material and literature
Synthesis, properties and application of metal oxide nanostructures	3	1				4	**8**	Reading of course material and literature
Oral presentation of selected review articles	1	10				9	**23**	Study and presentation of scientific review article
Total:	**32**	**16**				**48**	**87**	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Presentation (oral)	40%	During semester	Deepening on the presented topic, presentation comprehensiveness, use of proper terminology during presentation, and fluency of presentation. The presentation must receive a positive evaluation.
Exam (written)	60%	During session	Ability to answer clearly and precisely the questions asked (in writing). Ability to properly use terminology. The level of knowledge of the essential ways of obtaining nanostructures. The exam must be passed (the student must be evaluated positively)

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsory reading				
C. N. R. Rao, A. Muller, A. K. Cheetham	2004	The Chemistry of Nanomaterials: Synthesis, Properties and Applications	I ir II volumes	Vilnius University library, Chemistry reading room
Optional reading				
Robert Vajtai	2013	Springer Handbook of Nanomaterials	1 ledimas	https://www.springer.com/us/book/9783642205941

Andrew M. Collins	2012	Nanotechnology Cookbook	1 leidimas	https://www.elsevier.com/books/nanotechnology-cookbook/collins/978-0-08-097172-8