COURSE UNIT DESCRIPTION

Course unit title	
Spectroscopic ellipsometry application for nanotechnology	

Lecturer(s)	Department
Phd Ieva Plikusienė	Institute of Chemistry

Cycle		Type of the course unit
second		optional

Mode of delivery	Period of delivery	Language of instruction
Face to face	3 semester	Lithuanian

Prerequisites and co-requisites
General course of optics, physical chemistry, mathematics

Number of credits	Student's total workload	Contact hours	Self-study hours
5	111	48	63

Programme competences to be developed.
A2. Ability to integrate knowledge from various fields of chemistry to solve unknown problems. A3. Ability to apply knowledge and understanding to the solution of qualitative and quantitative problems of an unfamiliar nature. B3. Ability to interpret data obtained from laboratory observations and measurements. B4. Ability to work in the interdisciplinary areas and use the knowledge of different scientific fields in practical work C1. Ability to formulate problems of practical activities, plan and design the progress of the activity, and control its performance. C2. Ability to analyze, make generalizations and critically evaluate scientific and practical information. D3. Readiness to study continuously and autonomously, ability to evaluate critically the novelties in the field of chemistry and related sciences, ability to improve and update knowledge and skills and to seek new ones.

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
After successful completion of this course student should be able to: • Use spectroscopic ellipsometer M2000X. • To have skills for alignment of samples for ellipsometric measurements. • To make a measurements using different angle of incident. • Create unique optical model. • To obtain the best fitting results using unique optical model. • Calculate the refractive index. • Calculate the extinction coefficient. • Calculate the absorption coefficient. • Interpret the results of obtained optical constants. • Calculate thickness of the layer using optical constants. • Use in-situ measurement mode. • Work in chemical laboratory safely by using simple laboratory glassware. • Present experimental results graphically ("by hand" and using Excel program). • Prepare and present laboratory work report	Lectures with demonstration of chemical experiments; Individual problem solving; Problem solving classes (tutorials); Laboratory work; Writing of laboratory work reports, presenting and defence of these reports in one-to-one conversation with instructor; Textbook reading.	Three tests (solving of numerical problems) One midterm exam (multiple choice tasks, short answer tasks and open answer tasks). All laboratory works must be done, laboratory reports must be compiled and defended. Final exam (includes multiple choice questions, open answer questions and numerical calculation problems).

Topics	Contact work hours						Time and tasks of self-study	
	Lectures	Consultations	Seminars	Tutorials	Laboratory work	Total contact hours	Self-study	Tasks
1. Introduction to Spectroscopic Ellipsometry	2					**2**	**5**	Lectures with demonstration of chemical experiments; Individual problem solving;
2. Propagation of Light	2					**2**	**5**	Lectures with demonstration of chemical experiments; Individual problem solving;
3. Reflection and Transmission of Light	4				4	**8**	**6**	Lectures with demonstration of chemical experiments; Individual problem solving;
4. Polarization of Light	4					**4**	**8**	Lectures with demonstration of chemical experiments; Individual problem solving;
5. Ellipsometry Measurement	4				4	**8**	**10**	Lectures with demonstration of chemical experiments; Individual problem solving;
6. Data analysis	4				4	**8**	**10**	Lectures with demonstration of chemical experiments; Individual problem solving;
7. Theoretical aspects of Surface Plasmon Resonance.	4					**4**	**5**	Lectures with demonstration of chemical experiments; Individual problem solving;
8. Some aspects in design of Surface Plasmon Resonance based devices	4					**4**	**8**	Lectures with demonstration of chemical experiments; Individual problem solving;
9. Application of Surface Plasmon Resonance in biosensors design.	4				4	**8**	**6**	Lectures with demonstration of chemical experiments; Individual problem solving;
Total	**32**				**16**	**48**	**63**	

Assesment strategy	Weight %	Assessment period	Assessment criteria
Laboratory work	Pass/Fail	Every week	Short quiz at the beginning of laboratory session (understanding of theoretical background is tested). Safe work in the laboratory. Ability to get reliable results. All laboratory works must be done, laboratory reports must be compiled and defended in one-to one conversation with laboratory teacher. In case of Fail, student must repeat laboratory work.

Individual data analysis by presented requirements.	40%	December	Multiple choice tasks, short answer tasks and open answer tasks
Final Exam	60%	January	Multiple choice questions, open answer questions and numerical calculation problems

Reading list

Author	**Year of publ.**	**Title**	**Publisher**	**Number of volumes in the library of faculty**
Main reading list				
Hiroyuki Fujiwara	2007	Spectroscopic Ellipsometry: Principles and Applications		http://www.ebook3000.com/Spectroscopic-Ellipsometry--Principles-and Applications_44566.html
Marvin J. Weber	2003	Handbook of Optical Materials		http://iate.oac.uncor.edu/~manuel/libros/Optics/Optics%20Handbook%20Of%20Optical%20Materials%20-%20webber.pdf
Additional reading list				