COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Optoelectronic devices in telecommunications	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: dr. Sandra Pralgauskaitė **Other(s):**	Institute of applied electrodynamics and telecommunications, Physics Faculty

Study cycle	Type of the course unit (module)
The second	Compulsory

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face	The second (spring) semester	Lithuanian

Requirements for students	
Prerequisites: Common knowledge of physics and basics of solid state physics are required	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	140	48	92

Purpose of the course unit (module): programme competences to be developed		
The purpose of the course is to provide knowledge about the structure, operation and characteristics of the optoelectronic devices employed in telecommunication systems, physical processes that take place in these devices, to develop a competence to assess by yourself the characteristics of optoelectronic devices, their quality, to critically estimate the suitability of devices for use in optical communication systems.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
Understanding of structure and operation principals of the optoelectronic devices used in optical communication systems. Understanding of relations between device structure and operation characteristics.	Problem-based learning, research-based learning (information search, preparation of a report).	Test, seminar presentation
Knowledge of the factors that determine optoelectronic devices' quality and reliability and competence to assess their quality and lifetime.	Problem-based learning, research-based learning (information search, preparation of a report).	Test, seminar presentation
Competence to assess characteristics of optoelectronic devices and to use them in optical communication systems.	Problem-based learning, research-based learning (information search, preparation of a project), discussion.	Test, project presentation, participation in discussion

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	**Contact hours**	**Self-study hours**	**Assignments**
1. Basics of optoelectronics	4		1				**5**	**2**	Read the literature on the topic, prepare for the tests, search information and prepare presentation for seminar on the selected topic.
2. Transmitters of optical communication systems	6		3				**9**	**18**	
3. Receivers of optical communication systems	6		3				**9**	**18**	
4. Optical cable	4		2				**6**	**12**	
5. Other components of optical communication system: optical modulators, optical amplifiers and regenerators, wavelength division multiplexers and demultiplexers, couplers, driving circuits of transmitters and receivers, etc.	4		3				**7**	**15**	
6. Quality and reliability problems of optoelectronic devices, their solutions	4		2				**6**	**12**	
7. Optical communication networks and application of optoelectronic devices	4		2				**6**	**15**	Read the literature on the topic, prepare for the test, search information and prepare a project, prepare a presentation of the project, prepare for a discussion.
Total	**32**		**16**				**48**	**92**	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Test No. 1	16.7	During the semester	**K1**: Test of 10 closed questions. Assessment: 1 point is awarded for every correct answer.
Test No. 2	16.7	During the semester	**K2**: Test of 10 closed questions. Assessment: 1 point is awarded for every correct answer.
Test No. 3	16.6	During the semester	**K3**: Test of 5 open questions. Assessment: 2 points are awarded for every full and correct answer.
Seminar presentation No. 1	15	During the semester	**S1**: Seminar presentation on the selected topic. Assessment: 1.5 point: the topic is disclosed in detail, presentation is based on scientific articles, presentation is fluent, visual means are informative; 1.0 point: the topic is disclosed in detail, presentation is based on scientific articles, but there are shortcomings in the quality of the presentation; or the topic is disclosed in detail, presentation is fluent, visual means are informative, but the presentation is not based on the scientific articles; 0.5 point: the topic is disclosed incompletely, presentation is not based on the scientific articles, there are shortcomings in the quality of the presentation; 0 point: presentation is not prepared.
Seminar presentation No. 2	15	During the semester	**S2**: Seminar presentation on the selected topic. Assessment: 1.5 point: the topic is disclosed in detail, presentation is based on scientific articles, presentation is fluent, visual means are

			informative; 1.0 point: the topic is disclosed in detail, presentation is based on scientific articles, but there are shortcomings in the quality of the presentation; or the topic is disclosed in detail, presentation is fluent, visual means are informative, but the presentation is not based on the scientific articles; 0.5 point: the topic is disclosed incompletely, presentation is not based on the scientific articles, there are shortcomings in the quality of the presentation; 0 point: presentation is not prepared.
Project (description in written, presentation, participation in discussion)	20	By the end of the semester	**P**: The project of the optical communication system: written description, presentation of the project during the seminar, participation in the discussion. The assessment consists of: P1: the project is prepared taking into account the tasks of the chosen communication system, the appropriate elements of the system are selected (up to 0.5 point); P2: the quality of the project description is evaluated according to the VU Physics Faculty requirements for the written works (up to 0.5 point); P3: the quality of presentation: fluent and focused speech, informative visual means, focusing on the audience (up to 0.5 point); P4: reasoned answer to questions, active participation in the discussion (up to 0.5 point). P=P1+P2+P3+P4.
Exam (instead of tests)	50	During the exam session	**E:** 3 open questions. Assessment: 5 points – excellent knowledge, ability to analyse and summarize the knowledge gained during the course; 4 points – good knowledge, course material is mastered, minor mistakes can be present; 3 points – average knowledge, mistakes are present, not able to analyse and summarize the knowledge gained during the course; 2 points – knowledge and skills are below average, a fundamental errors are made; 1 point – knowledge and skills meet the minimum requirements, mastering only part of the course material; 0 points – knowledge and skills do not meet the minimum requirements.
Final (cumulative) score			=K1·5:30+K2·5:30+K3·5:30+S1+S2+P (in the case the tests were written) or =E+S1+S2+P (in the case the exam was taken).

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsary reading				
S. Pralgauskaitė	2010	Otoelektronikos įtaisai telekomunikacijų sistemose		Vilnius, VU leidykla
Optional reading				
C. Hamaguchi	2017	Basic Semiconductor Physics		Springer International Publishing, AG
M. Fukuda	1998	Optical semiconductor devices		John Willey&Sons, New York
P. K. Basu	2003	Theory of optical processes in semiconductors: bulk and microstructures		Clarendon Press

Ed. H. Venghaus, N. Grote	2017	Fibre Optic Communication: Key Devices		Springer International Publishing, Switzerland
G. P. Agrawal	2004	Lightwave technology: components and devices		John Willey&Sons, New York
S. Kumar, M. J. Deen	2014	Fiber Optic Communications : Fundamentals and Applications		John Wiley & Sons, Incorporated; https://ebookcentral.proquest.com/lib/viluniv-ebooks/detail.action?docID=1712884
O. Strobel	2016	Optical and Microwave Technologies for Telecommunication Networks		John Wiley & Sons, Incorporated; https://ebookcentral.proquest.com/lib/viluniv-ebooks/detail.action?docID=4457846
G. P. Agrawal	2005	Lightwave technology: telecommunication systems		John Willey&Sons, New York
Z. Fang, H. Cai, G. Chen, R. Qu	2017	Single Frequency Semiconductor Lasers		Springer, Singapore
Ed. T.-Y. Seong, J. Han, H. Amano, H. Morkoç	2017	III-Nitride Based Light Emitting Diodes and Applications		Springer Nature, Singapore
Ed. M. Kneissl, J. Rass	2016	III-Nitride Ultraviolet Emitters		Springer International Publishing Switzerland