RTU Course "Electrodynamics of Driving Systems"

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General data

Code	RDE601
Course title	Electrodynamics of Driving Systems
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Ģirts Ivanovs
Academic staff	Jurģis Poriņš Vjačeslavs Bobrovs
Volume of the course: parts and credits points	2 parts, 10.0 Credit Points, 15.0 ECTS credits
Language of instruction	LV, EN, DE
Annotation	This subject covers the analysis, modelling and evaluation of modern optical telecommunication systems, including WDM technology. Particular attention is devoted to special modulation and coding formats in FOTS, reliability, renovation and design of components, Electromagnetic processes in conductors and insulators are discussed. Topics include wave forms, light propagation in planar waveguides and fibre-optic waveguides, types of waveguides, refractive and tunnelling rays, phase and group velocities, coupled and local mode theory, internal sources of optical irradiation in waveguides, nonlinear effects.
Goals and objectives of the course in terms of competences and skills	The goal of the course: to acquire knowledge necessary for planning research in the subject area. Objectives of the course: 1. to develop the student's understanding of innovations and critical thinking necessary for presenting the results of research; 2. to acquire knowledge of the optical communication systems, providing the theoretical knowledge as well as practical skills in the field; 3. to enhance skills in optical networking technologies as the basis for future network convergence.
Structure and tasks of independent studies	Study methods: interactive lectures, research and case studies – workshops on research topics. The aim of interactive lectures is to discuss specific problems within the framework of the course. Research process aims to develop necessary skills, and workshops are intended for presentation and defence of research papers.
Recommended literature	1.GOVIND P. AGRAWAL. Nonlinear Fiber Optics. OPTICS AND PHOTONICS. ACADEMIC PRESS, 2001. 445 p. (International Standard Book Number: 0-12-045144-1) 2.Francis T. Entropy and Information Optics. NEW YORK, BASEL, 2002. 325 p. (ISBN 0-8247-0363-4) 3.Michael Bass. HANDBOOK OF OPTICS. Vol. 4. Fiber Optics and Nonlinear Optics. McGRAW-HILL, OPTICAL SOCIETY OF AMERICA, 2009. 657 p. (ISBN 0-07-141479-7) 4.J.K. Shaw. Mathematical Principles of Optical Fiber Communication. Virginia: OPTICAL SOCIETY OF AMERICA, 2004. 91 p.
Course prerequisites	Students are expected to have a Master’s degree in TELECOMMUNICATIONS

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Light propagation in optical fibres. Optical fibre. Beams of light in the homogeneous environment.	14	0	0	0
Direct optical system. Wave propagation in planar dielectric waveguides. Wave propagation in cylindrical waveguides.	10	0	0	0
Dispersion and attenuation of direct optical systems. Delay and dispersion of planar systems.	12	0	0	0
Dispersion in multimode fibres. A small number of modes. A large number of modes.	14	0	0	0
Chromatic dispersion. Non-coherent light stochastic model. Multimode optical signals.Chromatic dispersion in single mode	10	0	0	0
Planar model and cylindrical model chromatic dispersion. Total dispersion.	12	0	0	0
Solitons.	14	0	0	0
Mode models in direct cylindrical systems. Bessel functions as models.	16	0	0	0
Delay and dispersion of linear systems.	16	0	0	0
Borders and approximations. Poisson distribution. Chernova limit. Poisson and Gaussian distribution.	12	0	0	0
Saddle point approximation. Continuous and discrete distributions.	16	0	0	0
Optimal receivers. Max SNR receiver. MSE receiver.	14	0	0	0
Phase noises. Lorentz theory of light sources. Filtration.	12	0	0	0
Laboratory works.	20	0	0	0
Total:	192	0	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Students are able to identify and analyze major design concepts, parameters and functionality of optical communication systems.	an oral examination, research project evaluation
Students are able to identify, analyze and classify main formation techniques of optical networking according to the application requirements.	an oral examinations, research project evaluation
Students are able to identify, analyze and classify the theoretical and practical concepts, forming a networking system with optical multiplexing and the use of non-linear effect.	an oral examinations, research project evaluation
Students are able to identify, analyze and evaluate research opportunities within the framework of the course.	an oral examinations, research project evaluation
Students are able to conduct relevant research at the doctoral level independently.	an oral examination, research project evaluation

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	5.0	3.0	0.0	2.0	*		
2.	5.0	4.0	1.0	0.0		*	