



## RTU Course "Transmission Systems (special course)"

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**General data**

Code	RDE432
Course title	Transmission Systems (special course)
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Rolands Parts
Academic staff	Sandis Spolītis Vjačeslavs Bobrovs Jānis Braunfelds
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN
Annotation	The course deals with transmission systems (TS) at an advanced level. It includes the theoretical analysis of TS as well as their practical implementation. In the laboratory, students are trained in the practical skills in the area of TS. The following topics are discussed: noise and its influence on transmission quality, regeneration of digital signals, baseband line codes, passband line codes, clock extraction and timing, xDSL technologies.
Goals and objectives of the course in terms of competences and skills	The goal of the course: to acquire advanced theoretical knowledge about transmission systems (TS). The objectives of this course: 1. Train to prepare the theoretical background for laboratory experiments. 2. Train to process and analyze results of laboratory experiments and produce a report. 3. Train to make a TS course Project and present it. 4. Develop abilities to solve TS problems and discuss publications of IEEE in the seminars.
Structure and tasks of independent studies	Extensive reading of technical literature and problem solving activities. Theoretical substantiation for practical measurements performed in the laboratory. Making projects, reports and delivering presentations.
Recommended literature	Obligātā literatūra / Obligatory literature: J.G. Proakis. Digital communications. 2008. B. Sklar, Digital Communications: Fundamentals and applications, 2021. R. Parts, J. Poriņš, DSL tehnoloģijas, RTU, 2010.  Papildliteratūra / Additional literature: M. Viswanathan, Wireless communication systems in MATLAB, 2020. R. Heath, Foundations of MIMO communication, 2019. Eric Coll, Telecom 101, Reference Book, Fifth Edition, 2020. Harry Newton, Steven Schoen, Newton's Telecom Dictionary, 2018. J.G. Proakis, M. Salehi. Fundamentals of communication systems. 2007. K. Kaļiņina. Pārraides sistēmas. II daļa. RTU, 2006.
Course prerequisites	Students are expected to have a basic knowledge of transmission systems.

**Course contents**

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Development of transmission systems (TS) in context with other technologies.	4	6	0	0
Architecture of TS, its evolution. TS as a part of telecommunications network.	4	6	0	0
TS as the means of signal transmission. Noise and disturbances, their impact. Thermal noise.	8	12	0	0
Noise caused by crosstalk in the cable and other external sources of noise.	2	4	0	0
Evaluation of the total influence of noise in the long-distance trunks.	4	6	0	0
Regeneration of digital signals (DS). Evaluation of error probability.	4	6	0	0
Transmission of DS in band-limited environment.	4	6	0	0
Power spectral density of digital signals.	4	6	0	0
Line codes designed for baseband.	4	6	0	0
Line codes for bandpass environment.	8	10	0	0
Clock frequency extraction and timing.	2	4	0	0
Channel coding (forward error coding).	2	4	0	0
ISDN, HDSL and SHDSL technologies.	4	6	0	0
ADSL, ADSL2+ and VDSL Technologies, principles of MIMO and Wi-Fi.	8	10	0	0
Reliability of TS, further development trends.	2	4	0	0
<b>Total:</b>	<b>64</b>	<b>96</b>	<b>0</b>	<b>0</b>

**Learning outcomes and assessment**

Learning outcomes	Assessment methods
Students are able to carry out measurements in the field of transmission systems independently.	Laboratory work, course project.
Students are able to successfully solve the tasks (problems) corresponding to the course.	Tests, course project, exam.
Students can perform calculations on PS with MATLAB tools.	Tests, course project.
Students can work with SIMULINK modeling tools.	Course project.
Students are able to work independently with literature and conduct research in the field of transmission systems (PS).	Course project.

**Evaluation criteria of study results**

Criterion	%
Tests	60
Laboratory work and practical tasks	20
Course project/Exam	20
<b>Total:</b>	<b>100</b>

**Study subject structure**

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