

RTU Course "Electrical Measurements in Telecommunications"

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General data

Code	RDE709
Course title	Electrical Measurements in Telecommunications
Course status in the programme	Compulsory/Courses of Limited Choice; Courses of Free Choice
Responsible instructor	Elmārs Lipenbergs
Academic staff	Vjačeslavs Bobrovs Inga Vagale
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 provides knowledge and skills about electrical signal measurement methods and principles in the field of electronic communication. The course covers the following measurements: measurement of signal voltage and signal levels; frequency and time interval measurement, measurement and analysis of signal frequency spectrum, attenuation measurement, as well as service quality measurement. Students will obtain knowledge of measuring tools and measuring systems, as well as learn about measurement and valuation methods of the quality of electronic communication services.
Goals and objectives of the course in terms of competences and skills	The goal of the course: to develop the skills necessary to perform measurements, using the appropriate measuring equipment and measuring equipment software. The objectives: to process the obtained results mathematically and to analyse them; to acquire knowledge of measuring tools used in electronic communication, including measurement systems and measuring equipment software.
Structure and tasks of independent studies	Independent survey of study material. Preparation for practical measurements, including the installation of measurement tools in order to make measurements. Mathematical processing and analysis of the obtained results.
Recommended literature	Obligātā. / Obligatory: Elmārs Lipenbergs, Inga Vagale. Lekciju konspekts un videomateriāli/ lecture notes and videos ORTUS Christoph Rauscher, Volker Janssen, Roland Minihold. "Fundamentals of Spectrum Analysis" Rohde&Schwarz GmbH&Co. KG, GE, 2008 Rohde & Schwarz. "dB or not dB?" Rohde & Schwarz USA, Inc., 2019 Toni Janevski. "QoS for Fixed and Mobile Ultra-Broadband" John Wiley & Sons Ltd (Wiley – IEEE series), UK, April 2019 Papildu. / Additional: CEPT ECC WG NaN PT TRIS. Eiropas pasta un telesakaru administrāciju konferences (CEPT) Elektronisko sakaru komitejas (ECC) pārskats ECC Report 195 "Minimum Set of Quality of Service Parameters and Measurement Methods for Retail Internet Access Services" 2013 CEPT ECC WG NaN PT TRIS. Eiropas pasta un telesakaru administrāciju konferences (CEPT) Elektronisko sakaru komitejas (ECC) rekomendācija ECC Recommendation (15)03 "Provision of Comparable Information on Retail Internet Access Service Quality" 2015, 2018 CEPT ECC WG NaN PT TRIS. Eiropas pasta un telesakaru administrāciju konferences (CEPT) Elektronisko sakaru komitejas (ECC) pārskats ECC Report 312 "Measuring and evaluating Mobile Internet Access Service Quality" 2019 Kursa apguvē var izmantot arī interneta resursus. / Internet resource can also be used to acquire the course: Interneta avots. / internet source: https://www.etsi.org/ Interneta avots. / internet source: https://www.itu.int/ Interneta avots. / internet source: https://www.cept.org/
Course prerequisites	Student are required to have knowledge of general electrical measurements and circuit theory, as well as knowledge about valuation methods of measurement errors, confidence intervals, and measurement uncertainties.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Institutions, standards and recommendations for electronic communications measurements	8	8	0	0
Basic principles and evaluation methods of processing measurement results	4	4	0	0
Measurement of signal voltage and levels in a linear scale	8	8	0	0
Types of electronic oscilloscopes, their operating principles and application for signal parameter measurements	8	8	0	0
Measurement of frequencies and time intervals	6	6	0	0
Signal spectrum analysis and principles of signal parameter measurement	8	8	0	0
Signal level measurements and evaluation on a logarithmic scale	8	8	0	0
Principles and methods of measuring the attenuation of electrical signals	10	10	0	0

Principles of measuring the quality of Voice Communication Service in electronic communication networks	10	8	0	0
Principles of measuring the quality of Internet Access Service in electronic communications networks	10	12	0	0
Total:	80	80	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Students know the standardization organizations and supervisory bodies related to the field of measurement, understands their activities, needs, goals, and tasks	Report practical work.
Students know the principles of electrical parameter measurements and measuring equipment and are able to independently solve all the tasks, using the acquired knowledge	Report on laboratory and practical work. Test
Students know the principles of service quality measurement in electronic communications networks and are able to evaluate and analyze quality parameters	Report on laboratory and practical work. Test.
Students are able to competently orientate in the measurements of electrical and quality parameters, know the measuring equipment used in measurements, understand and are able to analyze measurement results	Exam.

Evaluation criteria of study results

Criterion	%
Tests	40
Laboratory and practical works	40
Exam	20
Total:	100

Study subject structure

Part	CP	Hours per Week			Tests			Tests (free choice)		
		Lectures	Practical	Lab.	Test	Exam	Work	Test	Exam	Work
1.	4.0	2.0	1.0	1.0		*				