

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Communications and Information Technologies - Communications and Information Processing		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Laboratory 1		
Lecturer (for lectures)		Milović M. Daniela, Milić N. Dejan, Đorđević T. Goran		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)		Cvetković M. Aleksandra, Panajotović S. Aleksandra, Anastasov A. Jelena, Eferica M. Predrag		
Number of ECTS	4	Course status (obligatory/elective)	Obligatory	
Prerequisites				
Acquiring knowledge and skills for work in the laboratory in the field of telecommunications. Training for team engineering work. Training for writing seminar work and oral presentation of measurement results.				
Course objectives				
Students will be able to do individual measurements in laboratory conditions. They will learn how to use measuring devices and will be introduced to modern measuring systems in the field of information and communication technologies. They will be trained to prepare the seminar work well and will orally present the results of this work.				
Course outcomes				
Students will be able to do individual measurements in laboratory conditions. They will learn how to use measuring devices and will be introduced to modern measuring systems in the field of information and communication technologies. They will be trained to prepare the seminar work well and will orally present the results of this work.				
Course outline				
<p>Примена мерних иснтрумената и уређаја у Лабораторији за телекомуникационе системе. Осцилоскоп, извор напајања, генератор сигнала произвољног облика, анализатор мрежа и анализатор спектра. Повезивање уређаја и инструмената. Заштита уређаја од статичког наелектрисања и спољашњих утицаја. Сонде, атенуатори, одстрањивачи једносмерне компоненте, блокови и мреже напајања. Бројачи и мерачи фреквенције. А/Д и Д/А конвертори. Мерење ЕВМ-а (Error Vector Magnitude). Генератори псеудослучајног низа бита. Анализа дијаграма ока, цитер и вероватноћа грешке. Аквизиција, обрада и визуелизација лабораторијских резултата. Презентовање резултата. Писање извештаја о раду у лабораторији. Правила у вези са навођењем литературе. Карактеристике студентских радова. Делови студентског семинарског рада. Постер и усмена презентација студентских радова. Етика у инжењерском и научном раду. Application of measuring instruments and devices in the Laboratory for Telecommunication Systems. Oscilloscope, power source, signal generator, network analyzer and spectrum analyzer. Connecting devices and instruments. Devices protection from static charge and external influences. Probes, attenuators, DC component removal, power supply blocks and networks. Counters and frequency meters. A/D and D/A converters. EVM measurement (Error Vector Magnitude). Generators of the pseudo-random string of bits. Analysis of eye diagram, jitter and error probability. Acquisition, processing and visualization of laboratory results. Presentation of results. Writing Lab Reports. Basics of literature referencing, characteristics of student works and elements of student seminar report. Poster and oral presentation of student projects. Ethics in engineering and scientific work.</p>				
Theoretical teaching				
Лабораторијске вежбе. Реализацији тимских пројеката.				
Practical teaching (exercises, OFE, study and research)				
Textbooks/references				
1	Z. Popovic, E. F. Kuester, Principles of RF and Microwave Measurements, University of Colorado Boulder, Colorado, 2001.			
2	G. T. Đorđević, D. Milić, D. Milović (editori), Zbirka praktičnih radova iz Telekomunikacija, skripta, 2014.			
3	K. Feher, Telecommunications Measurements, Analysis, and Instrumentation, Noble Publishing Corporation, Atlanta, 1997.			
4	Z. B. Popović, kako napisati i objaviti naučno delo, Akademska misao, Beograd, 2014.			
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Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
1	0	2	0	0

Teaching methods	Lectures, auditory exercises, homeworks, office hours.		
Grade (maximum number of points 100)			
Pre-exam duties	Points	Final exam	Points
Activity during lectures	10	Written exam	20
Exercises	10	Oral exam	20
Colloquia			
Projects	40		