



Country BULGARIA	Institution Vasil Levski National Military University	Course Modelling in telecommunications	ECTS 5.0
Service ICT Languages English, Bulgarian	Minimum Qualification for Lecturers <ul style="list-style-type: none"> • English: Common European Framework of Reference for Languages (CEFR) Level B2 or NATO STANAG 6001 Level 2. • Computer Architectures. • Computer Networks. • Network Security Fundamentals. 		
Prerequisites for international participants: <ul style="list-style-type: none"> • English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2. • 3rd year of national (military) higher education. • Knowledge of computer systems and computer networks. 		Goal of the Course: <ul style="list-style-type: none"> • Presentation of communication channels. • Presentation of open system network models. • Skills for modelling basic communication channels. • Skills for modelling basic communication systems. • Exploration of developed real system models. 	

Learning outcomes	Knowledge	<ul style="list-style-type: none"> • Models of communication channels. • Open system network models. • Digital modulation. • Bit error rate calculation.
	Skills	<ul style="list-style-type: none"> • Modelling basic communication channels. • Modelling basic communication systems. • Modelling systems with error rate calculation. • Plot a BER characteristics.
	Competences	<ul style="list-style-type: none"> • Description of software instruments functionality. • Capacity to combine different instruments for software modelling. • Describing networks topology and their efficiency in a function of SNR. • Performing error rate calculations.
Verification of learning outcomes		
<ul style="list-style-type: none"> • Observation: Throughout the course students are to accomplish different practical tasks individually or in teams. This course has two chapters. During the tasks students are to be evaluated for competences. • Test: At the end of each chapter, the students have to accomplish specific practical tasks, which include usage of software instruments and techniques learned throughout the course. 		



Module Details		
Study topics	class hours	Details
Chapter I "Exploration of basic communication system models"		
Basics of channels and networks	15	<ul style="list-style-type: none"> • Mathematical models of communication signals and channels – 8 hours • Open system interconnection model and Cellular network models – 8 hours • Signals handmade drawing and energy calculations – 8 hours
Basic communication systems models	15	<ul style="list-style-type: none"> • Sinusoid and cosinusoid generation and observation – 4 hours • Models with basic phase switching key manipulation modulators - 4 hours • 16QAM models with different AWGN ratios– 4 hours • 1024QAM model observation. – 3 hours
Chapter II "Communication systems modelling and simulation"		
PSK and QAM systems	15	<ul style="list-style-type: none"> • PSK models with AWGN and multipath fading channels – 3 hours • QAM models with AWGN and multipath fading channels – 6 hours • Systems with channel encoding. Convolutional encoding - 6 hours
Standards models	15	<ul style="list-style-type: none"> • 3G standard cellular model system - 4 • 4G standard cellular model system - 4 • 5G standard cellular model system - 4 • ADSL standard model system - 3
Additional hours to increase the learning outcomes		
Self-Study	30	<ul style="list-style-type: none"> • Enhancing knowledge by studying specific real systems models and standards. • Reflection of the topics issued.
Total	60	Lectons: 30 Practice: 30

This study course description is created and revised at "Communication network and systems" Department and accepted at Faculty council.

Developed by:
 major, assist. prof. PhD Linko Nikolov

REFERENCES:

1. John G. Proakis, Masoud Salehi, "Digital Communications" – 5th ed., McGraw Hill, 2008.
2. Giordano, Levesque, „Modeling of digital communication systems using SIMULINK“
3. „1xEV-DO Revision A + B“ White Paper, Rohde & Schwarz GmbH & Co. KG Mühldorfstraße 15 | D - 81671 München
4. 3GPP2 C.S0024; cdma2000 High Rate Packet Data Air Interface Specification; Version C.S0024-B v3.0; June 2012 {Revision B}