COURSE SHEET

Course name	**Advanced processing of telecommunication signals**
Acronym	ZPSTC

Level:

1. (BSc)	*2. (MSc)*
	X

Field of study:

Electronics and Telecommunications	*Control Engineering and Robotics*	*Informatics*
X		

Person responsible for the course:

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List of Topics - Lecture

No	*Topic*	*Level of knowledge*			*skills*		*No of hours*
		A	*B*	*C*	*D*	*E*	
1.	Classification of contemporary telecommunications signals – speech and data transmission. Channel capacity.	X					1
2.	Modulation techniques used in data transmission: ITU-T standards – from telephone modem to OTN.		X				1
3.	Multiple access techniques for data transmission channel.		X				1
4.	Modulation techniques in digital transmission.			X			1
5.	Introduction to multirate signal processing. Fundamental building blocks of multirate algorithms and their properties.			X			1
6.	Equivalent structures in multirate processing. Transposition rules for multirate structures.			X			1
7.	Classic sample rate conversion algorithm and its polyphase implementations.			X			1
8.	Aliasing in polyphase structures. Computational complexity of polyphase structures.		X				1
9.	Digital signal processing for VoIP.		X				1
10.	Multirate ADC and DAC converters. Principles and operation of vocoder. Subband coding. Estimation of speech parameters.		X				1
11.	Digital filters in data transmission – theory and design. Hilbert transformer and complex Hilbert filter. Shaping and receiving filters.			X			1
12.	Quadrature mirror filters.		X				1
13.	Cascade and multistage filter structures. I-FIR filters. Multistage CIC filters.		X				1
14.	Multistage sample rate conversion.		X				1
15.	Modulation based on quadrature modulator with interpolation (QMI). Demodulation based on quadrature demodulator with decimation (QDD).			X			1
16.	Multichannel QDD and QMI.			X			1
17.	Digital implementation of resonators and narrowband filters.			X			1
18.	Carrier and symbol timing recovery in digital receiver.			X			1
19.	Delaying digital signals.		X				1
20.	Variable fractional delay filters and their application in symbol synchronizations.			X			1
21.	FFT as multirate DFT implementation. Arbitrary length FFT. Fast convolution.			X			1
22.	Analysis and synthesis filter banks - implementation based on DFT.			X			1

23.	Multicarrier modulations: FMT, DMT and OFDM.		X				1
24.	Multicarrier transmission in multipath environment.		X				1
25.	Spectrum spreading in data transmission - FHSS, DSSS.		X				1
26.	UWB technology. UWB signal. UWB receiver.		X				1
27.	Propagation of data transmission signals: distortions and countermeasures.		X				1
28.	Channel parameters estimation and equalization.		X				1
29.	Review of optical signal processing methods.		X				1
30.	Selected techniques for all digital optical signal processing used in OTN networks.		X				1
						Total	**0**

List of Topics - Lab

No	*Topic*	*Level of*					*No of hours*
		knowledge			*skills*		
		A	*B*	*C*	*D*	*E*	
1.	Introduction.						1
2.	Classic and multistage sample rate conversion.				X		2
3.	Incommensurate sample rate conversion.					X	2
4.	I-FIR filters and their applications.				X		2
5.	Multichannel modulator and demodulator.					X	2
6.	Speech signal analysis and synthesis – vocoder.				X		2
7.	Spectrum spreading techniques – FHSS and DSSS.				X		2
8.	Multipath channel – signals reception.				X		2
						Total	**0**