NORTH-EASTERN FEDERAL UNIVERSITY NAMED AFTER M.K. AMMOSOV

Course/program title:	Telecommunications
Main goals and topics of the course/program:	**Introduction** Information, messages and signals. Elements and Limitations of Communication Systems. Modulation and Coding. Modulation benefits and applications. Coding methods and benefits. **Signal Analysis** Signals and Spectra. Line Spectra and Fourier Series. Periodic signals and average power. Fourier transforms and Continuous Spectra. Time and Frequency Relations. Superposition. Frequency translation and modulation. Differentiation and integration. Convolution and multiplication. **Signal Transmission and Filtering** Impulse response and the superposition integral. Transfer functions and frequency response. Distortionless transmission. Linear distortion. Equalization. Nonlinear distortion and companding. Transmission loss and decibels. Power gain. Radio transmission. Ideal filters. Real filters. Pulse response and risetime. Correlation of power signals. Input-output correlations. Spectral density functions **Random Signals and Noise** Description of a random process. Ensemble averages and correlation functions. Stationary and Gaussian processes. Random signals. Signal power and time averages. Power spectrum. Superposition and modulation. Filtered random signals. Noise. White noise and filtered noise. Noise equivalent bandwidth. Signal transmission with noise. Additive noise and signal-to-noise ratio. **Analog Communication** Linear CW Modulation. Double-Sideband Amplitude Modulation (DSB AM). Suppressed-Sideband Amplitude Modulation (SSB AM). Exponential CW Modulation. Phase and Frequency modulation (PM and FM). Wideband FM. Generation and Detection of FM and PM. Noise in CW Modulation. Bandpass noise. Linear modulation with noise. Exponential modulation with noise. Analog pulse modulation. Sampling theory. Time Division Multiplexing (TDM). Noise in Pulse Modulation. **Digital Communication** Digital signals. Noise and errors. M-ary error probabilities.

	Bit and frame synchronizations.
	Pulse-Code Modulation (PCM). Nonuniform quantizing and companding. A and μ-laws.
	Delta modulation (DM). Adaptive delta modulation ADM). Differential PCM (DPCM).
	Digital multiplexing. Multiplexing and hierarchies.
	Transmission media
	Twisted-Pair Wire. Coaxial Cable.
	Fiber-Optics Cable.
	Wireless Technologies. Cordless Telephone.
	Cellular Telephony.
	Satellite Communications. Low Earth Orbit (LEO) satellites. Geosynchronous Orbit (GSO) satellites.
Name of the department/institution offering the course:	Department of Radio Physics and Electronics, Physics Engineering Institute
Name of lecturer/supervisor:	Dr. Timofey N.Solovyev
E-mail of lecturer/supervisor:	tim_sol@yahoo.com
Number of ECTS-Credits:	3

Regarding the selection of courses please contact the Center for International Education, oip-yakutsk@mail.ru Contact person: Dr. Vladlen Kugunurov