FIRST SEMESTER 2015-2016

Course Handout Part II

Date: 03-08-2015

In addition to Part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : **EEE F311**
Course Title : **Communication Systems**
Instructor-in-charge : **RAHUL SINGHAL**
Tutorial Instructor(s) : **Praveen Kumar AV, G M Sundaram, Vinita Tiwari**
Practical Instructor(s) : **G M Sundaram, Gaurav Purohit, Abhishek Joshi, Anuj Ojha, Harshvardhan**

1. Course description:

Principles of modern analog and digital communication with more emphasis on digital communication, Amplitude and Angle modulation, sampling, PCM, DM, ADPCM, pulse shaping, digital modulation: FSK, PSK, DPSK, QPSK etc., information theory, source coding & channel coding, Shannon capacity theorem, emerging trends in communication systems. Experiments in analog and digital communication.

2. Scope & Objective:

The course introduces the principles and practices of modern analog and digital communication systems. Students will be introduced to the functioning of modern communication systems and how they perform in the presence of noise. The laboratory component involves system design and simulation exercises using MATLAB and Simulink. Students will also be given assignments on communication system design, modeling and simulation. Students registering in this course are expected to have a good understanding of basics of Signals and Systems.

3. Text Books

T1 B.P. Lathi and Zhi Ding, *Modern Digital and Analog Communication Systems,* 4th Edition, Oxford University Press, 2010

4. Reference Books

R1 Simon Haykins, *Communication Systems,4*th Edition, John Wiley & Sons, 2000.

5. Course Plan

Lect. No.	Topics to be covered	Learning Objectives	Ref. to Text Book (T1)
1,2	Overview of the course, Introduction to Communication Systems.	History of electronic communications, block diagram, concepts of signal-to-noise ratio, bandwidth, channel capacity, modulation and demodulation, error detection and correction	Chapter 1
3,4,5	Signals: Analysis & Transmission	Classification of energy and power signals, correlation functions, power and energy spectral densities, review of Fourier series and Fourier Transforms, signal distortions.	Chapters 2& 3

6,7, 8,9	Amplitude Modulation (AM), DSB-SC, SSB-SC, VSB signals	Generation and demodulation of AM signals, modulator and modulator circuits, Frequency Division multiplexing	Chapter 4
10,11, 12,13	Frequency Modulation , FM generation and demodulation,	Angle modulation, FM transmitter and receivers, interference and bandwidth considerations, comparison of AM and FM	Chapter 5
14,15, 16	Sampling of analog signals, PCM	Sampling theorem, aliasing, quantization and encoding, PAM, PCM	Chapter 6
17,18	DPCM and Delta Modulation	Differential PCM, Delta modulation and Adaptive DM	Chapter 6
19, 20,21, 22	Digital Transmission	Line coding, Regenerative repeaters, pulse shaping, eye diagram, BER, Scrambling, M-ary baseband signaling	Chapter 7
23,24, 25,26, 27	Random Variables & Processes	Fundamentals of Probability Theory & Random Variables, Random processes, their classification and power spectral densities, bandpass random process, optimum filtering	Chapters 8& 9
28,29, 30	Performance analysis of Digital communication systems	Optimal threshold detection, Matched filters and Optimum receivers	Chapter 10
31,32, 33	Information Theory	Measure of information, entropy, Source Coding - Huffman code	Chapter 13
34,35, 36	Channel Capacity	Binary symmetric channel, channel capacity of discrete & Continuous memoryless channel, Mutual Information	Chapter 13
37,38, 39,40	Error Detection and Correction Codes	Hamming codes, Linear block codes, Cyclic codes, Convolutional codes	Chapter 14

6. **Laboratory component:** Laboratory exercises will mainly involve simulations using MATLAB. Additional details will be announced in the class.

7. **Evaluation Scheme**

Component	Duration	Weightage	Date & Time	Venue	Remarks
Mid-Sem Test	90 mts.	50	5/10 8:00 - 9:30 AM	*	Closed Book
Tutorials		40	Regular		
Assignments		10	*		
Laboratory (Regular)		10	Regular		
Laboratory Test(s)		20	*		
Compre	3 hrs	70	1/12 FN		Part A (Closed Book) Part B (Open Book)

** Details will be announced separately*

8. **Chamber Consultation Hour**: To be announced in the class.

9. **Notices**: Notices concerning this course will be displayed on EEE Notice Board or on *nalanda.bits-pilani.ac.in.*

Instructor-in-Charge
EEE F311