BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
SECOND SEMESTER 2015-2016
COURSE HANDOUT (PART-II)

Date: 13-01-2016

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 F416

COURSE TITLE: DIGITAL COMMUNICATION

INSTRUCTOR-IN-CHARGE: RAHUL SINGHAL

1. **SCOPE AND OBJECTIVE:** This course focuses on digital communication systems. The modeling and characterization of information sources, algorithms for source coding and encoding of analog output sources. Information transmission through AWGN channels using digital modulation methods and BER estimation; digital communication through band-limited Gaussian noise channels shall be treated and channel coding and decoding will be discussed. Wireless communication channels: its characterization and modulation schemes for such channel; emerging trends in the above field will also be covered.

2. **Text Book(s)[TB]:**
   "Communication System Engineering", J. G. Proakis and M. Salehi, 2/e, Pearson Education, 2002.

3. **Reference Book(s)[RB]:**
   RB1   "Digital Communications: Fundamental and Applications", Bernard Sklar, 2/e, Pearson Education, 2002.
   RB2   "Communication Systems", Simon Haykins, 4/e, John Wiley, 2000.

Lecture No.	Topic	Learning Objectives	Ref. to TB, RB
1	Introduction	Overview of course, elements of a digital communication system	Chp 1, TB
2 - 6	Signals and Processes	Signals and their Geometrical Representations, Probability, Random Variables, Random Processes	Chp 4, TB
7 - 9	Baseband Modulation	Sampling, Quantization, PCM, DPCM, DM, Line Coding, Correlative encoding	Chp 6, TB
10-12	Source Coding	Source Coding Theorem, Huffman Codes, Compression	Chp 6, TB
13-16	Baseband Demodulation	SNR, E_b/N_0, Matched Filter, Correlator Receiver, ISI, Equalization	Chp 8, TB
17-20	Bandpass Modulation and Demodulation	ASK, PSK, FSK, Coherent/Non-coherent Detection, Error Performance of Binary and M-ary Signaling systems	Chp 7, TB

21-22	Communication Link Analysis	Link Budget Analysis, Noise figure, Noise temperature	Chp 5, RB1
23-27	Channel Coding	Error Control, Linear Block codes, Cyclic codes, Convolutional encoding and decoding, RS Codes, Turbo Codes	Chp 9, TB
28-30	Modulation and Coding	Shannon-Hartley Capacity Theorem, Modulation and Coding Trade-offs, TCM	Chp 9, TB
31-32	Synchronization	Receiver and Network Synchronization, Early-late gate synchronizers	Chp 7, TB
33-34	Multiplexing and Multiple Access	FM/FM/FDMA, TDMA, Aloha, CSMA	Chp 11, RB1
35-37	Spread Spectrum Systems	Peudo-Noise sequences, direct-sequence and frequency hopping systems, CDMA	Chp 10, TB
38-40	Application to Wireless Communications	Channel Models, Rake Modulator/Demodulator, CPFSK/CPM	Chp 10, TB
41-42	Commercial & Future Trends	Introduction to OFDM, MIMO Cognitive Radio, SDR, Spectrum sensing, etc.	Review Papers/Supplementary Notes

4. **Evaluation scheme:**

Component	Duration	Weightage	Date	Venue	Remarks
Monthly Quiz	10-20 min.	20	Details will be announced in class		CB/OB
Mid-Sem Test	90 min	30	14/3 2:00 -3:30 PM		CB/OB
Assignment(s)		10	Details will be announced in class		
Comprehensive Exam	3 Hours	40	4/5 FN		CB/OB

5. **Chamber Consultation Hour:** To be announced in the class.
6. **Make-up Policy:** Prior requisition is essential and make-up is granted for extremely genuine cases only.
7. **Course Notice:** Notices concerning this course will be displayed on the Notice board of EEE Department and/or on nalanda.bits-pilani.ac.in only.

Instructor-in-charge
EEE F416