BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,
HYDERABAD CAMPUS

SECOND SEMESTER 2023-2024

Course Handout (Part-I)

Date: 21/12/2023

Course No. **: EEE G622**

Course Title **: Advanced Digital Communication.**

Instructor-in-charge : Dr. Prashant K. Wali

Course Description:

The course introduces topics and concepts in the areas of advance digital communications systems, This course deals with the design of digital communication systems, the representation of digitally modulated signals and characterization of narrowband signals and systems. The design of modulation and optimum demodulation and detection for channels perturbed by AWGN will be discussed. Carrier and phase estimation techniques will be described. The combined coding and modulation technique like trellis coded modulation will be treated. The signal design for band-limited channels will be discussed. Equalization for channels perturbed by ISI & AWGN will be treated. The pre-requisite of EEE C383 Communication Systems of BITS or equivalent is presumed for this graduate level course.

Scope and Objective:

Most modern telecommunications systems are digital. The purpose of this course is to describe the operating principles and performance of advanced digital communications systems. It is beneficial to provide the students with a wide variety of opportunities, both in the industry as well as in the R & D field. With the knowledge of this course students can work in various domain.

2. Text Book(s): 1. "Digital Communications", by John G. Proakis ,4th edition, McGraw Hill, 2001.
Reference Book(s): 1. "Communication System", by Simon Haykins,4th edition, John Wiley, 2001.
2. Communication Systems Engr" Proakis and Salehi, McGraw Hill.

Lecture No.	Topic	Learning Objective	Ref. To TB/RB
1.	Introduction	Introduction to digital communication systems.	Ch 1 T1
2 - 8.	Probability Theory and Random processes	Probability and random variables. Description of random processes; random processes and linear systems. Power spectrum of stochastic processes; Gaussian and white processes and bandpass processes.	Ch 2 T1
9 - 12	Signal space representation of digitally modulated signals	The concepts of representing digitally modulated signals and represent their energy in terms of Euclidean distance.	Ch 4 T1
13-16	Optimum receivers	Design of optimum receivers for channels perturbed by AWGN channels. Correlation type demodulator and matched filter type demodulator	Ch 5 T1
17-20	Optimum receivers	Demodulation and detection of carrier-phase modulated signals.	Ch-5 T1
21-22	Optimum receivers	Demodulation and detection of Quadrature amplitude modulated signals.	Ch-5 T1

23-26	Bit error probability	Computation of bit-error probability for QPSK, M-ary PSK, QAM signals etc. phase estimation and symbol timing estimation and ML estimators.	Ch-5 T1
27-33	Digital transmission through band limited channels	Design for band limited signals with no inter-symbol interference as well as with controlled ISI. Design for channels with distortion.	Ch-9 T1
34-36	Digital transmission through band limited channels	Probability of error in detection of digital PAM. The maximum likelihood sequence estimator.	Ch-9 T1
37-42	Equalizer design	Design of transmitting and receiving filters for a known channel and channel equalization. Linear and non-linear equalizers life decision feedback equalizer, predictive DFE and fractionally spaced equalizers	Ch-10---T1

3. Evaluation Scheme

Component	Duration	Weightage	Marks	Date & Time	Evaluation type
Mid sem	90 min	30%	60	-	Closed Book
Lab		20%	40	-	Open Book
Term Project		20%	40	-	Open Book
Compre. Exam.	3 hours	30%	60	-	Closed Book
Total			**200**		

5. Chamber Consultation Hour: To be announced in the class

email: wali@hyderabad.bits-pilani.ac.in

6. **Notices:** EEE Notice Board and CMS.

7. **Make-up Examination:**

No make-up will be given for Surprise Quizzes. However, for Tests and Comprehensive Examination make-up examination will be given only in **extremely genuine cases** for which prior permission of the instructor-in-charge is required.

8. **Academic Honesty and Integrity Policy:** Academic honesty and integrity areto be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
EEE G 622