

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ECC306	Digital Communication	3	0	0	9

Course Objective
The objective of the course is to know the elements in a digital communication system, techniques for achieving efficiency in terms of power and bandwidth, ways to compensate for channel distortions, efficient use of channel by sharing among multiple users and finally attempt to achieve communication with negligible error through use of suitable channel coding.
Learning Outcomes
Upon successful completion of this course, students will: - Learn about optimum detection of digital carrier-modulated signals (binary and M-ary), using signal space approach - Know different ways to mitigate the effects of channel e.g. intersymbol interference (ISI) on bandpass signals - Have an idea about synchronizing the transmitter and receiver which reduces bit error - Get acquainted with the techniques for sharing a given wireless channel among a number of users - Know the techniques for addition of appropriate redundancy to the original data bits for achieving error-free digital communication through a channel

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Geometric representation of signals, Gram-Schmidt procedure for orthogonalization; Conversion of the continuous AWGN channel into a vector channel; Optimum receivers for coherent detection.	7	Acquire the ability to see the signals as vectors and view the optimum detection of signals from this perspective
2	Digital carrier modulation schemes - Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.; M-ary modulation schemes; Coherent and noncoherent receiver structures; Power and bandwidth efficiency for different modulation schemes	12	Ability to analyze different digital modulation techniques and compare their performances
3	Equalization Techniques; Synchronization and Carrier Recovery for Digital modulation.	6	Learn the techniques for mitigation of distortions due to channel and also achieve synchronization between transmitter and receiver
4	Channel capacity and bounds on communication; Channel coding for reliable communication.	6	Learn the ways to introduce redundancy for reducing bit error, within the limits given by information theory
5	Multiple Access Communication: TDMA, FDMA, CDMA	6	Acquaintance with the techniques for sharing of a given wireless channel among a number of users
6	Introduction to Multicarrier modulation - OFDM and their applications.	5	Have the concept of using multiple carriers for combating channel distortion

Textbook:

- Haykin S., "Communications Systems", John Wiley and Sons.

Reference Books:

- Proakis J. G. and Salehi M., "Communication Systems", Pearson Education
- Carlson, A. B., "Communication Systems", McGraw Hill.
- Lathi, B. P., "Modern Analog and Digital Communication systems," Oxford University Press.
- Proakis J. G., "Digital Communications", McGraw-Hill.