

Advanced Digital Modulation and Coding Techniques

Course Code	20EC6502	Year	III	Semester	I
Course Category	Honors	Branch	ECE	Course Type	Theory
Credits	4	L-T-P	3-1-0	Prerequisites	Digital Communications
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to	
CO1	Illustrate different digital modulation schemes - L2
CO2	Apply the knowledge in designing turbo codes-L3
CO3	Design encoders and decoders for Space-Time Codes -L4
CO4	Understand the significance of LDPC and POLAR codes in various applications-L2

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
 * - Average value indicates course correlation strength with mapped PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2												3	
CO2	3								2			2	3	
CO3		3								2		2	3	
CO4	3								2	2		3	3	
Avg.	3	3							2	2		2	3	

Syllabus

Unit No.	Contents	Mapped CO
1	Passband Digital Modulation schemes Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying	CO1
2	Turbo Codes Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding	CO2
3	Low Density Parity Check codes Definition, properties, LDPC codes in 5G, proto-graph, base matrix, expansion, Encoding LDPC codes in 5G , SISO decoders for repetition, SPC codes, log-likelihood ratio Decoding LDPC codes: message passing, iterations	CO4

4	Space-Time Codes Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing: General Concept, Iterative APP Pre-processing and Per-layer Decoding.	CO3
5	Polar codes Generator matrix, binary tree representation, frozen bits and information bits Encoding polar codes, Successive cancellation decoder for polar codes	CO4

Learning Resources

Text Books

1. Wozencraft J. M. and Jacobs I. M., Principles of Communication Engineering', John Wiley, 1965
2. Shu Lin, Daniel J. Costello, Error Control Coding- Fundamentals and Applications, Prentice Hall, Inc 2014

Reference Books

1. John G. Proakis, Digital Communications, 5th Ed., TMH, 2008.
2. Salvatore Gravano, Introduction to Error Control Codes- Oxford

e- Resources & other digital material

- <https://nptel.ac.in/courses/108/105/108105159/>
<https://nptel.ac.in/courses/117105144>
<https://nptel.ac.in/courses/117101051>
