

4/4 B.Tech - SEVENTH SEMESTER

EC 7T5C

Advanced Coding Theory Techniques

Credits: 4

Lecture : 4 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination: 70 marks -----

Course Objectives:

- To understand and study source coding for data compression.
- To study channel coding for error detection and correction
- To study Trellis coded modulation for efficient bandwidth modulation.
- To study advanced codes for improving bit error performance.

Learning Outcomes:

- Analyses different source coding algorithms and their compression performance
- Studies different channel decoding algorithms
- Analyses the performance of interleavers in BER calculations
- Analyses powerful turbo & LDPC codes in waterfall and error flow regions.

UNIT – I

Information Theory: Information, Entropy, Information rate, Huffman coding, Lempel-Ziv algorithm, Mutual Information, Channel capacity.

UNIT – II

Channel coding: need for Channel coding, Linear Block Codes , Error Detecting and Correcting Capability of Linear Block Codes, Binary Cyclic Codes, Syndrome Calculation.

UNIT- III

Convolutional Codes: Convolutional Encoder, Time domain approach, Transform domain approach, Decoding of Convolutional Codes: Viterbi Algorithm, Sequential decoding algorithm

UNIT- IV

Algebraic codes: Hadamard codes, CRC codes, BCH codes, Golay codes, RS codes, Encoding, decoding.

UNIT- V

Trellis coded modulation: The idea behind Trellis coded modulation, Trellis coded modulation encoding, Trellis coded modulation decoding, other trellis codes, Multi dimensional Trellis coded modulation

UNIT- VI

Interleavers: Block Interleavers , Convolutional Interleavers ,Random Interleavers and other interleavers.

UNIT VII:

Turbo Codes: Turbo Coding, performance of Turbo Codes, Turbo decoding, BCJR algorithm

UNIT VIII:

LDPC Codes: Introduction, construction of LDPC Codes ,Minimum distance of LDPC Codes, Decoding of LDPC Codes.

Learning Resources**Text Books:**

1. Simon Haykin – Communication Systems, , John Wiley , 4th edition,2009
2. Digital Communications – Fundamentals and Applications , Bernard Sklar, Pearson Education Asia, 2003

References:

1. Error Control Coding – Fundamentals and Applications Shu Lin and Daniel J.Costello, JR., Prentice Hall Inc. 1986
2. Error Control Systems for Digital Communication and storage, Stephen B.Wicker, Prentice Hall, 1995
3. Digital Communications – John G. Proakis, Mc. Graw Hill Publications,4th Edition.,2009