INFORMATION THEORY AND CODING

Course Code:15EC2109

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Pre requisites: Probability Theory, Digital Communications

Course outcomes: After completion of the course, the student is able to

CO1: Design the channel performance using Information theory.
CO2: Comprehend various error control code properties.
CO3: Apply linear block codes for error detection and correction.
CO4: Apply convolution codes for performance analysis & cyclic codes for error detection and correction.
CO5: Design BCH & RS codes for Channel performance improvement against burst errors.

UNIT I (10-Lectures)

INFORMATION THEORY:

Entropy, Information rate, source coding: Shannon-Fano and Huffman coding techniques, Mutual Information, Channel capacity of Discrete Channel, Shannon- Hartley law, Trade-off between bandwidth and SNR.

UNIT II (10-Lectures)

ERROR CONTROL CODES:

Examples of the use of error control codes, basic notions, coding gain, Characterization of Error control codes performance of error control codes, comparison of uncoded and coded systems.

UNIT III (10-Lectures)

LINEAR BLOCK CODES:

Linear block codes and their properties, standard arrays, syndromes, weight distribution. Error detection/correction properties, modified linear block codes.

UNIT IV (10-Lectures)

CONVOLUTION CODES:

Convolution encoders, structural properties of convolution codes, trellis diagrams, Viterbi algorithm, performance analysis.

CYCLIC CODES:

General theory, Shift Register Implementations, Shortened Cyclic codes, CRCs for Error Detection.

UNIT V (10-Lectures)

BCH AND RS CODES:

Algebraic Description, Frequency Domain Description, Decoding Algorithms for BCH and RS Codes.

TEXT BOOKS:

1. Stephen B.Wicker, "*Error Control Systems for Digital Communication and storage*", Prentice Hall, 1995.
2. Kennedy, "*Electronic Communication systems*", McGraw Hill, 4th Ed., 1999.

REFERENCE BOOKS:

1. John Proakis, "*Digital Communications*", TMH, 5th Ed., 2008.
2. Simon Haykin, "*Communication System*", Wiley, 2008.