INFORMATION THEORY AND CODING

Course Code: 13EC2109

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Pre requisites: Probability Theory, Digital Communications

Course educational objectives:

1. To develop the fundamental limits of information theory.
2. To understand the concepts of the source coding and channel coding.
3. To study Error Detection and Error Correction techniques.

Course outcomes:

After completion of the course students are able to use Information Theory principle to analyze and compare error detecting/correcting facilities of simple linear and cyclic codes.

UNIT-I

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

ERROR CONTROL CODES:

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

UNIT-III

LINEAR BLOCK CODES:

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

UNIT-IV

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

TEXT BOOKS:

[1] Andre Neabauer, "*Coding Theory: Algorithms, Architectures & Applications*", Wiley Publications, 2010.

[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.

[3] Jorge Castineira, Moreira, "Essentials of Error Control Coding", Wiley, 2006.