

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME – I Year (Spl Digital Communication) Semester- A				
Subject Code & Name		Instructions Hours per Week			Credits			
DCRIG4 Information Theory and Coding		L	T	P	L	T	P	Total
		3	1	0	3	1	0	4
Duration of Theory Paper: 3 Hours								

Objectives: To understand encoding and decoding of digital data streams. To introduce methods for the generation of these codes and their decoding techniques. To have a detailed knowledge of compression and decompression techniques.

Pre-requisites: To have the basic knowledge of digital and analog communication systems, and channels.

COURSE CONTENTS

Unit I

Information theory

Concept of amount of information - units, Entropy -marginal, conditional and joint entropies -relation among entropies Mutual information, information rate, channel capacity, redundancy and efficiency of channels.

Unit II

channels

Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Cascaded channels, repetition of symbols, Binary unsymmetric channel, Shannon theorem. Continuous channels – Capacity of band limited Gaussian channels, Shannon-Hartley theorem, Trade off between band width and signal to noise ratio, Capacity of a channel with infinite band width, Optimum modulation system.

Unit III

Source coding

Encoding techniques, Purpose of encoding, Instantaneous codes, Construction of instantaneous codes, Kraft's inequality, Coding efficiency and redundancy, Noiseless coding theorem. Construction of basic source codes – Shannon-Fano algorithm, Huffman coding, Arithmetic coding, ZIP coding.

Unit IV

Error detection and correction

Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and Syndrome decoding, Hamming codes, Encoding and decoding of systematic and unsystematic codes. Cyclic codes – Generator polynomial, Generator and Parity check matrices, Encoding of cyclic codes, Syndrome computation and error detection, Decoding of cyclic codes, BCH codes, RS codes, Burst error correction.

Unit V

Convolutional codes

Encoding- State, Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes - Viterby algorithm, Sequential decoding -Stack algorithm. Interleaving techniques – Block and convolutional interleaving, Error Control and Signal Space Coding

Books Recommended:

- [1]. Simon Haykin, *Communication Systems*, John Wiley & Sons. Pvt. Ltd, 2009
- [2]. Taub& Schilling, *Principles of Communication Systems*, Tata McGraw-Hill, 2007
- [3]. Das, Mullick&Chatterjee, *Principles of Digital Communication*, Wiley Eastern Ltd,2002
- [4]. Shu Lin & Daniel J. Costello, *Error Control Coding Fundamentals and Applications*, Jr., Prentice Hall, Inc,2004.
- [5]. Bernard Sklar, *Digital Communications Fundamentals and Applications*, Person Education Asia, 2001.
- [6]. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007