INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPT. /CENTRE**:**   **Electronics and Computer Engineering**

1. Subject Code**: EC – 512N**   Course Title**: Information and Communication Theory**

2. Contact Hours: **L: 3**   **T: 0**   **P: 0**

3. Examination Duration (Hrs.):   **Theory** | **0** | **3** | **Practical** | **0** | **0** |

4. Relative Weight**:**   **CWS** | **15** | **PRS** | **00** | **MTE** | **35** | **ETE** | **50** | **PRE** | **00** |

5. Credits**:** | **0** | **3** | 6. Semester | **√** | | |
| **Autumn** | **Spring** | **Both** |

7. Pre-requisite**: EC - 312 or equivalent**

8. Subject Area**: MSC**

9. Objective: To provide the essential concepts of information and communication theory and their applications.

10. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	Introduction to detection and estimation problem in communication.	2
2.	The meaning and axioms of probability; Random variables; Examples of commonly used random variables and their density and distribution functions; Moments and characteristic functions.	6
3.	Bivariate distributions and functions of two random variables, joint moments and characteristic functions, conditional distributions and expected values.	4
4.	Binary hypothesis testing: Bayes, Neyman-Pearson, maximum likelihood, MAP and minimum probability of error criteria; Bayes, ML and MAP estimation.	6
5.	Information, entropy, source coding theorem, Markov sources; Channel capacity theorems for discrete and continuous ensembles; Introduction to rate distortion function.	8
6.	Correlation matrix and characteristic functions of sequences of random variables, jointly normal random variables; Mean square estimation, stochastic convergence and limit theorems; Random number generation.	6
7.	Random processes, correlation function and power spectrum, random process through linear systems, KLT, ergodicity; Spectral factorization and innovation; Optimum linear filters and mean square estimation.	10
	Total	**42**

11. Suggested Books:

Sl. No.	Name of Books/Author	Year of Publication
1.	Papoulis, A. and Pillai, S.U., "Probability, Random Variables and Stochastic Processes", Tata McGraw-Hill.	2002
2.	Cover, T.M. and Thomas, J.A., "Elements of Information Theory", 2nd Ed., Wiley Interscience.	2006
3.	Van Trees, H.L., "Detection, Estimation and Modulation Theory", Part I, Wiley Interscience.	2001
4.	Bose, R., "Information Theory, Coding and Cryptography", Tata McGraw-Hill.	2003
5.	Sayood, K., "Data Compression", Harcourt India.	2000
6.	Lafrance, P., "Fundamental Concepts in Communication", Prentice-Hall of India.	1992