# INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

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

1. Subject Code: **EC - 311** Course Title: **Principles of Digital Communication**

2. Contact Hours: **L: 3** **T: 1** **P: 0**

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

4. Relative Weight: **CWS** 25 **PRS** 00 **MTE** 25 **ETE** 50 **PRE** 00

5. Credits: 0 4 6. Semester √ **Autumn** ☐ **Spring** ☐ **Both**

7. Pre-requisite: **EC - 202**

8. Subject Area: **DCC**

9. Objective: The objective of this course is to provide a detailed treatment of the techniques used in digital communication. The course will also introduce the students to the basics of information theory and coding techniques.

10. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | Digital communication system model, modulation process, analog vs. digital communication; Fundamental limitations of communication systems. | 3 |
| 2. | Concept of probability, random variable and its characterization, probability density functions, transformations of random variables, statistical averages. | 6 |
| 3. | Sampling theorem for low-pass and band-pass signals, practical difficulties in signal reconstruction; Instantaneous, natural and flat-top sampling; PAM and TDM; Uniform quantization and its noise analysis, non-uniform quantization, A-law, μ-law; PCM, DM, and DPCM, performance comparison; Adaptive quantization and prediction, low bit rate coding and compression standards for speech signals; Emerging digital communication techniques including video compression and HDTV. | 12 |
| 4. | Baseband transmission; Matched filter; Nyquist rate and wave shaping techniques; ISI and adaptive equalization. | 6 |
| 5. | Passband transmission; Coherent and non-coherent detection of signals in noise; Generation and detection of PSK, DPSK, QPSK, OOK, FSK, QAM | 10 |

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| | and MSK; Probability of error analysis of digital modulation techniques. | |
| 6. | Measure of information, entropy; Channel capacity and Shannon's theorems; Introduction to source coding and channel coding techniques. | 5 |
| | **Total** | **42** |

11. Suggested Books:

| **Sl. No.** | **Name of Books/ Authors** | **Year of Publication** |
|---|---|---|
| 1. | Haykin, S., "Communication Systems", 4th Ed., John Wiley & Sons. | 2001 |
| 2. | Lathi, B.P., "Modern Digital and Analog Communication Systems", 3rd Ed., Oxford University Press. | 1998 |
| 3. | Roden, M.S., "Analog and Digital Communication Systems", 5th Ed., Discovery Press. | 2005 |
| 4. | Couch II, L.W., "Modern Communication Systems: Principles and Applications", Prentice-Hall. | 1998 |
| 5. | Carlson, A.B., Crilly, P.B. and Rutledge, J.C., "Communication Systems: An Introduction to Signals and Noise in Electrical Communication", 4th Ed., McGraw-Hill. | 2002 |