

Approval: 4th Senate Meeting

Course Name	: Communication Theory
Course Number	: EE-304
Credits	: 3-0-1-4
Prerequisites	: IC210, IC260
Intended for	: B.Tech.
Distribution	: Compulsory for EE; EE elective for CSE Semester: 5 th

Preamble: The proposed course is one of the discipline core courses of the new EE curriculum. The proposed course is developed in consultation with the faculty members of the SCEE, especially Prof. Ramesh Oruganti, Prof. Anand Srivastava, Dr. Bharat Singh Rajpurohit, Dr. Anil Sao, and Dr. Satinder Sharma.

Objective: The objective of the course is to provide the first detailed treatment of the communication systems and techniques used in analog and digital communication. The course will also provide a brief introduction to information and coding theories so that the students can better appreciate where the fundamental limits on communication come from and how those can be achieved.

Syllabus:

1. The communication process: motivation, building blocks of a canonical
[2 contact hours]
2. Representation of Signals and Systems: Fourier transform, Linear systems, etc
[3contact hours]
3. Brief review of Probability and Random Processes, and Linear Algebra
[3 contact hours]
4. Analog Communication: Analog modulation (Amplitude and Angle Modulation), Noise in analog communication (Receiver model, Noise in DSB-SC, SSB, VSB, AM, and FM/PM receivers)
[10 contact hours]
5. From Analog to Digital Communication: sampling, quantization. [6 contact hours]
6. Digital modulation (PAM, PPM, PCM and Delta Modulation), Baseband and Passband digital communication (Phase modulation, FSK), Noise in digital communication (optimal detection/optimum receiver design, performance and error-probability analysis of various digital modulation schemes). [12 contact hours]
7. Limits on Communication and achievability: Introduction to Information Theory and Coding Theory (Introduction to convolutional and block codes) [6 contact hours]

Reference Books:

1. J. G. Proakis and M. Salehi, Fundamentals of Communication Systems, Prentice Hall, December 2004.
2. S. Haykin and M. Moher, An Introduction to Analog and Digital Communications, Wiley, January 2006, 2/e.
3. R. G. Gallager, Principles of Digital Communication, Cambridge Univ. Press, March 2008.
4. B. P. Lathi and Z. Ding, Modern Digital and Analog Communication Systems, Oxford Univ. Press, January 2009, 4/e.
5. A. Lapidoth, A Foundation in Digital Communication, Cambridge Univ. Press, August 2009.