Course Title	Digital Communications
Course Code	EE5324
No. of Credit Hrs (Lecture + Tutorial + Lab)	3 (2+0+1)
No. of Contact Hrs (Lecture + Tutorial + Lab)	4 (2+0+2)
Level-Year	9/10-5
Prerequisite (if any)	EE3307, STAT1211

1) Course Objectives:

To understand the key ideas of digital communication systems and the techniques involved. By the end of this course, the students will be able to

- Students will gain an understanding of digital modulation and demodulation techniques.
- Perform system level design and analysis of digital communications systems.

2) Expected Learning Outcomes:

After completing this course, the students should be able to:

1. **Define and explain** the fundamentals and principles of digital communication systems. **KLO1 [1]**
2. **Analyze and design** digital communication systems to meet performance requirements. **KLO2 [2]**
3. **Investigate and evaluate** trade-offs between data rate and error probability in digital communication system design. **KLO3 [6]**
4. **Conduct experiments and simulations** to study essential techniques in digital communications. **KLO3 [6]**
5. **Recognize and justify** the role of engineering tools and methods in digital communication system implementation. **KLO5 [4]**

3) Course Contents:

1. Introduction to Digital Communication.
2. Sampling, Quantization, PCM, DPCM, DM, line coding.
3. Review of Probability Theory, Baseband Pulse Transmission (matched filters), M-Ary Signaling and Error probability in the Presence of AWGN.
4. Inter-Symbol-Interference, Nyquist ISI Criteria, pulse Shaping, Eye Diagram.
5. Equalization.
6. Digital Pass-Band Transmission: Coherent PSK, FSK, QPSK, MSK.
7. Non-Coherent Orthogonal Modulation, Power Spectra and Bandwidth Efficiency of Binary and Quaternary Modulation Schemes.

4) Lab experiments:

1. Sampling and reconstruction of signals: Simulation using MATLAB/Octave/Scilab/Python.
2. PCM communication Practice, PCM Codec Encoding and Decoding Circuit using Hardware/Kit.
3. ASK: Simulation of Modulation/Demodulation and BER performance evaluation using MATLAB/Octave/Scilab/Python.
4. PSK: Simulation of Modulation/Demodulation and BER performance evaluation, using MATLAB/Octave/Scilab/Python
5. Pulse Shaping: ISI, Eye Diagram using MATLAB/Octave/Scilab/Python.

6. FSK Modulation / Demodulation using Hardware Kit.
7. QPSK Modulation / Demodulation using Hardware Kit.

5) Teaching Methods:

- Lectures and Discussion
- Videos
- Self-learning
- Laboratory demonstrations

6) Mode of Evaluation: Course Assessment Methods

- Quizzes and assignment
- Major Exams
- Final Exam
- Lab Work

Evaluation

- **Semester Work**

Major Exams	30%
Quizzes	5%
Assignments	5%
Lab/Tutorial	20%

- **Final**

Paper work	40%

7) Textbook(s):

- Simon Haykin, "Communication Systems", John Wiley & Sons, Inc., New York, 4th Edition, 2001.

8) References:

- Bruce Carlson, Paul B. Crilly, and Janet C. Rutledge, "Communication Systems", McGraw Hill, Boston, 4th Edition, 2002.
- B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press, New York, 3rd Edition, 1998.
- William H. Trant, K. Sam Shanmugan, Theodore S. Rappaport and Kurt L. Kosbar., '' Principles of Communication Systems Simulation with Wireless Applications'', Prentice Hall, 2004.
- Laboratory experiment manual.