Course Code	ECE340
Course Name	Digital Communication Systems
Credits	4
Course Offered to	UG
Course Description	This course will introduce students to the fundamental blocks that constitute a digital communication system. Starting with the analog to digital conversion block, the students will study the functionalities of the blocks such as Digital Modulator/ Digital Demodulator, Channel Encoder-Decoder. The performance of various digital modulation schemes in AWGN channel will also be studied. Moreover, the course will also highlight the trade-off associated with bandwidth and power for various channel coding and digital modulation schemes. The course will also lay a foundation for designing optimum receivers for digital communication system in presence of AWGN channel

Pre-requisites

Pre-requisite (Mandatory)	**Pre-requisite (Desirable)**	**Pre-requisite(other)**
ECE240 Principles of Communication Systems	ECE240 Principles of Communication Systems	

*Please insert more rows if required

Post Conditions*(For suggestions on verbs please refer the second sheet)

CO1	**CO2**	**CO3**	**CO4**
Students are able to describe the blocks that constitute digital communication systems	Students are able to simulate (in Matlab) the performance of a complete digital communication system in presence in white Gaussian noise.	Students are able to analyze the performance, demodulate and decode the signals in presence of additive white Gaussian noise channel	Students are able to apply and evaluate the performance of various binary channel coding schemes.

Weekly Lecture Plan

Week Number	**Lecture Topic**	**COs Met**	**Assignment/Labs/Tutorial**
Week 1,2,3	Course logistics Digital communication vs analog communication Blocks of a digital communication Basics of Signals and systems Review of Random process and probability Gaussian Random Variable Q function and Erf function Analog to Digital Conversion Digital Modulation in an AWGN baseband channel Geometric representation of Signal Waveforms Binary Pulse Amplitude Modulation Matched filter and Coorelator type demodulators Property of Matched filter	CO1	End of chapter problems from the text

Week 4,5,6	Maximum aposteriori probability (MAP) criterion for signal detection Maximum Likelihood Criterion for signal detection Mary PAM Digital Transmission through Bandlimited Channels Coherent detection of Phase shift Keying (PSK) Coherent Detection of Binary ASK Signals Differential Phase-Shift Keying (DPSK) Coherent Detection of Binary FSK Signals M-ary Signaling techniques Coherent M-ary PSK Quadrature phase shift keying (QPSK) OQPSK (Offset Quadrature phase shift keying) π/4 QPSKCoherent M-ary FSK π/4 DQPSK Minimum Shift Keying Gaussian Minimum Shift Keying (GMSK) M-QAM Intersymbol Interference Nyquist criterion for zero ISI Pulse shaping Filters Root Raised Cosine pulse shaping filters Digital Bandpass Modulation Techniques	CO2	End of chapter problems from the text
Week 7,8,9,10	Introduction to channel coding Terminal Connectivity Classification Automatic Repeat Request Binary Symmetric channel Single-Parity-Check Code Rectangular Codes/ Product codes Coded vs. Un-coded performance Linear Block Codes Binary Cyclic codes Well known block codes Convolutional Codes Viterbi Decoding Best Known convolutional codes	CO3	End of chapter problems from the text
Week 11,12,13	Modulation-Coding Trade-Off Designing a Digital Communication System Brief Introduction to modulation and coding in different wireless standards	CO4	End of chapter problems from the text
*Please insert more rows if required			

Weekly Lab Plan			
Week Number	**Laboratory Exercise**	**COs Met**	**Platform (Hardware/Software)**
Course does not have a lab component			
*Please insert more rows if required			

Assessment Plan	
Type of Evaluation	**% Contribution in Grade**
Assignment	15
Mid-sem	20
Quiz	15
Project	20
End-sem	30
*Please insert more row for other type of Evaluation	

Resource Material	
Type	**Title**
Textbook	Digital Communication" by Bernard Sklar and Pabitra Kumar Ray
Textbook	Fundamentals of Communication Systems" by John Proakis and Masoud Salehi (3rd Edition)
Reference	Digital Communication " by Simon Haykin
Reference	Modern digital and analog communication systems" by B.P.Lathi and Zhi. Ding
Reference	Principles of communications by R. Ziemer and W. Tranter