GUJARAT TECHNOLOGICAL UNIVERSITY

INSTRUMENTATION & CONTROL ENGINEERING (17)
ANALOG AND DIGITAL COMMUNICATION
SUBJECT CODE: 2161704
B.E. 6th SEMESTER

Type of course: Core Engineering

Prerequisite: analog & Digital electronics, Basic mathematics

Rationale: Development in communication technology has increased its applications in allied fields of Electronics and Instrumentation, including Computer and Industrial control. Regardless of student's ultimate area of specialization, knowledge of communication concepts and application is no longer optional, it is essential to understand today's multidisciplinary applications

Teaching and Examination Scheme:

TeachingScheme			Credits	Examination Marks						Total Marks
L	T	P	C	TheoryMarks			PracticalMarks			
				ESE (E)	PA(M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to communication systems: Communication, communication systems, Modulation, bandwidth requirement	2	5
2	Noise: External noise, internal noise, Noise calculations, noise figure, noise temperature	2	5
3	Amplitude Modulation: Amplitude modulation theory – Frequency spectrum of AM wave, representation of AM wave, Power relation in the AM wave	3	7
4	Frequency and Phase Modulation: Theory of Frequency and Phase Modulation: Description of the systems, mathematical representation of FM, Frequency spectrum of FM wave, Phase modulation, Intersystem comparison, Noise and FM: Effect of noise on carrier, pre-emphasis and de-emphasis, other form of interference, comparison of wide band and narrow band FM	4	10
5	Modulation for Digital Signal: ASK, FSK, and PSK: Introduction, modulation and demodulation circuits and waveforms Pulse Modulation: Types, PWM	3	7

6	Introduction To Data And Network Communication: • Introduction, Data Communication System, Data Communication Links • Character Codes, Digital Data Rates, Serial Data Formats Encoded Data Formats.	3	7
7	Error Detection & Correction: Introduction, Asynchronous Data Method, Synchronous Data Error Methods, Error Testing Equipment.	2	5
8	Open System Network Models: Introduction, Data Topologies, Data Switching, Types Of Networks, The Open System Interconnection (OSI) Architecture, System Network Architecture (SNA), SNA Operating Sessions.	3	7
9	OSI Physical Layer Components: Introduction, Units Of a Communication Link, RS232C Interface Standard, RS449 interface standards, RS422 And RS423 Interface Standards, FSK Modems, Additional Types of modems, V.34 And V.90 Modems.	5	11
10	Higher Capacity Data Communication: Introduction, Multiplexing Methods, Sampling Theorem, Quantization, Pulse Code Modulation, Delta Modulation, Digital T Carriers, Companding, Codecs.	3	7
11	Data-Link Layer Protocols: • Introduction, Data-Link Section, Character-Oriented Protocols, • Bit-Oriented Protocols, Protocol Analyzers.	2	5
12	Network Architecture And Protocols: • Introduction, Network By Size, IEEE 802.3 And Ethernet, IEEE 802.4Token Bus, IEEE802.5 Token Ring • Network Interface Cards , Interconnecting LANs , IEEE 802.6 Metropolitan Area Network (MAN), X.25 Packet Switch Protocol.	3	7
13	Fiber Optic Communication: • Introduction, Basic Concepts of Light Propagation, • Fiber Cables, Light Sources, Optical Detectors, • Fiber-Cable Losses, Wave Division Multiplexing, Fiber Distributed Data Interface, FDD-II: Isochronous Traffic, The Fiber Channel, • SONET.	3	7
14	Wireless Communication Systems: • Introduction, Microwave Communications, Cellular Mobile Telephone Service, Personal Communication System, • IEEE802.11: Wireless LANs Using CSMA/CA, Cellular Digital Packet Network, Satellite Communication, Satellite Networking.	4	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
14	**21**	**21**	**7**	**7**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. 1. Communication Systems: Analog and Digital by R. P. Singh and B. D. Sapre, Tata-McGraw Hill
2. 2. Modern Digital and Analog Communication Systems (4th Edition) by B. P. Lathi and Zhi Ding, Oxford University Press
3. Electronic Communication Systems by Keddedy and Davis, Tata Mc-Graw Hill Publication
4. Introduction to Data and Network Communications by Michael A. Miller, Cengage Learning

Course Outcome:

After learning the course the students should be able to:

CO1 identify different types of cables and protocols.
CO2 implement wireless or wired communication in electronic systems or automation and control system.
CO3 recognize different layers of OSI used in systems and networking.
CO4 choose different modulation techniques.
CO5 select the right method of error detection and error correction for data transmission

List of Experiments:

1. To study Amplitude Modulation and Demodulation.
2. To study Frequency Modulation and Demodulation.
3. To Study and observe the performance of different types of line codes.
4. To Study and Perform sampling theorem and reconstruction.
5. To perform TDM-PCM Transmission and Reception.
6. To study Delta Modulation.
7. To study and observe the performance of An-adaptive Delta modulator/De-modulator circuits
8. Study and observe the performance of Digital carrier system—ASK.

9. To Study and observe the performance of Digital carrier system—FSK.
10. To Study and observe the performance of Digital carrier system—PSK
11. To study and perform PAM, PWM, PPM.

Design based Problems (DP)/Open Ended Problem:

1. Design an AM transmitter for a frequency of 1 MHz.
2. Design an AM receiver for a frequency of 1 MHz.
3. Design an FM transmitter for a frequency of 50 MHz.
4. Design an FM receiver for a frequency of 50 MHz.

Major Equipment:

Computers, Simulation software, AM/FM modulation kits, etc.

List of Open Source Software/learning website:

http://nptel.ac.in/video.php

http://coep.vlab.co.in/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.