Course Outcomes: By the end of this course, the students will be able to:	
1	Calculate a various parameters relevant to a communication system.
2	Comprehend the concept of filters in signal transmission through linear networks.
3	Formulate mathematical model of a communication system given a random signal.

Suggested Books:		
Sr. No.	**Name of Book/ Authors/ Publisher**	**Year of Publication/ Reprint**
1	Introduction to communication theory by P.D.Sharma, Publisher Nem Chand & Bros.	1971
2	Probability, Random variables and acoustic processes by Papoulis, S.Pillai, Tata McGraw Hill.	2014

Course Name	**:**	**COMPUTER ARCHITECTURE**
Course Code	**:**	**ECN301**
Credits	**:**	**4**
L T P	**:**	**3-1-0**

Course Objectives:
By the end of this course, the students should be able to identify and define the architecture and organization of the basic computer. The students should also be able to explain the role of different modules like control unit, central processing unit, input-output organization, memory unit in the organization of basic computer, solve computer arithmetic and define the concept of parallel processing.

Total No. of Lectures – 42

Lecture wise breakup		**Number of Lectures**
1	**REGISTER TRANSFER AND MICRO OPERATIONS:** Register transfer Language, Register transfer, Bus & memory transfer, micro operations, Instruction codes, Computer instructions, Timing & control, Instruction Cycles, Memory reference instruction, Input /Output & Interrupts, Complete computer description & design of basic computer.	8
2	**CONTROL UNIT:** Hardwired vs. Micro programmed control unit.	4
3	**CENTRAL PROCESSING UNIT:** General register organization, Stack organization, Instruction format, Data transfer & manipulation, Program control, RISC, CISC.	7
4	**COMPUTER ARITHMETIC:** Addition & subtraction, Multiplication Algorithms, Division algorithms.	5
5	**INPUT-OUTPUT ORGANIZATION:** Peripheral devices, I/O interface, Data transfer schemes, Program control, Interrupt, DMA transfer, I/O processor.	7
6	**MEMORY UNIT:** Memory hierarchy, Processor vs. memory speed, Hard disk drive, High-speed memories, Cache memory, Associative memory, Interleave, Virtual memory, Memory management	8
7	**PARALLEL PROCESSING:** Types of parallel processors, performance considerations, pipeline processors, array processors	3

Course Outcomes: By the end of this course, the students will be able to	
1	Define the syntax of Register transfer Language and different micro operations.
2	Design and construct the instruction format & addressing modes for a given operation and algorithms for

	addition, subtraction, multiplication & division.
3	Explain the interdependence of different modules like control unit, CPU and I/O interface and their design aspects.
4	Summarize the working of different types of memories like associate memory, cache memory, virtual memory etc. and their mapping techniques.
5	Outline the concept of pipelining and multiprocessors.

Suggested Books:		
Sr. No.	**Name of Book/ Authors/ Publisher**	**Year of Publication/ Reprint**
1	Computer System Architecture, Morris M. Mano, Prentice Hall, 3rded.	1992
2	Computer Architecture and Organization, J.P. Hayes, McGraw Hill, 3rd ed.	1998
3	Computer Architecture A Quantitative Approach, J.L. Hennessy, D.A. Patterson and D. Goldberg , Pearson Education Asia, 5th ed.	2006
4	System Architecture: software and hardware concepts, W.E. Leigh, and D.L. Ali, South Wester Publishing Co.	2000

Course Name	**:**	**ADVANCED COMMUNICATION**
Course Code	**:**	**ECN 302**
Credits	**:**	**4**
L T P	**:**	**3 0 2**

Course Objectives:
By the end of this course, the students should be able to gain knowledge and advancement in communication technology. The students should also be able to identify and compare various fields of advanced communication and their applications.

Total No. of Lectures – 42

Lecture wise breakup		**Number of Lectures**
1	**INTRODUCTION** Digital communication system (description of different modules of the block diagram), Complex baseband representation of signals, Gram-Schmidt orthogonalization procedure. M-ary orthogonal signals, bi-orthogonal signals, simplex signal waveforms.	**6**
2	**DIGITAL MODULATION TECHNIQUES** Pulse amplitude modulation (binary and M-ary, QAM), Pulse position modulation (binary and M-ary), Carrier modulation (M-ary ASK, PSK, FSK, DPSK), Continuous phase modulation (QPSK and variants, MSK, GMSK).	**10**
3	**SATELLITE COMMUNICATION** Evolution and growth of communication satellites, Kepler's laws of motion, orbits, Altitude control; Satellite launch vehicles- Arianne, SLV space shuttle; Sub systems of communication satellite; Spectrum allocation and Bandwidth considerations; Propagation characteristics, Satellite transponders and other sub systems; Earth station technology; Analog and Digital link design; Multiple access techniques.	**10**
4	**OPTICAL COMMUNICATION** Characteristics of optical transmission media, Optical fibers – preparation and transmission characteristics, Loss and dispersion mechanisms, Optical sources – principles of operation, Modulation characteristics and Driver circuits, Photo detectors – Principles of operation, Fiber Optic communication Systems and Link budget using direct detection, Fiber optic connectors, Couplers, Multiplexers and splices, Multi-channel transmission, Optical amplifiers, Coherent and WDM systems.	**10**

5	**PRINCIPLES OF VIDEO COMMUNICATIONS TECHNICS** Basics of Telephony and Telegraphy. Introduction to Video Signals, Block diagram of TV transmitter and receiver system, Picture signal transmission, Positive and negative modulation, vestigial sideband transmission, Standard channel BW.	**6**

List of Experiments:		**Number of Turns**
1	Measure the baseband analog signal parameters in a wireless link.	1
2	Study the phenomenon of linear and circular polarization of antennas.	1
3	Measure the C/N ratio and propagation delay of signal in a satcom link.	1
4	To estimate, calculate and design of satellite link budget.	1
5	To simulate satellite system using Qualnet	2
6	To study and analyze Digital modulation techniques in time and frequency domain and their constellation view.	2
7	To measure numerical aperture and various types of losses in fiber.	1
8	Measurement of insertion loss, directivity, back reflection /return loss for a series of fiber optic components (i.e coupler, WDM, isolator, circulator, DWDM Mux/ Demux devices)	2
9	Designing of optical communication systems and photonic devices as per the given Specifications using simulation softwares. Ddo investigations in terms of BER, Eye diagram for systems and mode calculation for devices.	3

Course Outcomes: By the end of this course the student will be able to	
1	Describe advanced communication systems.
2	Apply the underlying principles for up-to-date examples of real world systems.
3	Emphasize on modern digital data transmission concepts and optimization of receivers.
4	Build a basis for subsequent related courses such as optical and satellite communications.
5	Identify audio and video transmission.

Suggested Books:		
Sr. No.	**Name of Book/ Authors/ Publisher**	**Year of Publication/ Reprint**
1	Principles of Communication Systems by Taub and Schilling Tata McGraw-Hill Education, 3rd edition	2008
2	Advanced Electronic Communication Systems Pearson (6th edition) by Wayne Tomasi	2009
3	Digital satellite communications (2nd Edition) by Tri T Ha, PHI	1990
4	Fiber-Optic Communications Technology (1stEdition)by Djafar K.Mynbaev and Lowell L. Scheiner, Prentice-Hall	2000
5	Modern Television Practice Principles, Technology and Servicing by R R Gulati (2nd Edition), New Age International	2002
6	Electronic Communications,4th Edition, Roddy &Coolen, Prentice Hall	1995

Course Name	**:**	**MICROWAVE & RADAR ENGINEERING**
Course Code	**:**	**ECN 303**
Credits	**:**	**4**
L T P	**:**	**3-1/2-2/2**

Course Objectives:
By the end of this course the student should be able to explain the evolution and basics of microwave engineering and characteristics of microwave devices. The student should also be able to describe radar systems , scanning and tracking techniques used in radar systems. They should also analyse various microwave devices, their characteristics and microwave measurements using test bench.

Course Name	**:**	**WIRELESS COMMUNICATION**
Course Code	**:**	**ECN 304**
Credits	**:**	**4**
L T P	**:**	**3 0 2**

Course Objectives:
By the end of this course, students should be able to familiarize with the evolution and basics of wireless communication technology, identify and explain various wireless systems, design aspects of cellular systems, VSAT systems and their applications.

Total No. of Lectures – 42

Lecture wise breakup		**Number of Lectures**
1	**INTRODUCTION TO CELLULAR SYSTEMS:** A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular system, planning a cellular system, analog& digital cellular systems.	3
2	CELLULAR WIRELESS COMMUNICATION SYSTEM: Second generation cellular systems: GSM specification and air interface- specification of various units, GSM Architecture, 2.5 G systems: GPRS/EDGE specifications and features, 3G systems: UMTS & CDMA 2000 standards and specifications.	5
3	**ELEMENTS OF CELLULAR RADIO SYSTEMS DESIGN:** General description of the problem, Concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an Omni directional antenna system, cell splitting, consideration of the components of cellular systems.	7
4	INTERFERENCE: Introduction to co-channel Interference, real time co-channel interference , co-channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference- different types, Equalization, Equalization in Communication Receiver,, RAKE Receiver,Fundamental of Channel Coding.	6
5	**CELL COVERAGE FOR SIGNAL & TRAFFIC**: General introduction, Obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance ,long distance propagation ,point to point prediction model characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.	6
6	**CELL SITE ANTENNAS AND MOBILE ANTENNAS**: Characteristics, antenna at cell site, mobile antennas, Frequency Management and channel Assignment, Frequency Management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment.	5
7	**HAND OFF, DROPPED CALLS**: Why hand off, types of hand off and their characteristics, dropped call rates & their evaluation.	4
8	**EARTH STATION AND VSATS:** Spacecraft Structure, Primary Power, Various Subsystem of a Satellite, Transmitter, Receivers, Components of Earth Station, VSAT- type, Uses.	6

List of Experiments:		**Number of Turns**
1	To study GSM Architecture and network topologies	**2**
2	To study and estimate call flow(Voice and Data)	**1**
3	To comprehend the intra-circle roaming functionality	**1**
4	To estimate, calculate and design link budget.	1
5	To do frequency planning of the network along with neighbor definition	1
6	To estimate and design concept of frequency reuse	1
7	Create a scenario to study the bottleneck of the transmission rate of a link	1
8	To study optimization strategies to improve grade of service	1
9	To estimate various types of interference.	1
10	To study the effect of fading and measure the fading margin of a received signal on spectrum	2

	analyzer	

Course Outcomes: By the end of this course the students will be able to	
1	Explain the fundamental concepts of wireless communication systems will become clear to the students.
2	Learn cellular system design basics and frequency management techniques.
3	Describe capacity increase mechanisms, interference reduction strategies and long distance propagation concepts.
4	Identify satellite communication system and cell site antenna fundamentals

Suggested Books:		
Sr. No.	**Name of Book/ Authors/ Publisher**	**Year of Publication/ Reprint**
1	Mobile cellular Telecommunications; William, C Y Lee. 2nd Edition McGraw Hill	Latest edition
2	Wireless and Digital communications; Dr. KamiloFeher. 2nd Edition,PHI	Latest edition
3	Wireless communication, principal &practice, T.S Rappaport. 2nd Edition, PHI	Latest edition
4	Digital Satellite Communication,Tri T. Ha. 2nd Edition,McGraw Hill	Latest edition

Course Name	**:**	**EMBEDDED SYSTEMS**
Course Code	**:**	**ECN 305**
Credits	**:**	**4**
L T P	**:**	**3-0-2**

Course Objectives:
At the end of this course, the student should be able to learn concepts of embedded systems, explain Architecture & Programming of 8051 and PIC microcontrollers and its support devices.

Total No. of Lectures – 42

Lecture wise breakup		**Number of Lectures**
1	**INTRODUCTION TO EMBEDDED SYSTEMS:** Fundamentals of embedded system, block diagram and description of each unit	2
2	**8051 MICRO CONTROLLERS:** Architecture, Pin configuration, SFR's , Memory, 8051 Addressing modes, Timers, Interrupts	6
3	**8051 INSTRUCTIONS:** Introduction to 8051 assembly language programming: JUMP, LOOP and CALL instructions, Arithmetic instructions: Unsigned addition and subtraction, unsigned multiplications and Division, signed number concepts and arithmetic operations, Logic And Compare instructions, BCD and ASCII Application Programs.	5
4	**I/O PORT PROGRAMMING:** Single bit instruction programming, Single bit operations with CY, Reading Input Pins Vs Port latch, Programming 8051 timers	5
5	**INTERFACING WITH 8051:** LCD& Keyboard Interfacing , serial communications Programming	4
6	**PIC18FXXXX FAMILY:** Introduction to PIC microcontrollers, Architecture of PIC18 family of devices.	4
7	**PROGRAMMING MODEL:**	3

	PIC18F programming model, instruction set, instruction format. Data copy, arithmetic, branch, logical, bit manipulation and multiply-divide operations. Stacks, subroutines and macros.	
8	**INPUT/OUTPUT PORTS AND INTERFACING:** Concepts of I/O interfacing, PIC18 I/O ports, Interfacing of output and input peripherals.	3
9	**INTERRUPTS AND TIMERS:** Concepts of Interrupts and Timers, Interrupts and their implementation in PIC18, timer operation, Use of Interrupts in applications.	2
10	**CCP MODULE:** Concept of CCP module, Various modes of CCP module and its application.	4
11	**SERIAL I/O:** Concept of serial I/O, PIC18 serial communication module	2
12	**DATA CONVERTERS:** Basic concepts of Data Converters, PIC18F452 A/D and D/A converter modules and its applications.	2

List of Experiments:		**Number of Turns**
1	To get familiar with KEIL and develop at least 10 programs for 8051 Microcontroller	4
2	To get familiar with MPLAB and FLOWCODE software and develop at least 10 programs on each. for PIC Microcontroller	5
3	Using Flowcode, use ZIGBEE, Bluetooth module, GPS module along with PIC Controller	1
4	To interface the various sensors and devices available in the lab with PIC Controller	2
5	Design and developments of at least two applications based on PIC controller.	2

Course Outcomes: By the end of this course, the student will be able to	
1	Learn Architecture &Programming of 8051 and PIC microcontrollers.
2	Design and develop systems based on PIC micro-controller and its interfaces.
3	Design and develop systems based on 8051 micro-controller and its interfaces.

Suggested Books:		
Sr. No.	**Name of Book/ Authors/ Publisher**	**Year of Publication/ Reprint**
1	PIC Microcontroller and Embedded Systems using Assembly and C for PIC18 by M.A. Mazidi, R.D. McKinlay and D. Causey, Pearson	2007
2	The 8051 Microcontroller and Embedded System by- Muhammad Ali Mazidi, Janice Gillespie Mazidi, Pearson Education Publications.	2007
3	Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC18 Microcontroller Family), Ramesh GAONKAR, Penram International Publishing	2007 edition
4	Designing with PIC MICROCONTROLLERS By John B Peatman, Pearson Education	2004 reprint

Course Name	**:**	**CONTROL SYSTEMS**
Course Code	**:**	**ECN 401**
Credits	**:**	**4**
L T P	**:**	**3-1-0**

Course Objectives:
By the end of this course, the students should be able to model a control system using different approaches, perform error analysis, analyse the system in time domain and frequency domain and investigate the stability. The student should also be able to design lead, lag, lag lead compensators for the specified requirements, model and analyse the system using state space representation and do block diagram analysis of sampled data control systems.