SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

Nanded - 431606 Maharashtra State ,India

Established on 17th September 1994, Recognized by the UGC U/s 2(f) and 12(B) NAAC

Re-accredited with 'A' grade.

Proposed Course Curriculum for Final year engineering in

[Electronics Engineering/Electronics and Telecommunication Engineering]

With Effect from Academic Year 2017-18

TEACHING AND EXAMINATION SCHEME.

Final year BE(Electronics /Electronics and Telecommunication Engineering) [CGPA]

(With Effect from Academic Year 2017-18**)**

PART –I

Subject Code		Teaching Scheme		**Examination Marks**				
	Subject	**Hrs/Week**	**Credits**	**Paper**	**Test**	**TW**	**PR**	**Total**
ECN-401	Digital VLSI	4	4	80	20			100
ECN-402	RF antenna and Microwave Engineering	4	4	80	20			100
	Elective -I	4	4	80	20			100
ECN-403	1) Satellite Communication & radar engineering							
ECN-404	2) Micro Electronics							
ECN-405	3)Real Time Operating System							
ECN-406	4) System Software and Operating System							
	Elective -II	4	4	80	20			100
ECN-407	1) Wireless and Mobile Communication							
ECN-408	2) Artificial Neural Network							
ECN-409	3) Mechatronics							
ECN-410	4) Digital Image Processing							
ECN-411	Digital VLSI Laboratory	2	1			70	30	100
ECN-412	RF antenna & Microwave Engg. Laboratory.	2	1			70	30	100
ECN-413	Implant Training Seminar	2	1			100		100
ECN-414	Project-I	2	1			70	30	100
	Total	24	20	320	80	310	90	800

TEACHING AND EXAMINATION SCHEME.

Final year BE(Electronics /Electronics and Telecommunication Engineering) [CGPA]

(With Effect from Academic Year 2017-18**)**

PART –II

Subject Code		Teaching Scheme		Examination Marks				
	Subject	**Hrs/Week**	**Credits**	**Paper**	**Test**	**TW**	**PR**	**Total**
ECN-415	Computer Network	4	4	80	20			100
ECN-416	Optical Fiber Communication	4	4	80	20			100
	Elective -III	4	4	80	20			100
ECN-417	1) Audio Video Engineering							
ECN-418	2) Electronic product Design.							
ECN-419	3) IOT & Sensor Network							
ECN-420	4) Cloud Computing							
	Elective -IV	4	4	80	20			100
ECN-421	1)Multi Carrier Communication							
ECN-422	2) Analog and Mixed Signal VLSI Design							
ECN-423	3) Biomedical Electronics							
ECN-424	4) Industrial Organization & Project Management.							
ECN-425	Computer Network Laboratory	2	1			70	30	100
ECN-426	Optical fiber Communication Laboratory.	2	1			70	30	100
ECN-427	Project -II	2	2			100	100	200
	Total	22	20	320	80	240	160	800

ECN – 401	Digital VLSI DESIGN	4 Credits

COURSE OBJECTIVES:-

1] To understand fundamental steps in digital VLSI design.
2] To learn various techniques of CMOS design.
3] To study the data path design.

Course Outcomes:

1]Model digital circuit with, simulate, synthesis in Microwind.
2] Understand chip level issues and need of testability.
3]Design digital CMOS circuits for specified applications.

UNIT – I	7 Hrs.

INTRODUCTION

Historical perspective, issues in digital design, trends in design. Devices:MOS transistor, static behavior, dynamic behavior, secondary effects, CMOS technology, attributes, layouts, design rules, MOS as a switch, transmission gate.

UNIT – II	8 Hrs.

INVERTER ANALYSIS

Definition and properties, area and complexity, functionality– static behavior, performance – dynamic behavior, power, static CMOS inverter analysis, regions of operation, noise margin, bipolar /ECL inverter.

UNIT – III	5 Hrs.

STATIC CMOS DESIGN

CMOS Logic, ratioed logic, Pseudo NMOS, depletion load CMOS circuit design, pass transistor logic, transmission gate logic, transistor sizing, low power CMOS design, switching activity in a logic gate, glithing, short circuit currents, analyzing power consumption.

UNIT – IV	5 Hrs.

DYNAMIC CMOS DESIGN

Dynamic CMOS Design: Dynamic logic – basic principles, domino logic, NP-CMOS logic, DCVSL Logic

UNIT – V	7 Hrs.

CMOS SEQUENTIAL CIR CUIT DESIGN

Bistability, flip-flop classification, CMOS static flip-flops, master- slave and edge triggered flip-flops, dynamic sequential circuits – pseudo static latch, dynamic two phase flip-flop, C2MOS latch, NORA CMOS, Schmitt trigger.

UNIT – VI	8 Hrs.

DATAPATH DESIGN

The Adder – CMOS implementations of ripple carry adder, mirror adder, carry save adder, carry look ahead adder, tradeoffs, multiplier array, Booths, Wallace tree multiplier design, shifters – barrel Shifter, logarithmic shifters. Memory Design Classification, trends, RAM design – static RAM design, dynamic RAM (DRAM), ROM design – Nand-based, Nor-based ROM, programmable logic Array.

TEXT BOOK

1. Jan Rabey, Digital IC Design, Prentice Hall, ISBN 0-13-178609-1.
2. Weste–Eshragian, Principles of CMOS VLSI design, Addison-Wesley.

REFERENCE BOOK

1. Hodges and Jackson, Analysis and design of Digital Ics, Mc-Graw Hill International edition, 1996.
2. Morris Mano, Computer architecture.
3. Wayne Wolf, Modern VLSI design

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ECN – 402	RF Antenna & Microwave engineering	4 Credits

Course Objectives:

1]Study the operation of Microwave semiconductor devices
2]Study Microwave Communication System
3] Understand the basic concept of RF antenna and its application

Course Outcomes:

After successfully completing the course students will be able to
1] Ability to understand the basic operation and working of Microwave Tubes
2] Identify the state of art microwave tubes and semiconductors and their real use In real life
3] Application of microwave and RF antenna for industrial and scientific purpose

UNIT – I	6 Hrs.

Waveguide and Microwave Components

Introduction to microwaves and applications, advantages of microwaves, frequency bands and characteristics of microwaves, rectangular and circular waveguides, mode analysis, reentrant cavities, Tees, Directional couplers, isolators, circulators.

UNIT – II	6 Hrs.

Microwave Tubes

Introduction, microwave tubes, principle of operation and velocity modulation of two cavity klystron, multi cavity klystron, reflex klystron, TWT, linear Magnetron.

UNIT – III	8 Hrs.

Microwave Semiconductor Devices

Microwave Semiconductor Devices Microwave bipolar transistor, FET, Principle of Operation and application of tunnel diode, Principle of operation of Gunn diode, application of Gunn diode, advantages of Gunn diode, salient features of IMPATT and TRAPATT diodes, applications of IMPATT and TRAPATT diodes,

UNIT – IV	8 Hrs.

Antenna Fundamentals

Basic elements of RF Technology, Classification of Radio waves, Basic parameters of EM waves, Maxwell's equation, skin effect , radiation power density, radiation pattern, radiation intensity, beam width, beam solid angle, side lobes, efficiency, gain, radiation resistance, beam width, antenna temperature, polarization.

UNIT – V	6 Hrs.

Theory and Design of Linear Antenna

Introduction, Electric dipole antenna, Folded dipole, Reciprocity theorem, antenna effective receiving area, antenna behavior in presence of noise, Yagi-Uda antenna, aperture antennas, wire antennas.

UNIT – VI	6 Hrs.

Special Antennas

Introduction, Electromagnetic Interference and Compatibility (EMC), EMC antenna, Calibration of EMC antenna, Ground station, Mobile base station antenna, Mobile hand set antenna, smart antenna.

TEXT BOOK

1] Samuel Y. Liao, Microwave Devices and Circuits, Prentice-Hall of India.

2] Drabowitch, Papiernik “Modern Antennas”,2nd edition, Springer books.

REFERENCE BOOK

1] Das, Annapurna &Sisir K. Das, Microwave Engineering, Tata McGraw-Hili.

2] POZAR DM, Microwave Engg, John Wiley & Sons Inc.

ECN – 403	Satellite Communication & Radar Engineering	4 Credits

Course Objectives:

1] To provide an in-depth understanding of different concepts used in a satellite communication system.
2] To explain the tools necessary for the calculation of basic parameters in a satellite communication system.
3] To get knowledge of every aspects of satellite communication like orbital mechanics, launching techniques, satellite link design, earth station technology and different access system towards a satellite.
4] To get a complete knowledge about the earth and space subsystems
5] To gain knowledge about the Satellite Access schemes
6] To gain knowledge about the Satellite system and mobile services provided
7] To get the basic concepts, operation, and applications of modern radar systems.

Course Outcomes:

After successfully completing the course students will be able to
1] Understand fundamental underlying principles of satellite communication
2] Describe complete knowledge about the earth and space subsystems
3] Have a basic knowledge of the use of Satellite system and mobile services provided.
4] Explain the basics of satellite communication
5] Explain and analyzes link budget of satellite signal for proper communication
6] Use the different application of satellite communication

UNIT – I	8 Hrs.

Introduction

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications, Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance, Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification

UNIT – II	6 Hrs.

SATELLITE LINK DESIGN AND VSAT SYSTEM

Introduction to Data link Layer, DLC Services, DLL protocols, HDLC, PPP, Media AccessControl: Random Access, Controlled Access, Channelization. Wired LAN:Ethernet Protocol,Standard Ethernet, Fast Ethernet, Giagabit Ethernet, 10 Gigabit Ethernet. *Introduction, Overview of VSAT Systems,* Network Architecture ,VSAT Earth Station Engineering

UNIT – III	6 Hrs.

MULTIPLE ACCESS

Frequency division multiple access (FDMA) Intermediation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread spectrum transmission and reception

UNIT – IV	7 Hrs.

FUNDAMENTALS OF RADAR

Block diagram of radar, radar equation, radar frequencies, applications of radar, introduction to Doppler and MTI radar, Doppler filter banks, digital MTI processing, Moving target detector, Pulse Doppler radar

UNIT – V	8 Hrs.

RADAR ANTENNA **8 Hrs.**

Functions of radar Antenna, antenna fundamental parameters: Isotropic radiator, Radiation resistance, Antenna resistance, Bandwidth, Beamwidth, Radiation pattern, Radiation intensity, Gain - Power gain Directive gain, Directivity, Antenna aperture, Efficiency, Effective aperture, effective length, Polarization, Voltage and Current relations.

UNIT – VI	6 Hrs.

ANTENNA SCANNING AND TRACKING **6 Hrs**

Mono pulse tracking, conical scan and sequential lobbing, low angle tracking, phased array, planner array.

TEXT BOOK

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.
3. Balanis C. A. “Anteena theory analysis and design” Wiley pub.

REFERENCE BOOK

1. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition

5 . Introduction to Radar system-Mweeill I. Skolnik, Third edition, Tata McGraw Hill,2001

ECN – 404 Microelectronics 4 Credits

Course Objectives:

As part of this course, students,

1[Will understand the physical, electrical, and optical properties of semiconductor materials and their use in microelectronic.
2] Relate the atomic and physical properties of semiconductor materials to device and circuit performance issues.
3] develop an understanding of the connection between device-level and circuit-level performance of microelectronic systems.

Course Outcomes –

After successfully completing the course students will be able to

Upon successful completion of this course, students should be able to:

1] compute carrier concentrations for semiconductor materials under a variety of doping conditions.
2] compute conductivity and resistivity of semiconductor materials under a variety of condition.
3] Silicon wafer processing and formation of P N junction using diffusion and Ion Implantation technique
5] wet and Dry oxidation process required for photolithography process.
6] Manufacturing process for P N junction, BJT , MOS, and IC fabrication.

UNIT – I 6 Hrs.

SOLID STATE ELECTRONICS:

Solid state materials: Bonding force in solids, Metals, Semiconductors and Insulators, Direct and indirect semiconductors. Electrons and holes, Effective mass. Intrinsic materials ,Extrinsic material, electron and hole concentrations in doped semiconductors, Charge neutrality, Conductivity and mobility, Drift and resistance effect of temperature and doping on mobility, Diffusion of carriers , The continuity equation. Crystal defects and dislocation, electronic properties of defects.

UNIT – II	8 Hrs.

JUNCTIONS:

Fabrication of PN junctions, energy Band Model, Fermi level , Equilibrium conditions – The contact potential ,Equilibrium Fermi levels , space charge at a junction , Forward and reverse biased Junctions , reverse bias break down metal semiconductor junction .Shottky barriers ,rectifying contact , Ohmic contacts.

UNIT – III	6 Hrs.

PN JUNCTION DIODE:

Junction electrostatics, Derivation of depletion width, V-I characteristics of a diode. The diode equation, Characteristic, and energy band diagram, Diode circuit analysis, multiple diode circuits, tunnel diode, Photo diode, LED.

UNIT – IV	5 hrs.

BJT:

Fundamentals of BJT operation, Charge Transport, Amplification with BJT, BJT fabrication, switching characteristics of BJT, switching cycle, Drift in the base region, base narrowing, Avalanche break down, Base Resistance and Emitter Crowding, Krik effect, Capacitance and Charging Times, Transient Time effect.

UNIT – V	9 Hrs.

MOSFET AND CHARGE COUPLED DEVICE:

Electrical Properties of the Surface, Space-Charge Region, Analysis of the Space-Charge Region, C-V Characteristics of the MOS Capacitors, Real MOS Capacitors, The Si-SiO2 system. Enhancement and Depletion type MOSFET Principle of operation and current voltage characteristics and derivation.Linear Region and Saturation Region. Effect of substrate bias. Real MOS Transistors source and drain resistances Drain current in the saturation region. Carrier Mobility in the inversion layer. Threshold voltage control, Effect of Temperature on MOSFET performance .Body effect Short channel effect, Velocity Saturation.

UNIT – VI	6 Hrs.

UNIT VI] VLSI TECHNOLOGY:

Czochralski process, Oxidation, Epitaxy, Diffusion, Lithography, Basic NMOS process, N well, P well technology, Twin tub process, Silicon on Insulator Technology, Latch up Effect.

TEXT BOOK

1. Solid State Electronics devices – By BEN G STREETMAN Sixth Edition EEE Publication.

REFERENCE BOOK

1. M S Tyagi Semiconductor Materials and Devices, Wiley
2. Randall, Geiger and Strader, Analysis and design of CMOS integrated circuits,
3. Weste Eshragian, Principles of CMOS VLSI Design, Addison Wesley 2000

ECN – 405	Real Time Operating System	4 Credits

COURSE OBJECTIVES:

1.To introduce students to the fundamental problems, concepts, and approaches in the design and analysis of real-time systems.
2.To study issues related to the design and analysis of systems with real-time constraints.
3. To understand Different types of operating systems.

COURSE OUTCOMES:

1. An ability to analyze, design and implement a real-time system.
2. Characterize and debug a real-time system.
3. Apply formal methods for scheduling real-time systems.

UNIT – I	7 Hrs.

Introduction to Real-Time Operating Systems

Multiple Processes in an Application, Multiple Threads in an Application, Tasks, Task States, Tick and Data, Clear-cut Distinction between Functions, ISRS and Tasks by their Characteristics, Concept of Semaphores, Shared Data, Interprocess Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions, Socket Functions, RPC Functions

UNIT –II	7 Hrs.

Real-Time Operating System

OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and IO Subsystems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls, Real-time Operating Systems, Basic Design Using an RTOS, Rtos Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues.

UNIT –III	7 hrs.

Real-time Operating System Programming-1: MicroC/OS-II VxWorks

Need of a Well Tested and Debugged Real-Time Operating System (RTOS), Basic Functions and Types of RTOSES, Use of RTOS µC/OS-II,RTOS µC/OS-II,Use of RTOS VxWorks, RTOS VxWorks.

UNIT –IV	7 Hrs.

Design Examples and Case Studies of Program Modeling and Programming with RTOS-I

Case Study of Coding for an Automatic Chocolate Vending Machine (ACVM) Using MUCOS RTOS, Case Study of Digital Camera Hardware and Software Architecture, Case Study of Coding for Sending Application Layer Byte Streams on a TCP/IP Network Using RTOS VxWorks

UNIT- V	7Hrs.

Design Examples and Case Studies of Program Modeling and Programming with RTOS-II

Case Study of Communication Between Orchestra Robots, Embedded Systems in Automobile, Case Study of an Embedded System for an Adaptive Cruise Control (ACC) System in a Car, Case Study of an Embedded System for a Smart Card, Case Study of a Mobile Phone Software for Key Inputs.

UNIT- VI	5 Hrs.

Embedded Software Development Process and Tools

Introduction, Host and target machines, Linking and locating software, Getting embedded software into Target system, Issues in Hardware-Software design and Co-design

TEXT BOOK

1.Raj Kamal, “Embedded Systems: Architecture, Programming and Design”, Tata McGraw Hill Publication, Second Edition.

REFERENCE BOOK

1. C. M. Krishna, Kang G. Shin, “Real Time Systems”, Tata McGraw Hill Publication.
2.Jean J. Labrosse, “MicroC/OS-II: The Real Time Kernel”, Taylor & FrancisPublication.

ECN – 406	System Software & Operating System	4 Credits

Course Objectlive :

1] To familiarize the students with :

2] The introduction to software systems with an emphasis on operating system design and implementation.

3] Key aspect of computer architecture and system software interaction with process management, threading, synchronization, deadlock, scheduling, security and distributed systems.

Outcomes:

By the end of the course student will be able to:

1] Understand Operating System Structure, Operations and Services, Process Concept, thread ,deadlock, Process Scheduling and Synchronization.

2.] Understand concepts of Memory Management with memory allocation and File Systems with security .

UNIT – I	8 Hrs.

LANGUAGE PROCESSOR & DATA STRUCTURE

Introduction: Definition ,type, language processing activities, fundamental of language processing, language process development tool. Data structure : definition, Nature ,purpose & lifetime of DS, .

UNIT – II	6 Hrs.

BASICS OF SYSTEM PROGRAMMING

Introduction: Assembler, compiler-definition, types , interpreter,linker- definition, design of linker, relocation.

UNIT – III	6 hrs.

OPERATING SYSTEM

Introduction : definition , OS structure with objectives, Evolution & types of O.S.- batch processing systems , multiprogramming systems, time sharing systems, real time operating system.

UNIT – IV	8 Hrs.

PROCESSES & THREADS

Introduction : Definition, process control block, scheduling – definition , job & process scheduling, Deadlock – definition , conditions for deadlock, deadlock detection & resolution ,deadlock avoidance- Banker Algorithm.Threads : definition, types ,scheduling.

UNIT – V	7 Hrs.

PROCESS & MEMORY MANAGEMENT

Introduction : process synchronization- process precedence, precedence graph , Critical section – definition ,properties, synchronization with critical section, critical region.Memory Management – definition & basic unit of memory, memory allocation – definition , types , virtual memory with paging & segmentation.

UNIT – VI	5 Hrs.

FILE MANAGEMENT,SECURITY & DISTRIBUTED SYSTEM

Introduction : definition ,accessing & sharing files, security – definition ,encryption & decryption- definition ,technique – playfair & ceaser- cipher.Distributed system – definition , design & networking issues.

TEXT BOOK

1] Dhamdhere D.M, System programming and operating system.

REFERENCE BOOK

1] William stallings, operating system: internals and design principals, Pearson education

2. William stallings, cryptography and networking.

3. “Modern Operating Systems” by Andrew S. Tanenbaum (3rd Edition, Prentice Hall of India) ISBN: 978-81-203-3904.

ECN – 407	Wireless & Mobile Communication	4 Credits

Course Objectives:

1] The objective of the course is to introduce the Concepts of basic wireless and mobile communication systems.
2] To learn and understand the basic principles of Telecommunication switching, traffic and networks.
3] To learn and understand basic concepts of cellular system, wireless propagation and the techniques used to maximize the capacity of cellular network.
4] To learn and understand architecture of GSM and CDMA system.
5] To understand mobile management, voice signal processing and coding in GSM and CDMA system

Course Outcomes:

1. Explain and apply the concepts telecommunication switching, traffic and networks.
2. Analyze the telecommunication traffic.
3. Analyze radio channel and cellular capacity.
4. Explain and apply concepts of GSM and CDMA system.

UNIT – I	7 Hrs.

Introduction and Cellular Concept

Existing technology, Evolution in wireless systems, Trends in cellular system Frequency Reuse channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Cellular System, Design in worst case with an omni Directional Antenna, Co-ChannelInterference Reduction with use of Directional Antenna, Improving Coverage and Capacity in Cellular systems, Trunking and Grade of service

UNIT – II	6 Hrs.

WIRELESS DATA SERVICES:

Common Channel Signaling (CCC),Cellular Digital Packet Data (CDPD), ARDIS, RMD, Common channel signaling, and ATM, SS7, SS7 user part, signaling traffic in SS7.

UNIT – III	7 Hrs.

Wireless Communication Systems GSM

GSM Services and features, GSM Architecture and interfaces, GSM Radio Sub System, GSMChannel Types , Traffic Channels, Control Channels, Example of a GSM call, Framestructure for GSM , Signal Processing in GSM.

UNIT – IV 7 Hrs.

Wireless Communication Systems CDMA IS95

Direct sequence Spread Spectrum, Spreading codes, Multipath Signal Propagation and RAKEreceiver, Frame Quality and BER Requirements, Critical challenges of CDMA,TIA IS95System, Physical and Logical Channels of IS95, CDMA IS95 call processing, soft hand offand power control in CDMA, Access and Paging Channel Capacity, Reverseand ForwardLink Capacity of a CDMA System.

UNIT – V 7 Hrs.

Wireless Communication Systems

CDMA 2000: CDMA layering structure, CDMA 2000 channels, logical channels, forward link physical, forward link features, reverse physical channels, CDMA 2000 Media Access control and LAC sub layer, Data services, Data services in CDMA 2000, mapping of logical channels to physicals, evolution of CDMA IS95 to CDMA 2000.

UNIT – VI 6 Hrs.

More Wireless Communication Systems

Bluetooth, Wi Fi Standards, WIMAX, Wireless Sensor Networks, Zigbee, UWB, IEEE 802.20 and Beyond.

TEXT BOOK

1. Wireless Communication: Principles and Practice Theodare. S. Rappaport- Pearson Education.

REFERENCE BOOK

1] Wireless Communication and Networks by William Stallings, PHI.
2] Mobile Communications by Jochen Schiller, Pearson Education .
3] Wireless Communications and Networks: 3G and Beyond, ITI Saha Misra, Tata McGraw Hill Edition.
4] Mobile Cellular Telecommunications: Analog and Digital Systems, William C. Y. Lee, Tata McGraw Hill Edition.
5] Wireless Network Evolution: 2G to 3G ñ Vijay. K. Garg Pearson Education.

ECN – 408	Artificial Neural Network	4 Credits

Course Objectives:

1] To learn basic learning rules
2] To learn different classifiers
3] To understand multilayer feedforward networks
4] To understand single-layer feedback networks and associative memories
5] To give introduction to fuzzy logic

Course Outcomes:

After successfully completing the course students will be able to

1] Use neural networks for practical applications such as character recognition and control systems
2] Apply Fuzzy logic for practical application.

UNIT – I	6 Hrs.

Introduction

Fundamentals and Models of Artificial Neural Systems, Neural computation: Examples and applications, Biological neurons and their artificial models, Models of artificial networks, Neural processing, Learning and adaptation, Neural network learning rules, Overview of neural networks.

UNIT – II	8 Hrs.

Single-Layer Perceptron Classifiers

Classification model, features, and decision regions, discriminate functions, linear machine and minimum distance classifier, Non parametric training concept, SDPTA, SCPTA, R-category discrete Perception training algorithm.

UNIT –III	6 Hrs

Multilayer Feedforward Networks

Linearly non separable pattern classification, Delta learning rule for multiperceptron layer, generalized delta learning rule, feed forward recall and error back propagation training, learning factors.

UNIT – IV	6 Hrs.

Single-Layer Feedback Networks

Basic concepts and dynamical systems, Mathematical foundations of discrete-time and gradient-type Hopfield networks

UNIT – V	8 Hrs.

Associative Memories

Basic concepts, Linear Associator, Basic Concept of Recurrent Autoassociative Memory, Bidirectional Associative Memory.

APPLICATIONS OF NEURAL NETWORKS: Introduction to applications in characters recognition and control systems **.**

UNIT –VI	6 Hrs.

Introduction to Fuzzy Logic

Uncertainty and imprecision, Classical sets and Fuzzy sets, Classical relation and fuzzy relations, Operations on crisp and fuzzy relations. Fuzzy tolerance and equivalence.

TEXT BOOK

1.J. M. Zurada, Introduction to ArtificialNeural Networks, Jaico Publishing house.
2 T. M. Ross, Fuzzy logic, Mc-Graw Hill Inc.
3. Kosoko, Neural Networks and Fuzzy Systems, PHI
4. Zimermann, Fuzzy set Theory, Allied Pub

REFERENCE BOOK

1. Artificial Neural Network – Simon Haykin, Pearson Education, 2nd Ed.
2. Fundamental of Neural Networks – Laurene Fausett, Pearson, 1st Ed.
3. C.T Lin & C S George Lee: NeuralFuzzy Systems, Prentice Hall.
4. Ahamad M. Ibrahim: Introduction toApplied Fuzzy Electronics.

ECN – 409	Mechatronics	4 Credits

Course Objectives:

1] To understand the different sensors and measuring instruments..
2] To learn the different considerations of mechanical and electronic designs.
3] To understand different control systems and their designs.

Course Outcomes:

After successfully completing the course students will be able to
1] Understand various stages of electronics, mechanical control and design
2] Special design considerations and importance of different controller modes and discrete

UNIT – I	6 Hrs.

Introduction to Transducer and Mechatronics:

Measurement systems, static characteristics, Classification of Transducers and Sensors, Basic Divider Circuits, Bridge Circuits, Filters, Level measurements, strain measurements: Strain Gauge principles, types, strain gauge circuits, Load cells, temperature Compensation. Temperature measurement: Thermisters, RTD, Thermocouples

UNIT – II	8 Hrs.

Mechanical Sensors

Displacement & Position sensors: Potentiometric Sensor, Capacitive and Inductive Sensors, Variable Reluctance Sensors, Linear Variable Differential Transformers. Motion Sensors: Translational and Rotary Optical Encoders, Tachometers with output signal as electrical quantity.

UNIT – III	6 Hrs.

Converters and Controller and Data Acquisition system:

Concept of sampling, sample & hold operation, analog to digital converters, digital to analog converters. Introduction to SCADA & its applications, System Models: Mathematical models, introduction to mechanical, electrical, fluid and thermal system. Rotational and transnational systems, Basic concepts of transfer function.

UNIT – IV	8 Hrs.

Controller Principles Control systems:

Types of control system, Open loop, closed loop systems, transfer functions, feed back and feed forward control systems and their applications. Process Characteristics: Process equation, process load, Error, Variable range, Control Parameter Range, Dead time.

UNIT – V	6 Hrs.

Controller Modes:

Continuous Controller Modes, Proportional Controller, Integral Controller, Derivative Controller, with mathematical equations, advantages, disadvantages and applications. Composite controller Modes: Proportional, Proportional+Integral(PI), Proportional+ Derivative(PD), Proportional + Integral + Derivative(PID) controllers, with simple numerical treatment.

UNIT – VI	6 Hrs.

Discrete State Process Control :

Ladder Diagram Elements, and Ladder Diagram Examples. Programmable Logic Controllers: Relay sequencers, PLC Programming Concepts, logic, basic structure, input/output processing, timers, internal relays and counters, shift resisters, ladder diagram and programming, selection of PLCs, Case studies of Mechatronics with different applications like washing machine, dish washer, bottle filling plant, elevator, building automation.

TEXT BOOK/REFERENCE BOOK

1] Johnson C.D., Process Control Instrumentation Technology, Prentice Hall of India Pvt Ltd., New Delhi. Reference Books 1 Doebelin E.O., Measurement System-Application and Design, Tata McGraw Hill Publications Ltd., New Delhi.

2] Bolton W., Mechatronics : A Multidisciplinary Approach Pearson-Education

3] Rangan C.S. Sarma G.R., Mani V.S, Instrumentation- Devices and Systems, Tata McGraw Hill Publishing Company Ltd.,New Delhi.

4] Histand B.H. AlciatoreD.G. ,Introduction to Mechatronics and Measurement Systems. HMT, Mechatronics, HMT.

5] Mahalik N. g Company Ltd.,New Delhi.

6] Kolk R.A., Shetty D., Mechatronics Systems Design, Vikas Publishing Manual Delhi.

7] Fawcett J.R.- P. Mechatronics – Principles, concepts and applications, Tata McGraw Hill Publishin Pneumatic Circuits and Low Cost Automation

8] Ian C Turner -Engineering Applications of Pneumatics & Hydraulics

9] Mikell P Groovar- Automation, Production Systems and CIM.

10] Z.J Lansky, Lawrence F Schrader, JR. -Industrial Pneumatic Controls

11] Necsulescu – ‘Mechatronics’ 1/e - Pearson-Education.

ECN – 410	Digital Image Processing	4 Credits

COURSE OBJECTIVES:-

1] To understand fundamental steps in digital image processing.
2] To learn various techniques of image enhancement.
3] To study the techniques of image compression.

Course Outcomes:-

At the end of the course, the students will be able to
1] Enhance a poor quality image.
2] Develop and implement algorithms for digital image processing.
3] Explore the novel application of image processing.

UNIT – I 5 Hrs.

Digital Image Fundamentals

Introduction: Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing systems. Elements of Visual Perception, A Simple Image Model, Sampling and Quantization, Some basic relationship between Pixels.

UNIT – II 7 Hrs.

Intensity Transformations and Spatial Filtering

Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

UNIT – III 8 Hrs.

Image Transforms and Compression

Introduction to the Fourier Transform, The Discrete Fourier Transform, Some properties of the Two Dimensional Fourier Transform, The Fast Fourier Transform, 2-D Discrete Fourier Transform, Discrete Cosine Transform, Image compression techniques, Coding, inter pixel and psycho visual image redundancy, fidelity criteria, Error free compression.

UNIT – IV 6 Hrs.

Morphological Image Processing

Neighborhood concepts, adjacency and distance measures, dilation & erosion, opening & closing operations, basic morphological operations such as hit or miss transformation,boundary detection, region filling, thinning, thickening, skeletons, pruning for binary images.

UNIT – V	8 Hrs.

Image Segmentation

Image segmentation based on Discontinuities, Edge Detection, image segmentation using second order derivative, Thresholding, Region based segmentation.

UNIT –VI	6 Hrs.

Image Processing Applications

Character Recognition, Fingerprint Recognition, Remote Sensing, Medical imaging, Industrial application of image processing

TEXT BOOK

1] R.C. Gonzalez, R.E.Woods, Digital image processing, Pearson Education India, Third Edition, 2002

2] Anil K. Jain, Fundamentals of digital image processing, Prentice Hall of India.

REFERENCE BOOK

1] Milan Sonka 'Image Processing, Analysis & Machine Vision' Thomson Publication

2] Pratt W.K., 'Digital Image Processing', John Wiley, 2001.

ECN – 411	DIGITAL VLSI LABORATORY	1 CREDIT

List of Experiments:

1) To implement basic gates using CMOS logic.
2) Design and implement dynamic logic .
3)Design and implement domino logic.
4) To implement adder and mirror adder.
5) Design multiplexer using transmission gate.
6) To study PLA
7) To implement different registers and flipflops.
8) Explain layout rules and design basic gates.

Implement all experiments using switchercad or microwind software.

ECN – 412	RF ANTENNA & MICROWAVE ENGG LAOTRATORY	1 Credit

List of Experiments:

1] The study of microwave components.
2] To study the characteristics of reflex Klystron tube.
3] Study of attenuator
4] The study of radiation pattern for horn antenna using microwaves.
5] To study the characteristics of Gunn diode.
6] Study of Reciprocity theorem.
7] Design and study of radiation pattern for six element Yagi-Uda antenna.
8] To study the radiation pattern for simple dipole antenna
9] To study the variation of field strength of radiated waves with distance from transmitting antenna
10] To study the phenomenon of polarization of vertical, horizontal polarized antennas.

ECN – 413	Implant Training Seminar	1 Credit

The students will undergo industrial training for duration of one month after sixth semester examination with following choice any one.

1] Industrial Training .

The students will undergo industrial training for duration of one month after sixth semester examination. The student shall submit a report on industrial training undergone, duly certified by the authorities from industry. The assessment of the students will be based on the confidential feedback from the industry and seminar/presentation given by the student.

2] The student will complete minimum 60 Hrs of approved certification course in either C^{++} ,JAVA ,DOTNET or any other software course and make one module project based on the course.

3] The student will complete minimum 60 Hrs of approved certification course in either VLSI ,Embedded, or PLC or any automation course and deliver seminar on same.

ECN – 414	Project Part – I	1 Credit

The project work will be carried out by a batch of at the most 3 students (preferably 2 students) working on a topic related to the electronics and allied fields. The topic may be from one of the following.

1. Laboratory work involving constructional theoretical and design aspects of the project/ system.
2. Modification aspect of existing electronics systems.
3. It can be practical need of the industry, which should involve system design aspect.
4. Survey of latest development in Electronics and allied fields.

\It shall consist of the term work in the form of hand written or typed report not less than 25 pages. This should include the literature survey technical details related data that is collected & design that are required for project work part-I.

The candidate shall give a stage-1 progress demonstration on the subject chosen above in the presence of Guide.

PART - II

ECN – 415	Computer Network	4 Credits

OBJECTIVES:

The student should be made to:

1] Understand the division of network functionalities into layers.
2] Be familiar with the components required to build different of network
3] Be exposed to the required function at each layer
4] Learn the flow control and congestion control algorithms

OUTCOMES:

At the end of the course,the students should be able to :

1] Identify the components required to build different types of network
2] Choose the required functionality at each layer for given application identify solution for each function at each layer
3] Trace the fiow of information from one to another node in the network

UNIT – I	6 Hrs.

INTRODUCTION AND PHYSICAL LAYER :

Uses of computer networks, Network Hardware, Network software, Reference Models, ExampleNetworks. Theoretical basis for data communication, Guided Transmission media, Wireless Transmission, Communication Satellites, Public Switched telephone Networks, Mobile telephone system.

. UNIT – II	7 Hrs.

DATA LINK LAYER AND MEDIUM ACCESS CONTROL SUB LAYER:

Data link layer design issues, Error detection and correction, Elementary data link protocols, Sliding Window protocols. The Channel Allocation problem, multiple access protocols, Ethernet, Wireless LANs, Broadband wireless, Bluetooth, Data link layer switching.

UNIT – III	7 Hrs.

NETWORK LAYER AND TRANSPORT LAYER:

Network layer design issues, Routing algorithms, Quality of service, Inter-net working, Network layer in Inter-net. Transport service, Elements of transport protocols, simple transport protocol, and Inter-net transport protocols: UDP and TCP, Performance issues.

UNIT – IV 7 Hrs.

APPLICATION LAYER:

Domain name system (DNS), Electronic mail, multipurpose mail extensions (MIME),SMTP (Simple mail transfer prtocols).FTP. World-wide web (WWW),HTTP. Multimedia.

UNIT – V 7 Hrs.

NETWORK SECURITY:

Cryptography, Symmetric-key algorithms, Public key algorithms, Digital signatures, management of public keys, Communication security, Authentication protocols, E-mail security, Web security.

UNIT –VI 6 Hrs.

MOBILE AD-HOC NETWORK AND WIERLESS SENSAR NETWORK :

Overview of wireless ad-hoc networks, routing in ad-hoc networks outing protocols of ad-hoc networks.Senser networks .unic constraints and challenges advantages.Senser network applications.

TEXT BOOK

1] Andrew S. Tanenbaum, Computer Networks Prentice-Hall India.

REFERENCE BOOK

1] Willian Stalling, Data and Computer Communication, Prentice. Hall India.
2] Uyless Black, Computer Network, Prentice. Hall India.
3] V. Ahuja, Design and analysis of Computer Network, MGH.
4] Computer and communication networks by Nadir F.Mir by pearson education india
5] Ad-hoc mobile wireless network protocalls and system by C.K.TOH by persons
6] Wierless sensor networks by Feng ZHAO Leonidas GUIBAS by MORGAN KAOFMANN.

ECN – 416	Optical Fiber Communication	4 Credits

COURSE OBJECTIVES:-

1] To understand basic elements of optical fiber communication link,
2] To know different kind of losses in optical fiber,
3] To design **a** fiber optic communication link and carry out power budget analysis

Course Outcomes:-

At the end of the course, the students will be able to

1] Estimate various losses in optical fiber,
2] Design fiber optic communication link,
3] Find out the necessity of optical amplifier.

UNIT – I	7 Hrs.

OVERVIEW OF OPTICAL FIBER COMMUNICATION:

Introduction, block diagram of optical fiber communication, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, propagation of light through optical fiber, Numerical aperture, classification of optical fiber, cutoff wave length, mode filed diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables ,specialty fibers.

UNIT – II	8 Hrs.

OPTICAL SOURCES AND DETECTORS, SIGNAL DEGRADATION IN OPTICAL FIBERS:

Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, comparison of photo detectors. Attenuation, absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion.

UNIT – III	5 Hrs.

FIBER COUPLERS AND CONNECTORS:

Introduction,fiber alignment and joint loss, single mode fiber joints,fiber splices, fiber connectors and fiber couplers.

UNIT – IV	6 Hrs.

OPTICAL RECEIVER:

Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, coherent detection, burst mode receiver operation, Analog receivers.

UNIT – V	7 Hrs.

ANALOG AND DIGITAL LINKS:

Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, Radio over fiber links microwave photonics. Digital links – Introduction, point–to–point links, System considerations, link power budget, rise time budget, transmission distance for single mode links, line coding, error correction, modal noise and chirping.

UNIT – VI	7 Hrs.

WDM CONCEPTS AND COMPONENTS:

Operational Principles of WDM, Passive optical couplers, isolators and circulators, tunable filters, Optical Amplifiers: basic applications and types of optical amplifiers, semiconductor optical amplifiers, EDFA, Raman amplifier, optical sensor systems, Military and industrial applications of optical fiber.

TEXT BOOK

1] Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007

2] Optical Fiber Communication – Gerd Keiser– Mc Graw Hill Third Edition.- 2000

REFERENCE BOOK

1] J.Gower, “Optical Communication System”, Prentice Hall of India, 2001

2] Govind P. Agrawal, Fiberoptic communication systems”, third edition, John Wiley & sons, 2004.

3] R.P. Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2007

ECN – 417	Audio Video Engineering	4 Credits

Objective: is to provide students with a strong understanding of the fundamental principle and practical application of audio and video with latest updates.

Course Outcome:

1. Understand the concept of basic television signal processing.
2. Identify globally accepted colour TV standards.
3. Demonstrate the need of audio and video compression techniques in real life.
4. Acquire knowledge of latest digital TV systems and applications.
5. Describe the attributes of acoustics, sound engineering and storage media.

UNIT – I	7 Hrs.

Fundamentals of Colour Television

Aspect ,scanning ,perception of brightness and colour,colour mixing, composite video signal ,synchronization details digital TV camera, modulation of audio and video terrestrial signal transmission ,video display, LED vs. LCD.

UNIT – II	6 Hrs.

Colour standards and digital video

Standards:NTSC,PAL,SECAM colour system ,generalized colour TV receiver block diagram ,study of functionality of each block, alignment issues ,sampling of video signal,colour sub sampling ,composite vs. component video ,interlace vs. progressive scan.

UNIT – III	7 Hrs.

Digital TV

Digital video, resolution, notation, digital video formats, digital video quality measure ,video restoration. video streaming, DTH ,video compression :MPEG 2,MPEG 4, comparison of SDTV, EDTV ,and HDTV

UNIT – IV	6 Hrs.

Advanced TV Systems and Techniques

Introduction to UHDTV: 4K and 8K, IPTV/web TV, smart TV, Wi-Fi TV, digital surveillance, 3D TV concept, over view of H.264 features, camcorders, webcams, perspective of TV White spaces.

UNIT – V	7 Hrs.

Acoustics

Human Hearing and sound, frequency range, dynamic ranger, digital representation of sound wave, intensity decibal sound level, sound wave in rooms, reverberation, room/studio acoustics as a component system , PA system, special types of microphones and speakers

UNIT – VI	7 Hrs.

Audio and video recording Systems:

Digital sound, sound recording, CD/DVD player,MP3 player, Blue Ray DVD player, ITU-T(G) compression standards, multichannel/Dolby 5.1 sounds in DTV.

TEXT BOOK/REFERENCES

1. A. M. Dhake, Television and video Engineering, TMH Publication, 2nd Edition, 2001.

2. Kelth jack, Video Demystified: A Handbook for the Digital Engineer, 5th Edition, Newnes, 2007.

3. R.G. Gupta, Audio and Video Systems, McGraw Hill l Education (India), 2nd Edition,2010.

4. S. P. Bali, Color Television Theory and Practice, McGraw Hill Education (India), 1994.

5. A. M. Tekalp, Digital Video, Prentice Hall, 1995.

6] R. P. Gulathi, Modern Television Practice, 4th edition, New Age International Publisher,2014.

ECN – 418	Electronic Product Design	4 Credits

Course Objectives:

1] To understand the stages of product (hardware/ software) design and development.
2] To learn the different considerations of analog, digital and mixed circuit design.
3] To be acquainted with methods of PCB design & different tools used for PCB design.
4] To understand the importance of testing in product design cycle.
5] To understand the processes and importance of documentation.

Course Outcomes:

After successfully completing the course students will be able to
1] Understand various stages of hardware, software and PCB design.
2] Importance of product test & test specifications.
3] Special design consideration and importance of documentation.

UNIT – I	7 Hrs.

Introduction to Electronic Product Design

Electronic Products Classification- Consumer, Industrial and Military. Their peculiarities in terms of Cost/performance ratio and Reliability. Reliability- Bath tub curve, Measures taken (at Component and Product level and various soldering techniques including Surface Mount Technology) to improve reliability. five element of successful design, cognition, ergonomics. Packaging and factors, design for manufacture, assembly and disassembly, wiring, temperature, vibration and shock. Safety, noise, energy coupling, grounding, filtering and shielding.

UNIT – II	8 Hrs.

Analog &Digital Hardware Design

Analog Signal Conditioning- Factors affecting choice of OPAMPs in signal conditioning applications. Need for Instrumentation Amplifiers- Case study. Interpretation of ADC and DAC and their specifications from design point of view Interface examples for- LED, LCD, Keyboard, Touch Screen. Microcontrollers- Comparative study of different Microcontroller Architectures, Design of various blocks of communication systems such as- Phase-locked Loop, Equalizer and Interleaver. Introduction to buses and protocols used in Electronic Products- I2C, SPI.

UNIT – III	6 Hrs.

Software Design and Testing :

Types of Software. Waterfall model of software development Software bugs and testing. Good programming practice. User interface .Embedded, Real time software. Different approaches to development of application software for Electronic Product. Factors affecting choice between Assembly language and High level language like C and C++. Hardware Test Programs.

UNIT – IV	7 Hrs.

PCB Design

Introduction, Fundamental Definition , standards, Routing Topology Configurations, Fabrication Layer Stack up assignment, Grounding Methodologies, Aspect Ratio, Image Planes, Functional Partitioning, process of single sided and double sided PCB. PCB Design Practices for High Speed Digital Circuits, Signal integrity and EMC. EMI/EMC testing standards and compliance.

UNIT – V	7 Hrs.

Product Debugging and testing

Debugging tools and techniques for software- Features and limitations of- Debuggers, Simulators, ICE, IDE. Techniques for troubleshooting, characterization, Electromechanical components, passive components, active components, active devices, operational amplifier, Analog-Digital Conversion, Digital Components, Inspection and test of components, Simulation, Prototyping and testing, Integration, validation and verification.

UNIT – VI	5 Hrs.

Documentation

Definition, need, and types of documentation. Records, Accountability, and Liability. Audience. Preparation, Presentation, and Preservation of documents. Methods of documentation, Visual techniques, Layout of documentation, Bill of material.

TEXT BOOK

1. Kim Fowler," Electronic Instrument Design" Oxford university press.
2. Robert J. Herrick, "Printed Circuit board design Techniques for EMC Compliance", Second edition, IEEE press.
3. Bernhard E. Bürdek, "History,Theory and Practice of Product Design", Springer Science, 2005
4. Paul Horowitz, "Art of Electronics", Cambridge University Press
5. Howard Johnson, Martin Graham, "High-speed Digital design- A Handbook of Black Magic", Prentice Hall Publication
6. Proakis and Salehi "Contemporary Communication Systems Using Matlab", PWS Publishing Company, 1998

7. G. Pahl andW. Beitz J. Feldhusen and K.-H. Grote, “Engineering Design - A Systematic Approach”, Springer,2007
8. Tim Williams, “EMC for Product Designers”, Elsevier, Fourth edition 2007

REFERENCES

1. James K. Peckol, “Embedded Systems – A Contemporary Design Tool”, Wiley publication

2. J C Whitakar,” The Electronics Handbook”, CRC press.

3. David Bailey, “Practical Radio Engineering and Telemetry for Industry”, Elsevier, ISBN 07506 58037
4. Bernard Sklar , “Digital Communication” , Pearson Ed
5. Pressman , “Software Engineering - A Practitioner's Approach”
6. David Bailey, “Practical Radio Engineering & Telemetry for Industry”, Elsevier, ISBN 07506 58037
7. Domine Leenaerts ,Johan van der Tang , Cicero S. Vaucher , “Circuit Design for RF Transceivers” , Kluwer Academic Publishers, 2003.

ECN – 419 Internet Of Things & Sensor 4 Credits

Course Objectives:

1] Vision and Introduction to IoT.
2] Understand IoT Market perspective.
3] Data and Knowledge Management and use of Devices in IoT Technology.
4] Understand State of the Art – IoT Architecture.
5] Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes:

After successfully completing the course students will be able to
1] Explain in a concise manner how the general Internet as well as Internet of Things work.
2] Understand constraints and opportunities of wireless and mobile networks for Internet of Things
3] Use basic measurement tools to determine the real-time performance of packet based networks.
4] Analyze trade-offs in interconnected wireless embedded sensor networks.
5] Understand the vision of IoT from a global context.
6] Determine the Market perspective of IoT.
7] Use of Devices, Gateways and Data Management in IoT.
8] Building state of the art architecture in IoT.
9] Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

UNIT – I	6 Hrs.

Internet in general and Internet of Things:
layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia.

UNIT – II	7 Hrs.

Transport services: TCP, UDP, socket programming.
Network layer: forwarding & routing algorithms (Link, DV), IP-addresses, DNS, NAT, and routers

UNIT – III	7 Hrs.

Local Area Networks, MAC level, link protocols such as:
point-to-point protocols, Ethernet, WiFi 802.11, cellular Internet access, and Machine-to-machine.

UNIT – IV	6 Hrs.

Mobile Networking:
Roaming and handoffs, mobile IP, and ad hoc and infrastructure less networks.

UNIT – V	7 Hrs.

Real-time networking:
Soft and real time, quality of service/information, resource reservation and scheduling, and performance measurements.

UNIT – VI	7 hrs.

IoT definitions: Overview, applications, potential & challenges, and architecture.
IoT examples: Case studies, e.g. sensor body-area-network and control of a smart home.

TEXT/REFERENCE BOOK

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",** 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and Arshdeep Bahga, **"Internet of Things (A Hands-on-Approach)",** 1st Edition, VPT, 2014.
3. Francis daCosta, **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** 1st Edition, Apress Publications, 2013.

ECN – 420	Cloud Computing	4 Credits

Course Objectives:

1] Discuss, with confidence, what is cloud computing and what are key security and control considerations within cloud computing environments.
2] Identify various cloud services.
3] Assess cloud characteristics and service attributes, for compliance with enterprise objectives.
4] Explain the four primary cloud category —types‖.
5] Evaluate various cloud delivery models.
6] Contrast the risks and benefits of implementing cloud computing.
7] Specify security threat exposure within a cloud computing infrastructure.
8] Recognize steps and processes used to perform an audit assessment of a cloud Computing environment.
9] Summarize specific environments that would benefit from implementing cloud computing, Contrasted against those environments that might not benefit.
10] Weight the impact of improperly controlled cloud computing environments on organizational sustainability.

Course Outcomes:

1. To impart fundamental concepts in the area of cloud computing.
2. To impart knowledge in applications of cloud computing.
3. Understanding the systems, protocols and mechanisms to support cloud computing.
4. Develop applications for cloud computing.
5. Understanding the hardware necessary for cloud computing.
6. Design and implement a novel cloud computing application.

UNIT – I	6 Hrs.

INTRODUCTION
Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment.

UNIT – II	6 Hrs.

Cloud Computing Technology:
Client systems, Networks, server systems and security from services perspectives; accessing the cloud with platforms and applications; cloud storage.

UNIT – III	8 Hrs.

Working with Cloud:
Infrastructure as a Service – conceptual model and working Platform as a Service – conceptual model and functionalities. Software as a Service –conceptual model and working. Trends in Service provisioning with clouds.

UNIT – IV	8 hrs.

Cloud Services:
Using Cloud Services-Cloud collaborative applications and services – case studies with calendars, schedulers and event management.

UNIT – V	6 Hrs.

Cloud applications:
Cloud applications in project management.

UNIT – VI	6 Hrs.

Case studies:
Case studies- Microsoft Azure, Google App Engine and Open source clouds-Open-Nebula and Eucalyptus.

TEXT/REFERENCE BOOK

1] Anthony T. Velte, Toby J. Velte and Robert E, Cloud Computing – A Practical Approach, TMH 2010.
2] Michael Miller, Cloud Computing – Web based Applications, Pearson Publishing, 2011.
3] Resources from Internet.

ECN – 421	Multi Carrier Communication	4 Credits

Course Objectives

1] Understand the basic concept of OFDM system with its advantages, disadvantages and limitations.
2] Understand the limits on CDMA & OFDM systems
3] Understand basic principles of OFDM systems
4] Perform analysis of OFDM systems
5] Be familiar with other modern communication systems.

Course Outcomes:

1]Able to distinguish between different modern communications systems.
2] Able to overcome the limitations of different multicarrier system.
3] Knows the importance of channel estimation.
4] Be able to design OFDM systems

UNIT – I	6 Hrs.

Review of wireless channel characteristics –
Multi carrier and OFDM system fundamentals – OFDM system model - Comparison with single carrier - Channel capacity and OFDM – FFT implementation – Power spectrum – Impairments of wireless channels to OFDM signals – Comparison with other multicarrier modulation scheme: MC CDMA .

UNIT – II	6 Hrs.

Synchronization in OFDM –
Timing and Frequency Offset in OFDM, Synchronization & system architecture, Timing and Frequency Offset estimation – Pilot and Non pilot based methods, Joint Time & Frequency Offset estimation.

UNIT – III	8 Hrs.

Channel Estimation in OFDM systems –
Differential and Coherent detection; Pilot symbol aided estimation - Block type and Comb type pilot arrangement; Decision directed channel estimation – MMSE estimation using time and frequency domain correlation; MIMO channel estimation- basic concepts; Concepts of Time and Frequency domain equalization.

UNIT – IV	8 Hrs.

Clipping in Multi carrier systems –
Power amplifier non linearity – Error probability analysis – Performance in AWGN – PAPR properties of OFDM signals – PAPR reduction techniques with signal distortion; Techniques for distortion less PAPR reduction – Selective mapping and Optimization techniques.

UNIT – V	6 Hrs.

Channel coding:
Need for coding block, coding in OFDM convolution encoding, concatenated coding, coding in OFDM.

UNIT – VI	6 Hrs.

Applications of multi-carrier communication Coding in OFDM, wireless LAN, digital audio & video broadcasting OFDM based multiple access techniques, mitigation of clipping effects.

TEXT/REFERENCE BOOK

1.Bahai, Saltzberg, Ergen : Multi-carriers Digital communications,
2.Rappaport, T.S, Wireless communication, Prentice Hall Springer
3.Heiskala, J., Terry J., OFDM wireless LANs: A Theoretical and practical guide. Samps Publishing 2002
4.Haykinls, Communication system, John Wiley & Sons.
5. Oppenheim, A.V., Schafer R.W., Discrete – Time signal processing New Jerssey : Prentice Hall Inc.
6.Bingham, J.A.C., ADSL, VDSL and multi-carrier modulation New York Wiley.
7.OFDM orthogonal frequency Division Multiplexing. Nova Engineering.

ECN – 422	Analog and Mixed Signal VLSI	4 Credits

COURSE OBJECTIVES:-

1] To understand fundamental steps in analog VLSI design.
2] To learn various techniques ADC and DAC design.
3] To study the OP-AMP design.

Course Outcomes:

1] Model analog circuit with, simulate, synthesis in Microwind.
2] Understand chip level issues and need of testability.
3] Design OP-AMP circuits for specified applications.

UNIT – I	6 Hrs.

Data converter fundamentals: Analog versus Digital Discrete Time Signals, Converting Analog Signals to Data Signals, Sample and Hold Characteristics, DAC Specifications, ADC Specifications, Mixed-Signal Layout Issues.

UNIT – II	10 Hrs.

Data Converters Architectures: DAC Architectures, Digital Input Code, Resistors String, R-2R Ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, Pipeline DAC, ADC Architectures, Flash, 2-Step Flash ADC, Pipeline ADC, Integrating ADC, Successive Approximation ADC.

UNIT – III	6 Hrs.

Non-Linear Analog Circuits: Basic CMOS Comparator Design (Excluding Characterization), Analog Multipliers, Multiplying Quad (Excluding Stimulation), Level Shifting (Excluding Input Level Shifting For Multiplier).

UNIT – IV	6 Hrs.

Data Converter SNR: Improving SNR Using Averaging (Excluding Jitter & Averaging onwards), Decimating Filters for ADCs (Excluding Decimating without averaging onwards), Interpolating Filters for DAC, B and pass and High pass Sync filters.

UNIT – V	10 Hrs.

Su-Microns CMOS circuit design: Process Flow, Capacitors and Resistors, MOSFET Switch (up to Bidirectional Switches), Delay and adder Elements, Analog Circuits MOSFET Biasing (up to MOSFET Transition Frequency).

UNIT –VI	6 Hrs.

OPAmp Design (Excluding Circuits Noise onwards)

TEXT BOOK

1. **Design, Layout, Stimulation ,**R. Jacaob Baker, Harry W Li, David E Boyce, CMOS Circuit, PHI Edition, 2005
2. **CMOS- Mixed Signal Circuit Design, R**. Jacob Baker, (Vol ll of CMOS: Circuit Design, Layout and Stimulation), IEEE Press and Wiley Nescience, 2002.

REFERENCE BOOK

1. **Design of Analog CMOS Integrated Circuits**, B Razavi, First Edition, McGraw Hill, 2001.
2. **CMOS Analog Circuit Design**, P e Allen and D R Holberg, Second Edition, Oxford University Press, 2002.

ECN – 423	Biomedical Electronics	4 Credits.

Course Objectives:

1. To develop skills enabling Biomedical Engineers to serve Hospitals, National and International Industries and Government Agencies
2.To understand the basic principle, working and design of various automated diagnostic equipments.
3. To develop core competency in the field of Biomedical Engineering to gain technical expertise in biology and medicine for effective contribution in the development and improvement of health care solutions.

Course Outcomes:

1. Demonstrate the principles of electronics used in designing various diagnostic equipment and provide a better technical support with exposure to the hospitals .
2. Exhibit competency in suggesting, designing and offering the reliable and optimum solution after understanding customer's requirement completely.
3. Demonstrate ability of correlating theoretical concepts with their practical implementation while performing laboratory exercises and project work.
4.Use modern methodologies, multidisciplinary skill set and knowledge while working on real time projects that demand convergence of engineering, science and technology.

UNIT –I	6 Hrs.

Biomedical signals & Physiological transducers :

Source of biomedical signal , Origin of bioelectric signals , recording electrodes , Electrodes for ECG , EMG & EEG .Physiological transducers : Pressure , Temperature , photoelectric & ultrasound transducers .

UNIT –II	7 Hrs.

Recording Systems:

Basic recording system, General considerations for signal conditioners, Preamplifiers, Main amplifiers, Signal processing techniques. Writing systems: Direct writing recorder, ink-jet recorder, potentiometric recorder, digital recorders. Biomedical recorders: ECG, EEG & EMG.

UNIT –III	10 Hrs.

Patient Monitoring systems & Audiometers:

Cardiac monitor , Bedside patient monitor , measurement of heart rate , blood pressure , temperature , respiration rate , Arrhythmia monitor , Methods of monitoring fetal heart rate , Monitoring labor activity .

Audiometers: Audiometers, Blood cell counters, Oximeter, Blood flow meter, cardiac output measurement, Blood gas analyzers.

UNIT –IV	5 Hrs.

Modern Imaging systems:

Introduction , Basic principle & Block diagram of x-ray machine , x- ray Computed Tomography (CT) , Magnetic resonance imaging system(NMR) , ultrasonic imaging system .

UNIT –V	8 Hrs.

Therapeutic Equipments:

Cardiac pacemakers , cardiac defibrillators , Hemodialysis machine , Surgical diathermy machine , **Physiotherapy :** Soft wave Diathermy, microwave Diathermy , Ultrasound therapy unit. Electrotherapy Equipments, Ventilators.

UNIT –VI	4 Hrs.

Patients safety & Computer Applications in Biomedical field:

Precaution , safety codes for electro medical equipment , Electric safety analyzer , Testing of biomedical equipment , Use of microprocessors in medical instruments , Microcontrollers , PC based medical instruments , Computerized Critical care units , Planning & designing a computerized critical care unit

TEXT BOOK

1] Electronics in medicine & Biomedical instrumentation by Nandini K.Jog
2] Textbook of Biomedical instrumentation by K.N.SCOTT & A.K.Mathur
3] Biomedical Engineering by S .N.Sarbadhikari

REFEDRENCE BOOK

1] Hand book of Biomedical instrumentation by R.S.Khandpur , TMH
2] Biomedical Instruments : Theory and Design by Walter Welko- Witiz and Sid Doutsch
3] Biomedical Instrumentation & Measurements by Lesile Cromwell , Fred J.Weibell & Erich A. Pfeiffer , PHI

ECN – 424	Industrial Organization & Project Management	4 credits

Course Objectives :

1] To understand Organizational Structure.
2] To understand the role of private sector in industry growth.
3] To handle complex task of time estimation & project scheduling including PERT & CPM.
4] To understand behavior & psychology of the industry.
5] To appreciate & understand the use of computers in project management.

Course Outcomes :

1] Students will able to follow types of industries.
2] Students can evaluate time estimation of the project used in industry.
3] Students will able to understand software evaluation used with industry.

UNIT – I	8 Hrs

BUSINESS ORGANIZATION AND BASIC CONCEPT OF MANAGEMENT :

Introduction, definition, type of business organization, basic concept of management, function of management, organization structure, authority, span of control, matching of jobs, types of organization structures, system concept, decision making.

UNIT – II	6 Hrs.

MANAGEMENT INFORMATION SYSTEMS (MIS) :

Introduction, definition, needs, aim, characteristic and information system, source of information, application of MIS, design, development, implementation levels, information handling, advantages and disadvantages.

UNIT – III	6 Hrs

ORGANIZATION BEHAVIOR AND INDUSTRIAL PSYCHOLOGY :

Organization behavior leadership, industrial psychology, motivation, participative management, quality circles and group decisions, brain storming, small scale industries, project planning.

UNIT – IV	7 Hrs.

INTRODUCTION TO PERT / CPM :

Project management, network modeling-probabilistic model, various types of activity times estimation-programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method (CPM)-critical path calculation-crashing of simple of networks.

UNIT – V	5 Hrs.

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT :

Introduction, important of project management, what is project? , overview of project planning, program management and project evaluation, cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques.

UNIT – VI	8 Hrs.

ACTIVITY PLANNING AND RISK MANAGEMENT :

Introduction, objective, project schedule and activity, sequencing and scheduling activity, network planning models, adding time dimension, the forward pass, backward pass, identifying the critical activity, activity on arrow network, risk management: risk, categories of risk, identification, assessment, planning, management, resource allocation, monitoring and control.

TEXT BOOK

1] T. R. Banga, S. C. Sharma, “industrial organization and engineering economics”, Khanna publication

2] Amrine, Manufacturing Organization and Management, Pearson, 2nd Edition, 2004.

REFEDRENCE BOOK

1] Bob Hughes and Mike Cotterell, “software project management” 4 Th edition, tata McGraw-Hall.

2] Industrial Engineering and Management O.P. Khanna, Dhanpat Rai.

ECN – 425 COMPUTER NETWORK LABORATORY 1 Credits

COMPUTER NETWORK LAB

1] Write C program to find shortest path between two or more nodes.
2] Write a program to determine shortest path using flyod's algorithim.
3] Using generator polynomial obtains CRC Code & hence calculates checksum for the code.
4] Write a C program to find the minimum spanning tree of a subset.
5] Write an program for the encryption and decryption of given data.
6] Write a program to simulate character stuffing and stuffing.
7] Write a program to simulate bit stuffing and stuffing.

ECN – 426 OPTICAL FIBER COMMUNICATION LABORATORY 1 Credits

LIST OF EXPERIMENTS: (Any eight)

1] Study and plot of V-I Characteristics of LED as a light source.
2] Study and Measurement of Numerical Aperture of a fiber.
3] Transmission of Digital Signals through a fiber optic link.
   a) PSK/QPSK modulation & demodulation
   b) ASK modulation & demodulation
   c) PC module
   d) To study DPSK modulation.
4] Measurement of attenuation of optical fiber cable of various lengths.
5]To Study various type of losses in Optical fibers using laser transmission.
6] To demonstrate optical amplifier design for dense WDM system using EDFA Physical Model.
7] Effect of EMI/RFI
8.]Pulse broadening effect in fiber optics communication
9] To demonstrate the NRZ & RZ modulation formats in Optical Communication.
10]. To study the effect of stimulated Brillouin scattering (SBS) on a fiber's transmission performance.
11]Study of modulation & Demodulation of light source by pulse width modulation technique.
12] Setting up of F. O. Voice Link using PWM.

ECN – 426	Project Part – II	2 Credits

Project part II will be continuation of project part-I under taken by the candidates in the first term. The term work shall consist of a typed report of about 60 pages on the work carried out by a batch of students in respect of the project assigned during the first term part-I and the second term Part-II.

Practical Examination: It shall consist of an oral examination based on the report submitted by the candidates and or the demonstration of the fabricated design project. The said examination will be conducted by a panel of two examiners consisting of preferably the guide working as a senior and other external examiner preferably from Industry or the university.

Note:

The candidate must bring the project part-I report and the final report completed in all respect while appearing for practical examination of the project.