Rashtrasant Tukadoji Maharaj Nagpur University

Formerly Known as Nagpur University

SCHEME OF EXAMINATION FOR

B.E. EIGHTH SEMESTER (ELECTRONICS ENGINEERING)

Sub. Code	Board	SUBJECT	Work Load				Credit				Marks				
											Theory		Practical		Total Marks
			L	P	T	Total	L	P	T	Total	Internal	University	Internal	University	
BEENE801T	Electronics	Microelectromechanical System & System on Chip	4	0	0	4	4	0	0	4	20	80	0	0	100
BEENE802T	Electronics	Computer Communication Network	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE802P	Electronics	Computer communication Network	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE803T	Electronics	CMOS VLSI Design	4	0	0	4	4	0	0	4	20	80	0	0	100
BEENE803P	Electronics	CMOS VLSI Design	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE804T	Electronics	Elective-II	3	0	1	4	3	0	1	4	20	80	0	0	100
BEENE805T	Electronics	Elective-III	3	0	1	4	3	0	1	4	20	80	0	0	100
BEENE806P	Electronics	Project	0	6	0	6	0	6	0	6	0	0	75	75	150
Total			**18**	**10**	**3**	**31**	**18**	**8**	**3**	**29**	**100**	**400**	**125**	**125**	**750**

Elective-II – 1. Wireless Sensor Network 2. Nanotechnology 3. Fuzzy Logic and Neural Networks 4. Satellite Communication

Elective-III – 1.Artificial Intelligence 2. Robotics & Automation 3.Speech Processing 4.Data Compression & Encryption

B. E. Eighth Semester

(Electronics Engineering)

MICROELECTROMECHANICAL SYSTEMS & SYSTEMS ON CHIP

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE801T **[4 – 0 – 0 – 4]**

Objectives:

1. To understand Standard micro fabrication techniques and the issues surrounding them.
2. To understand Major classes, components, and applications of MEMS devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems.
3. To understand micro fabrication techniques and applications to the design and Manufacturing of an MEMS device or a microsystem

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Outcome: **By the end of the course ,the students shall be able to**

1. Understand working principles of currently available microsensors, actuators used in Microsystems.
2. Apply scaling laws that are used extensively in the conceptual design of micro devices and systems.
3. Understand the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching.
4. Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process
5. Consider recent advancements in the field of MEMS and devices

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UNIT 1: Introduction to MEMS

(06)

Benefits of Miniaturization, Types of MEMS: Optical MEMS, Bio- MEMS, RF- MEMS, Microfluids, Success Stories, Pressure sensor, Accelerometer, Micro-mirror TV Projector

UNIT 2 : **Microfabrication and Micromachining**

(08)

Integrated Circuit Processes, Bulk Micromachining, Surface LIGA process , *wet & dry etching processes* , Device fabrication using Surface Micromachining example, Microcantilever fabrication

Unit 3: Transducers

(10)

Chemical and Biological Transducers: basic concepts of cellular biology, chemical sensors, molecule-based biosensors, cell-based biosensors, chemical actuators, biological transducers and electrophoresis: optical transducers, thermal transducers, magnetic transducers, RF transducers.

UNIT 4: RF MEMS Devices **(08)**

Capacitor, Inductor, Switches, and antennas, RF MEMS components in communications, space and defense applications

UNIT 5: Micro System Packaging **(06)**

Overview of mechanical packaging of microelectronics micro-system packaging.

UNIT 6: Introduction to system-on-chip

(07)

Design of system on chip , Microsystems technology and applications, core architecture for digital media and the associated compilation techniques

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TEXT BOOKS:

1." Micro and Smart Systems", Ananthasuresh, G. K., Vinoy, K. J., Gopalakrishnan, S., Bhat, K. N., and Aatre V.K., Wiley-India, NewDelhi, 2010.
2. . "Micromachined Transducers Sourcebook" , Kovacs, Gregory T. A, McGraw-Hill Publications

REFERENCE BOOKS:

1. VLSI Technology, Sze S.M. (ed), McGraw Hill Publications
2. RFMEMS and Their Applications: Vijay Varadan, K. J. Vinoy, K. A. Jose, Wiley, 2002.
3. "MEMS Practical Guide to Design, analysis and Applications", Jan G Korvinik and Oliver Paul William Andrew, Inc Springer.
4. "MEMs & Microsystem Design and Manufacture", Tai-Ran Hsu, McGraw Hill Publication
5. "MEMs", Nitaigour Premchand Mahalik, McGraw Hill Publications

B. E. Eighth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

COMPUTER COMMUNICATION NETWORK

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code : BEECE802T/ BEETE802T/ BEENE802T **[4 – 0 – 1 – 5]**

Objectives:

1. To explain the basic concept of computer communication network.
2. To explain the computer network layer.
3 To explain IP addressing scheme.
4. To explain network process.
5. To study Hardware aspect of network communication.
6. To make selection of IEEE LAN standards.
7. To explain network security & administration.

Outcome: **By the end of course, the students shall be able to**

1. Understand the requirement of theoretical & practical aspect of computer network.
2. Understand the network traffic in computer network.
3. Describe various protocols used in network.
4. Describe the concept of computer network security.
5. Understand the different wired &wireless LAN stds.& Routers.

Unit 1: Introduction to Computer Networks **(06)**

Uses of computer Network, Network Software-design Issues for layers, Service primitives and relationship of services to Protocols, Reference models-OSI &TCP/IP, network architectures introduction, Example of networks-X.25, Frame Relay & ATM, Protocols and Standards.

Unit 2: Physical Layer **(10)**

Physical layer-Data rate limits, Transmission media-guided and Unguided, Switching systems-Circuit switching, Datagram Switching & Virtual circuit switching, Structure of circuit and packet switch, cable modem and DSL technologies, SONET basics, selection of IEEE std 802.11 ,a,b,c,g.

Unit 3: Data link layer **(10)**

Data link layer: Framing, Flow & Error control Protocols, HDLC, PPP, Multiple access techniques-random access, controlled access & Channelization, Ethernet types-bridged, Switched, Full duplex, Fast & gigabit Ethernet, Introduction to Data link layer in 802.11 LAN, Connecting devices like passive hubs, repeaters, Active hubs, Bridges, Two-layer Switches, Routers, three layer switches, Gateway etc., Backbone networks, Virtual LANs, Simple Router architecture, Sliding window protocol.

Unit 4: Transport Layer and Network Layer **(10)**

Transport layer-Process to process delivery, Connection oriented & Connectionless Transport, UDP, TCP, congestion control and Quality of Service.

Network Layer: IPv4 address, IPv6 address, Address mapping-ARP, RARP & DHCP, IPv4 datagram detail format, IPv6 datagram detail format, ICMP, IGMP, Network layer issues like Delivery, forwarding, intra-domain and Inter-domain routing, Routing algorithms like Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Path vector routing etc., Addressing types-Physical, Logical & port address.

Unit 5: Application Layer **(10)**

Application layer protocols and applications like Ping, FTP, telnet, http (www), SMTP, SNMP, Trace route, TFTP, BOOTP, DNS, NFS, RPC, X-server, E-mail, Introduction to streaming Audio/Video,P2P file sharing, Introduction to socket programming.

Unit 6: Basics of Network Security and Network administration. **(09)**

Network security: Introduction to Cryptography, Secret key algorithm, public key algorithm, Hash Functions, basic ITU-T Recommendation - X.805 Security Architecture, Basics of Security Requirements/Services/Dimensions, Basics of Security attacks, Basics of Security mechanisms / solutions**.**

Network Administration: UTP Cabling for PC to PC communication, Network tester, network monitoring, Protocol Analyzer, Network Simulation, internet access through Dialup/DSL/Leased Line/Mobile handset.

Text Books

1. Behrouz A. Forouzan," Data Communications and Networking", 4th Edition, Tata McGraw Hill
2. Andrew Tenenbaum, "Computer Networks", 4th Edition, Pearson Education.
3. Kurose & Ross, "Computer Networking- A top Down Approach featuring the Internet", 3rd edition, Pearson Education.
4. William Stallings, "computer Networks and Cryptography", 3rd edition, Pearson Education

Reference Books

1. Behrouz A. Forouzan, "TCP/IP protocol Suit", 3rd edition, Tata McGraw Hill Publications
2. Stevens,"TCP/IP illustrated Volume - I & II", Pearson education.
3. Feibel Werner, "Encyclopaedia of networking", Pearson education.
4. Frank J. Derfler, "Practical Networking", 2nd edition, QUE international Publishing.
5. Atul Kahate, "Cryptography and Network Security", 2nd edition, TATA McGraw Hill
6. Kenneth Mansfield, "Computer Networking from LANs to WANs: Hardware, software & Security", CENGAGE learning.
7. Nurul Sarkar, "Computer Networking & Hardware concepts", Information Science Publisher, USA.

B. E. Eighth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

COMPUTER COMMUNICATION NETWORK

Duration: 2 Hrs.
College Assessment: 25 Marks
University Assessment: 25Marks

Subject Code: BEECE802P/ BEETE802P/ BEENE802P **[0 – 2 – 0– 2]**

Objectives:

The objective of this course is to provide students with understanding of

1. Various physical equipments used for networking
2. Various types of protocols working on various layers of OSI reference model
3. Connecting computers in Local Area Network

Outcomes:

At the end of the course the student should be able to

1. understand and select various cables and connectors used for networking
2. Establish peer to peer computers as well as Local Area Network connectivity
3. Effectively use available networking tools in Computer Communication Network

Any EIGHT practicals are to be conducted

LIST OF EXPERIMENTS

1) To study network simulator & get familiar with NS2
2) To create network Topology in NS2.
3) To demonstrate data transmission using Ping protocol, tracert, IP configuration & hub.
4) To study the fundamental of socket programming.
5) To understand IP address of the system, dhcp, network address translation.
6) To understand the domain name server.
7) To Study Protocol analyzer.
8) To configure router
9) To Study of FTP, HTFT protocol.
10) To perform PC to PC communication using RS-232 port.
11) To understand Wireless TCP and UDP protocols
12) To demonstrate Network security cryptography

B. E. Eighth Semester

(Electronics Engineering)

CMOS VLSI DESIGN

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE803T **[4 – 0 – 0 – 4]**

Objectives:

1. Motivating students to learn basics of CMOS VLSI design.
2. To learn CMOS device parameters and characteristics.
3. To detect faults and errors in the design.
4. To learn physical design of logic gates.
5. To Study CMOS processing technology.

Outcome: By the end of course, the students shall be able to

1. Design PMOS and NMOS transistor.
2. Implementation different combinational logic circuits.
3. Design layout for various circuits.
4. Design CMOS transistor.
5. Experiment on CMOS logic design.
6. Detect and correct errors in VLSI Design.

UNIT 1: MOS TRANSISTORS **(08)**

nMOS enhancement and pMOS enhancement transistor, threshold voltage, body effect, MOS effect, MOS device equations, small signal model for MOS transistor.

UNIT 2: CMOS INVERTER **(10)**

Principle of operation, dc characteristics, transient characteristics, β_n/β_p ration, noise margin, static load MOS inverter, transmission gate, introduction to Bi-CMOS inverter.

UNIT 3: STUDY OF CMOS LOGIC **(08)**

Study of combinational logic, gates, compound gates, multiplexers, and memory elements using CMOS technology.

UNIT 4: CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION **(06)**

Resistance and capacitance estimation, switching characteristics, power dissipation, charge sharing.

UNIT 5: VLSI DESIGN (06)

VLSI processing integration , layout design rules, and stick diagram representation latch up, CMOS circuits and logic design: transistor sizing, fan-in, fan-out and physical design of simple logic gates, CMOS logic structures and clocking strategies.

UNIT 6: DESIGN FAULTS (07)

Types of fault, stuck open, short, stuck at 1, 0 faults, Fault coverage, Need of Design for Testability (DFT), Controllability, predictability, testability, Built In Self Test (BIST), Partial and full scan check, Need of boundary scan check, JTAG, Test Access Port (TAP) controller.

Text Books:

1. "Principal of CMOS VLSI design", Neil H. E. Weste, K. Eshraghian, Addison Wesley VLSI Series.
2. "Digital Interrogated circuits, A Design Perspective" , J. M. Rabaey, A. Chandrakasan, and B. Nikolic., PHI Publications .
3. "CMOS VLSI Design" , Pucknell & K. Eshraghain, PHI Publications

REFERENCES BOOKS:

1. "VLSI Technology", S.M. Sze, McGraw Hill Publications
2. "VLSI Design Technologies for Analog & Digital Circuits", Randall L Gei , McGraw Hill Publications

B. E. Eighth Semester

(Electronics Engineering)

CMOS VLSI DESIGN

Duration: 2 Hrs.
College Assessment: 25 Marks
University Assessment: 25Marks

Subject Code: BEENE803P **[0 – 2 – 0– 2]**

Objectives:

1. To learn CMOS device parameters and characteristics.
3. To implement different combinational circuits using CMOS.
4. To learn physical design of logic gates.
5. To Study CMOS processing technology.

Outcome: By the end of course, the students shall be able to

1. Design PMOS and NMOS transistor.
2. Implementation different combinational logic circuits.
3. Design layout for various circuits.
4. Design CMOS transistor.

Any EIGHT practicals are to be conducted

LIST OF EXPERIMENTS

1. To study characteristic of NMOS/PMOS.
2. To study DC characteristic of CMOS.
3. To study CMOS as a inverter.
4. Implement 2:1 Multiplexer using transmission gate.
5. Implementation of NAND gate.
6. Implementation of NOR gate.
7. Implement Half adder using transmission gate.
8. Implement XOR operation using Pass transistor.
9. To study characteristic of BiCMOS inverter.
10. Design a layout $Y = \overline{A.(D + E) + B.C}$
11. Implement D-Flip flop.
12. To study characteristics of NMOS transistor by varying W/L ratio.
13. Implementation of Psudo –NMOS.

NOTE: All the designs should DRC (Design Rule checked)

B. E. Eighth Semester
(Electronics Engineering)

Elective 2- WIRELESS SENSOR NETWORK

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE804T **[3 – 0 – 1 – 4]**

Objectives:

1. Introduce wireless sensor network architectures and communications protocols provide an understanding of mutual relationships and dependencies between different protocols and architectural decisions by offering an in-depth investigation of relevant protocol mechanisms.
2. Introduce sensor network platforms, operating systems and programming tools for sensor networks.
3. Introduce design spaces for sensor networks
4. Study wireless sensor network solutions with practical implementation examples and case studies.
5. Introduction to wireless sensor networks: Challenges for WSNs, enabling technologies.
6. Single node architecture: Hardware components, energy consumption of sensor nodes, operating systems and execution environments.

Outcome:

By the end of this course, the students shall be able to

1. Demonstrate advanced knowledge and understanding of the engineering principle of sensor design, signal processing, established digital communications techniques, embedded hardware and software, sensor network architecture, sensor networking principles and protocols.
2. Demonstrate a computing science approach, in terms of software techniques, for wireless sensor networking with emphasis on tiny sensors, sensor specific programming languages, RFID technology, embedded architectures, software program design and associated hardware, data fusion.
3. Demonstrate knowledge of the associated business, legislative, safety and commercial issues; future technological advances and the way these will impact on the engineering product enterprise process.

Unit: I **(08)**

Introduction and Overview of Wireless Sensor Networks, Commercial and Scientific Applications of Wireless Sensor Networks, Basic Wireless Sensor Technology, Sensor Taxonomy, wireless network environment, wireless network trends.

Unit: II **(08)**

Radio technology primer, Available wireless technologies, Wireless Sensors Networks Protocols, Physical Layer, Fundamentals of Medium Access Control Protocols for Wireless Sensor Networks, MAC protocols for WSN, Case Study, IEEE 802.15 4LR WPAN, Standard case study.

Unit: III **(08)**

Sensors Network Protocols, Data dissemination and gathering, Routing Challenges and design issues in wireless sensor network, Routing strategies in WSN.

Unit: IV **(08)**

Protocols, Transport Control Protocols for Wireless Sensors Networks, Traditional transport control protocol, transport protocol design issues, examples of existing transport control protocol, performance of TCP.

Unit: V **(06)**

Middleware for Sensor Networks, WSN middleware principles, Middleware architecture, existing middleware.

Unit: VI **(07)**

Network Management for Wireless Sensor Networks, Requirements, Design issues, Examples of management Architecture, Performance and Traffic Management Issues.

Text Books:

1. Morgan Kaufmann F. Zhao and L. Guibas, ' Wireless Sensor Networks',San Francisco, 2004.
2. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati , 'Wireless sensor networks',Edition: 2, Published by Springer, 2004 ISBN 1402078838, 9781402078835

Reference Books:

1. "Wireless Sensor Networks: Technology, Protocols, and Applications", Kazem Sohraby, Daniel Minoli, Taieb Znati, WIey Interscience Publication, 2007
2. "Computer Networks" ,Andrew Tanenbaum, 4th ed, Pearson Education,2007

B. E. Eighth Semester
(Electronics Engineering)

Elective 2- NANOTECHNOLOGY

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE804T **[3 – 0 – 1 – 4]**

Objectives: The objective of the course is to

1. **Study the fundamentals of nanotechnology.**
2. **Study different tools for measuring nanostructures.**
3. **Learn different nano-devices and its fabrication process**
4. **Learn the applications of nanotechnology in different area of Engineering and Technology**

Outcome: **By the end of the course, the students shall be able to**

1. **Understand the fundamental of nanotechnology**
2. **Apply different tools for the measurement of nano-structures.**
3. **Apply specific methodology for Fabrication of nano-devices for specific application.**
4. **To understand the use of nanotechnology in Electronics engineering field.**

Unit 1: Introduction **(06)**

Introduction to Nanotechnology: Fundamental science behind nanotechnology, tools for measuring nanostructures, tools to make nanostructures and imagine nano-behaviours

Unit 2: Nano-CMOS Devices **(08)**

Silicon Nanocrystal non volatile memories, Novel dielectric materials for future transistors, Nano-CMOS devices and applications. Tools for measuring nanostructures, scanning probe instrument, nanoscale lithography.

Unit 3: Nano particles and Nanotubes **(10)**

Properties of Nano particles: Metal nanostructures and semiconducting nanoparticles, Carbon nanostructures: carbon molecules, clusters, nanotubes, properties of nanotubes- strength and elasticity, applications of carbon nanotubes.

Unit 4: Nanomachines and Nanodevices **(06)**

Nanomachines and Nanodevices, NEMS and MEMS and their fabrication, molecular and super molecular switches. Lithography.

Unit 5: Nanoelectronics

(08)

Introduction, the tools of manufacturing of micro and nano fabrication optical lithography, electron beam lithography, atomic lithography. Nano-Electronics for advanced computation and communication.

Unit 6: Nanotechnology in Electronics

(07)

Use of Nanotechnology in Electronics: Application of nano structures in electronics, sensors, optics, energy capture, transformation and storage. Application of nanotechnology in biomedical electronics.

Text Books

1. Anatoli Korkin, Jan Labanowski, Evgeni Gusev, Serge Luryi , "Nanotechnology for Electronic Materials and Devices"; Springer.
2. Mark Ratner, Daniel Ratner , "Nanotechnology: A Gentle introduction to a next big Idea"; Pearson Education.
3. Gregory Timp, "Nanotechnology"; Springer-Verlag NY.
4. Introduction to Nanotechnology –by Charles P. Poole Jr., Frank J. Owens – John Wiley & Sons.

A. Text Book of Nanoscience & Nanotechnology – T. Pradip, McGraw Hill Publications

B. E. Eighth Semester
(Electronics Engineering)

ELECTIVE 2 - FUZZY LOGIC & NEURAL NETWORKS

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE804T **[3 – 0 – 1 – 4]**

Objectives:

1. **To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals , Program the related algorithms and design the required and related systems**
2. **To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm**
3. **To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events**

Outcome: By the end of the course, the students shall be able to

1. **Understand the adequate knowledge about feedback neural networks.**
2. **Understand the concept fuzzy logic control to real time systems.**
3. **Provide adequate knowledge about fuzzy set theory.**
4. **provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic**
5. **Study and understand defuzzification techniques.**
6. **Understand and design genetic fuzzy controller.**
7. **Gain comprehensive knowledge of adaptive fuzzy system.**

UNIT I: INTRODUCTION: **(10)**

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, Single Layer Perception , multilayer perception & its limitation.

UNIT II: MULTILAYER FEED FORWARD NETWORKS **(08)**

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

UNIT III: SINGLE LAYER FEEDBACK NETWORKS: (07)

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

Application of Neural Networks: control system application like washing machine, refrigerator, signal processing application like ECG,EMG,EEG.

UNIT IV: INTRODUCTION TO FUZZY LOGIC (08)

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

UNIT V: FUZZYFICATION AND DEFUZZIFICATION (07)

Membership functions, Membership assignment, lambda cuts, Defuzzification methods, **Fuzzy Arithmetic:** Fuzzy numbers, vectors, extension principle, crisp functions, mapping, fuzzy transforms, interval analysis, fuzzy logic controller design.

UNIT VI: APPLICATIONS OF FUZZY LOGIC (05)

Specific application in the field of control system and Image processing and signal processing, Design of genetic fuzzy controller.

TEXT BOOKS:

1. J. M. Zurada, Introduction to Artificial Neural Networks, Jaico Publishing house.
2 T. M. Ross, Fuzzy logic, Mc-Graw Hill Inc.
3. Kosoko, Neural Networks and Fuzzy Systems, PHI Publications

REFERENCE BOOKS:

1. Artificial Neural Network – Simon Haykin, Pearson Education, 2nd Ed.
2. Fundamental of Neural Networks – Laurene Fausett, Pearson, 1st Ed.
3. Neural Fuzzy Systems, C.T Lin & C S George Lee, Prentice Hall.
4. , Fuzzy Logic with Engineering Applications , Timothy J. Ross, 2nd edition, McGraw Hill.
5. Fuzzy Sets & Fuzzy Logic- Theory & Applications, George J. Klir, Bo Yuan , Prentice Hall Publications
6. Neural Network, Fuzzy Logic & Genetic Algorithm , S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI Publications.
7.Neural Networks – A classroom approach , Satish Kumar, McGraw Hill
8. Neural Network Design - Martin T. Hagan, Cenage Learning

B. E. Eighth Semester
(Electronics Engineering)

Elective 2- SATELLITE COMMUNICATION

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE804T **[3 – 0 – 1 – 4]**

Objectives: Course Objectives:

1. **To learn working principle of satellite communication system.**
3. **To understand the orbital aspects and components of a satellite communication system.**
4. **To analyze the link budget of a satellite communication system and study of satellite orbits and launching.**
5. **To get knowledge and relate different components in satellite communication and use them in projects.**

Outcome: At the end of the course, the student shall be able to:

1. **Do research with capabilities in the design, development and manufacture of satellite communication systems used in a wide spectrum of applications.**
2. **Experience real world experience from household appliances to sophisticated satellite communication, from electronic ignition to neural networks and signal processing chips & to integrate academic discipline with project-based engineering applications, classroom learning theory**
3. **Able for Acquisition of technical competence in specialized areas of Satellite Communication engineering.**
4. **Able to identify, formulate and model problems and find Satellite Communication engineering solutions based on a system approach.**

UNIT I:

(08)

Introduction: Origin of Satellite communication, Current state of satellite communication. Orbital aspect of satellite communication: Orbital mechanism, equation of orbit, locating satellite in orbit, orbital elements, and orbital perturbation. Space craft subsystem: Attitude and orbit control system, Telemetry tracking and command power system, and communication subsystem.

UNIT II:

(08)

Satellite link design: System noise temperature and T / T ratio, down link design, domestic satellite system, uplink design, design of satellite link for specified (C / N).

UNIT III: **(08)**

Multiple access techniques: FDMA, FDM / FM / FDMA, effects of intermodulation, companded FDM / FM / FDMA, TDMA, TDMA frame structure and design, TDMA synchronization and timing, code division multiple access, SS transmission and reception; Applicability of CDMA to commercial system, multiple access on board processing SCPS system, digital speech interpolation system, DAMA.

UNIT IV: **(08)**

Propagation on satellite: Earth's path – propagation effects, atmospheric absorption, Scintillation effects, Land and Sea multipath, Rain and ice effects, Rain drop distribution, calculation of attenuation. Rain effects on Antenna noise temperature.

UNIT V: **(08)**

Encoding and forward error correction: Error detection and correction, channel capacity, error detecting codes, linear block codes, error correction with linear block codes, performance of block error correction codes, convolution codes, cyclic codes, BCH and codes, error detection on satellite links.

UNIT VI: **(05)**

Earth Station technology: Earth Station design; antennas tracking, LNA, HPA, RF multiplexing, factors affecting orbit utilization, tracking, equipment for earth station.

Text BOOKS:

1. "Satellite Communication" by T. Pratt. Charles Bostian and Jeremy Allnutt, 2nd Edition, John Wiley & Sons, 2003.
2. " Satellite Communication", D. C. Agrawal, Khanna Publishers
3. "Satellite Communication", Dennis Roddy , 4th Edition, McGraw- Hill International edition, 2006.
4. "Satellite Communication" , T. T. Hai., Mc.Graw Hill Publications

REFERENCES BOOKS:

1. Satellite Communication Systems Engineering, W. L. Pitchand, H. L. Suyderhoud, R. A. Nelson, 2nd Ed., Pearson Education., 2007.

2. Satellite Communication , Mark R Chartrand, Cenage Learning

B. E. Eighth Semester
(Electronics Engineering)

Elective 3- ARTIFICIAL INTELLIGENCE

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE805T **[3 – 0 – 1 – 4]**

Objectives:

1. To introduce the fundamental concepts of artificial intelligence;
2. To equip students with the knowledge and skills in logic programming using Prolog;
3. To explore the different paradigms in knowledge representation and reasoning;
4. To explain the contemporary techniques in machine learning;
5. To evaluate the effectiveness of hybridization of different artificial intelligence techniques.

Outcome:
By the end of the course students shall be able to:

1) 1.understand the history, development and various applications of artificial intelligence;
2) 2.familiarize with propositional and predicate logic and their roles in logic programming;
3) understand the programming language Prolog and write programs in declarative programming style;
4) learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
5) understand how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic);
6) master the skills and techniques in machine learning, such as decision tree induction, artificial neural networks, and genetic algorithm;
7) apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.

Unit 1: Foundation **(08)**

Intelligent Agents, Agents and environments, Good behavior, The nature of environments, structure of agents, Problem Solving, problem solving agents, example problems, searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information.

Unit 2: Searching **(08)**

Search and exploration, Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Constraint satisfaction problems (CSP), Backtracking search and Local search for CSP, Structure of problems, Adversarial Search, Games: Optimal decisions in games, Alpha- Beta Pruning, imperfect real-time decision, games that include an element of chance.

Unit 3: Knowledge Representation (08)

First order logic, representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution, Knowledge representation, Ontological Engineering, Categories and objects, Actions - Simulation and events, Mental events and mental objects.

Unit 4: Learning (08)

Learning from observations: forms of learning, Inductive learning, Learning decision \trees, Ensemble learning, Knowledge in learning, Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learning methods, Learning with complete data, Learning with hidden variable, EM algorithm, Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement learning.

Unit 5: Perception and Expert System (06)

Visual perception -Waltz's algorithm, Introduction to Expert System, Architecture and functionality, Example Expert system

Unit 6: Natural Language Understanding (07)

Why NL, Formal grammar for a fragment of English, Syntactic analysis, Augmented grammars, Semantic interpretation, Ambiguity and disambiguation, Discourse understanding, Grammar induction, Probabilistic language processing, Probabilistic language models.

Text Book

1. Stuart Russell, Peter Norvig, "Artificial Intelligence, A Modern Approach", 2nd Edition, Pearson Education / Prentice Hall of India, 2004.

Reference Books

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw- Hill,
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.
4. Eugene charniak, "Introduction to Artificial Intelligence", Pearson Education.
5. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Publications

B. E. Eighth Semester
(Electronics Engineering)

Elective 3- ROBOTICS & AUTOMATION

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE805T **[3 – 0 – 1 – 4]**

Objectives:
The course has been so designed to give the students an overall view of the mechanical components. The mathematics associated with the same. Actuators and sensors necessary for the functioning of the robot.

Outcome:
By the end of the course, the students shall be able to
1. Explore 8051 microcontroller architecture
2. Effectively utilize instruction set for assembly language programming
3. Interface different on & off chip peripherals with 8051 using C language
4. Basics of 8051 can be used for robotic applications

UNIT1: **(10)**

Definition of a Robot, A brief introduction to Robot Technology, Sensory perception, Intelligence, End Effectors, Sensory feedback, Robot Vision / Computer Vision and its fundamental components, Tactile Sensing, Range finding and real world navigation Speech synthesis and recognition. Robot control fundamentals : The Artificial intelligence view point, comparison of human brain and computer in the context of intelligent behavior, problem representation in A.I., system problem solving technique in A.I.

UNIT 2: **(08)**

Definition of knowledge, Domain and logic : Elements of logic, proportional calculus, predicate calculus, pros and cons of logic, production system and their basis elements, about Expert system comparison of various methods of knowledge representation.

UNIT 3: **(08)**

Elements of speech, Time Domain Analysis / Synthesis of speech and waveform digitization, frequency Domain Analysis / Synthesis of speech phoneme Speech Synthesis, various type of speech recognition Systems and their basics ideas, Isolated word Recognition, Connected Speech understanding.

UNIT4: **(06)**

Elements of vision, Image Transformation, Image Analysis, Image Understanding of Machine perception, Industrial Vision System.

UNIT 5: **(06)**

Triangularation Method, Time of Flight (TOF), Ranging Method, Robot Position and Proximity Sensing, Tactile- Sensing System, Sensing Joint Forces and their importance in Robot programming, sensing tough and slip

UNIT 6 : **(07)**

Various Root Programming Languages and their characteristics, characteristics of Robot Task Level language, comparison of Robot programming language, features of the high level languages used in conventional programming language, featuring with the high level language used in conventional programming.

TEXT BOOKS :

1. Staugard A.C. : "Robotic and AI", Prentice Hall, Engle Wood Cliff N.J. 1987.
2. Lee C.S.G., Fu K. S., Gonzalez R.C. : "Robotic-Control, Sensing and Intelligence", Mc- Graw Hill, Singapore, 1987.

REFERENCE BOOKS :-

1. Klafferetal : "Robotics", Prantice Hall Publications
2. Parent M. and Laugreau C. : "Robot Technology (Vol.4 : Logic and Programming", Kogan Page, London, 1985.
3. Aleksander I. ,Farreny H. and Ghallab M. : "Robot Technology" (Vol-1)., Decision and Intelligence "Kogan Page", 1986.
4. S.R. Deb, " Robotics Technology & Flexible Automation", McGraw Hill Publication
5. S.K. shaha, "Introduction to Robotics", McGraw Hill Publication

B. E. Eighth Semester
(Electronics Engineering)

Elective 3- SPEECH PROCESSING

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE805T **[3 – 0 – 1 – 4]**

Objectives: The objective of the course is

1. To get familiarize about different speech processing techniques and algorithms.
2. To study different models in time domain and frequency domain for speech processing.
3. To learn different techniques of speech enhancement.
4. To learn techniques for automatic speech recognition and speaker recognition.

Outcome:

By the end of the course, the students shall be able to

1. Apply different techniques for enhancement of speech signals
2. Correctly apply specific speech processing technique and algorithm for a particular application.
3. Develop speech processing models.

Unit 1: Fundamentals of Digital Speech Processing

(08)

Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production, Digital models for speech signals.

Time Domain Models For Speech Processing: Introduction, Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs. silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach,

Unit 2: Linear Predictive Coding (LPC)

(08)

Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Pitch Detection and using LPC Parameters.

Unit 3: Homomorphic Speech Processing

(08)

Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, Mel frequency cepstrum computation.

Unit 4: Speech Enhancement

(06)

Nature of interfering sounds, Speech enhancement techniques: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter.

Unit 5: Automatic Speech Recognition

(08)

Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech patterns, isolated digit Recognition System, Continuous digit Recognition System. Hidden Markov Model for Speech Recognition: Hidden Markov Model (HMM) for speech recognition,

Unit 6: Speaker Recognition

(07)

fundamentals in in speaker recognition and speech synthesis of different speakers. Text to speech conversion, Calculating acoustic parameters, synthesized speech output performance and characteristics of text to speech, Voice processing hardware and software architectures.

Text Books

1. R Rabiner and S.W. Schafer, “Digital processing of speech signals”; Pearson Education.
2. Thomas F. Quateri 1ed, “Discrete Time Speech Signal Processing: Principles and Practice”
3. Deller J. R. Proakis J. G. and Hanson J.H., “Discrete Time Processing of Speech Signal”, Macmillian.
4. L.R Rabinar and B.H. Juang, “Fundamentals of Speech Recognition”, PUBLISHER

Reference books

1. Ben Gold & Nelson Morgan, “Speech & Audio Signal Processing” 1 ed., Wiley.
2. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, Wiley
3. Douglas O'Shaughnessy, “Speech Communications: Human & Machine” 2nd ed., IEEE Press

B. E. Eighth Semester
(Electronics Engineering)

Elective 3- DATA COMPRESSION & ENCRYPTION

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE805T **[3 – 0 – 1 – 4]**

Objectives:

1. To understand the different text compression technique.
2. To study the various audio compression scheme.
3. To verify different video compression & image compression methods.
4. To have the knowledge of various encryption technique.
5. To acquire the information about different authentication technique.

Outcome:

By the end of the course, the students shall be able to

1. Implement various text, audio, video, compression technique.
2. Provide various authentication using digital communication.
3. Gain the knowledge of encryption techniques application to digital communication.

Unit 1: TEXT COMPRESSION (08)

Shannon Fano Coding, Huffmann coding, Arithmetic coding and dictionary techniques- LZW, family algorithms, Entropy measures of performance and Quality measures.

Unit 2: AUDIO COMPRESSION (08)

Digital Audio, Lossy sound compression, μ-law and A-law companding, DPCM and ADPCM audio compression, MPEG audio standard, frequency domain coding, format of compressed data.

Unit 3: IMAGE AND VIDEO COMPRESSION (08)

Lossless techniques of image compression, gray codes, Two dimensional image transforms, JPEG, JPEG 2000, Predictive Techniques PCM and DPCM. Video compression and MPEG industry standard.

Unit 4: CONVENTIONAL ENCRYPTION **(08)**

Introduction, Types of attacks, Steganography, Data Encryption Standards, Block Cipher Principle, S-box design, triple DES with two three keys.

Unit 5: PUBLIC KEY ENCRYPTION AND NUMBER THEORY

(08)

Euler's theorems, Chinese remainder theorem, Principles of public key cryptography, RSA algorithm, Diffie-Hellman Key Exchange. Elliptic curve cryptology, message authentification and Hash functions, Hash and Mac algorithms, Digital signatures.

Unit 6: SYSTEM SECURITY & CASE STUDIES **(05)**

Intruders, Viruses, Worms, firewall design, antivirus techniques, digital Immune systems, Certificate based & Biometric authentication, Secure Electronic Payment System.

Text Books

1. Data Compression – David Salomon , Springer Publication, 4th Edition.

2. Introduction to Data Compression – Khalid Sayood, Morgan Kaufmann Series, 3rd Edition

3. Cryptography and Network Security – William Stallings, Pearson Education Asia Publication,

4. Cryptography and Network Security – Behrouz Forouzan, McGraw-Hill, 1st Edition.

Reference Books:

1. The Data Compression Book – Mark Nelson, BPB publication, 2nd Edition

2. Applied Cryptography – Bruce Schnerer, John Willey & Sons Inc. Publication, 2nd Edition

3. Cryptography & Network Security – Atul Kahate, Tata McGraw Hill, 2nd Edition

4. Cryptography and Network Security – Behrouz A. Forouzan , Special Indian Addition, SIE

5. Network Security & Cryptography – Bernard Menezes, Cenage Learning