STRUCTURE OF

B.E. (ELECTRONICS & TELECOMMUNICATIONS) 2008 COURSE

TERM - I

SUBJECT CODE	NAME OF SUBJECT	TH	PR	TUT	PP	TW	OR	PR	TOTAL MARKS
404181	ELECTRONICS PRODUCT DESIGN	3		1	100	25			125
404182	VLSI DESIGN & TECHNOLOGY	4	2		100			50	150
404183	COMPUTER NETWORK	4	2		100		50		150
404184	ELECTIVE-I	4	2		100	25		50	175
404185	ELECTIVE-II	4			100				100
404186	PROJECT (PART-1)		2			50			50
		19	8	1	500	100	50	100	750

Elective –I

1. Digital Image Processing
2. Embedded System and RTOS
3. Industrial Drives Control
4. Microwave Communication and Radar

Elective-II

1. Entrepreneurship Development
2. Joint Time Frequency Analysis
3. Micro-electromechanical-system and System on chip (MEMS and SOC)
4. Mobile Communication

ELECTRONIC PRODUCT DESIGN (404181)

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	**Paper:** 100 Marks
Tutorial: 1 Hr/week	**Term work**: 25 Marks

Unit 1: Introduction

Stages in product design- Market survey, Product Specifications (Electrical, Mechanical, Environmental), R&D and Engineering Prototypes, Pilot Production Batch, Environmental testing, Documentation, Manufacturing. 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. Fundamentals of Communication System Design, criteria for selection of frequency bands, requirements of Voice and Multimedia Applications

Unit 2: Hardware designs- Analog

Analog Signal Conditioning- Factors affecting choice of OPAMPs in signal conditioning applications. Need for Instrumentation Amplifiers- Case study. Error budget analysis with Case study. ADCs- Interpretation of ADC specifications from design view point. Considerations in selecting References (Vref for ADC).DACs- Interpretation of DAC specifications from design view point.

Unit 3: Hardware design- Digital

Interface examples for- LED, HB LED, LCD, Keyboard, Touch Screen. Microcontrollers- Comparative study of different Microcontroller Architectures, Factors affecting choice of Microcontroller for particular application with Case study of one application. Introduction to buses and protocols used in Electronic Products- I2C, SPI.

Unit 4: Software design and testing for Electronic Product

Different approaches to development of application software for Electronic Product. Factors affecting choice between Assembly language and High level language like C and C++. Documentation practices and templates for above software.Debugging tools and techniques for software- Features and limitations of- Debuggers, Simulators, ICE, IDE. Hardware Test Programs.

Unit 5: PCB design and EMI/EMC

PCB Design practices for Analog and Mixed signal circuits- Ground Loops, Precision circuits, shielding and guarding. PCB Design Practices for High Speed Digital Circuits, Signal integrity and EMC. EMI/EMC testing standards and compliance.

Unit 6: Design Considerations of Communication Systems

Implementing Radio link, Path profile. RF path loss calculations, Transmitter/Receiver sensitivity, Signal to Noise Ratio and SINAD, Fade Margin. Study and evaluation of Performance parameters like- Bit and Symbol error rates. Spectral bandwidth calculations. Design of various blocks of communication systems such as- Phase-locked Loop, Equalizer and Interleaver.

Text Books

1. Bernhard E. Bürdek, “History,Theory and Practice of Product Design”, Springer Science, 2005
2. Paul Horowitz, “Art of Electronics”, Cambridge University Press
3. Howard Johnson, Martin Graham, “High-speed Digital design- A Handbook of Black Magic”, Prentice Hall Publication
4. Proakis and Salehi “Contemporary Communication Systems Using Matlab”, PWS Publishing Company, 1998
5. G. Pahl andW. Beitz J. Feldhusen and K.-H. Grote, “Engineering Design - A Systematic Approach”, Springer,2007
6. Tim Williams, “EMC for Product Designers”, Elsevier, Fourth edition 2007

Reference Books

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

Tutorials

1. Power supply sizing (Estimation of current requirement)
2. Design of SPAN ZERO circuit
3. Error budget analysis
4. ADC Interface example 6

5. DAC interface example
6. Interfaces- LED, LCD, Touch Screen
7. Case study for deciding appropriate Microcontroller for given application
8. PCB Design for Mixed Signal Circuit (Involving ADC and Signal Conditioning)
9. DC analysis of given circuit
10. AC analysis of given circuit
11. Sensitivity analysis for given circuit
12. Reliability calculations for given circuit from given data
13. Case study of CDMA and OFDM (Using software tools like SIMULINK, MATLAB)
14. Digital Phase-locked loop
15. Equalizer
16. Interleaver 7

VLSI DESIGN AND TECHNOLOGY (404182)

Teaching Scheme	**Examination Scheme**
Lectures/Week: 4Hrs	**Paper:** 100 Marks
Practical/Week: 2Hrs.	**Practical:** 50 Marks

Unit 1: Analog CMOS Design

Enhancement MOSFET equivalent circuit, parasitics, as resistor, diode. Active load, current source and push pull inverter amplifiers. Current source and sink. Common source, drain and gate amplifiers. Cascode amplifier. Differential amplifier. CMOS op-amp.

Unit 2: Digital CMOS Design

CMOS Inverter, voltage transfer curve, body effect, hot electron effect, velocity saturation. Static and dynamic dissipations. Power delay product. Noise margin. Combinational logic design, W/L calculations. Transmission gate, design using TGs. λ parameter, layout, Design Rule Check. Technology scaling.

Unit 3: VHDL and Finite State Machines

VHDL design units, modeling styles, synthesizable and non synthesizable test benches, design flow, functions, procedures, attributes, test benches, configurations, packages. Synchronous and asynchronous machines, Finite State Machines (FSM), metastability, state diagrams and VHDL codes for FSMs.

Unit 4: Programmable Logic Devices (PLDs)

Need of PLDs. Comparison with ASIC, general purpose processor, DSP processor, microcontroller, memories etc. Features, specifications, detail architectures, application areas, limitations of Complex Programmable Logic Device (CPLD) and Field Programmable Logic Devices (FPGA).

Unit 5: Fault tolerance and testability

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.

Unit 6: Signal Integrity and System on Chip

Clock skew, Clock distribution techniques, clock jitter. Supply and ground bounce, power distribution techniques. Power optimization. Interconnect routing techniques, wire parasitics. Design validation. Off chip connections, I/O architectures. Signal integrity issues, EMI immune chip design.

Textbooks

1. Neil H. Weste and Kamran, “Principles of CMOS VLSI Design”, Pearson Publication.
2. Wyane Wolf, “Modern VLSI Design (System on Chip)”, Pearson Publication.
3. John F. Wakerly, “Digital Design, Principles and Practices”, Prentice Hall Publication.

Reference Books

1. Allen Holberg, “Analog CMOS Design”, Oxford University Press.
2. Perry, “VHDL”, McGraw Hill Publication.
3. Charles Roth, “Digital System Design using VHDL”, McGraw Hill Publication.
4. Data Sheets of PLDs.
5. Sung-Mo(Steve) Kang, Yusuf Leblebici, “CMOS Digital Integrated Circuits”, Tata McGraw Hill Publication.

List of practical’s

Group A: To write VHDL code and test bench, synthesis, simulate and down load in to PLD, for the following (Any four).
1. To sense physical parameter such as temperature/pressure/flow etc., convert in to digital using ADC, interface to PLD and display.
2. To write/read in to RAM.
3. To generate ramp/square waveform using DAC.
4. To measure the period of a signal.
5. To design lift/traffic light controller.
6. To design programmable timer/counter.
Group B. To design following logic, calculate W/L ratios, prepare layout in multi metal layers and simulate (Any four).
Assume suitable technology, load capacitance, free running frequency, switching timings etc.
1. CMOS Inverter.

2. CMOS NAND, NOR.
3. 2:1 Mux by conventional method and by using Transmission gates. Comparison of them.
4. CMOS Combinational logic for minimum 4 variables.
5. Minimum 5 stage cascaded Inverter ring counter and understand technology limitations.
6. Clock skew generation and mitigation by any one method for synchronous machine.

COMPUTER NETWORK (404183)

Teaching Scheme	**Examination Scheme**
Lectures: 4 Hrs/week	**Paper:** 100 Marks
Practical: 2Hrs/week	**Oral**: 50 Marks

Unit 1: Physical Layer

Data Communications, Networks, Networks models, OSI model, Layers in OSI model, TCP / IP protocol suite, Addressing, Guided and Unguided Transmission media. Switching: Circuit switched networks, Data gram Networks, Virtual circuit networks. Cable networks for Data transmission: Dialup modems, DSL, Cable TV, Cable TV for Data transfer.

Unit 2: Data Link Layer

Data link control: Framing, Flow and error control, Protocols for Noiseless and Noisy Channels, HDLC. Multiple access: Random access, Controlled access. Wired LANS : Ethernet, IEEE standards, standard Ethernet, changes in the standard, Fast Ethernet, Gigabit Ethernet.

Unit 3: Wireless LANS

Wireless LANS : IEEE 802.11–Bluetooth. Connecting LANS: Connecting devices, Backbone networks, Virtual LANS. Virtual circuit networks: Architecture and Layers of Frame Relay and ATM.

Unit 4: Network Layer

Logical addressing: IPv4, IPv6 addresses. Internet Protocol: Internetworking- IPv4, IPv6 - Address mapping- ARP, RARP,BOOTP, DHCP, ICMP, IGMP, Delivery- Forwarding , Routing -Unicast, Multicast routing protocols.

Unit 5: Transport Layer

Process-to-Process delivery, User Datagram Protocol (UDP), Transmission Control, Protocol (TCP), Congestion Control, Quality of services (QoS), Techniques to improve QoS.

Unit 6: Application Layer

Domain Name System (DNS), E-mail, FTP, WWW, HTTP, Multimedia Network Security: Cryptography, Symmetric key and Public Key algorithms, Digital signature, Management of Public keys, Communication Security, Authentication Protocols. Objective: To study about various applications and to understand the various network security algorithms.

Text Books

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill,2006
2. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition,2003

Reference Books

1. Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education
2. James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown Approach Featuring",3/e, Pearson Education.
3. C.Sivaram Murthy, B.S.Manoj, "Ad hoc Wireless Networks – Architecture and Protocols", Second Edition, Pearson Education.
4. Greg Tomshon, Ed Tittel, David Johnson. "Guide to Networking Essentials", fifth edition, Thomson India Learning, 2007.
5. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.

List of the Experiments (Minimum 8 experiments are to be performed).

1. Study of Windows 2000 operating System & Implementation of LAN
Introduction to Windows 2000 operating systems, Creating accounts and changing passwords, Introduction to networking devices, cables, connectors, etc , Build a small network using Windows 2000 Operating System, Install TCP/IP, Manually configure TCP/IP parameters, Use the IPCONFIG utility to view configured IP parameters, Use the PING utility to test TCP/IP communications and its different options, Share a folder, Connect to a shared folder, Stop sharing a folder, Install and test NetBEUI.

2. Installation and configuration of Web & FTP Services
Install Microsoft Internet Information Server (IIS5) services, Connect to a Web server. Verifying the installed IIS5 services, Assign multiple IP addresses to the web server. Install virtual web servers using IP addresses and port numbers, Use FTP service to transfer files. Use netstat to check the status of the TCP ports. Install virtual FTP servers using IP addresses and port numbers, Network performance study using FTP.

3. Study of DNS, SMTP & POP3 Determine the local host address, Ping to a host using its NetBIOS name Add IP addresses/host name mappings to the local host file Configure DNS service on Windows 2000 server Use Domain Name Service to resolve hostnames into IP addresses. Interact with an Email server using SMTP and POP3 protocols commands.
4. Socket Programming for client/Server application
5. Installation and configuration of Telnet server for Telnet communication.
6. Study of IP Address Classes and DHCP.
Determine the address class, Identify invalid IP address. Assigning IP address in a local area network. Overview about the DHCP server, Installing and configuring a DHCP server, Installing DHCP client.
7. Study of IP Addresses subnetting and CIDR
Basic principles of subnetting, Define a range of subnetted network IDs. Implementation of LANs using subnetted IP address. Assign classless IP address CIDR Implementation of LANs using CIDR IP addresses.
8. Network Protocol Analyser
Examine how networking packets are transferred and exchanged in a TCP/IP network. Student will develop an understanding of the protocols in packets transfer and corresponding protocols like Address Resolution Protocol (ARP), and Internet Control Message Protocol (ICMP). Ethereal software is used to capture, decode and analyze the packets. Students learn how to detect, identify and correct some of the network problems.
9. Configuration of router & study of routing between LAN's
This lab introduces the concepts of IP forwarding and routing between IP networks. The lab exercise show how to set up a Windows PC and a router as an IP router and reveals the similarities of IP forwarding and routing tables on a Widows PC and a router. Students learn how to interpret and manually edit routing-table entries in a network with multiple IP networks and IP routers. Since this is the first lab that uses the routers, there is a component that shows how to access the console port of a router from a Windows PC and how to issue configuration commands on a router.
10. Write a program for Encryption and Decryption
11. Write a program for implementation of Shortest Path algorithm.
12. Study of wireless LANs.

Elective-I

DIGITAL IMAGE PROCESSING (404184)

Teaching Scheme	**Examination Scheme**
Lecturers/week: 4 hrs	**Paper:** 100 Marks
Practicals/week: 2 hrs	**Practical:** 50 Marks
	Term work: 25 Marks

Unit 1: Digital Image Fundamentals

Components of Image Processing System. , Elements of Visual Perception, MTF of Visual System, Image Sensing and Acquisition, Image formation model, Image Sampling & Quantization Spatial and Gray Level Resolution, Basic Relationships between Pixels. Statistical parameters, Measures and their significance, Mean, standard deviation, variance, SNR, PSNR etc.

Unit 2: Image Enhancement

Enhancement in Spatial Domain: basic gray level transformations, histogram processing, equalization, Arithmetic and logical operations between images, Basics of spatial filtering, smoothening and sharpening spatial filters. Image Enhancement in frequency Domain: smoothening and sharpening frequency domain filters. Fundamental of color image processing: color models, RGB, CMY, YIQ, HIS. Pseudo Color Image processing: Intensity filtering, gray level to color transformation, Basics of full color image processing.

Unit 3: Image Transforms

2D-DFT, FFT, DCT, the KL Transform, Walsh/Hadamard Transform, Haar Transform

Unit 4: Image Coding and Compression

Image Coding Fundamentals, Image Compression Model, fundamentals- redundancy: coding, interpixel, psychovisual, fidelity criteria, elements of information theory. Error Free Compression - variable length, bit plane, Lossless Predictive, Lossy Compression-Lossy Predictive. Fundamentals of JPEG, MPEG, fractals.

Unit 5: Image Analysis

Edge detection, spatial feature and boundary extraction, boundary representation by chain codes and B splines, Hough Transform. Morphological Image Processing: Dilation, Erosion, Opening, Closing on Binary Images, Segmentation: Point, line. Edge detection, Boundary detection and Thersholding.

Unit 6: Image restoration and Image Processing Applications

Image Degradation Mode, Noise Models, and Restoration in Presence c Noise in spatial Domain, Linear Filtering, Applications: Character Recognition, Fingerprint Recognition, Remote Sensing. Applications using different Imaging modalities such as acoustic Imaging, Medical imaging, electron microscopy etc.

Text Books

1. Gonzalez and Woods, "Digital Image Processing", Pearson Education,
2. Arthur Weeks Jr., "Fundamentals of Digital Intake Processing", PHI.

Reference Book

1. A. K. Jain, "Fundamentals of Digital Image Processing"; Pearson Education
2. Pratt William, "Digital Image Processing", John Wiley & Sons

List of Practicals

(Atleast 5 assignments should be done using ‘C'. Optional MATLAB support may be given to relevant assignments.)

1. Study of BMP file format and Conversion of 24 bit color image to 8 bit image
2. Study of statistical properties- mean, standard deviation, profile, variance and Histogram plotting.
3. Histogram equalization & modification.
4. Gray level transformations such as contrast stretching, negative, power law transformation etc.
5. Spatial Domain filtering- smoothing & sharpening filters.
6. DCT/IDCT of given image.
7. Edge detection using Sobel, Prewitt and Roberts operators.
8. Morphological operations- erosion, dilation, opening & closing on binary
a. Image.
9. Pseudo coloring.
10. Creating noisy image and filtering using MATLAB. 12

EMBEDDED SYSTEM AND RTOS (404184)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/week	**Paper:** 100 Marks
Practical: 2Hrs/week	**Practical**: 50 Marks
	Term work: 25 Marks

Unit 1: Introduction to Embedded System

Characteristics , design metrics and optimization of various parameters of embedded system .
Current trends and challenges of embedded systems in terms of demand of number of applications,size,cost and power**.**Wireless communication like Bluetooth, GPRS, IRDA, IEEE 802.11 and 802.16. Other protocols like CAN,LIN ,flexray Survey of applications using linux. win CE and Android such as ipod, touch screen, tablet etc Exposure to different architectures. Survey of currently available processors from various manufacturers and comparison of them for embedded application

Unit 2: Processor and Memory

Limitations of 8 bit processors and need of 32 bit processors. Different series of ARM : Arm7,Arm9, Arm11and Arm Cortex architecture. ,Features and applications of each with typical example. Hardware interfacing of devices like LPC2148. using Embedded C language: LED,, Switches, LCD Display ,Serial Communication using on chip UART. On chip Multichannel ADC programming and USB interface with PC. On chip Real Time Clock and .On chip Timer/ counter programming with practical implementation. DSP,VLSI devices such as FPGA,IP CORES & SOC in embedded system. Memory types such as RAM, ROM,, FLASH, EEPROM ,NVRAM, application and selection for embedded system.

Unit 3: Real time Operating System Concept

Comparison of traditional and embedded OS. Software architectures of embedded system and comparison of them. Architecture of kernel, types of scheduler algorithms. µcos II RTOS services **:** Task management, ISR, Timer, Semaphores, mailbox, message queues, pipes, events, signals, memory management.

Unit 4: Embedded Linux

What is Embedded Linux? Development tools required for ARM/Linux applications. Tool chain building. Tool utilities such as Minicomp, Busybox, Redboot, Libc, debugging tools , MTD. First Linux application on ARM: “Hello world!” Linux Kernel architecture and 13

configuration. File system types & support. Interface and accessing PC104 compatible digital and analog I/O cards Introduction to Ethernet and TCP/IP .Writing simple device drivers , Real-time variants of Linux (free and commercial).Linux applications.

Unit 5: Commercial RTOS

Overview of Commercial RTOS like Vxworks, QNX, Nucleus.and symbian. Features of each applicable for embedded applications. Features of Linux, Win CE, Android and symbian OS used in smart mobile phones & development support features. Software development life cycle. Various models like waterfall, spiral, V models and Comparison.

Unit 6: Case Study of Embedded system

Case study of embedded system like digital camera, smart card, ATM. Mobile phones Automotive applications for Car area network ,engine control, safety & fuel efficiency, energy meters, ECG Machines,industrial automations, points of sales terminals. Mobile Internet Device(MTD). Case study should be demonstrated by suitable hardware and software with or w/o RTOS. Should specify processor, Memory & special I/O device. In software should mention No of tasks, priorities, RTOS services such as Semaphore, Mailboxes queues, signals etc. Simple application W/O RTOS should have modular design with drivers and c codes.

Text Books

1. Rajkamal " Embedded Sytems " TMH.
2. David Simon " Embedded systems software primer" pearson
3. Andrew sloss " Arm System Developer guide"
4. Christopher Hallinan " Embedded linux primer" Prenice Hall

References Books

1. Frank Vahid, " Embedded sytem design " , PHI
2. Steve Furber "Arm System on chip architecture", AddisonWesely
3. Alessandro Rubini and Jonathan Corbet, "LinuxDevice Drivers", 3rd Edition O'Reilly

List of Practical

1. Interfacing LCD & KEYPAD to Arm microcontroller (Arm7)
2. I2C interfacing to Arm microcontroller (Arm7)
3. On chip ADC interfacing using interrupt & display on LCD(Arm7)
4. Multitasking in Ucos RTOS using min 4 tasks (LED,LCD,SERIAL,KEYPAD) on Arm7
5. Semaphore as signaling & Synchronizing on Arm7
6. Mailbox implementation for message passing on Arm7
7. Building tool chain for Embb Linux and porting Kernel on Arm9 target board 14

8. writing simple application using embb linux on Arm9
OR
8. Writing simple application using WIN CE on Arm9
Note Simple demo should be arranged to show effect of Power down modes on power Consumption at two different clock frequencies 15

INDUSTRIAL DRIVES AND CONTROL (404184)

Teaching Scheme	Examination Scheme
Lectures/Week: 4 Hrs	**Paper:** 100 Marks
Practical/Week: 2Hrs.	**Practical:** 50 Marks
	Term Work: 25 Marks

Unit 1: Line Commutated Converters & Choppers

Analysis of 3ϕ full converter with level load, comparison with 3ϕ semi converter. Effect of source impedance on 1ϕ converters with analysis. 1ϕ and 3ϕ dual converters (ideal and practical), control schemes for non-circulating current type dual converter, analysis of circulating current type dual converter.Control of DC/ DC converters. Analysis of step-down chopper (buck converter) & 2-quadrant type C chopper with level load. Operation of 4-quadrant type E chopper.

Unit 2: Inverters & Cycloconverters

Half-bridge and full bridge 3ϕ voltage source inverters with square wave operation (180° & 120°). Voltage control & harmonic reduction using sinusoidal PWM. 3ϕ current source inverter. Concept of resonant & soft switched inverters. 1ϕ to 1ϕ and 3ϕ to 1ϕ cycloconverters.

Unit 3: DC Motor Drives & Control

Motor performance parameters. 1ϕ & 3ϕ converter drives for separately excited & series DC motors, dual converter drives, 2 quadrant and 4 quadrant DC chopper drives. Open-loop & closed-loop control of DC drives with transfer function. Dynamic and regenerative braking. Protection circuits for DC drives.

Unit 4: Induction Motor Drives & Control

Induction motor characteristics, control strategies like stator voltage control, V/f control, rotor resistance control, current control, slip power recovery system, closed loop controlled slip system, direct vector control & indirect vector control, braking of induction motors, soft acceleration and deceleration. Protection circuits for AC drives. 16

Unit 5: Synchronous Motor & Special Motor Drives

Cylindrical-rotor motor, salient-pole motor, reluctance motor, and permanent-magnet motors. Closed loop V/f control and load-commutated inverter (LCI) control. Variable reluctance & permanent magnet stepper motors & drives, switched reluctance motors & drives, brushless DC and AC motors & drives.

Unit 6: Drives Applications & Power Quality

Traction motor AC drives, fuzzy logic-based induction motor speed control, fuzzy logic-based wind generation system. Power Quality: Types of power line disturbances, sources of power line disturbances, preventive and nullifying techniques. Energy audit.

Text Books

1. M.H Rashid, "Power Electronics Circuit Devices & Applications", Pearson, Third edition
2. Bimal K. Bose, "Modern Power Electronics and AC Drives", Pearson.
3. N. Mohan, T. M. Undeland & W. P. Robbins, "Power Electronics, Converters Applications and Design" John Wiley and Sons, 3rd Edition.

Reference Books

1. Gopal K. Dubey, "Fundamental of Electrical Drives", Narosa Publishing House
2. M D Singh & K B Khanchandani, "Power Electronics", TMH
3. Krishnan R., "Electric Motor Drives: Modelling, Analysis & Control", PHI

List of Practicals

1. DC motor control using semi/full 1-Φ /3-Φ converter.
2. Dual converter 1-Φ /3-Φ controlled DC drive.
3. 2Q /4Q chopper DC drive.
4. 3-Φ induction motor control using square wave/PWM inverter.
5. Stepper motor drive.
6. Study of cycloconverter.
7. Simulation of 3-Φ LCC (HCB or FCB or Dual Converter).
8. Simulation of 3-Φ VSI (180° or 120° or PWM)
9. Simulation of DC drives.
10. Simulation of AC drives. 17

MICROWAVE COMMUNICATION AND RADAR (404184)

Teaching Scheme	Examination Scheme
Lecturers/week**:** 4 hrs	**Paper:** 100 Marks
Practicals/week**:** 2 hrs	**Practical:** 50 Marks
	Term work: 25 Marks

Unit 1: Waveguides

Introduction to microwaves, short history of microwave engineering, frequency band definitions, advantages and applications of microwaves (overall applications). Introduction to wave guides, advantages of waveguides, comparison of waveguides and co-axial cables, Rectangular waveguides, modes of propagation in waveguides, cut off frequency, dominant mode, waveguide characteristics and parameters, excitation in waveguides, coupling methods (probe, slot, loop), application of re-entrant cavities, coupling of cavities.

Unit 2: Microwave Components

Principle of S-parameters, S-parameters for multi-ports (2-port, 3-port, 4-port etc.) properties of S-matrix, waveguide Tees (E, H, E-H planes), Directional Couplers, waveguide joints, bends, corners, twists, coupling probes and coupling loops, matched termination, Ferrite devices for microwave applications, Circulators, Isolators, Microwave Filters, Microwave attenuators and loads, Co-axial to wave guide transitions, Slotted line, iris, tuners.

Unit 3: Microwave Tubes

Introduction to conventional vacuum tubes, High frequency limitations of conventional tubes, Microwave tubes and circuits, Klystrons (multi cavity, reflex); velocity modulation, bunching process, applications, TWT: slow-wave structure, wave modes, gain, and applications, Principle of operation, construction, characteristics, parameters with analytical treatment of Magnetron, Magnetron oscillator, types.

Unit 4: Solid State Microwave Devices

Introduction, Principle of operation, construction, characteristics, parameters with analysis of Microwave transistors, MOSFET, Varactor diodes, Parametric amplifiers, PIN diodes, Tunnel diodes, application as amplifiers, oscillators, modulators, demodulators, Schottky Barrier diodes, Transferred Electron devices: Gunn diode, Avalanche diode, Transit Time devices like IMPATT, TRAPATT diodes.

Unit 5: Microwave measurements

Introduction to microwave measurements, definition and measurement methods of parameters such as frequency, power, attenuation, phase shift, VSWR, impedance, insertion loss, dielectric constant, noise factor, Q of a cavity resonator, etc using the X-band microwave bench set-up. Block diagram and classification of network analyzer and its applications. General overview and applications of power meter/dB meter/VSWR meter.

Unit 6: Radar Communication

Basic principles and fundamentals, block diagram of basic radar, classification, radar performance factors, radar range equation, factors influencing maximum range, effects of noise, Pulsed radar systems, block diagram and description, antennas and scanning, display methods, moving target indication, radar beacons, other radar systems such as CW Doppler radar, FM CW Doppler radar, phased array radars, planar array radars, various applications of radar such as navigational aids, military, surveillance.

Text Books

1. S.Y. Liao, "Microwave Devices and Circuits", Prentice Hall India.
2. David M. Pozar, "Microwave Engineering", John Willey & Sons.
3. Skolnik, "Principles of Radar Engineering"MCH

List of Practicals

1. Study of microwave components and equipments.
2. Reflex Klystron as a Microwave source in laboratory and plot its mode characteristics.
3. Measurement of the free space wavelength of the microwave (for TE 10 mode) with the help of the X-band microwave test bench and verify with its theoretical calculation.
4. Study of cavity resonator and calculation of its resonant frequency and Q-factor.
5. Study of Gunn Diode & PIN Modulator as a Microwave source. Plot the V-I characteristics.
6. Verification of Port Characteristics of Microwave Tees (E, H, E-H Planes).
7. Verification of Port Characteristics of Directional Coupler. Calculation of coupling factor, insertion loss and directivity.
8. Verification of Port Characteristics of Isolator and Circulator. Also calculation of insertion loss and isolation in dB.
9. Study of slotted section with probe carriage. Measure the VSWR for various values of terminating impedances (open/short/matched termination).
10. Plot the radiation pattern of any one of the microwave antennas (ie: horn (E/H/E-H) or parabolic antenna). Calculation of its antenna gain and beam width. 19

11. Study of Network Analyzer (Vector or Scalar) and its applications for characterization of typical multiport microwave circuits/devices. Study of front panel & rear panel controls, accessories, calibration methods etc. of any one analyzer.

12. Report of a „Field Trip" to a Microwave transmission / reception station. (Such as Radio/ TV / Radar / Satellite earth station or any other station which uses the microwave components). 20

Elective –II

ENTREPRENEURSHIP DEVELOPMENT (404185)

Teaching Scheme **Examination Scheme**

Lectures/Week: 4Hrs **Paper:** 100 Marks

Unit 1: Introduction

Entrepreneur: Present and Past, Entrepreneurship for an Engineer, Identify Business Opportunities and Set Goals. Entrepreneurs Skills: Communication Skills, Math Skills, Problem-Solving Skills

Unit 2: Entrepreneurs in a Market Economy and Ownership

Entrepreneurs in a Market Economy: An Economy, The Concept of Cost, Government in a Market Economy. Select a Type of Ownership: Run an Existing Business, Own a Franchise or start a Business, Choose the legal form business

Unit 3: Business Plan

Develop a Business Plan: Necessity a business plan, What goes into a business Plan?, Create an effective business plan. Identity and Meet a Market Need: The value of market research, How to perform market research, Identify your competition. Finance, Protect, and Insure Business: Put together a financial plan, Obtain financing for business, Theft proof business, Insure business Choose Location & Setup for Business: Choose a retail business location, Choose a location for a non-retail business, Obtain space and design the physical layout, Purchase equipment, supplies and inventory. Market Business: The Marketing mix-product, distribution, price, The Marketing mix-promotion, Set marketing goals

Unit 4: Hire and Manage a Staff: Record keeping and Accounting

Hire and Manage a Staff: Hire Employees, Create a compensation package, Manage staff , Record Keeping and Accounting: Set up a record keeping system, Understand basic accounting, Tracking inventory

Unit 5: Financial Management, Use Technology

Financial Management: Manage cash flow, Analyze financial performance, Hire experts, Use of Technology: Technology and business, Learning about the internet, Purchase technology 21

Unit 6: Meeting Legal, Ethical, and Social Obligation Growth in Today's Marketplace

Meeting Legal, Ethical, and Social Obligation: Understanding legal requirements, Ethical issues in business, meeting social responsibilities. Growth in Today's Marketplace: Developing a strategy for growth, Global Trends and opportunities, Culture and business

Text books

1. Cynthia L. Greene, "Entrepreneurship Ideas in Action", South Western Publishing Company (A Division of Thomson Learning Inc.,), First Edition.2000.
2. G.S. Batra, "Entrepreneurship Development", Deep & Deep Publications : 1st Edition.

JOINT TIME FREQUENCY ANALYSIS (404185)

Teaching Scheme **Examination Scheme**

Lectures: 4 Hrs/week **Paper:** 100 Marks

Unit 1: Introduction

Review of Fourier Transform, Parseval Theorem and need for joint time-frequency Analysis. Concept of non-stationary signals, Short-time Fourier transform (STFT), Uncertainty Principle, Localization/Isolation in time and frequency, Hilbert Spaces, Banach Spaces, Fundamentals of Hilbert Transform.

Unit 2: Bases for Time-Frequency Analysis

Wavelet Bases and filter Banks, Tilings of Wavelet Packet and Local Cosine Bases, Wavelet Transform, Real Wavelets, Analytic Wavelets, Discrete Wavelets, Instantaneous frequency, Quadratic time-frequency energy, Wavelet Frames, Dyadic wavelet Transform, Construction of Haar and Roof scaling function using dilation equation and graphical method.

Unit 3: Multiresolution Analysis

Haar Multiresolution Analysis, MRA Axioms, Spanning Linear Subspaces, nested subspaces, Orthogonal Wavelets Bases, Scaling Functions, Conjugate Mirror Filters, Haar 2-band filter Banks, Study of upsamplers and downsamplers, Conditions for alias cancellation and perfect reconstruction, Discrete wavelet transform and relationship with filter Banks, Frequency analysis of Haar 2-band filter banks, scaling and wavelet dilation equations in time and frequency domains, case study of decomposition and reconstruction of given signal using orthogonal framework of Haar 2-band filter bank.

Unit 4: Wavelets

Daubechies Wavelet Bases, Daubechies compactly supported family of wavelets, Daubechies filter coefficient calculations, Case study of Daub-4 filter design, Connection between Haar and Daub-4, Concept of Regularity, Vanishing moments. Other classes of wavelets like Shannon, Meyer, Battle-Lamarie.

Unit 5: Bi-orthogonal wavelets and Applications

Construction and design. Case study of bi-orthogonal 5/3 tap design and its use in JPEG 2000. Wavelet Packet Trees, Time-frequency localization, compactly supported wavelet packets, case study of Walsh wavelet packet bases generated using Haar conjugate mirror filters till depth level 3. Lifting schemes for generating orthogonal bases of second-generation wavelets. 23

Unit 6: JTFA Applications

Riesz Bases, Scalograms, Time-Frequency distributions: fundamental ideas, Applications: Speech,audio, image and video compression; signal denoising, feature extraction, inverse problem.

Text Books

1. S. Mallat, "A Wavelet Tour of Signal Processing," Academic Press, Second Edition, 1999.
2. L. Cohen, “Time-frequency analysis”, Prentice Hall, 1995.

Reference Books

1. G. Strang and T. Q. Nguyen, "Wavelets and Filter Banks", Wellesley-Cambridge Press, Revised Edition, 1998.
2. I. Daubechies, "Ten Lectures on Wavelets", SIAM, 1992.
3. P. P. Vaidyanathan, "Multirate Systems and Filter Banks", Prentice Hall, 1993.
4. M. Vetterli and J. Kovacevic, "Wavelets and Subband Coding", Prentice Hall, 1995 24

MICROELECTROMECHANICAL SYSTEMS AND SYSTEMS ON CHIP (404185)

Teaching Scheme **Examination Scheme**

Lectures: 4 Hrs/week **Paper:** 100 Marks

Unit 1: Introduction to MEMS and SoC

Introduction, History, Concepts of MEMS: Principles, application and design, Scaling Properties/Issues, Micromachining Processes: Substrates, lithography, wet/dry etching processes, deposition processes, film stress, exotic processes. Mechanical Transducers : transduction methods, accelerometers, gyroscopes ,pressure sensors, MEMS microphones, mechanical structures, actuators.

Unit 2: Control and Materials of MEMS

Controls of MEMS: Analog control of MEMS, Sliding mode control of MEMS, Digital control of MEMS, Materials for MEMS: Substrate and wafers, Active substrate material, silicon, Silicon compound, Silicon pezoresisters, Gallium arsenide, Quartz, piezoelectric crystals, Polymers.

Unit 3: Transducers

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: Introduction to SOC

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

Unit 5: Overview of Physical Design Automation

Physical design automation, behavioural synthesis, synthesis of FPGAs and testable ASICs micromachining processes: substrates, lithography, wet/dry etching processes, deposition processes, film stress, exotic process

Unit 6: SOC Testing and Packaging

Hardware/software co-design, test and design test for circuit to integrated systems, testable design and testing of Microsystems, embedded core based system on chip test strategies

Micro System Packaging: Over view of mechanical packaging of micro electronics micro system packaging

Text Books

1. Kovacs, Gregory T. A. “Micromachined Transducers Sourcebook” McGraw-Hill
2. Max J. Madou: “Fundamentals Of Micro Fabrication”- The science of miniaturization,
3. Nanogen Corporation, USA, CRC press, March 2002.
4. Sergey Edward Lyshevski: “Nano-And Micro Electro Mechanical Systems”, Second edition, CRC press, Boca Ratron London.

Reference Books

1. Jan G Korvinik and Oliver Paul, “MEMS Practical Guide to Design, analysis and Applications” William Andrew, Inc Springer
2. G.K. Anantsuresh, K.J. Vinoy, S. Gopalkrishnan, K.N. Bhat, V.K. Atare, “ Micro and Smart Systems” Wiley 26

MOBILE COMMUNICATION (404185)

Teaching Scheme **Examination Scheme**

Lectures/Week: 4 Hrs **Paper:** 100 Marks

Unit 1: Introduction to Mobile Communication

Introduction to wireless Communication Systems: Evolution of Mobile Radio Communication, Examples of Wireless Communication Systems, Trends in cellular radio & Personal Communication. Modern Wireless Communication System: Second Generation (2G) and Third Generation (3G) cellular networks. The Cellular Concepts: Introduction, Frequency reuse, Channel Assignment, Handoff, Interference & System capacity, Trunking & Grade of Service, Improving coverage & capacity.

Unit 2: Mobile Radio Propagation

Propagation Mechanism: Free space loss, Reflection, Diffraction, Scattering.
Fading & Multipath: Small scale multipath propagation, Impulse response model of multipath channel, Small scale multipath measurements, Parameters of mobile multipath channels, Types of small scale fading.

Unit 3: Modulation & Equalization Techniques for Mobile Radio

Modulation: Analog modulation, Digital modulation, Line Coding, Pulse shaping Technique, Geometric representation of Modulation Signal, Linear Modulation Techniques: BPSK, DPSK, QPSK, offset QPSK, BFSK, MSK, GMSK, MPSK, QAM, MFSK, Spread Spectrum Modulation Techniques, Modulation Performance in Fading & Multipath channels.
Equalization: Survey of Equalization Techniques, Linear Equalization, Non-linear Equalization, Algorithms for Adaptive Equalization, Diversity Techniques, RAKE receiver.

Unit 4: Coding & Multiple Access Techniques for Wireless Communications

Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec. Multiple Access: FDMA, TDMA, FHMA, CDMA, SDMA, OFDM, Packet Radio, Capacity of Cellular Systems.

Unit 5: Global System for Mobile Communications (GSM)

System Overview, The air interface, Logical & Physical channel, Synchronisation, Coding, Equalizer, Circuit Switched data transmission, Establishing connection and handover, GSM services. 27

Unit 6: IS-95 CDMA and CDMA 2000

System overview, Air interface, Coding, Spreading and modulation, Logical and physical channels, Handover.

Text Books

1. Theodore S Rappaport, “Wireless Communications Principles & Practice” Second Edition, Pearson Education
2. Andreas F Molisch, “Wireless Communications”, Wiley India.

Reference Books

1. Vijay K Garg, Joseph E Wilkes, “Principles & Applications of GSM” Pearson Education
2. Vijay K Garg, Joseph E Wilkes, “IS-95 CDMA And cdma 2000 Cellular/PCS Systems implementation” Pearson Education
3. R. Blake, "Wireless Communication Technology", Thomson Delmar.
4. W.C.Y. Lee, "Mobile Communications Engineering: Theory and applications”, Second Edition,
McGraw-Hill International.

Project Part I (404186)

Teaching Scheme	Examination Scheme
Tutorial: 2 Hrs/Week	**Term Work: 50 Marks**

Note:

1. Term work assessment is based on the project topic. It consists of Literature Survey and basic project work. The abstract of the project should be submitted before Term work assessment.
2. The report consists of the Literature Survey, basic project work and the size of the report should be maximum of 40 pages.
3. The examination is conducted by two examiners (internal and external) appointed by the university. The examiners appointed must have minimum 6 years of experience with UG qualification and 3 years with PG qualification.
4. The assessment is based on Innovative Idea, Depth of understanding, Applications, Individual contributions, presentation, and the grade given by the internal guide based on the work carried out in a semester.
5. A certified copy of report is required to be presented to external examiner at the time of final examination.

TERM – II

SUBJECT CODE	NAME OF SUBJECT	TH	PR	TUT	PP	TW	OR	PR	TOTAL MARKS
404187	TELECOMMUNICATION & SWITCHING SYSTEM	4	2	1	100		50		150
404188	OPTICAL FIBER COMMUNICATION	4	2		100	25		50	175
404189	ELECTIVE-III	4	2		100	25		50	175
404190	ELECTIVE-IV	4			100				100
404191	PROJECT (PART-II)***		6			100	50		150
		16	12	0	400	150	100	100	750

Elective-III

1. Soft Computing
2. Speech Processing
3. Television and Video Engineering
4. Test and Measurement Systems

Elective-IV

1. Artificial intelligence
2. Automotive Electronics
3. Nanotechnology
4. PLC and Industrial Process Automation
5. Any one subject from the list of Elective IV of Computer/IT/Electrical/Instrumentation OR institute can offer an elective-IV based on any industry need with prior approval of BOS (Electronics)

Note:

1) All Theory papers are three hours duration

2) Practical/Oral shall be based on term-work

3) Term-work of Project Part I consist of project report based on project

4) ** * Exam at the end of II term

TELECOMMUNICATION SWITCHING SYSTEMS (404187)

Teaching Scheme	**Examination Scheme**
Lectures / Week: 4Hrs	**Paper:** 100 Marks
Practical /Week: 2Hrs.	**Oral:** 50 Marks

Unit 1: Development of Telecommunication Switching Systems

Message switching, Circuit switching, Manual switching, and Electronic Switching. Digital switching: Switching functions, space division switching, time division switching, two dimensional switching, digital cross connect systems, digital switching in an analog environment

Unit 2: Telecommunication Traffic

Unit of Traffic, Traffic measurement, A mathematical model, Lost- call systems: Theory, traffic performance, loss systems in tandem. Queuing systems: Erlang Distribution, probability of delay, Finite queue capacity, systems with a single server, Queues in tandem, delay tables and application of Delay formulae. Analysis: Traffic Characteristics: Arrival Distributions, Holding time Distribution. Loss Systems: Lost calls cleared, lost calls returning, lost calls Held, lost calls cleared- Finite sources, lost calls Held - Finite sources. Networking Blocking Probabilities: End to End Blocking Probabilities, Overflow Traffic. Delay systems: Exponential Service Times, Constant Service Times, Finite Queues and Tandem Queues

Unit 3: Switching Networks

Single Stage Networks, Gradings: Principle, Design of progressive grading, other gradings, Traffic capacity of gradings, Applications of gradings. Link Systems: General, Two stage networks, three stage networks, four stage networks. Grades of service of link systems: General, Two stage networks, three stage networks, four stage networks Call packing, Rearrangeable networks, Strict sense non blocking networks, Sectionalized switching networks Control of Switching Systems: Call processing Functions: Sequence f operations, Signal exchanges, State transition diagrams.Common Control, Reliability, Availability and Security. Signaling:Customer line signaling. FDM carrier systems: Outband signaling, Inband signaling. PCM signaling, Inter-register signaling, Common channel signaling principles: general, signaling networks, CCITT signaling No. 6, CCITT signaling No. 7: General, High level Data – link control protocol, Signal units, Signaling information field. Digital customer line signaling

Unit 4: Network Synchronization and Management

Timing: Timing Recovery, Clock Instability, Elastic Stores, Jitter measurements, systematic jitter. Timing Inaccuracy: Slips, Asynchronous Multiplexing, Waiting time jitter. Network Synchronization: Plesiochronous, pulse stuffing, mutual synchronization, Network master, Master – Slave synchronization, Hierarchical synchronization Processes. Network management: Routing control, Flow control 31

Unit 5: Networks

Data Networks: Data Transmission in PSTN, Data Communication Architecture, Link to link layers, End to End layers, Satellite based Data networks, LANs, MANs, Fibre optic networks, Data network Standards, Protocol stacks, Interworking. Integrated Services Digital Networks: ISDN, Network and protocol Architecture, Transmission Channels, User network interfaces, signaling, Numbering and Addressing, ISDN Standards, Broadband ISDN, Voice Data Integration

Unit 6: Cellular Telephone Concepts

Mobile telephone services, cellular telephone, Frequency reuse, Interference, Cellular system topology, Roaming and handoffs, Cellular telephone network components, Cellular telephone call processing. Cellular Telephone systems: Digital cellular telephone, IS–95. GSM GPRS for Mobile communications, Personal Satellite communication system

Books

1. J. E. Flood , “Telecommunications Switching, Traffic and Networks”, Pearson Education
2. John C. Bellamy, “Digital Telephony”, Third Edition; Wiley Publications
3. Thiagarajan Vishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications
4. Wayne Tomasi, “Electronic Communications Systems”; 5th Edition; Pearson Education

List of Practicals

1. Study of PSTN TST switch
2. Study of CDMA Trainer
3. Study of Mobile phone trainer
4. Study of AT commands
5. Study of VOIP implementation
6. Study of 3G Mobile trainer Kit
7. Visit to Mobile Switching Office (MTSO)

OPTICAL FIBER COMMUNICATION (404188)

Teaching Scheme	Examination Scheme
Lectures / Week: 4Hrs	**Paper:** 100 Marks
Practical /Week: 2Hrs.	**Practical:** 50 Marks
	Term work: 25 Marks

Unit 1: Fiber optic communications system

Electromagnetic Spectrum & Optical spectral bands, Key elements of fiber optic communications system, Advantages of optical fiber communication over other communication systems, Ray theory transmission: TIR, Acceptance angle, Numerical aperture, Electromagnetic mode theory for optical propagation: phase and group velocity, cutoff wavelength & group delay. Fiber types according to: materials used; refractive index profiles & mode transmission. Optical fibers: Fiber Materials, Fiber Fabrication & Cable design. State of art: Materials & fabrication Technology

Unit 2: Optical Fiber for Telecommunication

Transmission characteristics of optical fibers: Attenuation due to absorption, scattering & bending, Signal Distortion in optical fibers: Intra modal Dispersion: Material & Waveguide dispersion; Intermodal dispersion: MMSI, MMGI & modal noise; Overall fiber dispersion: MM & SM fibers. Special use fibers: Dispersion shifted (DSF), NZDSF, Dispersion flattened, Polarization maintaining fibers, Fiber Nonlinearities. State of art: Fiber

Unit 3: Optical Sources & Transmitters

Introduction to optical sources: Wavelength and Material Considerations, LEDs & semiconductor LASERs: principle of working & their Characteristics. Line coding
Different modulation schemes, Optical transmitters: LED drive circuits for digital and analog transmission. Power launching & Coupling: Fiber optic splices, connectors & couplers & Coupling losses. State of art: LEDs and LASERs

Unit 4: Optical detectors & Receivers

Introduction: Material Considerations, PN, P-i-N, Avalanche photodiodes & photo transistors: Principle of working & characteristics and relative merits and demerits of photodiodes. Receiver Noise: Noise considerations in PN, P-i-N & Avalanche photodiodes. Receiver structures, State of art: Optical detectors & detection scheme 29

Unit 5: Design considerations in optical links

Point to point Links: System design considerations, Link Power budget, Rise Time budget,
Analog Links: CNR, Multichannel transmission techniques.

Unit 6: Advanced Optical Systems

Overview of WDM, Optical Amplifiers: Classification of OAs, Principle of operation of a Semiconductor Optical Amplifier (SOA) & Gain calculations of Fabry Perot Amplifiers (FPA). SOA applications: advantages and drawbacks, Principle of operation of Erbium Doped Fiber Amplifiers (EDFA), Gain and Noise in an EDFA.WDM Couplers/ Splitters: Excess loss, Insertion loss Coupling ratio, Isolation and Uniformity properties. State of art: WDM components.

Text Books

1. Gerd Keiser, Optical Fiber Communications, Tata McGraw Hill, Fourth Edition.
2. John M. Senior, Optical Fiber Communications-Principles and Practice, Prentice Hall of India, second Edition

References

1. Djafar K. Mynbaev and Lowell L.Scheiner, “Fiber Optic Communications Technology”, Pearson Education
2. Govind P.Agrawal, “Fiber Optic Communication Systems”, WILEY INDIA, Third Edition

List of Experiments

1. Optical Source Characteristics:
Aim: To plot the electrical and optical characteristics of different light sources.
2. Numerical Aperture of fiber:
Aim: To estimate the numerical aperture of given fiber.
3. Fiber Attenuation:
Aim: To measure the attenuation of given MMSI and SMSI fibers.
Also study the effect of length and effect of bending on attenuation.
4. Optical Detector Characteristics:
Aim: To plot the frequency response of detectors with different values of load resistor.
5. Fiber Bandwidth/Data rate:
Aim: To estimate the bandwidth of given fiber.
6. Design, build and test a simple fiber optic link for transmission of analog signal.
7. Design, build and test a simple fiber optic link for transmission of digital signal.
8. Study of any two optical instruments: Optical Power Meter, OTDR, OSA etc.

Elective –III

SOFT COMPUTING (404189)

Teaching Scheme	Examination Scheme
Lectures/Week: 4Hrs	**Paper:** 100 Marks.
Practical/Week: 2Hrs	**Practical:** 50 Marks
	Term work: 25 Marks

Unit 1: Introduction to Neuro-Fuzzy and soft computing

Introduction, Soft computing constituents and conventional artificial intelligence, from conventional AI to computational intelligence, neural networks, Fuzzy set theory, Evolutionary computation, Neuro-Fuzzy and Soft Computing Characteristics

Unit 2: Fuzzy Set Theory

Fuzzy logic, Fuzzy sets, Fuzzy set operations, Fuzzy rules, Fuzzy algorithms, the fuzzy algorithm with linear constituents, determining the fuzzy algorithm

Unit 3: Fuzzy Control

Systematic approach for the design of fuzzy control system, Synthesis and validation of a fuzzy controller, determining the control laws, determining the fuzzy controller, validating the fuzzy controller

Unit 4: Artificial Neural Network

Artificial neural network theory, Topologies, Multilayer perceptron, unsupervising neural network, Radial basis function, Learning algorithm, Numerical Examples regarding MLP's and RBF.

Unit 5: Neural Network Application

Neural network applications for identifying non-linear dynamic system and for complex system control, Image processing, and communication.

Unit 6: Neuro Fuzzy Modelling

Introduction, ANFIS architecture, Hybrid learning algorithm Learning methods that cross-fertilize ANFIS and RBFN, Use of ANN for process control. 33

Text Books:

1. J.S. Jang, C.T. Sun, E. Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI Learning Private Limited.
2. L-Fortuna, G. Rizzotto, M. Lavorgna, G. Nunnari, M. G. Xibilia and R.Caponetto , “Soft Computing”, Springer.

Reference Books:

1. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications and Programming Techniques”, Pearson Education.
2. S. N. Sivanandam, S. N. Deepa,” Principals of soft Computing”, Wiley India.

List of practicals

1. Design and implement ANN to compute OR, AND, NOT gate for the two input using MP model .
2. Implement perceptron algorithm for solving EX-OR problem.
3. Implement Back Propogation algorithm to solve classification problem
4. Implementation of various learning learning laws
5. Implement Kohonen algorithm for character recognition
6. Implement various membership functions
7. Implement primary and composite linguistic fuzzy variables
8. Implementation of defuzzification using various method
9. Implement fuzzy controller to control simple process (Mamdani / Sugeno / Tsukamoto) 34

SPEECH PROCESSING (404189)

Teaching Scheme	Examination Scheme
Lectures / Week: 4Hrs	**Paper**: 100 Marks
Practical /Week: 2Hrs	**Practical:** 50 Marks
	Term work: 25 Marks

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Unit 1: Fundamentals of Digital Speech Processing

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, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

Unit 2: Linear Predictive Coding (LPC)

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

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

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

Unit 5: Automatic Speech Recognition

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, Training and testing using HMMs.

Unit 6: Speaker Recognition

Issues 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

List of Experiments

The Laboratory work gives hands-on exposure to the concepts conveyed in lectures. It provides you with hands-on design experience and exposure to algorithms used in speech processing. Software tool such as MATLAB may be used. Also the required data may be acquired using sound card.
1. Spectral Analysis (Spectrographic).
2. Feature Extraction.
3. Linear Predictive Coding.
4. Speech Synthesis using LPC.
5. Voice Activity Detection.
6. Speech Enhancement using Homomarphic Deconvolution for removal of Distortion.
7. Speaker Recognition.
8. Speech Recognition. 37

TELEVISION AND VIDEO ENGINEERING (404189)

Teaching Scheme	Examination Scheme
Lectures/week: 4 Hrs	**Paper:** 100 Marks
Practical/week: 2Hrs	**Practical**: 50 Marks
	Term work: 25 Marks

Unit 1:Fundamentals of Television and Display

Television basics: Factors of TV systems, Composite video signal, Signal transmission and channel bandwidth etc.., Color TV systems, colour fundamentals, mixing of colours, colour perception, chromaticity diagram.

Unit 2:TV Standards

NTSC, PAL, SECAM systems, colour TV transmitter, high level, low level transmitters, colour TV receivers, remote control, antennas for transmission. TV alignment and fault finding with Wobbuloscope and TV pattern generation, field strength meter.

Unit 3:Digital TV

Introduction to Digital TV, Principle of Digital TV, Digital TV signals and parameters, Digital TV Transmitters, MAC signals, advanced MAC signal transmission, Digital TV receivers, Basic principles of Digital Video compression techniques, MPEG1, MPEG2, MPEG4, Video compression ITU-Standards(H.). Digital TV recording techniques.

Unit 4:HDTV

HDTV standards and systems, HDTV transmitter and receiver/encoder, Digital TV satellite Systems, video on demand, CCTV, CATV, direct to home TV, set top box with recording facility, conditional access system (CAS), 3D TV systems, Digital broadcasting, case study (Cricket match, Marathon, Foot ball match).

Unit 5:Video Recorders

IP Audio and Video, IPTV systems, Mobile TV, Video transmission in 3G mobile System, IPod(MPEG4 Video player), Digital Video Recorders, Personal Video Recorders, Wi-Fi Audio / Video Transmitter and Receivers. Video Projectors, HD Video projectors, Video Intercom systems/ Video door phones. 38

Unit 6:Consumer Applications

Colour TV Digital cameras, Camcoders, Handycams, and Digicams. Display devices: LED, LCD, TFT, Plasma, HDTV, CD/ DVD player, MP3 player, Blue Ray DVD Players, MPEG, MP3.

Text Books

1. Television and video Engineering, A. M. Dhake, TMH Publication.
2. Video Demisified, Kelth jack, Penram International Publication.
3. Audio Video Systems, R.G. Gupta, Technical Education.

Reference Books

1. S. P. Bali, “Color TV Theory and Practice”.
2. Bernard Grobb, Charles E, “Basic TV and Video Sytems”.
3. Gulathi, “Monochrome & Color TV”.

List of Practical Assignments

1. Voltage and waveform analysis for color TV.
2. Alignment and fault finding for color TV using Wobbulosocpe and Pattern Generator.
3. Study of direct to home TV and set top box.
4. Study Wi-Fi TV systems/ Mobile TV/IPTV
5. Simulation of video compressing techniques (Software Assignments)
6. Practical visit to TV transmitter/Digital TV studio.
7. Study of Audio system: CD /DVD / MP3 player
8. Study of HDTV.
9. Study of Digital TV. 39

TEST AND MEASUREMENT SYSTEMS (404189)

Teaching Scheme	Examination Scheme
Lecturers/week: 4 hrs	**Paper:** 100 Marks
Practicals/week: 2 hrs	**Practical:** 50 Marks
	Term work: 25 Marks

Unit 1: Introduction

Statistical metrics in measurement systems, probability of errors. Instrument / Measurement Basics Parameters such as Sensitivity, Resolution, Dynamic Range, Linearity, Accuracy, Settling Time, Sample Rates Analog Signal Processing, Digital Signal Processing, Human & Computer Interfaces. Typical instrument block diagram, Simple & Distributing types of measurements, calibration, traceability and standards.

Unit 2: Measuring Instruments

Voltage , current and impedance measurement. VTVM, TVM, DVMs, AC voltmeters, true RMS meters, vector voltmeter, vector impedance meter. Direct current probes, alternating current probes. RF impedance measurement, problems at RF, RF meter methods, RF bridges. LCR Q meter.

Unit 3: Oscilloscopes

Analog CRO, HF CRO Block diagram, Working principles of special purpose oscilloscope like Digital Storage Oscilloscope, Block diagram-Working principles of Digital Phosphor Oscilloscope, Measurements on oscilloscope, Oscilloscope accessories.

Unit 4: Frequency Domain Measurement

Frequency domain measurement. Wave analyzer, harmonic distortion analyzer. Microwave signal analysis, swept superheterodyne spectrum analyzer, TRF spectrum analyzer, tracking generator, counter, microwave power measurement. Logic analyzer, CRO vs Logic analyzer, logic timing analyzer, logic state analyzer, FFT analyzer, Mixed signal oscilloscope.

Unit 5: Synthesizers and generators

Synthesizers and generators. Frequency synthesis techniques, digital signal generators, microwave sources, EMI / EMC basics and measurement methods, Microwave network analysis. 40

Unit 6:Case Study

Automatic Test Equipments. Software in instrumentation, such as labVIEW. Network connection model, virtual instruments. Case study of complete measurements systems.

Text Books

1. Oliver-Cage, "Electronic measurements and instrumentation", TMH edition.
2. M.M.S. Anand, "Electronics instruments and instrumentation technology", PHI.
3. Coombs, Clide F. Jr., "Electronic instrument handbook", McGraw –Hill.

Reference Books

1. Car Joseph, "elements of Electronics Instrumentation and Measurement", PHI
2. A. J. Bouwens, "Digital Instrumentation", TATA McGraw Hill.

List of practicals:

1. Statistical analysis of measurements, probable error, calibration of meters.
2. Measurement of RMS of common and true RMS of complex waveforms.
3. Measurements using Digital Storage Oscilloscope, different modes of DSO, capturing transients and analysis of waveforms.
4. Measurement of Total Harmonic Distortion contained by output of amplifier, inverter.
5. Measurement using spectrum analyzer and tracking generator. Observing spectrum of AM and FM waveforms for different modulation indices, plotting frequency response of filters using tracking generator.
6. Measurement and timing analysis of digital signals using Logic Analyzer.
7. Microwave network analysis. Measurement of SWR, reflection coefficient and s parameters using network analyzer.
8. Case study of measurement system using software package like LABVIEW. 41

Elective-IV

ARTIFICIAL INTELLIGENCE (404190)

Teaching Scheme **Examination Scheme**

Lectures/Week: 4Hrs **Paper:** 100 Marks

Unit 1: Foundation

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

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

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

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. 42

Unit 5: Perception and Expert System

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

Unit 6: Natural Language Understanding

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, 2003.
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002. 43

AUTOMOTIVE ELECTRONICS (404190)

Teaching Scheme **Examination Scheme**

Lectures / Week: 4Hrs **Paper:** 100 Marks

Unit 1: Power Train Engineering and fundamentals of Automotive.

Fundamentals of Petrol, diesel and gas engines, electric motors and control systems. Basic Automotive System, System Components. Evolution of Electronics in Automotive. Alternators and charging, battery technology, Ignition systems. Working principles of various electronic components and accessories used in Automotive. Emission control. Developments in existing engine forms and alternatives, Hybrid designs (solar power, electric/gasoline, LPG, fuel cells). Basic Transmission systems, Different forms and developments.

Unit 2: Sensor technologies in Automotive

In-vehicle sensors: Working principles, Characteristics, limitations and use within the automotive context of the following: Temperature sensing e.g. coolant, air intake, Position sensing e.g. crankshaft, throttle plate. Pressure sensing e.g. manifold, exhaust differential, tyre. Distance sensing e.g. anti-collision, Velocity sensing e.g. speedometer, anti-skid, Torque sensing e.g. automatic transmission, Vibration sensing e.g. Airbags, Flow sensing and measurement e.g. Fuel injection. Interfacing principles: Operation, topologies and limitations of all sensors covered in the above to in-vehicle processing or communications nodes. Interfacing electronics, Operational amplifier circuits, Instrumentation amplifiers, Comparators. Level shifting, Wave-shaping, Filters. Noise mechanisms and reduction. ADCs and DACs. Use of Actuators: Types, Working principle, Characteristics, limitations and use within the automotive context of each type

Unit 3: Automotive Control Systems.

Control system approach in Automotive: Analog and Digital control methods, stability augmentation, control augmentation, Transmission control, System components and functions. Cruise control, traction control, actuator limiting, wind-up, gain scheduling, adaptive control. Special Control Schemes: Vehicle braking fundamentals, Antilock systems, Variable assist steering and steering control, Controls for Lighting, Wipers, Air-conditions/Heating, Remote keyless Entry and Anti-theft System, Emission sub-system control, Control techniques used in hybrid system. Electronic Engine control: Motion equations, modeling of linear and non-linear systems, numerical methods, system responses Objective of Electronic Engine control, Spark Ignition and Compression Ignition Engines and their electronic controls. Engine management testing: Engine management system strategies and implementation, Simulation and implementation methods, Methods of improving engine performance and efficiency. 44

Unit 4: Electronic Control Unit Design.

Critical review of microprocessor, microcontroller and digital signal processor development (overview of development within the automotive context). Architecture of 8 /16 bit microcontrollers with emphasis on Ports, Timer/Counters, Interrupts, Watch-dog timers, PWM, Memory requirement and Usage. High-level language programming: Effective use of „C" programming with particular reference to: Operators- including bit wise, Control constructs, Pointers. Real-Time Program Design: Pointers to physical addresses and linking, Input and Output device programming, Timers and interrupts, latency. Program Development: Software development strategies, Compiling and linking, Software testing and debugging, Use of a professional development system (Use of Embedded C).

Unit 5: Automotive Communication Systems

Communication interface with ECUs: Interfacing techniques and interfacing with infotainment gadgets. Relevance of internet protocols, such as TCP/IP for automotive applications. Wireless LANs standards, such as Bluetooth, IEEE802.11x. Communication protocols for automotive applications. Automotive Buses: Use of various buses such as CAN, LIN, FlexRay, Recent trends in Automotive buses (Such as OBDII, MOST, IE, IELLI, D2B, and DSI). Application of Telematics in Automotive: Global Positioning Systems (GPS) and General Packet Radio Service (GPRS), for use in an automotive environment. Higher End Technology: Comparative study and applications of ARM Cortex:-A series/M-series, ARM 9 and ARM11.Current developments and issues.

Unit 6: Diagnostics and Safety in Automotive

Fundamentals of Diagnostics: Basic wiring system and Multiplex wiring system. Preliminary checks and adjustments. Self Diagnostic system. Fault finding and corrective measures. Electronic transmission checks and Diagnosis. Diagnostic procedures and sequence. On board and off board diagnostics in Automotive. Safety in Automotive: Safety norms and standards. Passenger comfort and security systems. Electromagnetic environment and Automotive EMC Standards. SAE and IEEE Standards. Future trends in Automotive Electronics.

Text Books

1. Williams. B.Ribbens, “Understanding Automotive Electronics”, 6th Edition, 2003, Elsevier Science, Newness Publication.
2. Robert Bosch, “Automotive Electronics Handbook”, John Wiley and Sons, 2004.
3. Nitaigour Mahalik, “Mechatronics: Principles, Concepts and Applications”, TMH, 2003.
4. K.P.Ramchandran, G.K.Vijayraghavan, M.S. Balsundaram, “Mechatronics: Integrated Mechanical and Electronic System”, Wiley India, 2010.

Reference Books

1. Ronald K Jurgen, “Automotive Electronics Handbook”, 2nd Edition, McGraw-Hill, 1999. 2. James D Halderman, “Automotive Electricity and Electronics”, PHI Publication 2005.
3. Terence Rybak, Mark Steffka, “Automotive Electromagnetic Compatibility (EMC)”, Springer, 2004.
4. Allan Bonnick, “Automotive Computer Controlled Systems: Diagnostic Tools and Techniques”, Elsevier Science, 2001.
5. Uwe Kiencke and Lars Nielsen, “Automotive Control Systems: Engine, Driveline and Vehicle”, 2nd Edition, Springer Verlag, 2005.
6. David Alciatore, Michael Histand, “Introduction to Mechatronics and Measurement Systems (SIE)”, TMH, 2007.
7. Iqbal Husain, “Electric and Hybrid Vehicles: Design Fundamentals”, CRC Press, 2003.
8. Tom Denton, “Advanced Automotive Diagnosis”, 2nd Edition, Elsevier, 2006.
9. G. Meyer, J. Valldorf and W. Gessner, “Advanced Microsystems for Automotive Applications”, Springer, 2009.
10. Tracy Martin, “How to Diagnose And Repair Automotive Electrical Systems” Motor Books/MBI Publishing Company, 2005.
11. Mehrdad Ehsani, Ali Emadi, Yimin Gao, “Modern Electronic, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, 2nd Edition, CRC Press, 2009.

NANOTECHNOLOGY (404190)

Teaching Scheme **Examination Scheme**

Lectures: 4 Hrs/week **Paper:** 100 Marks

Unit 1: Introduction

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

Unit 2: Nano-CMOS Devices

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

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

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

Unit 5: Nanoelectronics

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

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

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.

PLC AND AUTOMATON (404190)

Teaching scheme **Examination Scheme**

Lectures/week: 4 Hrs **Paper:** 100 Marks

Unit 1: Introduction to Process Control

Control Systems, Process control principles, Servomechanisms, Discrete State Control Systems, Control System Evaluation, Stability, Transient regulation, Steady state regulation, Evaluation criteria, Analog control, Digital control, Supervisory control, Direct Digital control, Programmable Logic Controllers, Control System Networks, Foundation Fieldbus and Profibus

Unit 2: Transmitters and Signal Conditioning

Need of transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, Two wire transmitters, Electronic Differential Pressure Transmitter, Analog and Digital signal conditioning for RTD, Thermocouple, DPT etc , Smart and Intelligent transmitters.

Unit 3: Controller Principles and Applications

PID Controller Principles, Tuning, Anolog Implementation, Design considerations, Digital implementation, Modification of PID algorithms, Integral wind up, Operational aspects of PID controllers.

Unit 4: Actuators and Final Control Elements

Final control operation, Signal conversions, Electrical actuators, Mechanical switches, Solid state switches, AC and DC motors, Stepper Motors, Pneumatic and hydraulic actuators , Fluid control valves.

Unit 5: Programmable Logic Controllers, Applications and Interfacing

PLC Programming, Interfacing Input and Output devices with PLC, Analog Input / Output, Ladder programming, Selection of PLC, PLC based automated systems, Networking of PLCs

Unit 6: Advanced Process Automation Techniques

Fuzzy logic systems and Fuzzy controllers, Artificial Neural Network (ANN) based controllers, Introduction to Statistical Process Control. 48

Text Books

. Curtis Johnson, “Process Control Instrumentation Technology”; 8th Edition, Pearson Education.
2. Madhuchhanda Mitra, Samarjit Sen Gupta, “Programmable Logic controllers and Industrial Automation”; Penram International Publishing India Pvt. Ltd.
3. George J Clir, Bo Youn, “Fuzzy Sets and Fuzzy Logic Theory and Applications”, Prentice Hall of India Pvt. Ltd.

Reference Books

1. John W. Webb, Ronold A Reis, “Programmable Logic Controllers, Principles and Applications”; 5th Edition, Prentice Hall of India Pvt. Ltd.
2. K. Krishna Swamy, “Process Control”; New Age International Publishers.
3. K. Astram, T Haggland, “PID Controllers, Theory, Design and Tuning”;2nd Edition, ISA

PROJECT (404191)

Teaching Scheme	Examination Scheme
Practical: 2 Hrs/Week (Sem –I)	**Term work: 100 Marks**
Practical: 6 Hrs/Week (Sem-II)	**Oral: 50 Marks**

1. **Group Size**

The student will carry the project work individually or by a group of students. Optimum group size is in 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of the work.

2. Selection and approval of topic

Topic should be related to real life application in the field of Electronics and Telecommunication
OR
Investigation of the latest development in a specific field of Electronics or Communication or Signal Processing
OR
The investigation of practical problem in manufacture and / or testing of electronics or communication equipments
OR
The Microprocessor / Microcontroller based applications project is preferable.
OR
Software development project related to VSDL, Communication, Instrumentation, Signal Processing and Agriculture Engineering with the justification for techniques used / implemented is accepted.
OR
Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

Note:
The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by internal and external guides.
Project report must be submitted in the prescribed format only. No variation in the format will be accepted. One guide will be assigned at the most 3 project groups.