## STRUCTURE OF

### B.E. (ELECTRONICS & TELECOMMUNICATIONS) 2008 COURSE

#### TERM - I

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**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

Lectures: 3 Hrs/week

Tutorial: 1 Hr/week

Examination Scheme

Paper: 100 Marks

Term work: 25 Marks

Unit 1: Introduction


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**


**Reference Books**


**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

Lectures/Week: 4 Hrs

Practical/Week: 2 Hrs.

Examination Scheme

Paper: 100 Marks

Practical: 50 Marks

Unit 1: Analog CMOS Design


Unit 2: Digital CMOS Design


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


Textbooks


Reference Books

4. Data Sheets of PLDs.

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

Lectures: 4 Hrs/week
Practical: 2Hrs/week

Examination Scheme

Paper: 100 Marks
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


Unit 4: Network Layer


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


Reference Books

1. Wayne Tomasi, “Introduction to Data Communication and Networking”, 1/e, Pearson Education

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

Lecturers/week: 4 hrs
Practicals/week: 2 hrs

Examination Scheme

Paper: 100 Marks
Practical: 50 Marks
Term work: 25 Marks

Unit 1: Digital Image Fundamentals


Unit 2: Image Enhancement


Unit 3: Image Transforms

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

Unit 4: Image Coding and Compression

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 Thresholding.

Unit 6: Image Restoration and Image Processing Applications

Image Degradation Mode, Noise Models, and Restoration in Presence of 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


Reference Book


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.
10. Creating noisy image and filtering using MATLAB. 12
EMBEDDED SYSTEM AND RTOS (404184)

Teaching Scheme

Lectures: 4 Hrs/week
Practical: 2 Hrs/week

Examination Scheme

Paper: 100 Marks
Practical: 50 Marks
Term work: 25 Marks

Unit 1: Introduction to Embedded System

Characteristics, design metrics and optimization of various parameters of embedded systems. 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, Arm11 and 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 Systems “ 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 system design “ , PHI
2. Steve Furber “Arm System on chip architecture”, AddisonWesely

**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

Lectures/Week: 4 Hrs

Practical/Week: 2 Hrs.

Examination Scheme

Paper: 100 Marks

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


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


Unit 6: Drives Applications & Power Quality


Text Books


Reference Books

2. M D Singh & K B Khanchandani, “Power Electronics”, TMH

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.
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

Lecturers/week: 4 hrs
Practicals/week: 2 hrs

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

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.
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).
Elective –II

ENTREPRENEURSHIP DEVELOPMENT (404185)

Teaching Scheme

Lectures/Week: 4 Hrs

Examination Scheme

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


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

Textbooks

JOINT TIME FREQUENCY ANALYSIS (404185)

Teaching Scheme

Lectures: 4 Hrs/week

Examination Scheme

Paper: 100 Marks

Unit 1: Introduction


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

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


Reference Books

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


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**

2. Max J. Madou: “Fundamentals Of Micro Fabrication”- The science of miniaturization,

**Reference Books**

## MOBILE COMMUNICATION (404185)

<table>
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<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tr>
<td>Lectures/Week: 4 Hrs</td>
<td>Paper: 100 Marks</td>
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### Unit 1: Introduction to Mobile Communication


### Unit 2: Mobile Radio Propagation


### Unit 3: Modulation & Equalization Techniques for Mobile Radio


### Unit 4: Coding & Multiple Access Techniques for Wireless Communications


### 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


Reference Books

### Project Part I (404186)

<table>
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<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tr>
<td>Tutorial: 2 Hrs/Week</td>
<td>Term Work: 50 Marks</td>
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**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

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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

Lectures / Week: 4Hrs

Practical /Week: 2Hrs.

Examination Scheme

Paper: 100 Marks

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 3: Switching Networks

Unit 4: Network Synchronization and Management


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
3. Thiagarajan Vishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications

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

Lectures / Week: 4Hrs
Practical /Week: 2Hrs.

Examination Scheme

Paper: 100 Marks
Practical: 50 Marks
Term work: 25 Marks

Unit 1: Fiber optic communications system


Unit 2: Optical Fiber for Telecommunication


Unit 3: Optical Sources & Transmitters


Unit 4: Optical detectors & Receivers

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


Text Books


References

1. Djafar K. Mynbaev and Lowell L. Scheiner, “Fiber Optic Communications Technology”, Pearson Education

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)

<table>
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<td>Lectures/Week: 4 Hrs</td>
<td>Paper: 100 Marks.</td>
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<tr>
<td>Practical/Week: 2 Hrs</td>
<td>Practical: 50 Marks</td>
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<tr>
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<td>Term work: 25 Marks</td>
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**Unit 1: Introduction to Neuro-Fuzzy and soft computing**


**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:


Reference Books:

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)
SPEECH PROCESSING (404189)

Teaching Scheme

Lectures / Week: 4Hrs
Practical /Week: 2Hrs

Examination Scheme

Paper: 100 Marks
Practical: 50 Marks
Term work: 25 Marks

Unit 1: Fundamentals of Digital Speech Processing

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)


Unit 3: Homomorphic Speech Processing


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

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.

Reference books

2. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, Wiley

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.
7. Speaker Recognition.
8. Speech Recognition. 37
TELEVISION AND VIDEO ENGINEERING (404189)

Teaching Scheme

Lectures/week: 4 Hrs

Practical/week: 2Hrs

Examination Scheme

Paper: 100 Marks

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


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, Football 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.
Unit 6: Consumer Applications


Text Books

2. Video Demisified, Kelth jack, Penram International Publication.

Reference Books

2. Bernard Grobb, Charles E, “Basic TV and Video Sytems”.

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.
TEST AND MEASUREMENT SYSTEMS (404189)

Teaching Scheme

**Lecturers/week:** 4 hrs

**Practicals/week:** 2 hrs

Examination Scheme

**Paper:** 100 Marks

**Practical:** 50 Marks

**Term work:** 25 Marks

Unit 1: Introduction


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

2. M.M.S. Anand, “Electronics instruments and instrumentation technology”, PHI.

Reference Books


List of practicals:

1. Statistical analysis of measurements, probable error, calibration of meters.
3. Measurements using Digital Storage Oscilloscope, different modes of DSO, capturing transients and analysis of waveforms.
8. Case study of measurement system using software package like LABVIEW.
Elective-IV

ARTIFICIAL INTELLIGENCE (404190)

Teaching Scheme

Lectures/Week: 4 Hrs

Examination Scheme

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


Reference Books

AUTOMOTIVE ELECTRONICS (404190)

Teaching Scheme

| Lectures / Week: 4Hrs |

Examination Scheme

| Paper: 100 Marks |

Unit 1: Power Train Engineering and fundamentals of Automotive.


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.

Unit 4: Electronic Control Unit Design.


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


Text Books

Reference Books

## NANOTECHNOLOGY (404190)

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<td><strong>Paper:</strong> 100 Marks</td>
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### 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


### 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

Unit 1: Introduction to Process Control


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, Analog 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.
Text Books


Reference Books

PROJECT (404191)

Teaching Scheme

Practical: 2 Hrs/Week (Sem –I)

Practical: 6 Hrs/Week (Sem-II)

Examination Scheme

Term work: 100 Marks

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.