OK

FACULTY OF ENGINEERING No. 49

Revised Syllabus for the

B.E. (Electronics)

(From Academic Year : 2006-2007)

University of Pune

Price : Rs. 30/-

UNIVERSITY OF PUNE

STRUCTURE B. E. (ELECTRONICS), 2003 COURSE-TERM-I

Subject Code	Subject	Teaching Scheme Hrs/Week Lect.	Pract.	T	Exam Scheme Th	Tw	Pr	Or	Total Marks
404201	Computer Networks	3	—	—	100	—	—	—	100
404202	Electronic Product Design	4	—	—	100	—	—	—	100
404203	Advanced Power Electronics	4	—	—	100	—	—	—	100
404204	VLSI Design	3	2	—	100	—	50	25	175
404205	Elective - I	4	2	—	100	25	50	—	175
404206	Electronics Laboratory - III	—	4	—	—	—	50	25	75
404207	Seminar**	—	—	2	—	50	—	—	50
404208	Project***	—	2	—	—	—	—	—	—
	Total	**18**	**10**	**2**	**500**	**75**	**150**	**50**	**775**

Total Hours = Theory 18Hrs + Practical 10 Hrs + Tutorial 2 = 30 Hours

Elective - I

I. Embedded Systems Design
II. Process Instrumentation
III. Advanced Digital Signal Processing
IV. Advanced Communication Engineering
V. Software Engineering

Note :

(1) All three papers are three hours duration
(2) Practical/Oral shall be based on term-work
(3) Term-work of Seminar consists of seminar report based on project.
(4) ** * Exam at the end of II term

STRUCTURE B. E. (ELECTRONICS), 2003 COURSE-TERM-II

Subject Code	Subject	Teaching Scheme Hrs/Week Lect.	Pract.	T	Exam Scheme Th	Tw	Pr	Or	Total Marks
404209	Electronic Measurement Systems	4	—	—	100	—	—	—	100
404210	Management Information Systems	4	—	—	100	—	—	—	100
404211	Bio-Medical Electronics	4	—	—	100	—	—	—	100
404212	Elective - II	4	2	—	100	—	50	25	175
404213	Electronics Laboratory - IV	—	4	—	—	—	50	50	100
404208	Project***	—	6	—	—	100	—	50	150
	Total	**16**	**12**	**—**	**400**	**100**	**100**	**125**	**725**

Total Hours = Theory 16 Hrs + Practical 12 Hrs = 28 Hours

Elective - II

I. Real Time Operating Systems
II. Artificial Intelligence
II. Robotics and Industrial Automation
V. System Programming and Operating Systems
V. Digital Image Processing

Note :

1) All three papers are three hours duration
2) Practical/Oral shall be based on term-work
3) Term-work of Seminar consist of seminar report based on project
4) ** * Exam at the end of II term

404201 : COMPUTER NETWORK

Teaching Scheme — **Examination Scheme**
Lectures : 3 Hrs/week — **Paper : 100 Marks**

Unit I

Introduction to Computer Networks and Transmission Media :

Types of Networks, topologies, centralized and distributed networks, LAN, WAN, MAN, Broadcast vs Point-to-Point networks, overview of wireless networks, Internet. Network design issues, layered architecture, interfaces and services, service primitives and relationships of services to protocols. Overview of network model: OSI and TCP/IP.

Unit II

Physical Layer :

Maximum data rate of channel, transmission media-guided and unguided and their types with specifications, Communication satellites (GEO/MEO). Modems and protocols, Multiplexing techniques, circuit switching, message switching, packet switching network, Cable TV and Internet over cable.

Unit III

Data Link Layer (LLC and MAC sub layer) :

Framing, error control, flow control, simplex stop and wait protocol, sliding window protocols, data link layer in Internet, HDLC, PPP, SLIP. Static and Dynamic Channel Allocation in LAN, CSMA/CD protocols, collision free protocols, WDMA protocol, IEEE 802 standards for Ethernet, token bus and token ring, DQDB. Bridges, High speed LAN (fast Ethernet, gigabit Ethernet and FDDI)

Unit IV

Networks and Transport Layer :

Virtual circuits, and datagram networks, circuit switching, and packet switching. Routing algorithms, routers, and routing protocols. Congestion control, and algorithms (issues like delay, load, throughput, jitter etc.) Transport layer services and principles. Connectionless v/s connection oriented services like UDP and TCP, QOS (Quality of Services).

Unit V

Application Layer :

Introduction to Cryptography, Secret key and public key algorithm, Security issues for Intranet and Internet, DNS (Domain name System), Electronic mail, World wide Web, Writing a web page in HTML, Introduction to sockets and socket programming, Video on Demand.

Unit VI

TCP/IP Protocol Suite :

Layered Architecture, Protocol Stack., IP Addressing: Classes, static, dynamic (DHCP). Ipv4 v/s Ipv6, Sub-netting: masking and subnet masking. Protocols: Ping, FTP, telnet, http (www), SMTP, SNMP, Trace route, TFTP, BOOTP, DNS, NFS, RPC, ICMP, IGMP, ARP, RARP, etc.

Text Books :

1. Andrew Tenenbaum, "Computer Networks", 3rd and 4th Edition, Prentice Hall.
2. Behrouz A. Forouzan, "Data Communications and Networking", 4th Edition, McGraw Hill

Reference Books :

1. D. Comer, "Computer Networks and Internet TCP/IP".
2. William Stallings, "Data and Computer Communications", 7th Edition, Prentice Hall.
3. William Stallings, "Computer Networks", Prentice Hall.
4. Kurse & Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Addison Wesley.

404202 : Electronics Product Design

Teaching Scheme
Lectures : 4 Hrs/week

Examination Scheme
Paper : 100 Marks

Unit I

Product Design and Development

An overview of product development stages: Study of techno-commercial feasibility of specifications (Case study), R & D prototype, Assessment Of reliability (case study), Ergonomic and aesthetic design considerations, Pilot Production batch, QA testing of, products (verification of specifications), Packaging and storage. Estimating power supply requirement (power supply sizing), Study of power supply protection devices: Line filters, Transzorbs, MOVs, Fuses and Suppressor capacitors, Noise reduction, grounding, shielding and guarding techniques, Thermal management.

Unit II

PCB Designing

PCB design: General layout considerations for analog and digital circuits. Power and ground traces routing for better decoupling, Recommendations for decoupling and bypassing, Layout considerations for mixed signal circuits, Component mounting considerations: Study of packages for Discrete devices and ICs, Calculation of parasitic elements in PCB, High-speed, EMI reduction methods in PCB designing, Cross talk, reflections and terminations, Transmission line effects in high-speed PCBs, Mounting in presence of vibration. SMD assemblies, testing of assembled PCBs.

Unit III

Hardware Design and Testing Methods

Use of Logic analyzer, Digital Storage Oscilloscope (DSO), Mixed Signal Oscilloscope (MSO) and Digital Phosphor Oscilloscope (DPO) for hardware testing, Signal integrity issues, Use and limitations of different types of analyses- DC or Operating point analysis, AC analysis, Transient analysis, Monte-Carlo analysis.

Unit IV

Software Design and Testing Methods

Software design methods: Top-down and Bottom-up approaches, ASM / FSM method of design, Decision to use assembly and / or high-level language for software development. Use of assemblers, compliers and cross compilers in developing product software, Software testing using simulators, in-circuit emulators.

Unit V

Product Testing

Environmental testing: Dry heat, Vibration, Temperature cycling, Bump, and Humidity tests as specified in IS standards, EMI/EMC compliance testing, Standardization required for UL and CE certification of industrial electronic products.

Unit VI

Documentation

PCB documentation; Assembly and fabrication related documentation; Laminate grade, Drilling details, Plating, Bare board testing etc. Product documentation: Bill Of Materials, Production test specifications, Interconnection diagrams, Front and rear panel diagrams, Instruction. User manual, Service/Maintenance manual, Software documentation standards, and practices

Text Books :

1. J. C. Whitaker, "The Electronics Handbook, CRC Press, IEEE Press
2. Charles A. Harper, "Electronic Packaging and Interconnection Handbook", McGraw-Hill Handbooks, ISBN 0-07-143048-2
3. Norman Fuqua, "Reliability Engineering for Electronic Design", Marcel Dekker INC.
4. Howard Johnson, Martin Graham, "High-speed Digital design- A Handbook of Black Magic", Prentice Hall Publication

404203 : Advanced Power Electronics

Teaching Scheme
Lectures : 4 Hrs/week

Examination Scheme
Paper : 100 Marks

Unit I
Converters

Analysis of 3-phase full converter, comparison with 3-phase semi converter (derivations for semi converter is not required), Effect of source impedance on single-phase converters with analysis, Single-phase and three-phase dual converters (ideal and practical dual converter, control schemes for non-circulating current type dual converter, analysis of circulating current type dual converter), Series and parallel operation of power devices.

Unit II
Inverters

3-phase VSI (analysis for R load), Voltage control and harmonic reduction in inverters, Space vector modulation, Boost and Buck-boost inverters (analysis), ASCSI with IM as load (analysis of no-overlap region).

Unit III

Resonant converters: Class E, ZCS and ZVS, Power factor control: PF Improvement in LCC by SAC technique, PF Correction using active wave shaping techniques, Instrumentation in Power Electronics: Measurement & Sensing techniques.

Unit IV

LCC fed separately excited DC motor drives, Stepper Motor Drives, Servo Motor Drives.

Unit V
Induction Motor Drives

Stator voltage control, Slip power recovery scheme (LCC based Scherbius Drive), V/F Drive, Vector control, Brushless DC motor drive (3-phase full wave), Protection circuits for AC and DC motor drives, Braking techniques for separately excited DC motor and Induction motor.

Unit VI
Power Quality

Types of power line disturbances, Sources of power line disturbances, Preventive and nullifying measurement techniques, Measurement of power line disturbances. Energy audit

Text Books :

1. M. H. Rashid, "Power Electronics", 3e, Pearson Education, 2004,
2. Mohan, Undeland & Robbins "Power Electronics", 3e, John Wiley, 2003
3. B.K. Bose, "Modern Power Electronics & AC Drives", Pearson Education, 2002,

Reference Books :

1. Dubey, Doradla, Joshi & Sinha, "Thyristorised Power Controllers", New Age International, 1986.
2. Singh & Khanchandani, "Power Electronics", Tata McGraw Hill, 1998.
3. P. C. Sen, "Thyristor DC Drives", John Wiley, 1981.

404204 : VLSI Design

Teaching Scheme
Lectures : 3 Hrs/week
Practical : 2 Hrs/Week

Examination Scheme
Paper : 100 Marks
Practical : 50 Marks
Oral : 25 Marks

Unit-I
VHDL Modeling and Design Flow

Introduction to VLSI: complete VLSI design flow (with reference to an EDA tool), Sequential, Data flow, and Structural Modeling. Functions, Procedures, attributes, Test benches, Synthesizable, and non synthesizable statements; packages and configurations Modeling in VHDL with examples of circuits such as counters, shift registers, bi-directional bus, etc.

Unit-II
FSM And Sequential Logic Principles

Sequential Circuits, Meta-stability Synchronization, Design of Finite State Machines, and State minimization, FSM CASE STUDIES - Traffic Light control, Lift Control and UART STA and DTA

Unit-III
Programmable Logic Devices

Introduction to the CPLDs, Study of architecture of CPLD, and Study of the Architecture of FPGA

Unit IV
System On Chip

One, two phase clock, Clock distribution, Power distribution, Power optimization, SRC and DRC, Design validation, Global routing, Switch box routing, Off chip connections, I/O

Architectures, Wire parasitics, EMI immune design. Study of memory-Basics of memory includes types of memory cells and memory architectures, Types of memory, based on architecture specific and application specific viz. SRAM, DRAM, SDRAM, FLASH, FIFO.

Unit V
CMOS VLSI

CMOS parasitics, equivalent circuit, body effect, Technology Scaling, λ parameter, Detail study of Inverter Characteristics, power dissipation, power delay product, CMOS combinational logic design and W/L calculations, Transmission gates, Introduction to CMOS layout.

Unit VI
Testability

Need of Design for testability, Introduction to Fault Coverage, Testability, Design-for-Testability, Controllability and Observability, Stuck-at Fault Model, Stuck-Open and Stuck-Short faults, Boundary Scan check, JTAG technology; TAP Controller and TAP Controller State Diagram. Scan path, Full and Partial scan, BIST

Text Books :

1. John F. Wakerly, "Digital Design, Principles and Practices", Prentice Hall Publication
2. Neil H. E Weste and Kamran Eshraghian, "Principles of CMOS VLSI Design".
3. Wyane Wolf, "Modern VLSI Design"
4. Sudhkar Yalamachalli, "Introductory VHDL from simulation to Synthesis"

Reference Books :

1. Perry "VHDL".
2. Charles Roth, "Digital System Design using VHDL", McGraw Hill.
3. Xilinx Data Manual "The Programmable Logic Data Book".
4. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design", Second Edition, McGraw-Hill, 2005.'
5. Michael John Sebastian Smith, "Application-Specific Integrated Circuits", Addison Wesley.
6. Wayne Wolf, "FPGA-Based System Design", Prentice Hall,
7. Miron Abramovici, "Digital Systems Testing and Testable Design", Jaico Publishing.

LIST OF EXPERIMENTS :

Instructions and Tools to be used :

1. Aim is the Final Experimental Testing on Hardware Prototype for Verification of Correct Functional and Performance Operation of Synthesized Digital System.
2. Tools

*EDA tool Front-end (including Synthesis, Simulation, place and route).

*VLSI Trainers with FPGAs and CPLD.

Any 8 assignments out of the following :

Simulation, Synthesis, and Implementation of

1. 8: 1 Multiplexer, 2:4 Decoder, Comparator and Adder.
2. Flip Flop(s), Shift Register and Counter.

3. Lift Controller/Traffic Light Controller / UART. Anyone of the three.
4. Purity generator and Checker.
5. Implementation of RAM/FIFO.
6. Ramp waveform generator using DAC
7. Bi-directional buffer
8. Temperature sensing using ADC, Displaying on 7-Segment display and threshold setting using keyboard
9. Implementation of 4-bit RISC processor

404205 : Embedded System Design

Teaching Scheme	Examination Scheme
Lecture s: 4 Hrs./Week	Theory : 100 Marks
Practical : 2 Hrs./Week	Practical : 50 Marks
	Term Work : 25 Marks

Unit I

Embedded System Introduction

History, Design Challenges, optimizing design metrics, time to market, NRE and unit cost, design metrics. Applications of embedded systems and recent trends in embedded systems.

Other protocols like CAN and MOD BUS, wireless communication like Blue tooth, GPRS, IrDA, IEEE 802.11 and 802.16

Unit II

System and Processor Architecture

Hardware and software architecture, processor selection for embedded system, memory Architecture and I/O devices, Interrupt service mechanism, interrupt latency, context switching.

Unit III

Programming Concepts

Interprocessor communication and synchronization of process, tasks, threads, scheduling, device drivers for embedded devices.

Unit IV

Real Time Operating System Concept

Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS.

Unit V

Commertial RTOS

Overview of comemertial RTOS like Vxworks, RT Linux, Ucos, QNX, Nucleus software development life cycle. Introduction to mobile computing.

Unit VI

Case Study of Embedded System

Case study of embedded system like digital camera, smart card, flight simulation and control.

Text Books :

1. Frank Vahid, "Embedded System Design", Prentice Hall Publication.
2. Rajkamal, "Embedded Systems", TMH.

List of Practicals :

404205 : Process Instrumentation

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

Unit 1 :

Introduction to Process Control and Transmitters :

(a) Introduction to Process Control :
Process Control Principles, Block Diagram Control System evaluation and control system quality. Instrumentation Standard signals

(b) Transducers, Converters and Transmitters :
Transducers-Classification, principles and application oriented information about pressure, temperature, flow, displacement (strain gauges, optical, resistive, capacitive , inductive etc.) PH, conductivity, Converters-E/P, P/E, V/I, I/V, V/F, F/V, Transmitters-2 Wire Transmitters, Smart Tx (Wire and wireless).

Unit 2 :

Control Elements and Controllers :

(a) Control Elements-Mechanical, Electrical, Fluid valve, Control valve: principle, classification, different parts of a standard control valve, selection of control valve, Various types of control valve and their applications, CV noise, Actuators and positioner, cavitation and flashing.

(b) Controllers :
Typical closed loop control-, Process characteristics, control system parameters, Control modes- Discontinuous, continuous and composite control modes. Electronic controllers-Realisation of controller modes using OP-amp circuits, Controller Tuning, General Features of PID controller, Pneumatic Controllers, Hydraulic controllers

Unit 3 :

Advanced Process Control :

(a) Control system: Manual and Auto control system, open loop and close loop, feedback and feed forward, cascade and ratio, selective and adaptive control system and their applications in process industry.

(b) Statistical Process Control, Self Tuning Controllers.

Unit 4 :

Model Based Control and Optimization :

(a) Structure, different modeling approaches: Internal Model Control (IMC), Model Predictive Control (MPC), Process Model Based Control (PMBC), Modeling and Simulation of Temperature Process.

(b) Optimization: Considerations in optimization. Feed forward optimizing Control, Optimizing Tools, Constraint Handling and following.

404205 : Process Instrumentation

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

Unit 1 :

Introduction to Process Control and Transmitters :

(a) Introduction to Process Control :
Process Control Principles, Block Diagram Control System evaluation and control system quality. Instrumentation Standard signals

(b) Transducers, Converters and Transmitters :
Transducers-Classification, principles and application oriented information about pressure, temperature, flow, displacement (strain gauges, optical, resistive, capacitive , inductive etc.) PH, conductivity, Converters-E/P, P/E, V/I, I/V, V/F, F/V, Transmitters-2 Wire Transmitters, Smart Tx (Wire and wireless).

Unit 2 :

Control Elements and Controllers :

(a) Control Elements-Mechanical, Electrical, Fluid valve, Control valve: principle, classification, different parts of a standard control valve, selection of control valve, Various types of control valve and their applications, CV noise, Actuators and positioner, cavitation and flashing.

(b) Controllers :
Typical closed loop control-, Process characteristics, control system parameters, Control modes- Discontinuous, continuous and composite control modes. Electronic controllers-Realisation of controller modes using OP-amp circuits, Controller Tuning, General Features of PID controller, Pneumatic Controllers, Hydraulic controllers

Unit 3 :

Advanced Process Control :

(a) Control system: Manual and Auto control system, open loop and close loop, feedback and feed forward, cascade and ratio, selective and adaptive control system and their applications in process industry.

(b) Statistical Process Control, Self Tuning Controllers.

Unit 4 :

Model Based Control and Optimization :

(a) Structure, different modeling approaches: Internal Model Control (IMC), Model Predictive Control (MPC), Process Model Based Control (PMBC), Modeling and Simulation of Temperature Process.

(b) Optimization: Considerations in optimization. Feed forward optimizing Control, Optimizing Tools, Constraint Handling and following.

Unit 5 :

Programmable Logic Controllers :

Discrete state process control system, Methods for describing sequence of events in a process. Introduction to PLC, Architecture of PLC, Input Modules and Output Modules of PLC Introduction to PLC Ladder Logic, Choosing the correct processor for an application, Ladder programming for simple applications, Typical specifications of PLC processors.

Unit 6 :

(a) Computer in Instrumentation: Supervisory Control Systems, Direct Digital Control Systems, Distributed Control Systems, SCADA.

(b) Auxiliary Components: Totalizer, square Root Extractor, Indicators, Recorders, Alarm Annunciators, Control panels, Digital display, Digital Recorders.

Reference Books :

1. Liptak, " Instrument Engineers Handbook" Volume I & II, Chilton Book Co.
2. C. D. Johnson," Process Control Instrumentation Technology", PHI.
3. Gary Dunning, " Introduction to Programmable Logic Controllers", Thomson Learning Inc.
4. Bob Connell," Process Instrumentation Applications Manual", McGrawHill.
5. G. K. McMillan " Process/Industrial Instruments & Controls Handbook" McGrawHill.
6. J. W. Webb & R.A. Reis " Programmable Logic Controllers" PHI ISBM 0-02-424980-7
7. Thomas Merlin

List of Practicals :

1. Calibration of E/P and P/E converter
2. Tuning of PID controller for different control actions.
3. Microprocessor based process control.
4. Development of Ladder Diagram and implanting it on PLC.
5. Communication with SMART TX.
6. Plot the characteristics of a control valve
7. Experiment based on Computer Simulation of the Instrumentation system/Control/Process.
8. Measurement of pH/Conductivity.

404205 : Advanced Digital Signal Processing

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

Unit I
Random Signals & Multi-rate DSP

Characterization of random signals: review of deterministic signals, random signals, correlation function, power spectra, DT random signals, time averages for DT random process.

Multi-rate DSP: Decimation, Interpolation, design of practical sampling rate conversion, software implementation of sampling rate converters, sample rate conversion using poly-phase filter structures, Efficient D/A conversion in Hi-Fi systems.

Unit II
Adaptive filters

Need of adaptive filters, adaptive filters as noise cancellation, configuration of adaptive filters, main components of adaptive filters, Adaptive Algorithms: LMS adaptive algorithms, recursive least square algorithms, Adaptive filtering of ocular artifacts from the human EEG, adaptive telephone echo cancellation.

Unit III
Linear prediction and optimum linear filters

Lattice structures, innovation representation of random process, rational power spectra, AR, MA & ARMA, forward & backward linear prediction, Wiener filter for filtering and prediction, Solution of the normal equation- Levinson - Durbin algorithm.

Unit IV
Power Spectrum Estimation

Estimation of Spectra From Finite duration observation of signals, Estimation of autocorrelation and power spectrum of random signal, Non parametric methods for power spectrum estimation- Bartlett window and Welch method.

Unit V
Architectures for DSPs

Basic Generic Architectures for DSPs, Harward Architecture, Introduction to SHARC, Pipelining, MAC, special Instructions, on chip memory, Fixed and Floating point DSPs, Selection of DSPs, case study of TMS320c54XX, Implementation of Basic DS algorithms, like FIR, IIR Filters, Decimation and Interpolation.

Unit VI
Speech Processing

Speech Theory and Speech Processing

Text Books :

1. E. C. Ifleachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education.
2. John G. Proakis, Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson education.
3. Avtar Singh, S. Srinivasan, "Digital Signal Processing Implementation using DSP, Microprocessors with examples from TMS 320C54XX", Thomas Publication.
4. Rabinar, Gold, "Speech Signal Processing".

Reference Books :

1. P. P. Vaidyanathan, "Multirate Systems and filter banks", PHI.
2. B. Venkatramani, M. Bhaskar, "Digital Signal Processors, Architecture, Programming & Applications", TMH.
3. "A Handbook of Digital Image Processing", IEEE Press.
4. Simon Haykins, "Adaptive Filter Theory", 4th Edition, Pearson Education, 2002,
5. "Texas Manual for DSP Processors & Starter kit".
6. www.dspguide.com

List of Practical Assignments :

* Any five from 1 to 8, Assignment 9 is compulsory, Any two assignments form 10-13.

1. Generate random signals and plot their realization.
2. Software implementation of Decimation and interpolation
3. Implementation of Least mean Square (LMS) Algorithm.
4. Determination of FIR prediction filters using Forward and Backward prediction.
5. FIR or IIR Filter Implementation using VLSI
6. To implement Levinson Durbin Algorithm for Solution of Normal equations.
7. Realization of cascade Lattice of FIR Filter.
8. Power Spectrum Estimation using any one non-parametric method.
9. Demonstration of Hardware and Software utilities for DSP starter kits (Texas, ADSP or Motorola).

Implementation of the following DSP Algorithms on DSP processors:

10. Implementation of FIR Filter.
11. Implementation of IIR Filter.
12. Implementation of Interpolation.
13. Implementation of Decimation.

404205 : Advanced Communication Engineering

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

Unit I

Microwave communication, Principle, components and Devices :

Rectangular wave-guides microwave components- T-junction, directional coupler, joints, bends, cavity resonator, Faraday's devices, and phase shifter, attenuators.

Microwave sources: Principle of operation & application of two cavities Klystron, reflex Klystron, TWT, Magnetrons. Horn & Parabolic Antennas

Unit II

Solid State Microwave Devices & Integrated Circuits :

MESFET, Varactor Diode, Pin Diode, Tunnel Diode, TEDs and ATTDs. Micro striplines, parallel striplines coplanar striplines, shielded striplines, materials, MMI, Fabrication Techniques and Hybrid integrated ckts application.

Unit III

Radar Communication :

Radar fundamentals, types of radar-MTI, pulsed Doppler radar, CE radar, delay line canceller, tracking radar, Conical scan & Sequential lobbing. Radar range, prediction, min detectable signals, system losses.

Unit IV

Optical Fiber Communication :

Optics Review : Nature of light, Ray Theory, acceptance angle, critical angle, acceptance cone, numerical aperture. Block diagram of OFC link, frequencies used, modulation techniques.

Modes & Types : Step Index, Graded Index, Single & multimode fibers

Signal Degradation in OFC : Attenuation, absorption, scattering losses, bending losses, core & cladding losses, material dispersion, group delay & pulse broadening, Power link budget, OTDR Instruments used for OFC.

Unit V

Mobile Communication :

Architecture and working of GSM, cell splitting, hand off mechanism, Co-channel Interference & its reduction factor, fixed channel assignment, ARQ Technique. Digital Cellular Modulation Technique. Introduction to Spread Spectrum & GPS

Wireless technologies: TDMA, CDMA, WCDMA, TD-SCDMA, TD-CDM-OFDM, Mobile Ad-Hoc networking.

Unit VI

Mobile Satellite Communication :

Introduction to basic satellite communication, System architecture, satellite orbits, satellite constellations (Polar, inclined orbits, hybrid) use of spot beams, radio link, spectrum sharing and forecast methods, propagation characteristics

Text Books :

1. Samuel Liao, "Microwave Devices & Circuits", PHI.
2. Skolnik, "Introduction To Radar System", TMH Publication.
3. William C. Y. Lee, "Mobile Cellular Telecommunication", McGraw Hill.

Reference Books :

1. Raj Pandya, "Mobile and Personal Communication Systems & Services", PHI.
2. M. Richharia, "Mobile Satellite Communication", Price Edition.
3. Pratt & Bostial, "Satellite Communication", Jhon Wiley & Son's.
4. Kaiser, "Optical Fiber Communication", McGraw Hill.
5. John M. Senior, "Optical Fiber Communication", PHI.

List of Practicals :

1. GPS Trainers.
2. Advanced Satellite trainer.
3. Pulse/Doppler Radar Trainer.
4. GSM Trainer.
5. CDMA-DSSS Trainer.
6. Mobile Communication Tx/Rx Trainer.
7. Fiber Optic Voice Tx/Rx (Analog & Digital).
8. Digital Optical Link (Eye Pattern).
9. Optical Power Meter.
10. Characteristics of Reflex Klystron.
11. Study of Gun Diode Characteristics.
    Microwave Components study and measurement of Directional Coupler Parameter

404205 : SOFTWARE ENGINEERING

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

Unit I

Introduction to software engineering:, software, software myths, process framework, CMMI, process pattern, process assessment, personal and team process models. Process models: waterfall model, incremental models, evolutionary models. Introduction to specialized process models, the unified process.

Unit II

Software engineering practice : the essence of practice, core principle, communication practices, planning practices, modeling practices: analysis and design modeling, construction practice: coding and testing principal, deployment System engineering: computer based system, hierarchy: system modeling and simulation, business process engineering, product engineering, system modeling: hatley-pirbhai modeling and modeling using UML

Unit III

Requirement engineering

Requirement engineering tasks, initiating the process, eliciting requirement, development use-cases, building the analysis model: requirement analysis, data modeling concept, object oriented analysis, scenario based analysis, floe oriented modeling, class based modeling, creating a behavioral model

Unit IV

Design Engineering : Design process and design quality, design concept, the design model, introduction to pattern based software design.

Architectural Design : software architecture, data design and architectural

User interface Design : rules, user interface analysis and step in interface design, design evaluation.

Unit V

Project Management : the management spectrum, the people, the product, the process, the w5HH principle, critical practices

Metrices For Process And Product

Metrices in process and project domains, software measurement, matrices for software quality, integrating metrics within software process

Unit VI

Estimation : software scope and feasibility, resources, decomposition technique, empirical estimation models, the make-buy decision

Change management : software configuration management, the SCM repository, and the SCM process

Reengineering : Business process reengineering, software renaming, reverse engineering, restructuring, and forward engineering.

Text Books :

1. Roger Pressman, "Software Engineering, A Practitioner's approach", 6th Ed., Tata McGraw Hill, Publication Company, 2004.

Reference Books :

1. Peters J. Pedrycz W, "Software Engineering: An Engineering Approach", John Wiley &Sons 2000
2. Vliet H, "Software Engineering Principal and Practices", Second Edition, John Wiley &Sons
3. Ghezzi C, Jazayeri M, Mandrioli D, "Fundamental of Software Engineering", Second Edition, Prentice Hall India, 2003
4. Behfarooz A, Hudson F," Software Engineering: Fundamentals", Oxford University Press, 2002

List of Practical Assignments

Use any professional or freeware/shareware tools like Borland ALM suite/Rational Suite/Umbrello/Magic Draw/ Gaphor /Poscidon and complete the following of project assigned to you.

1. Requirement Analysis (Rational Requisites PRO)
2. Modeling and design (Use case diagram, class diagram, sequence diagram and collaboration diagram using Rational Rose).
3. Coding
4. Testing (Rational Robot or GNATS/Bugzilla -Bug Tracking Tools).

Build User Interface Design of your project using Macromedia Authoware/Motif Common Desktop Environment.

Sample Program

1. Supermarket Automation Software (SAS) :

   The manager of a supermarket wants automation software to be developed. The supermarket stocks a set of items. Customers pick up their desired items from the different counters in required quantities. The customers present these items to the sales clerk. The sales clerk enters the code numbers of these items along with their respective quantities/units.

   (a) SAS should at the end of a sales transaction print the bill containing the serial number of the sales transaction, the name of each item, code number, quantity, unit price, and item price. The bill should indicate the total amount payable.

   (b) SAS should maintain the inventory of the various items of the supermarket. The manager upon query should be able to see the inventory details. In order to support inventory management, the inventory of an item should be decreased whenever an item is sold. SAS should also support an option by which employees can update the inventory whenever new supply arrives.

   (c) SAS should support printing the sales statistics for every item the supermarket deals with for any particular day or fat any particular period. The sales statistics should indicate the quantity if at 1 item sold, the price realized, and the profit accrued.

   (d) The manager of the supermarket should be able to change the price at which an item is sold as the prices of the different items may vary on a day-to-day basis.

2. Library Information System (LIS) :

   Different activities of the library pertaining to the issue and return of the books by the members of the library and various queries regarding books as listed below are automated.

   (a) The library has 10,000 books. Each book is assigned a unique identification number (called ISBN number). The library clerk should be able to enter the details of the book into the LIS through a suitable interface.

   (b) There are four categories of members of the library: undergraduate students, postgraduate students, research scholars, and faculty members.

   (c) Each library member IS assigned a unique library membership code number.

   (d) Each undergraduate student can be issued up to two books for one-month duration.

   (e) Each postgraduate student can be issued up to four books for one-month duration.

   (f) Each research scholar can be issued up to six books for three-months duration.

   (g) Each faculty member can be issued up to ten books for six-month duration.

   (h) The LIS should answer user queries regarding whether a particular book is available. If the book is available, the LIS should display the rack number in which the book is available and the number of copies available.

(i) The LIS registers each book issued to a member. When a member returns a book, the LIS deletes the book from the member's account and makes the book available for further issue.

(j) Members should be allowed to reserve books which have been issued our. When such a reserved book is returned, the LIS should print a slip for the concerned member to get the book issued and should disallow issue of the book to any other member for a period of seven days or until the member who has reserved the books gets it issued.

(k) When a member returns a book, the LIS prints a bill for the penalty charge for the overdue book. The LIS calculates the penalty charge by multiplying the number of days the book was overdue by he penalty rate.

(l) The LIS prints the remainder messages to the members against whom books are overdue, upon request by the Librarian.

(m) The LIS should allow the Librarian to create and delete member records. Each member should be allocated a unique membership identification number, which the member can use to issue, return, and reserve books.

3. Transport company computerization (TCE) software : A transport company wishes to computerize the various book keeping activities associated with its operations.

(a) The transport company owns a number of trucks.

(b) The transport company has its head office located ate the capital and has branch offices at several other cities.

(c) The transport company receives consignments of various sizes at (measured in cubic members) its different offices to be forwarded to different branch across the country.

(d) Once the consignment arrives at the office of the transport company, details of the volume, destination address, sender's address, etc, are into the computer. The computer is to compute the transport charge depending upon the volume of the consignment and its destination and then issue for the consignment.

(e) A truck stays with the branch office until the branch office has enough cargo to load the truck fully.

(f) The manger should be able to view the status of different trucks at any time.

(g) The manger should be able to view truck usage over a given period of time.

(h) When a truck is available and the required consignment also becomes available for dispatch, the computer system should print the details of the consignment number, volume, sender's name and address, and the receiver's name address to be forwarded along with the consignment.

(i) The manger can query the status of any particular consignment and the details of volume of consignments handled to any particular destination and corresponding revenue generated.

(j) The manger should also be able to view the average waiting period I different consignments. This statistics is important for him since he normal orders new trucks when the average waiting period for consignments becomes high due to non availability of trucks. Also, the manager would like to know the average idle time of the truck in the branch for a given period for future planning.

404206 : ELECTRONICS LABORATORY-III

Teaching Scheme	Examination Scheme
Practical : 4 Hrs/Week	Practical : 50 Marks
	Oral : 25 Marks

List of Experiments :

Any six assignments from group A, four from group B and six from group C.

A : List of the Experiments Computer Networks :

1. Implementation of LAN using star topology and connectivity between two computers using cross over UTP CAT5 cable.
2. Installation and configuration of Web Server.
3. Installation and configuration of Proxy Server.
4. Installation and configuration of network applications like FTP.
5. Installation and configuration of network applications like Telnet.
6. Connectivity of LAN computers to Internet using Dial-Up modem/leased line modem. (Installation and configuration).

B : List of Practical Assignments for Electronic Product Design :

1. Error budget analysis and verification by constructing front end signal conditioning circuit up to ADC input.
2. Temperature cycling test for above circuit. (Cycling-Ambient to 55°C adn back to ambient, three times).
3. Use of Logic analyzer for hardware debugging.
4. Use of Spectrum Analyzer for EMC Testing.

5. AC Dc, Transient and Tolerance or Sensitivity analyses of given circuit. Comparison of the same with actual performance with conclusions.

C : List of Assignments for Advanced Power Electronic :

Any 5 experiments from 1 to 8 with 9 & 10 being compulsory

1. Study of Dual Converter (1-Φ or 3-Φ).
2. Study of 3-Φ VSI (180° or 120°).
3. 2 Q or 4 Q Chopper DC Drive.
4. LCC (1-Φ or 3-Φ) based DC Drive.
5. Resonant converter (Class E or ZCS or ZVS or SLR or PLR).
6. Power factor improvement techniques (SAC or EAC or PWM)
7. Study of VVVF 3-Φ IM Drive.
8. Sensing and Protection circuits for AC and DC Drives.
9. Simulation of 3-Φ LCC (HCB or FCB or Dual Converter).
10. Simulation of 3-Φ VSI (120° or 180° or PWM)

404207 : SEMINAR

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

Note :

1. Seminar is based on the project topic. It consists of Literature Survey and basic project work. The abstract of the project should be submitted before the examination of seminar.
2. The seminar report consists of the Literature Survey basic project work and the size of the seminar 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 for seminar must have minimum 6 years of experience with UG qualification and 3 years with PG qualification.
4. At the time of examination, the student will have to give the presentation, and seminar assessment is based on Innovative Idea, Depth of understanding, Applications, Individual contributions, and presentation, and the grade given by the internal guide, which is based on the work carried out in a semester.
5. A certified copy of seminar report is required to be presented to external examiner at the time of final examination.

404208 : PROJECT

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

**** Exam at the end of second term**

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.

404209 : Electronics Measurement Systems

Teaching Scheme — **Examination Scheme**
Lectures : 4 Hrs/week — **Paper : 100 Marks**

Unit I
Analog Instruments

LCR-Q-meter, True RMS voltmeter, Multimeter, Vector Impedance voltmeter, phase meter, power meter, transistor tester, Instrument calibration standards.

Unit II
Digital Instruments

Digital Counters and Timers- basic counter circuitry, input circuitry, main gate, decimal counting unit and display, Time base circuitry, control circuit, modes of operation, tantalization of Electrical input events, frequency measurement, frequency ratio measurement, period measurement, time interval measurement, pulse width measurement, capacitance measurement, Automation in digital instruments (Auto zeroing, Auto polarity, etc.).

Unit III
Signal Analysis

Spectrum Analyzer, Logic Analyzer, Wave Analyzer, Total harmonic distortion Analyzer, FFT Analyzer, protocol Analyzer.

Unit IV
High Frequency Measurement

Measurement of transmitters and receivers, basic measurement, special system measurement, measurements on receiving systems, measurement on transmitting system, Sinad sensitivity, Automatic gain controls characteristics.

Network Analysis- System elements, measurement accuracy, scalar network analysis, vector network analysis.

Unit V
Special Purpose and Automated Test Instruments

DSO- block diagram, Acquisition methods, enchanus features, applications. Bit error rate measurement, pattern generators and error detector, high frequency and sampling CRO, power scope, Data acquisition system, ATE (Computer based and controlled ATE).

Unit VI
Computer Controlled Test Measurements

Virtual Instruments and its applications, TDM, FDM, ASK, PSK their applications in instruction, PCI interface, PCI express interface, Introduction to ___ view.

Text Books :

1. A. J. Bowon, "Digital Communication".
2. Oliver Cage, "Electric Instrumentation", Tata McGraw Hill.
3. H.S. Kalsi, "Digital Instrumentation", Tata McGraw Hill.

Reference Books :

1. Coombs "Electronic Instrumentation Handbook".
2. Cooper Herfric, "Electric Instrumentation & Measurement Techniques", Prentice Hall Publication.
3. J. J. Carr, "Digital Instrumentation"
4. M. M. S. Anand, "Electric Instrument & Instrumentation Techniques"

404210 : Management Information Systems

Teaching Scheme — **Lectures : 4 Hrs/week**

Examination Scheme — **Paper : 100 Marks**

Unit I

Introduction to Management Information Systems for Large and Complex Engineering Enterprise

Overview of Management Information Systems, Survey of Information Systems Technologies, Development, implementation and management of IS resources, Rise of Convergence Technology, e.g., IT infrastructure, Network, Enterprise, Applications, Wireless Networks, Mobile Devices, Mobile Users.

Future developments in MIS and its organizational and social implications-Complexity Advantage, (Complexity of an enterprise is ultimately limited by the amount of information that it can economically process and transfer, i.e., by the (costly) bandwidth of its internal communication channels and it is strategically critical for increased market share).

Unit II

Conceptual Foundations - Designing systems for complex and changing markets

Shift from Collective to Individual Design Decision: IS view of an engineering system, Shift from information economics to information economics, Implications of uncertainty in IS view - System failure from Complex Errors, Need for Information Evaluation - Introduction to Information Integrity, Information Integrity Risk

Systems approach to error reduction- Basis for I*I Technology Design

Unit III

Introduction to System Dynamics Modeling and Computer Simulation Language Tool for 1*1 Technology Development - I

System Dynamics Approach for Large, Complex Real World Problems, Problem Identification and its System Conceptualization, Introduction to the Computer Simulation Language.

Unit IV

Introduction 'to System Dynamics Modeling and Computer Simulation Language -Tool for 1*1 Technology Development - II

Model Formulation, Model Testing and Further Development, Policy Analysis and Recommendation.

Unit V

Information Integrity Technology Development - I

Information Envelop comprising dynamic decision stages and its I*I Implications, Significance of Efficient & Economic Processing of information: On Criticality of Information Integrity for Competitive Market Advantage, Existing I*I Mechanisms and their main limitations, Usefulness-Usability-Integrity Paradigm.

Unit VI

Information Integrity Technology Development - II

Information Integrity Attributes, Cost Benefit Analysis, of I* I, Equation for IMc value

I*I Technology a Systems Value.

Texts Books :

1. Gordon B. Davis and Margrethe H. Olson, "Management Information Systems", Mc-Graw-Hill International Editions.
2. George P. Richardson and Alexander L. Pugh III, "Introduction to System Dynamics Modeling", System Dynamics Series, PEGASUS Communic1tions, 1999, Pounds 25.95
3. Susanne Kelly and Mary Ann Allison, "The Complexity Advantage", A Business Week Book, Mc-Graw Hill, 1999.
4. Neil Storey, "Safety Critical Computer Systems," Addison-Wesley, Reading, Massachusetts Longman. 1996.

Reference Books :

1. Anders Tallberg, "An Economic Framework for Information Integrity", Library, Swedish School of Economics and Business Administration, P.O. Box 479, 00101 Helsinki, Finland, 1999.
2. Dietrich Dorner, "The Logic of Failure- Recognizing and Avoiding Error in Complex Situations", Perseus Books, Reading, Massachusetts, 1996
3. Fracois E. Cellier, "Continuous System Modeling", Springer -Verlag, NY, 1991.
4. V. Rajaraman, and V. V. Mandkc, Editors, "Information Integrity: Issues and Approaches", Proc. Of Discussion meeting at Jawaharlal Nehru Center For Advanced Scientific Research, June 1995.
5. Further, course will also refer to latest research papers in the area published through 1997 - 2003
6. www.centerforinfarmationintegrityresearch.arg..

404211 : Bio-Medical Electronics

Teaching Scheme
Lectures : 4 Hrs/week

Examination Scheme
Paper : 100 Marks

Unit I

Introduction to Biomedical System, Man Machine Interface, Bio-electric Signals, Types of Electrodes, Electrodes for ECG, EMG, EEG, Transducers and sensors related to biomedical measurements including respiration, Skin contact impedance, Motion artifacts, Fiber Optic sensor for temp.

Unit II

Cardiovascular System, Heart Anatomy, Functioning of System, ECG Amplifiers, ECG Machine, B. P., Heart Rate, Heart Sound, Blood Flow Measurements.

Unit III

Phonocardiography, Echocardiography, Vector Cardiography, Stress Testing System, Beside Monitors, Central Monitoring System, Pacemakers, Defibrillators, Grounding and Shielding, Patient Safety.

Unit IV

Colorimeter, Spectrophotometer, Autoanalyser, Flamephotometer, PH/Blood Gas Analyzer, Pulse Oximeter, Hemodialisis, Blood Cell Counter, Study of Essential Parameters of Recorders Related to Biomedical Engineering. Non-Fed CRO, Mediscope.

Unit V

Nervous System-Anatomy, Human Brain Recording of EEG Signal, EEG Amplifier, Analysis of Diseases using EEG Electromyography.

Unit VI

Diagnostic Medical instruments such as CT Scan, MRI, Ultrasonic Doppler Machine, Lasers in Medicine- Vision Correction, Dermatological.

Text Books :

1. Cromwell, "Biomedical Instrumentation and Measurement", PHI.
2. Webster, "Application and Design of Medical Instruments".
3. R. S. Khandpur, "Biomedical Instrumentation".
4. Carr and Brown, "Biomedical Instrumentation".

List of Practical Assignments :

Students are expected to perform maximum 8 practicals from the list mentioned below.

1. To study and check specifications of an ECG Recorder.
2. To Design and implement an ECG calibrator/ Phonocardiography
3. To measure Blood Pressure using Sphygmomanometer, Calibration of BP apparatus.
4. Study of Pacemaker, defibrillators
5. To design a Clinical Thermometer.

6. To record/monitor heart sounds using Electronic Stethoscope
7. To implement Heart rate Meter.
8. Study of EEG/EMG Machine.
9. Study of Bedside Monitor, Drip Rate Monitor (ICU Monitor).
10. Study of Dialysis System.
11. Study of Clinical Lab Instrumentation.
12. Study of Laser Treatments in Medicines.

404212 : Artificial Intelligence

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

Unit I

Introduction to Artificial Intelligence

Definition, A.I. Applications, A.I. Representations, Properties of internal representations. Heuristic search techniques, Best file search, mean and ends analysis, A* and AO* Algorithms.

Unit II

Game Playing

Minimax search procedure, Alpha-beta cutoffs, waiting for Quiescence, Secondary search.

Knowledge representation using predicate logic

Predicate Calculus, Predicate and arguments, ISA Hierarchy, Frame notation. Resolution, Natural Deduction.

Unit III

Knowledge representation using non-monotonic logic

TMS (Truth Maintenance System), Statistical and probabilistic reasoning Fuzzy-Logic Structure knowledge representation. Semantic-net, Frames, Script, Conceptual Dependency.

Unit IV

Planning

Block world, strips, Implementation using goal stack. Non-linear planning using goal Stacks, Hierarchical planning, List commitment strategy.

Unit V

Perception : Action, Robot architecture. Vision, Texture and images, Representing and recognizing Scenes Walts algorithm constraints determination, Trihedral and nontrihadral figures labeling

Learning By training neural networks. Introduction to neural networks and perception - qualitative analysis only, neutral net architecture and applications.

Unit VI

Natural language processing & understanding & pragmatic, syntactic, semantic. Qualities, finite, slate M/c, RTN, and ATN, understanding sentences.

Expert system

Utilization and functionality, Architecture of expert system, knowledge representation. Two case studies on expert systems.

Text Books:

1. Elaine Rich and Kerin Knight, "Artificial Intelligence".
2.

Reference Books:

1. Eugane, Charniak, Frew, "Introduction to Artificial Intelligence", McDermott.
2. Kishan Mehrotra, Sanjay Rawika, K. Mohan, "Artificial Neural Network".
3. Rajendra Akerkar, ""Introduction to Artificial Intelligence", Prentice Hall Publication.

List of Assignment:

Part I

1. Implement the game 'Tic-Tac-Toe' by using intelligent algorithm (or magic square method)
2. Implement A* algorithm to solve the problem of 8-puzzle (consider any initial state & final state).
3. Show the working of A0* algorithm.
4. Implement two-player game using mini-max search algorithm.

Part II

1. Implement program in prolog for Family history management.
2. Implement authentication program
3. Write a program for Recursion (Tower of Hanoi)
4. Implement a program for Graphics (Individual)
5. Implement Expert system (Mini project: Group Task)

404212 : Robotics and Industrial Automation

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

Unit I

Introduction :

Automation and Robotics, Definition, Basic Structure of Robots, Classification of Robots based on co-ordinate system, Present trends and future trends in robotics, Overview of robot subsystems, Components of Robot system- Manipulator, Controller, Power conversion unit etc, Specifications of robot.

Unit II

Dynamics & Kinematics :

Dynamic constraints, velocity & acceleration of moving frames, Robotic Mass Distribution & Inertia, Tension, Newton's equation, Euler equations, Dynamic Modeling of Robotic Manipulators. Homogeneous co-ordinate vector operations, matrix operations, co-ordinate reference frames, Homogeneous transformation and manipulator orientation relative points reference frames, forward solutions- Link co-ordinate frames, D-H matrix, Inverse or back solutions- problem of obtaining inverse solution, techniques of using direct & geometric approach.

Unit III

End Effectors and Actuators :

Different types of grippers, vacuum & other methods of gripping, overview of actuators, Internal & External sensors, position, relocking and acceleration sensors, proximity sensors, force sensors, touch slip laser range tinder, camera.

Unit IV

Motion Planning and Controllers :

On-off trajectory, relocking and acceleration profile, Cartesian motion of manipulator, joint interpolated control, Jacobian in terms of D-H matrix, Obstacle avoidance, Basic control system, control loops of robotic system, Fuzzy controllers.

Unit V

Robot Vision :

Machine Vision system, description, sensing, Digitizing, Image Processing and Analysis and Application of Machine Vision System, Robotic assembly sensors & Intelligent Sensors. Object recognition.

Unit VI

Robots for Industrial Automation :

Need for Automation, Robotics for automation. Robot Intelligence and Task Planning, MEMS (Micro Electro Mechanical Systems) - Introduction and working principle, Nano-robots

Text Books :

1. Fundamentals of Robotics: Analysis and Control - Robert J Schilling, PHI, NewDelhi
2. Robotic Engineering - Klafter, Thomas, Negin, PHI, New Delhi

Reference Books :

1. 3. Robotics for Engineers - Yoram Koren, McGraw Hill, New York
2. Fundamentals of Robotics - T.C. Manjunath, Nandu Publishers, Mumbai

3. Robotics and Control- R. K. Mittal, I. J. Nagrath, TMH, NewDelhi
4. MEMS and Microsystems Design and Manufacture- HSU, TMH, NewDelhi

Practical :

(1) Study of motion conversion (rotary to rotary, rotary to linear) using mechanical components.

(2) To build robot arms using mechanical components and applying motor drive.

(3) To build robot for given configuration and degrees of freedom.

(4) Motion of robot for each degree of freedom. Teaching a sequence to robot using Teach Pendant.

(5) To perform pick and place operation using Simulation Control Software.

(6) Robot path planning using Simulation & Control Software.

(7) Study of Pneumatic Robot OR Study of Robot Vision System.

(8) 2D simulation of a 3 DOF robot arm. (C / C++ OR MATLAB)

(9) Direct Kinematics analysis of 4-axis robot. (C / C++ OR MATLAB)

404212 : System Programming and Operating Systems

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

Unit I

Basics of System programming :

Language processes, Language processing activities, Fundamentals of language processing, Language processes development tools.

Data structures of language processing : search data structure, Allocation data structures. Need of system software, translated types, compiles, assembles, loaders linker and preprocessor

Introduction to compliers : Basic compliers function, Phases of compilers 9 with a simple, example of assignment statement in C- shoring how each phase of complier)

Unit II

Assemblers and Microprocessor :

Assemblers : structures of assembler assembly process, machine dependents, In dependents assemblers features. Pass-I & Pass-II of assemblers design (with 8086), Design of single pass assemblers, Advantages of and Disadvantages of dingle pass Assemblers.

Microprocessor : Macro definition and call, macro expansion, Machine Independent macro processor features, Nested macro calls, advanced macro facilities, Design of microprocessor.

Unit III

Loaders and Linkers :

Basic loaders functions, central loaders scheme Absolute loaders, Subroutine linkers, relocation Loader, Direct linking loader, Dynamic linking loader, Design of absolute loaders direct linking loader, Implantation of MS DOS linker,

Unit IV

Operating System :

Evolution of O. S. Function: Batch processing system, Multiprogramming systems, Time-sharing systems, real time systems, O.S. structures, Processor Management: Concept of a process, process definition, process control, interacting processes

Scheduling : policies, Job Scheduling, Process scheduling

Deadlocks : Definition, Handing deadlocks detection and resolution avoidance Process Synchronization; implementing control Synchronization, critical sections semaphores classical process synchronization problems Introduction to intercrosses communication.

Unit V

Memory management

Contiguous memory allocation, Non-Contiguous memory allocation, Virtual memory using paging, Virtual memory using Segmentation , File Systems: Directory structure , file protection , allocation of disk space, Implementing file access , File sharing , File system reliability, Case study FAT 32, NTFS.

Unit VI

I/O Organization and I/O Programming :

I/O Organization, I/O devices, Physical IOCS, Fundamental file I/O Organization, Advanced I/O Programming, Case Study: Devices drivers for USB, Serial port and parallel port.

Text Books :

1. D. M. Dhamdhare, "Systems Programming and Operating System", TMH.
2. Leland L. Beck, "System Software," Pearson Editions.

Reference Books :

3. A. S. Tanenbaum & Ablert Woodhull, "Operating Systems", Pearson Editions.
4. J. J. Donovan, "Systems Programming", McGraw Hill

404212 : Digital Image Processing

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

Unit I (6)

Digital Image Processing

Components of Image Processing Systems, Elements of Visual perception, MTF of Visual System, Image Sensing and Acquisition, Image Sampling & Quantization, Basic pixel relationship, Statistical Properties- Histogram, Mean, Standard Deviation, Profile, Different Distributions.

Unit II (6)

Image Transforms & Color Fundamentals

Properties of 2-D Transforms, Discrete Fourier Transform, Discrete Cosine Transform, Walsh/Hadamard Transform, Harr Transform, K-L Transform, Color Image Fundamentals, Chromaticity Diagram, Color Model-RGB, HSI, YIQ, RGB to HSI and HSI to RGB conversion.

Unit III (7)

Image Enhancement

Enhancement in Spatial Domain- basic gray level transformations, histogram processing, enhancements using

arithmetic and logical operations, basics of spatial filtering, smoothening and sharpening spatial filters,

Enhancement in frequency Domain- smoothing & sharpening frequency domain filters. Pseudo Color Image Processing, Basics of Full Color Image Processing.

Unit IV **(7)**

Image Coding & Compression

Image Coding Fundamentals, Image Compression Model, Error Free Compression- VLC, Huffman, Arithmetic, RLC, Lossless Predictive coding, Lossy-Compression, Lossy Predictive Coding & Transform Coding, Image Compression Standards - JPEG Baseline Coder Decoder.

Unit V **(6)**

Image Analysis

Morphological Image Processing- Dilation, Erosion, Opening, Closing on Binary Images, Skeleton

Segmentation- Point, line, Edge detection, Boundary detection & Thersholding

Image Representation & description - Boundary Representation by Chain Codes and B-splines, Hough Transform.

Unit VI **(6)**

Image restoration & Image Processing Applications

Image Degradation Model, Noise Models, and Restoration in Presence of Noise in spatial Domain, Linear Filtering, Applications- Character Recognition, Fingerprint Recognition, and Remote Sensing.

Text Books :

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

Reference Books :

1. A. K. Jain, "Digital Image Processing".
2. Pratt, "Digital Image Processing".

List of Practical Assignments

1. Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.
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 image.
9. Pseudo coloring.
10. Creating noisy image and filtering using MATLAB.

* **All the assignments except No. 10 should be done using 'C'.**

* **Optional MATLAB support may be given to relevant assignments.**

P.U.P.—500+5–9–2006 (387) [PC-1]