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॥ अंतरी पेटवू ज्ञानज्योत ॥

North Maharashtra University,

Jalgaon

Syllabus for Second Year Engineering Degree Course in

COMPUTER ENGINEERING

(w.e.f. July, 1999)

North Maharashtra University, Jalgaon

Syllabus for S.E. (Computer Engineering)

(With Effect from July, 1999)

SEMESTER I

Sr. No.	Subject Code	Subject	Teaching Scheme Hours / Week		Examination Scheme				
			Lectures	Practical	Paper duration Hours	Maximum Marks			
						Paper	Termwork	Practical	Oral
1		Electronic Devices and Cricuits	4	2	3	100	25	25	–
2		Linear Cricuits Analysis	4	2	3	100	25	25	–
3		Discrete Structures and Graph Theory	4	2	3	100	25	–	–
4		Digital Cricuits and Logic Design	4	4	3	100	25	25	–
5		Electromagnetic Engineering *	4	–	3	100	25	–	–
		Total	20	10	–	500	125	75	–
		Grand Total	30		–	700			

SEMESTER II

Sr. No.	Subject Code	Subject	Teaching Scheme Hours / Week		Examination Scheme				
			Lectures	Practical	Paper duration Hours	Maximum Marks			
						Paper	Termwork	Practical	Oral
1		Analog Cricuits	4	2	3	100	25	25	–
2		Electrical Machines **	4	2	3	100	25	–	–
3		Computer Architrcture	4	2	3	100	25	25	–
4		Data Structure and Files	4	4	3	100	25	25	–
5		Engineering Mathematics III *	4	–	3	100	25	–	–
		Total	20	10	–	500	125	75	–
		Grand Total	30		–	700			

Total Marks of Term I + II = 1400

* Common Paper with S. E. (Electronics, Electronics and Telecommunication, Industrial Electronics, Instrumentation, Electrical)

** Common Paper with S.E. (Electronics, Electronics and Telecommunication, Industrial Electronics, Instrumentation)

Semester-I, Paper-I

Electronic Devices and Circuits

Teaching scheme:
Lectures: 4Hrs/ Week
Praticals: 2 Hrs/Week

Examination scheme:
Theory paper:100 marks
(3 Hrs. duration)
Termwork: 25 marks
Pratical: 25 marks

Unit 1

Diode circuits: Diode as a circuit element, load-line concept,piecewise linear diode model. Clipping circuits; Rectifiers,half-wave, full-wave and full-wave bridge, ripple factor and regulation ; capacitor filters; clamping circuit; voltage multipliers, doubler, tripler and quadrupler. (10 Hrs.)

Unit 2

Transistors at low frequencies : h-parameters, transistor hybrid model. Analysis of a transistor amplifier circuit using h-parameters. Parameters conversion for three transistor configurations. Emitter follower. Miller's theorem. Cascading transistor amplifiers ,CE-CC,CC-CE,CE-CE, analysis of mid-band gain, input and output impedances. High input resistance circuits, Darlington circuit, bootstrapping. (10 Hrs.)

Unit 3

Transistors at high frequencies : hybrid-Pi(π) common- emitter transistor model, hybrid-pi conductances and capacitances. CE short-circuit current gain, single-stage CE transistor amplifier response, gain-bandwidth product. (5 Hrs.)
Transistor biasing and thermal stabilisation : Operating point, bias stability, stability factors, comparison of different biasing circuits. Bias compensation. Thermal runaway and thermal stability. (5 Hrs.)

Unit 4

Field-effect transistors : Junction field-effect transistor, V-I characteristics, small-signal model; MOS-FET , enhancement and depletion types; low frequency common-source and common-drain amplifiers, gain and impedance calculations; biasing the FET .Common-source and common-drain amplifiers at high frequencies, gain and impedance calculations. (10 Hrs.)

Unit 5

Feedback amplifiers : Classification of amplifiers. The feedback concept, advantages of negative feedback, transfer gain with feedback.Analysis of negative feedback circuits, voltage-series, current-series, current-shunt and voltage-shunt. (5 hrs.)
Oscillator : Barkhausen criterion, phase-shift RC oscillators, resonance circuit oscillator. General form of oscillator circuit, Colpitts and Hartley oscillators. Wien-bridge oscillator. Clapp and crystal oscillators. (5 hrs.)

References :

1. Integrated Electronics, Millman and Halkias, Tata Mcgraw - Hill.
2. Electronic Devices and Circuits, Salivahanan, Kumar and Vallavaraj, Tata McGraw - Hill.
3. Electronic Devices and Circuit Theory, 5th edition, Robert Boylestad and Louis Nashelsky, Prentice-Hall of India.

List of Experiments :

Group A

1. Diode clipping circuits.
2. Diode clamping circuits.
3. To find line regulation, load regulation and ripple factor for a full-wave bridge rectifier with capacitor filter.
4. Voltage multipliers, doubler, tripler and quadrupler. Measure output voltage for a fixed load and compare with the designed value.
5. To measure input, output impedances and mid-band voltage gain of a CE transistor stage followed by CC stage.
6. To measure input, output impedances and voltage gain of a Darlington circuit (a)without, (b)with bootstrapping.

Group B

7. To determine FET parameters, amplification factor,transconductance and dynamic drain resistance.
8. To measure input, output impedances, voltage gain of a voltage series feedback amplifier (a)without, (b)with feed back.
9. To plot frequency response of a voltage series feedback amplifier (a)without, (b) with feedback.Determine band-width in both cases. Justify.

10. To measure output wave of phase-shift RC oscillator. Determine peak-to-peak output voltage and frequency.Compare with the designed values.
11. To measure output wave of Colpitts oscillator. Determine peak-to-peak output voltage and frequency. Compare with the designed values.
12. To measure output wave of Crystal oscillator. Determine peak-to-peak output voltage and frequency. Compare with the designed values.

The termwork should include a minimum of eight experiments, four each from groups A and B of the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-I, Paper-II
Linear Circuits Analysis

Teaching scheme :
Lectures : 4 Hrs./week
Practicals : 2 Hrs./ week

Examination scheme :
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Energy and power in resistor circuits ; Independent and dependent voltage and current sources.
Circuit simplification techniques : Series and parallel circuits, voltage sources in series and current sources in parallel.Source tranformations. Source shifting. Thevenin and Norton equivalent circuits. (10 Hrs.)

Unit 2

Circuit analysis methods : Node analysis, loop analysis, circuits with mixed sources, ladder circuits, superposition, Power transfer.
RC circuits : Undriven and driven, with initial condition.
RL circuits : Undriven and driven, with initial condition.
Coupled coils and transformers. (10 Hrs.)

Unit 3

Rise time , ringing and sustained oscillations : Response of RLC circuit driven by step input, rise time, overshoot, settling time; RLC circuit driven by initial charge, ringing ; LC circuit with initial charge for sustained oscillations.
Circuit functions and analysis techniques : Concept of complex frequencies, impedance , admittance and transfer functions, series and parallel impedances, Thevenin and Norton equivalents, superposition. (10 Hrs.)

Unit 4

Two port parameters : Short-circuit admittance(Y) parameters, open-circuit impedance(Z) parameters, transmission parameters. Relationship between Z and Y parameters. Parallel connection of two port networks. Some applications. (10 Hrs.)

Unit 5

Sinusoidal steady state analysis, input power, power transfer and insertion loss. State variable analysis.
Active filters : First order and second order, high pass and band pass Butterworth filters using op-amp. Series and parallel resonant circuits, 'Q' factor and bandwidth. (10 Hrs.)

References :

1. Linear Circuits, Van Valkenburg and Kinariwala, Prentice-Hall of India.
2. Network Analysis, 3rd edition, Van Valkenburg , Prentice-Hall of India.
3. Engineering Circuit Analysis, 5th edition, Hayt and Kemmerly, McGraw - Hill International.
4. Circuits and Networks, Sudhakar and Shyammohan, Tata McGraw - Hill.

List of Experiments

Group A

1. To experimentally find the Thevenin/Norton equivalent of a given circuit with more than one source.
2. To experimentally analyse a given circuit having one dc and one ac source using the principle of superposition.
3. To observe the response of a given RC/RL circuit for a step input .To determine the time - constant and delay-time.
4. To observe the response of given RLC circuit for a step input.To determine the rise time, overshoot and settling time.

5. To measure z and y parameters of a given two - port circuit. Compare with theoretical values.
6. To measure transmission parameters of a given two - port circuit.Compare with theoretical values.

Group B

7 To plot the frequency-response of a given low - pass second - order active filter. Find the cut-off frequency and compare with theoretical value.
8. To plot the frequency-response of a given high-pass second - order active filter. Find the cut-off frequency and compare with the theoretical value.
9. To plot the frequency-response of a given band-pass second order active filter. Find the cut-off frequencies and compare with the theoretical values.
10. To plot the frequency-response of a series - resonant circuit. Find the Q-factor and band-width. Compare with the theoretical values.
11. To plot the frequecy-response of a parallel - resonant circuit. Find the Q-factor and bandwidth. Compare with the theoretical values.
12. For a given circuit find the input power, output power and insertion loss.

The termwork should include a minimum of eight experiments from the above list, four each from groups A and B. The termwork marks will be based on the performance in theory and practicals, having 40% and 60% weightage respectively.

Semester-I, Paper-III

Discrete Structures and Graph Theory

Teaching scheme :
Lectures : 4 Hrs./week
Practicals : 2 Hrs./week

Examination scheme:
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks

Unit 1

Sets : Introduction, combination of sets, finite and infinite sets, uncountable infinite sets, mathematical induction principle of inclusion and exclusion. Rules of sum and product.
Discrete probability and Information Theory Introduction to discrete probability, Information and Mutual information.

Unit 2 (10 Hrs.)

Relations : Definitions, properties of binary relations, equivalence relation and partitions, partial ordering relations, lattices, chains, anti-chains, applications in relational algebra.
Functions and Propositional Calculus Definition of function, pigeon-hole principle, propositions and propositional calculus.

(10 Hrs.)

Unit 3

Graphs and Planar graphs: Basic technology, multi-graphs and weighted graphs, paths and circuits, shortest path in weighted graphs.Hamiltonian and Eulerian paths and circuits, factors of a graph, planar graph, applications of graph.
Trees and Cutsets : Trees, rooted trees, path lengths in rooted trees, prefix codes, binary search trees, spanning trees and cut sets, minimum spanning tree, application of tree.

Unit 4 (10 Hrs.)

Analysis of algorithms : Time complexity of algorithms, shortest path algorithms, complexity of problems, tractable and intractable problems.
Algebraic Systems : Groups, subgroups,Isomorphism, automorphism, homomorphism, definitions of rings , integral domains and fields.

Unit 5 (10 Hrs.)

Boolean Algebra : Lattices and algebraic systems, principle of duality, basic properties of algebraic systems defined by lattices, distributive and complemented lattices, Boolean lattices and Boolean algebra, Boolean functions and Boolean expressions, binary no. systems - binary, octal, hex, base conversion. Application of Boolean algebra.

References:

1. Elements of Discrete Mathematics, 2nd edition, C.L.Liu, McGraw - Hill International.
2. Discrete Mathematical Structures With Applications to Computer Science, Tremblay and Manohar, Tata McGraw-Hill.
3. Modern Applied Algebra, Goneff Birkhaft and Barti, McGraw - Hill.
4. Foundation of Discrete Mathematics, K.D.Joshi, New Age International.
5. Discrete Mathematics, 2nd edition , Lipschutz and Lipson, Schaum's Outlines, Tata McGraw - Hill.

List of programming assignments to be executed in C :

1. Generation of permutations of a given list.
2. Generation of combinations from a list of elements.
3. Generation of power set of a given set.
4. String operations : copy, length, matching.
5. Sorting of n elements using Bubble - sort or Shell - sort.
6. Sorting of n elements using Quick - sort or Bucket - sort.
7. Breadth first search of a given graph.
8. Depth first search of a given graph.
9. Searching a given element in an ordered list using binary search method.
10. Maintaining a small database for a student's information system using sequential file.
11. Implement projection and join operation in a relational model for databases.
12. Find a shortest path in a weighted graph.
13. Implementation of logic gates using logical and bitwise operation.

The termwork should include a minimum of eight assignments from the above list. The termwork marks will be based on the performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-I, Paper-IV

Digital Circuits And Logic Design

Teaching scheme :
Lectures : 4 Hrs./week
Practicals : 4 Hrs./week

Examination scheme:
Theory paper: 100 marks
(3 Hrs duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Basic Principles : Introduction to digital circuits and systems, digital signals, positive and negative logics. Comparison of logic families such as RTL,DCTL, I2L, DTL ,HTL, TTL , PMOS, NMOS and CMOS.Characteristics of digital ICs. Boolean algebra , minimisation of logical expressions. Excess-3 and Grey codes. Excusive-OR operation. (10 Hrs.)

Unit 2

Combinational logic design : Representation of logical functions in sum of products and product of sums forms. Minterms and maxterms.Simplifications of logical functions using K-maps, specified in minterm or maxterm form or along with don't care conditions. (10 Hrs.)

Unit 3

Design of full adder, full subtractor, BCD to 7-segment decoder using NAND gates. Combinational logic design using MSI circuits, multiplexer, demultiplexer, adders. (10 Hrs.)

Unit 4

MSI Circuits : BCD adder , digital comparator, code converter, BCD to binary, binary to BCD , BCD to 7-segment decoder/driver, arithmetic logic unit, parity generator/checkers. (10 Hrs.)

Unit 5

Sequential logic design : One bit memory cell, clocked S-R flip-flop, preset and clear, J-K, D and T type flip-flops, race-around condition, master slave J-K flip-flop, excitation tables of flip-flops , conversion of one type of flip-flop to another type (General Model Method).Analysis of clocked sequential circuit, state table,state diagram, next state equations, state reduction.Registers,classifications, shift registers. Counters, synchronous and asynchronous. (10 Hrs.)

References:

1. Modern Digital Electronics,2 nd edition,R.P.Jain,Tata McGraw - Hill.
2. Digital Logic and Computer Design, M.Morris Mano,Prentice - Hall ofIndia.
3. Introduction to Switching Theory and Logic Design, Hill and Peterson,John Wiley and Sons.

List of experiments:

Group A

1. a)Verification of truth table for basic gates such as AND, OR, NOT.
   b)Verification of truth table for universal gates such as NAND, NOR.
2. Implementation of basic gates using universal gates.

3. Implementation of given boolean function using NAND gates.
4. Verification of De-Morgan's theorem using NAND/NOR gates.
5. Implementation of half adder/subtractor and full adder/subtractor.
6. Implementation of 4-bit binary full adder using ICs.
7. Verification of multiplexer and demultiplexer using ICs.
8. Implementation of given logical expression using MUX and DEMUX ICs.

Group B

9. Implementation of BCD to 7-segment decoder.
10. Implementation of comparator circuits.
11. Implementation of BCD to Excess-3 code converter.
12. Implementation of binary to Gray/ Gray to binary code converter.
13. Implementation of BCD adder by using IC-7483.
14. Verification of S-R, J-K, D and T flip flops.
15. Implementation of counters using IC-7493.
16. ALU implementation using IC-74181.

The termwork should include minimum of twelve experiments, six each from groups A and B.The termwork marks will be based on performance in theory and practicals, 40% and 60% respectively.

Semester-I, Paper-V

Electromagnetic Engineering

Teaching Scheme :
Lectures : 4 Hrs./week

(Common with Electronics, Electronics & Telecommunication, Industrial Electronics, Instrumentation,Electrical Engineering)

Examination Scheme :
Theory Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks.

Unit 1

Electrostatics : Coulomb's law, electric field intensity, field due to continuous volume charge distribution, line charge, sheet of charge. Electric flux density, Gauss' law, application, divergence theorem. Energy and potential; potential gradient. The dipole, its electric field, dipole moment. Energy density in electrostatic field. (10 Hrs.)

Unit 2

Conductors, dielectrics and capacitance : Current and current density, continuity of current, conductor properties and boundary conditions. Nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance of parallel plates, energy stored, capacitance of coaxial cable, two-wire line.
Poisson's and Laplace's equations. (10 Hrs.)

Unit 3

Magnetostatics : Biot-Savart law, application to infinitely long current carrying conductor, Ampere's circuital law, application to coaxial cable. Curl operator. Magnetic flux and flux density. Scalar and Vector magnetic potentials. Lorentz force equation. Magnetization and permeability. Magnetic circuit. Energy stored in magnetic field. (10 Hrs.)

Unit 4

Time-varying fields : Faraday's law, Maxwell's equations, Maxwell's equations in integral form, boundary conditions. (4 Hrs)

Uniform plane wave : Wave motion in free space, in perfect dielectrics, in lossy dielectrics, Poynting vector and power density. Propogation in good conductors, skin effect. Reflection of uniform plane waves. Standing wave ratio. (6 Hrs.)

Unit 5

Radiation and Antennas : Radiated power, radiation resistance for short dipole, short monopole, halfwave dipole and quarter wave monopole antennas. Radiation pattern and directivity. Reciprocacity between transmitting and receiving antennas. Folded dipole and yagi antenna. (8 Hrs.)

Antenna arrays : General pattern of two isotropic radiators, broadside and end fire arrays. Binomial and Tchebysheff arrays. Principle of pattern multiplication. (4 Hrs.)

References :

1. Engineering Electromagnetics, 5th edition, W. Hayt, Tata McGraw-Hill.
2. Electromagnetics, 4th edition, J. D. Kraus, McGraw-Hill International.
3. Electromagnetic Waves and Radiating Systems, second edition, Jordan and Balmain, Prentice-Hall of India.

4. Antennas, second edition, J.D. Kraus, McGraw-Hill International.
5. Basic Electromagnetics with Applications, Narayana Rao, Prentice-Hall of India.

Semester-II, Paper-I

Analog Circuits

Teaching scheme:
Lectures:4 Hrs/Week
Praticals:2 Hrs/Week

Examination scheme:
Theory paper:100 marks
(3 Hrs. duration)
Termwork: 25 marks
Practical: 25 marks

Unit 1

Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier ,step respouse of an amplifier, square wave testing. Bandpass of cascaded stages. RC-Coupled amplifier using transistor/FET, low-frequency response, effect of coupling capacitor, effect of bypass capacitor; high frequency response of two cascaded CE transistor stages. (10 Hrs.)

Unit 2

Differential amplifiers: Common-mode gain, Differential gain, Common-mode rejection ratio, emitter-coupled differential amplifier, with constant current source. (4 Hrs.)

IC operational amplifier applications: Voltage follower, comparator, zero- crossing detector, precision AC/DC converters, logrithmic amplifier, waveform generators,square wave,pulse,triangular wave,regenerative comparator. IC timer 555 and its applications. (6 Hrs.)

Unit 3

Large-signal amplifiers: Class A amplifier,harmonic distortion,transformer coupled audio power amplifier,efficiency; push-pull amplifier, class B and class AB operations; complimentary symmetry push-pull amplifier. (6 Hrs.)

SCR,Triac and Diac: SCR control,power control, half-wave and full-wave operation.Triac light dimmer circuit. (4 Hrs.)

Unit 4

Regulated power supplies : Series regulator, IC voltage regulators, line and load regulation, overload and short-circuit protection circuits. Switched mode power supply (SMPS), block diagram and operation. Uninterrupted power supply (UPS), block diagram and operation. (10 Hrs.)

Unit 5

Fabrication of monolithic integrated circuits. (5 Hrs.)

Printed circuit boards : Base and conducting materials, artwork, photographic etching techniques. Multilayered flexible PCBs. (5 Hrs.)

References

1. Integrated Electronics , Millman and Halkias, Tata McGraw - Hill.
2. Electronic Devices and Circuits, Salivahanan, Kumar, Vallavaraj, Tata McGraw - Hill.
3. Op-amps and Linear Integrated Circuits, Ramakant Gaikwad, Prentice - Hall of India.
4. Printed Circuit Boards-Design and Fabrication , W.Bosshart, Tata McGraw-Hill.

List of Experiments

Group A

1. Square-wave testing of an amplifier. To find low and high cut-off frequencies.
2. To plot the frequency response of RC - coupled amplifier. Determine bandwidth and cut-off frequencies.
3. To find CMRR of an emitter-coupled differential amplifier with constant current source.
4. To study precision full wave rectifier using op-amp.
5. To make zero-crossing detector using op-amp.
6. To make square-wave generator using op-amp.

Group B

7. To make monostable multivibrator using IC 555.
8. To make push-pull class B power amplifier. Compare the output with class AB amplifier.
9. Triac/Diac light dimmer circuit.

10. Line and load regulation of series regulator.
11. Line and load regulation of IC voltage regulator.
12. Study of UPS.

The termwork should include a minimum of eight experiments, four each from groups A and B of the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-II, Paper-II

Electrical Machines

Teaching scheme :
Lectures : 4 Hrs/week
Practicals : 2 Hrs/week

(Common with Electronics, Electronics & Telecommunication, Industrial Electronics, Instrumentation Engineering)

Examination scheme:
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks

Unit 1

Three phase circuits : Three phase supplies, phase sequence, connection of three phase windings, star and delta connections. Line and phase voltages and currents in star, delta connections. Power in three phase circuits with balanced load for star and delta connections. Measurement of power by two wattmeter method. Calculation of active and reactive powers. (5 Hrs.)

Magnetic circuits : Concept of mmf, magnetic flux, flux density, field strength, reluctance, permeability, their units and relationships. Series and parallel magnetic circuits. Comparison of electric and magnetic circuits. Hysteresis loss and eddy current loss. (5 Hrs.)

Unit 2

D.C. machines : Construction, types (shunt, series and compound), generator action, emf equation; motor action, significance o back emf, torque and speed equations; torque-armature current, speed-armature current and torque-speed characteristics of different types of motors, different methods of speed control; starter; applications. (10 Hrs.)

Unit 3

Transformers : Single phase transformer, construction, emf equation of transformer, voltage and current transformation ratios, transformer on no load, leakage reactance, transformer on load, phasor diagram, equivalent circuit, regulation, efficiency of transformer, open-circuit and short-circuit tests. Three phase transformers, star/star, delta/delta, star/delta, delta/star connections, Vee and Scott connections, Autotransformer, C.T. and P.T. (10 Hrs.)

Unit 4

Synchronous machines : Alternators, principle of operation, constructional features, synchronous speed, emf equation, winding factors, regulation by synchronous impedance method; Synchronous motors, principle of operation, rotating magnetic field, on no load, on load phasor diagrams, Vee curves, hunting, methods of starting. (10 Hrs.)

Unit 5

Induction motors : Three phase motors, principle of operation, slip, torque equation, torque-slip characteristic, relation between slip and rotor copper loss, equivalent circuit, different types of starters; application. Single phase induction motors, principles of working, types; applications. (7 Hrs.)

Special purpose machines : Principle, working and applications of stepper motor, servomotors and universal motors. (3 Hrs.)

References :

1. Electrical Technology, Edward Hughes, 6th edition, ELBS.
2. Basic Electrical Engineering, V.N. Mittle, Tata McGraw-Hill.
3. Electrical Machines, Second edition, Nagrath and Kothari, Tata McGraw-Hill.
4. Electrical Machines and Power Systems, V. Del Toro, Prentice-Hall of India.
5. Electromechanical Energy Conversion with dynamics of machines, R.D. Bagamudre, New Age International.
6. Electrical Machines, second edition, S.K. Bhattacharya, Tata McGraw-Hill.

List of Experiments :

1. Two wattmeter method of power measurement in 3 phase balanced circuit.
2. Speed control of dc shunt motor by armature voltage and flux control methods.
3. Study of dc shunt motor starter.
4. Load test on dc shunt motor.
5. Load test on dc series motor.
6. O.C. and S.C. test of single phase transformer to determine regulation and efficiency.
7. Scott connection to convert 3-phase supply into 2-phase supply.

8. Regulation of alternator by synchronous impedance method.
9. Regulation of alternator by direct loading method.
10. To plot Vee curves and p.f. curve for synchronous motor.
11. Load test on 3-phase induction motor.
12. Study of various single phase motors

The termwork should include a minimum of eight experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% of the total marks respectively.

Semester-II, Paper-III
Computer Architecture

Teaching scheme:
Lectures: 4 Hrs./week
Practicals:4 Hrs./week

Examination scheme:
Theory paper: 100 marks
(3 Hrs. duration)
Termwork: 25 marks
Practical : 25 marks

Unit 1

Evolution of microprocessor, single chip microcomputers, microprocessor applications such as word processing, teletex system, industrial and commercial application , data analysis, graphics.Programming of microprocessor, digital computers, CPU, microprocessor, input output devices, memory.Microprocessor architecture and it's operation, address bus, data bus, control bus, register, accumulator, flags, program counters, stack pointers. (6 Hrs.)

8085 microprocessor : Pinout diagram, signal diagram, block diagram.Multiplexed address/data bus, control and status signal, power supply and clock frequency. Bus timings and generating control signals. (4 Hrs.)

Unit 2

Instruction cycle, fetch operation, execute operation, machine cycle and state, instruction and data flow. Timing diagrams, timing diagram for opcode.Fetch cycle, memory read, I/O read, memory write, I/O write. (5 Hrs.)
Instruction set of 8085 microprocessor, Instruction and data formats, addressing modes such as direct addressing ,register, register Indirect and immediate addressing. Status flags, symbols and abbreviations, instruction set such as data transfer group, arithmetic group, logical group, branch group, stack, input ,output and machine control group. (5 Hrs.)

Unit 3

Programming of microprocessor : Assembly language, one pass and two pass assembler, memory address , machine code , mnemonics, operand,comments, high level language, comparison of high level and machine language. Advantages, disadvantages and applications of high level and machine level languages. Stack operations, subroutine, system software such as monitor, operating system, file manager, linker, locator, loader, debugger, text editor.System softwares, application softwares and utility programs.Debugging of programs, modular programming, MACROs and microprogramming. (4 Hrs.)

Assembly language programming of 8085 : Addition and subtraction of 8 and 16 bit numbers, one's and two's complements of 8 and 16 bit numbers, multiplication and division of 8 and 16 bit numbers, largest and smallest number using array, sorting of numbers using array, finding square from look-up table, square-root of a number, program related to shift and masking operation of 8 and 16 bit numbers. (6 Hrs.)

Unit 4

Peripheral devices and interfacing : Address space partitioning, memory mapped I/O scheme, I/O mapped I/O scheme, memory and I/O Interfacing. Data transfer scheme, programmed data transfer scheme, DMA data transfer scheme, burst mode of DMA data transfer, cycle stealing technique, synchronous and asynchronous data transfer, multiple interrupts. Interrupts of 8085 microprocessor, hardware and software interrupts, interrupts call location, INTER CALL location, RST 7.5, 6.5 and 5.5, triggering levels, pending Interrupts. Interfacing devices and I/O devices , generation of control signals for memory and I/O devices, I/O ports. (5 Hrs.)

The 8255A programmable peripheral interface, block diagram, mode '0' simple input or output, bit set - reset mode interfacing A/D converter in mode 0 and BSR mode. The 8253 programmable interval timer, block diagram, use as a counter. (5 Hrs.)

Unit 5

The 8259A programmable interrupt controller, block diagram, interrupt operation, priority modes and other features. Direct memory access and 8257 DMA controller, block diagram, DMA channels, DMA execution such as slave mode and master mode.

(4 Hrs.)

Digital to analog converters : Basic concepts, D/A converter circuits, R/2R ladder network, Interfacing of an 8 bit D/A converter with 8085. Analog to digital converters: Basic concepts, successive approximation A/D converter, software controlled A/D converter, interfacing of 8 bit A/D converter. (4 Hrs.)

Microprocessor application such as designing a microcomputer system with input as hex keyboard with minimum 20 keys, output on 7 segment LED, memory as 2K of EPROM ,1K of RAM, 8085 microprocessor, peripheral devices such as 8255, 3 to 8 decoder, Hexdecoder driver etc. (2 Hrs.)

References:

1. Fundamentals of Microprocessor and Microcomputer,4th edition, B.Ram, Dhanpat rai and Sons.
2. Microprocessor Architecture, Programming Applications with 8085/8080A, Gaonkar,Wiley Eastern.
3. Computer Fundamentals,Architechture and Organization, second edition, B. Ram, New Age International.
4. Computer System Architecture, Second edition, Mano, Printice-Hall of India.

List of Experiments

1. Addition and substraction of 8 and 16 bit numbers.
2. Determining maximum and minumum element in an array.
3. Sum of elements of an array.
4. Block movement of an array of numbers from one area in memory to another.
5. 8 bit multiplication and division
6. Look-up table for BCD to 7 segments conversion.
7. HEX to BCD and BCD to HEX conversion.
8. Arranging the numbers in ascending and descending order.
9. Shift and mask off operation of 8 bit numbers.
10. Square root of number.
11. Interfacing of 8279 keyboard/display controller.
12. Interfacing of 8255 or 8253 operations on various modes.

The termwork should include minimum of 8 experiments from the above list. The termwork marks will be based on the performance in theory and practical, 40% and 60% respectively.

Semester-II, Paper-IV

Data Structures and Files

Teaching scheme:
Lectures: 4 Hrs/week
Practicals : 4 Hrs/week

Examination scheme:
Theory paper:100 marks
(3 Hrs duration)
Termwork: 25 marks
Practical : 25 marks

Unit 1

Introduction to data structures : Concept of data, data types , data object, data structure, abstract data type (ADT). Study of data structure. Implementation of data structure.

Stacks and Queues: Fundamentals of stacks and queues, data structure of stacks and queues, basic operations on stacks and queues, and its implementation. Disadvantagesof queue, concept of circular queue, basic operations on circular queue and it's implementations. Multiple stacks and queues, double ended queue (DEQUES), priority queues.

(10 Hrs.)

Unit 2

Application of stack: Polish notations (Infix, Postfix, Prefix) of mathemetical expressions,evaluation of expressions, inter conversion of infix, postfix and prefix expressions. Use of stack by function call and recursive function call.

Linked lists : Single linked list, creation,insertion ,deletion and traversal on single linked list. Operations on single linked list ,inverting, concatenating, to find length.Storage pool, initializing the storage pool, allocating a node (GETNODE), deallocating a node (RET). Circular linked list, advantage of circular linked list, erasing a circular linked list.

Double linked list, basic operations on double linked list.

(10 Hrs.)

Unit 3

Application of linked list : Linked stacks and queues, storing a polynomial using linked list, polynomialaddition, dynamic storage management, best-fit, first-fit, worst-fit memory allocation strategies. Data structure for allocation and freeing of blocks. Procedure for allocation and freeing of blocks. Generalized list, storing multivariable polynomial in a generalized list, operations on generalized list - copy, EQUAL, DEPTH, Data representation for strings, pattern matching in strings.

Binary Tree : Basic terminology, binary tree and it's data structure, binary tree representations. Binary tree traversals, recursive and non-recursive procedure for binary tree traversals, operations on binary tree - creation, printing in tree shape, copy, equal, depth, deletion of node in a binary tree. Threaded binary tree, inorder-,preoder-, postorder- threaded binary tree, inorder traversal of inorder threaded binary tree, insertion in an inorder threaded binary tree. (10 Hrs.)

Unit 4

Symbol Table: Concept of binary search tree, static tree tables, HUFFMAN algorithm, construction of optimal binary search tree. Dynamic tree tables. Basic operations on it- insertion, deletion height balanced binary tree, LL,LR,RR,RL rotations. Hash tables, hashing function, overflow handling.

Sequential and relative files : Description and organization, primitive operations on sequential files and relative files. Implementation of the primitive operations. (10 Hrs.)

Unit 5

Direct access files : Description and organization, primitive operations, hashing functions, overflow file, linear probing, rehashing, chaining without/with replacement.

Indexed sequential files and indexes : Description and organization of Indexed sequential files. Primitive operations on indexed sequential files.Index concepts,linear indexes, tree indexes, B-tree indexes, algorithms for B-Tree.

Multi-Indexed files: Description and organization of inverted files and multilist files. Algorithms for addition and deletion records from the files. (10 Hrs.)

References:

1. Fundamentals of Data Structures, Horwitz and Sahani, Galgotia.
2. File Systems, Structures and Algorithms, Thomas R.Harbron, Prentice-Hall International.
3. Data Structures, Seymour Lipschutz, Schaum's outline series. Tata
4. An introduction to data structures with applications, Tremblay and Sorenson/McGraw-Hill.
5. Data structures using C and C++, Tannenbaum, Prentice-Hall of India.

List of programming assignments to be executed in C/C++ :-

1. Implementation of stack using array or linked list.
2. Implementation of queue using array or linked list.
3. Implementation of circular queue using array or linked list.
4. Conversion of infix expression to postfix expression.
5. Conversion of postfix expression to infix expression.
6. Addition of two single variable polynomial using linked list.
7. Implementation of double linked list and perform insertion, deletion and searching.
8. Creation of binary tree and perform all non-recursive traversals.
9. Creation of binary search tree and perform insertion,deletion, printing in a tree shape.
10. Implementation of pattern matching in string using linked list.
11. Create a hash table and handle the collisions using linear probing with or without replacement.
12. Implementation of simple index file.
13. Insertion and deletion of a record from a direct access file using chaining with and without replacement.
14. Insertion and deletion of a record from sequential file.
15. Insertion and deletion of a record from a relative file.
16. Insertion and deletion of a record from a multilist file.

The termwork should include a minimum of twelve assignments from the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-II, Paper-V
Engineering Mathematics III

Teaching Scheme
Lectures : 4 Hrs./week

(Common with Electronics, Electronics & Telecommunication, Industrial Electronics, Instrumentation, Electrical Engineering)

Examination Scheme
Theory paper : 100 marks.
(3 Hrs duration)
Termwork : 25 marks

Unit 1

Linear differential equations of nth order with constant coefficients, method of variation of parameters. Homogenous linear D.E., Legendre's LDE, Simultaneous LDE, applications of simultaneous differential equations, application to electrical circuit.

(10 Hrs.)

Unit 2

(a) Application of partial differential equations :

i. $\frac{\partial v}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ (one-dimensional heat flow equation)

ii. $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$ (wave equation)

iii. Laplace equation or two dimensional heat flow equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

(5 Hrs.)

(b) Vector differentiation :

I) Differentiation of vector function.

II) Tangential and normal components of linear accelaration, radial and transverse components of velocity and accelaration.

III) Gradient of a scalar point function, Divergence and Curl of vector point function, irrotational and solenoidal vectors, vector identities.

(5 Hrs.)

Unit 3

Vector integration :

i) Line integral, Surface integral, Volume integral.
ii) Green's lemma, Stoke's theorem, Gauss's divergence theorem.
iii) Applications to electromagnetic fields.

(8 Hrs.)

Unit 4

(a) Fourier transform, inverse Fourier transform, properties and theorems; Fourier sine and cosine integrals; Fourier transform of standard functions; Applications of Fourier transform in sampling of signals. Discrete Fourier transform and its properties.

(6 Hrs.)

(b) Z-transform, definition of Z-transform, properties of Z-transform; Z-transform of standard sequences; Inverse Z-transform; relationship of Z- transform with Fourier transform; application of Z-transform.

(6 Hrs.)

Unit 5

Laplace transform, definition of Laplace transform, inverse Laplace transform, properties and theorems; Laplace transform of standard functions, unit step function, ramp function, impulse function; methods of finding inverse transforms; Applications to solutions of LDEs.

(10 Hrs)

References :

1. A Text Book of Engineering Mathematics, P.N. Wartikar, J.N. Wartikar, Pune Vidyarthigrih.
2. Higher Engineering Mathematics, B.S. Grewal.
3. Advanced Engineering Mathematics, Wylie.
4. Advanced Engineering Mathematics, Erwin Kreyszing.