ANNA UNIVERSITY CHENNAI: CHENNAI – 600 025

B.E DEGREE PROGRAMME (3 - 8 SEMESTERS)

ELECTRICAL AND ELECTRONICS ENGINEERING

(Offered in Colleges affiliated to Anna University)

CURRICULUM AND SYLLABUS – REGULATIONS – 2004

SEMESTER III

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

THEORY			**L**	**T**	**P**	**M**
1.	MA 1201	Mathematics – III	3	1	0	100
2.	CY 1201	Environmental Science and Engineering	3	0	0	100
3.	EE 1201	Electromagnetic Theory	3	1	0	100
4.	EE 1202	Electrical Machines – I	3	1	0	100
5.	EC 1211	Electronic Devices	3	0	0	100
6.	CS 1211	Data Structures and Algorithms	3	1	0	100
PRACTICAL						
1.	EE 1203	Electrical Machines Laboratory – I	0	0	3	100
2.	CS 1212	Data Structures and Algorithms Laboratory	0	0	3	100
3	EE 1152	Electric Circuits lab	0	0	3	100

SEMESTER IV

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

THEORY			**L**	**T**	**P**	**M**
1.	MA 1251	Numerical Methods	3	1	0	100
2.	EE 1251	Electrical Machines – II	3	1	0	100
3.	EE 1252	Transmission & Distribution	3	1	0	100
4.	IC 1251	Control Systems	3	1	0	100
5.	EC 1261	Electronic Circuits	3	0	0	100
6.	ME 1211	Applied Thermodynamics	3	1	0	100
PRACTICAL						
1.	IC 1252	Control Systems Laboratory	0	0	3	100
2.	EC 1262	Electronic Devices and Circuits Laboratory	0	0	3	100
3.	EE 1304	Electrical Machines Laboratory – II	0	0	3	100

SEMESTER V

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

THEORY			**L**	**T**	**P**	**M**
1.	EE 1301	Power Electronics	3	0	0	100
2.	EE 1302	Protection & Switchgear	3	0	0	100
3.	EC 1311	Communication Engineering	3	0	0	100
4.	EC 1312	Digital Logic Circuits	3	1	0	100
5.	EC 1313	Linear Integrated Circuits	3	0	0	100
6.	CS 1261	Object Oriented Programming	3	1	0	100
PRACTICAL						
1.	EE 1303	Power Electronics Laboratory	0	0	3	100
2.	CS 1262	Object Oriented Programming Laboratory (exercise on Application of C++)	0	0	3	100
3.	EC 1314	Integrated Circuits Laboratory	0	0	3	100
4.	GE 1303	Communication Skills and Technical Seminar	0	0	2	**

SEMESTER VI

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

THEORY			**L**	**T**	**P**	**M**
1.	EE 1351	Solid State Drives	3	0	0	100
2.	EE 1352	Power System Analysis	3	1	0	100
3.	EI 1361	Measurements & Instrumentation	3	0	0	100
4.	EC 1361	Digital Signal Processing	3	1	0	100
5.	EC 1362	Microprocessor & Microcontroller	3	1	0	100
6.	MG 1351	Principles of Management	3	0	0	100
PRACTICAL						
1.	EI 1362	Measurements & Instrumentation Laboratory	0	0	3	100
2.	EC 1363	Microprocessor & Micro controller Laboratory	0	0	3	100
3.	GE 1351	Presentation Skills and Technical Seminar	0	0	2	**

SEMESTER VII

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

THEORY			**L**	**T**	**P**	**M**
1.	EE 1401	Power System Operation and Control	3	1	0	100
2.	EE 1402	High Voltage Engineering	3	0	0	100
3.	EE 1403	Design of Electrical Apparatus	3	1	0	100

4.	EE 1001	Special Electrical Machines	3	0	0	100
5.		Elective – I	3	0	0	100
6.		Elective – II	3	0	0	100
PRACTICAL						
1.	EE 1404	Power System Simulation Laboratory	0	0	3	100
2.	EE 1453	Comprehension	0	0	2	**

**** No Examination**

SEMESTER VIII

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

THEORY			**L**	**T**	**P**	**M**
1.	EE 1451	Electric Energy Generation, Utilization and Conservation	3	0	0	100
2.		Elective – III	3	0	0	100
3.		Elective – IV	3	0	0	100
PRACTICAL						
1.	EE 1452	Project	0	0	12	200

**** No Examination.**

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

LIST OF ELECTIVES

ELECTIVE I						
Sl.No	**Code No.**	**Course Title**	**L**	**T**	**P**	**M**
1.	EI 1001	Fibre Optics and Laser Instruments	3	0	0	100
2.	CS 1031	Visual Languages and Applications	3	1	0	100
3.	IC 1031	Advanced Control System	3	0	0	100
4.	EC 1031	Tele Communication Switching and Networks	3	0	0	100
5.	GE 1301	Professional Ethics & Human Values	3	0	0	100
ELECTIVE II						
Sl.No	**Code No.**	**Course Title**	**L**	**T**	**P**	**M**
6.	EI 1351	Bio-Medical Instrumentation	3	0	0	100
7.	CS 1032	Artificial Intelligence and Expert Systems	3	0	0	100
8.	CS 1033	Data Communication and Networks	3	0	0	100
9.	EE 1002	Power System Dynamics	3	0	0	100
10.	CS 1034	Computer Architecture	3	1	0	100
11.	MG 1401	Total Quality Management	3	0	0	100
ELECTIVE III						
Sl.No	**Code No.**	**Course Title**	**L**	**T**	**P**	**M**
12.	CS 1035	Operating Systems	3	1	0	100
13.	EE 1003	Power System Transients	3	0	0	100
14.	CS 1036	Internetworking Technology	3	0	0	100
15.	EC 1032	Embedded System Design	3	0	0	100
16.	EC 1451	Mobile Communication	3	0	0	100
ELECTIVE IV						
Sl.No	**Code No.**	**Course Title**	**L**	**T**	**P**	**M**
17.	EE 1004	Power Quality	3	0	0	100
18.	IC 1002	Adaptive Control	3	0	0	100
19.	EE 1006	Operations Research	3	0	0	100
20.	EC 1461	VLSI Design	3	0	0	100

21.	IC 1403	Neural Network and Fuzzy Logic Control	3	0	0	100

SEMESTER III

MA 1201 MATHEMATICS III 3
1 0 100

AIM

The course aims to develop the skills of the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

OBJECTIVES

At the end of the course the students would

i. Be capable of mathematically formulating certain practical problems in terms of partial differential equations , solve them and physically interpret the results.

ii. Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.

iii. Have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.

iv. Have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization to Fourier transform pair, their properties, and possible special cases with attention to their applications.

v. Have learnt the basics of Z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z – transform technique bringing out the elegance of the procedure involved.

1. PARTIAL DIFFERENTIAL EQUATIONS
9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

2. FOURIER SERIES
9

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

3. BOUNDARY VALUE PROBLEMS
9

Classification of second order quasi-linear partial differential equations – Solutions of one-dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

4. FOURIER TRANSFORM
9

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

5. Z -TRANSFORM AND DIFFERENCE EQUATIONS
9

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. B.S. Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.

2. P. Kandasamy, K. Thilagavathy, and K. Gunavathy, 'Engineering Mathematics', Vol. III, S. Chand & Company ltd., New Delhi, 1996.

3. Wylie C. Ray and C. Barrett Louis, 'Advanced Engineering Mathematics', Sixth Edition, McGraw Hill, Inc., New York, 1995.

REFERENCE BOOKS

1. L.A. Andrews, and B.K. Shivamoggi, 'Integral Transforms for Engineers and Applied Mathematicians', Prentice Hall of India, 1988.

2. S. Narayanan, T.K. Manicavachagom Pillay and G. Ramaniah, 'Advanced Mathematics for Engineering Students', Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.

3. R.V. Churchill and J.W. Brown, 'Fourier Series and Boundary Value Problems', Fourth Edition, McGraw Hill Book Co., Singapore, 1987.

CY 1201 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 100

AIM

The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make him/her sensitive to the environment problems in every professional endeavour that he/she participates.

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

1. INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

10

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

2. ECOSYSTEMS AND BIODIVERSITY

14

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

3. ENVIRONMENTAL POLLUTION

8

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Soil waste management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

4. SOCIAL ISSUES AND THE ENVIRONMENT

7

From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Consumerism and waste products – Environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Issues involved in enforcement of environmental legislation – Public awareness.

5. HUMAN POPULATION AND THE ENVIRONMENT

6

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health – Case studies.

L = 45 Total = 45

TEXT BOOKS

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition,
   Pearson Education, 2004.
2. T.G. Jr. Miller, 'Environmental Science', Wadsworth Publishing Co.
3. C. Townsend, J. Harper and Michael Begon, 'Essentials of Ecology', Blackwell Science.
4. R.K. Trivedi and P.K. Goel, 'Introduction to Air Pollution', Techno-Science Publications.

REFERENCE BOOKS

1. Bharucha Erach, 'The Biodiversity of India', Mapin Publishing Pvt. Ltd., Ahmedabad India, Email: mapin@icenet.net.
2. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
3. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
4. K.D. Wager, 'Environmental Management', W.B. Saunders Co., Philadelphia, USA, 1998.

EE 1201 ELECTROMAGNETIC THEORY 3
1 0 100

AIM

To expose the students to the fundamentals of electromagnetic fields and their applications in Electrical Engineering .

OBJECTIVES

To impart knowledge on

i. Concepts of electrostatics, electrical potential, energy density and their applications.

ii. Concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.

iii. Faraday's laws, induced emf and their applications.

iv. Concepts of electromagnetic waves and Poynting vector.

v. Field modeling and computation with relevant software.

1. INTRODUCTION

8

Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems - Divergence theorem – Stoke's theorem.

2. ELECTROSTATICS

10

Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Gauss's law and application – Electrical potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectric – Dielectric polarization, Electric field in multiple dielectrics – boundary conditions, Poisson's and Laplace's equations – Capacitance-energy density – Dielectric strength.

3. MAGNETOSTATICS

9

Lorentz Law of force, magnetic field intensity – Biot–savart Law - Ampere's Law – Magnetic field due to straight conductors, circular loop, infinite sheet of current – Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization – Magnetic field in multiple media – Boundary conditions – Scalar and vector potential – Magnetic force – Torque – Inductance – Energy density – Magnetic circuits.

4. ELECTRODYNAMIC FIELDS

8

Faraday's laws, induced emf – Transformer and motional EMF, Maxwell's equations (differential and integral forms) – Displacement current – Relation between field theory and circuit theory.

5. ELECTROMAGNETIC WAVES

9

Generation – Electro Magnetic Wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and

lossless dielectrics, conductors-skin depth, Poynting vector – Plane wave reflection and refraction.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. John.D.Kraus, 'Electromagnetics', McGraw Hill book Co., New York, Fourth Edition, 1991.

2. William .H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill edition, 2001.

REFERENCE BOOKS

1. Joseph. A.Edminister, 'Theory and Problems of Electromagnetics', Second edition, Schaum Series, Tata McGraw Hill, 1993.

2. I.J. Nagrath, D.P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Co Ltd, Second Edition, 1997.

3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 1999.

4. Sadiku, 'Elements of Electromagnetics', Second edition, Oxford University Press, 1995.

EE 1202 ELECTRICAL MACHINES – I 3
1 0 100

AIM

To expose the students to the concepts of electromechanical energy conversions in D.C. machines and energy transfer in transformers and to analyse their performance.

OBJECTIVES

i. To introduce the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems.

ii. To understand the generation of D.C. voltages by using different type of generators and study their performance.

iii. To study the working principles of D.C. motors and their load characteristics, starting and methods of speed control.

iv. To familiarize with the constructional details of different type of transformers, working principle and their performance.

v. To estimate the various losses taking place in D.C. machines and transformers and to study the different testing method to arrive at their performance.

1. BASIC CONCEPTS OF ROTATING MACHINES

8

Principles of electromechanical energy conversion – Single and multiple excited systems – m.m.f of distributed A.C. windings – Rotating magnetic field – Generated voltage – Torque in round rotor machine.

2. DC GENERATORS

8

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

3. DC MOTORS

9

Principle of operation – Back emf and torque equation – Characteristics of series, shunt and compound motors – Starting of DC motors – Types of starters – Speed control of DC series and shunt motors.

4. TRANSFORMERS

12

Constructional details of core and shell type transformers – Types of windings – Principle of operation – emf equation – Transformation ratio – Transformer on no-load – Parameters referred to HV / LV windings – Equivalent circuit – Transformer on load – Regulation – Parallel operation of single phase transformers – Auto transformer – Three phase transformers – Vector group.

5. TESTING OF DC MACHINES AND TRANSFORMERS

8

Losses and efficiency in DC machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne’s test,

Retardation test and Hopkinson's test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests – All day efficiency.

Note : Unit 5 may be covered along with Unit 2,3,and 4.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

EC 1211 ELECTRONIC DEVICES 3
0 0 100

AIM

To study the characteristics and applications of electronic devices.

OBJECTIVES

To acquaint the students with construction, theory and characteristics of the following electronic devices:

i) p-n junction diode
ii) Bipolar transistor
iii) Field Effect transistor
iv) LED, LCD and other photo electronic devices.
v) Power control/regulator devices.

1. SEMICONDUCTOR DIODE

9

Theory of p-n junction – p-n junction as diode – p-n diode currents – Volt-amp characteristics – Diode resistance – Temperature effect of p-n junction – Transition and diffusion capacitance of p-n diode – Diode switching times.

2. BI-POLAR TRANSISTOR

9

Junction transistor – Transistor construction – Detailed study of currents in transistor – Input and output characteristics of CE, CB and CC configurations – Transistor hybrid model for CE configuration – Analytical expressions for transistor characteristics – Transistor switching times – Voltage rating – Power transistors.

3. FIELD EFFECT TRANSITORS

9

Junction field effect transistor – Pinch off voltage – JFET volt-ampere characteristics – JFET small signal model – MOSFETS and their characteristics – FET as a variable resistor – Unijunction transistor.

4. OPTO ELECTRONIC DEVICES

9

Photo emissivity and photo electric theory – Theory, construction and characteristics: light emitting diodes, liquid crystal cell, seven segment display, photo conductive cell, photodiode, solar cell, photo transistor, opto couplers and laser diode.

5. MISCELLANEOUS DEVICES

9

Theory, characteristics and application: SCR, TRIAC, PUT, tunnel diode, thermistors, piezo electric devices, zener diode, charge coupled devices, varactor diode and LDR.

L = 45 Total = 45

TEXT BOOKS

1. Jacob. Millman, Christos C.Halkias, ‘Electronic Devices and Circuits’, Tata McGraw Hill Publishing Limited, New Delhi, 2003.

2. David A.Bell, ‘Electronic Devices and Circuits’, Prentice Hall of India Private Limited, New Delhi, 2003.

REFERENCE BOOKS

1. Theodre. F. Boghert, ‘Electronic Devices & Circuits’, Pearson Education, VI Edition, 2003.

1. Ben G. Streetman and Sanjay Banerjee, 'Solid State Electronic Devices', Pearson Education, 2002 / PHI

3. Allen Mottershead, 'Electronic Devices and Circuits – An Introduction', Prentice Hall of India Private Limited, New Delhi, 2003.

CS 1211 DATA STRUCTURES AND ALGORITHMS 3 1 0 100

AIM

To present the concept of arrays, recursion, stack, queue, linked list, trees and graph data structures.

OBJECTIVES

i. To introduce the concept of arrays, structures, pointers and recursion.

ii. To study stack, queue and linked list concepts.

iii. To study trees, representation of trees, tree traversal and basic operations on trees.

iv. To study some of the sorting and searching techniques.

v. To study the concept of graphs, traversal techniques and minimum spanning tree.

1. INTRODUCTION TO DATA STRUCTURES

9

Abstract data types - Sequences as value definitions - Data types in C - Pointers in C -Data structures and C - Arrays in C - Array as ADT - One dimensional array - Implementing one dimensional array - Array as parameters - Two dimensional array -Structures in C - Implementing structures - Unions in C - Implementation of unions -Structure parameters - Allocation of storage and scope of variables.

Recursive definition and processes: Factorial function - Fibonacci sequence - Recursion in C - Efficiency of recursion.

2. STACK, QUEUE AND LINKED LIST

9

Stack definition and examples – Primitive operations – Example - Representing stacks in C - Push and pop operation implementation.

Queue as ADT - C Implementation of queues - Insert operation - Priority queue - Array implementation of priority queue.

Inserting and removing nodes from a list-linked implementation of stack, queue and priority queue - Other list structures - Circular lists: Stack and queue as circular list -Primitive operations on circular lists. Header nodes - Doubly linked lists - Addition of long positive integers on circular and doubly linked list.

3. TREES

9

Binary trees: Operations on binary trees - Applications of binary trees - Binary tree representation - Node representation of binary trees - Implicit array representation of binary tree – Binary tree traversal in C - Threaded binary tree - Representing list as binary tree - Finding the K^{th} element - Deleting an element.

Trees and their applications: C representation of trees - Tree traversals - Evaluating an expression tree - Constructing a tree.

4. SORTING AND SEARCHING

9

General background of sorting: Efficiency considerations, Notations, Efficiency of sorting. Exchange sorts: Bubble sort; Quick sort; Selection sort; Binary tree sort; Heap sort. Heap as a priority queue - Sorting using a heap-heap sort procedure - Insertion sorts: Simple insertion - Shell sort - Address calculation sort - Merge sort -Radix sort.

Sequential search: Indexed sequential search - Binary search - Interpolation search.

5. GRAPHS

9

Application of graph - C representation of graphs - Transitive closure - Warshall's algorithm – Shortest path algorithm - Linked representation of graphs - Dijkstra's algorithm - Graph traversal - Traversal methods for graphs - Spanning forests - Undirected graph and their traversals - Depth first traversal - Application of depth first traversal - Efficiency of depth first traversal - Breadth first traversal - Minimum spanning tree - Kruskal's algorithm - Round robin algorithm.

L=45 T=15 Total = 60

TEXT BOOK

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, 'Data structures using C', Pearson Education, 2004 / PHI.

REFERENCE BOOKS

1. E. Balagurusamy, 'Programming in Ansi C', Second Edition, Tata McGraw Hill Publication, 2003.

2. Robert L. Kruse, Bruce P. Leung Clovis L.Tondo, 'Data Structures and Program Design in C', Pearson Education, 2000 / PHI.

ME 1211 APPLIED THERMODYNAMICS 3 1 0 100

OBJECTIVES

i. To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.

ii. To integrate the basic concepts into various thermal applications like IC engines, gas turbines, steam boiler, steam turbine, compressors, refrigeration and air conditioning.

iii. To enlighten the various modes of heat transfer and their engineering applications.

(Use of standard steam tables, refrigeration tables and heat transfer data book are permitted)

1. BASIC CONCEPTS AND LAWS OF THERMODYNAMICS

12

Classical approach: Thermodynamic systems – Boundary - Control volume - System and surroundings – Universe – Properties - State-process – Cycle – Equilibrium - Work and heat transfer – Point and path functions - First law of thermodynamics for open and closed systems - First law applied to a control volume - SFEE equations [steady flow energy equation] - Second law of thermodynamics - Heat engines - Refrigerators and heat pumps - Carnot cycle - Carnot theorem - Clausius inequality - Concept of entropy - Principle of increase of entropy - Basic thermodynamic relations.

2. IC ENGINES AND GAS TURBINES

8

Air standard cycles: Otto, diesel and dual cycles and comparison of efficiency - Working Principle of four stroke and two stroke engines - Working principle of spark ignition and compression ignition engines - Applications of IC engines - Normal and abnormal combustion - Working principle of four stroke and two stroke engines - Working principle of spark ignition and compression ignition engines - Applications of IC engines.

Open and closed cycle gas turbines – Ideal and actual cycles - Brayton cycle - Cycle with reheat, intercooling and regeneration – Applications of gas turbines for aviation and power generation.

3. STEAM BOILERS AND TURBINES

8

Formation of steam - Properties of steam – Use of steam tables and charts – Steam power cycle (Rankine) - Modern features of high-pressure boilers – Mountings and accessories – Testing of boilers.
Steam turbines: Impulse and reaction principle – Velocity diagrams – Compounding and governing methods of steam turbines (qualitative treatment only) - Layout diagram and working principle of a steam power plant.

4. COMPRESSORS, REFRIGERATION AND AIR CONDITIONING

8

Positive displacement compressors – Reciprocating compressors – Indicated power – Clearance volume – Various efficiencies – Clearance ratio - Volume rate - Conditions for perfect and imperfect intercooling - Multi stage with intercooling – Rotary positive displacement compressors – Construction and working principle of centrifugal and axial flow compressors.

Unit of refrigeration - Basic functional difference between refrigeration and air conditioning – Various methods of producing refrigerating effects (RE) – Vapour compression cycle: P-H and T-S diagram - Saturation cycles - Effect of subcooling and super heating - (qualitative treatment only) - Airconditioning systems – Basic psychrometry - Simple psychrometric processes - Types of airconditioning systems -Selection criteria for a particular application (qualitative treatment only).

5. HEAT TRANSFER

9

One-dimensional Heat Conduction: Plane wall – Cylinder – Sphere - Composite walls – Critical thickness of insulation –Heat transfer through extended surfaces (simple fins).

Convection: Free convection and forced convection - Internal and external flow - Empirical relations - Determination of convection heat transfer co-efficient by using Dittus–Baetter equation.

Radiation: Black–Gray bodies - Radiation Shape Factor (RSF) - Cooling of electronic components: Thermoelectric cooling – Chip cooling.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. P.K. Nag, ‘Basic and Applied Engineering Thermodynamics’, Tata McGraw Hill, New Delhi, 2002.

2. B.K. Sachdeva, ‘Fundamentals of Engineering Heat and Mass Transfer (SI Units)’, New Age International (P) Limited, Chennai, 2003.

REFERENCE BOOKS

1. Rogers and Mayhew, 'Engineering Thermodynamics – Work and Heat Transfer', Addision Wesley, New Delhi, 1999.

2. Eastop and McConkey, 'Applied Thermodynamics', Addison Wesley, New Delhi. 1999.

3. M.L. Mathur and F.S. Metha, 'Thermal Engineering', Jain Brothers, New Delhi, 1997.

4 B.K. Sankaar, 'Thermal Enginerring', Tata McGraw Hill, New Delhi, 1998.

EE 1203 ELECTRICAL MACHINES LABORATORY – I 0 0 3 100

AIM

To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

1. Open circuit and load characteristics of D.C separately and self excited shunt generator

2. Load characteristics of D.C. compound generator with differential and cumulative connection

3. Load characteristics of D.C. shunt and compound motor

5. Load characteristics of D.C series motor

6. Swinburne's test and speed control of D.C shunt motor

7. Hopkinson's test on D.C motor – generator set

7. Load test on single-phase transformer and three phase transformer connections

8. Open circuit and short circuit tests on single phase transformer

9. Sumpner's test on transformers

10. Separation of no-load losses in single phase transformer

P = 45 Total = 45

Detailed Syllabus

1. Open Circuit and Load Characteristics of DC Separately and self excited shunt Generator

Aim

To conduct no load and load test on self and separately excited generators and obtain the characteristics.

Exercise

1. Obtain the open circuit characteristics of a separately and self excited D.C generator and determine critical resistance.

2. Draw the external and internal characteristics of a separately and self excited D.C generator and compute full load regulation.

2. Load Characteristics Of D.C. Compound Generator with differential and cumulative connection

Aim

To conduct load test on DC compound generator and obtain the load characteristic curves

Exercise

1. Obtain the following curves for cumulative, differential and shunt generator

   a. I_L Vs V for DC cumulative compound generator

   b. I_L Vs V for DC differential compound generator

All graphs should be drawn on the same graph sheet

3. Load characteristics of DC Shunt and compound motor

Aim

To conduct load test on DC shunt motor and compound motor and draw the characteristic curves

Exercise

1. Draw the following characteristic curves for DC shunt and compound motor

   a. Output Vs η%

   b. Output Vs T

   c. Output Vs N

   d. Output Vs I_L

   e. Torque Vs N

4. Load characteristics of DC series motor

Aim

To conduct load test on DC series motor and draw the characteristics curves

Exercise

1. Draw the following characteristics curve for DC series motor

   a. Output Vs η%
   b. Output Vs T
   c. Output Vs N
   d. Output Vs I
   e. Torque Vs N

5. Swinburne's Test and speed control of DC shunt motor

Aim

To conduct Swinburne's test and predetermine the performance characteristics of DC machine and speed control of DC motor

Exercise

1. Predetermine efficiency at various load current while operating as a motor and generator and plot a graph output Vs η%

2. Draw the following curves for

   a. I_f Vs N at $V_a = 0.8\ V_a$ and V_a
   b. V_a Vs N at $0.8\ I_f$ and I_f

6. Hopkinson's Test on DC motor – Generator set

Aim

To conduct Hopkinson's test on a pair of DC shunt machines and determine their efficiency.

Exercise

1. Determine the stray losses of the machines.
2. Obtain efficiency curves for the motor and generator and draw the curves.

7. Load Test On Single-Phase Transformer and three phase transformer connections

Aim

To conduct load test on the given single phase transformer and determine its Performance.

Exercise

1. Draw the following graph for single phase transformer
   a. Output Vs η%
2. To carry out the following three phase transformer connection
   Y-Y; Y-Δ; Δ – Δ; Δ – Y
   Check the input output voltage ratio for various three phase connection.

8. Open Circuit and Short Circuit Tests on Single Phase Transformer

Aim

To conduct O.C and S.C test on a single phase transformer and calculate the performances

Exercise

1. Determine the equivalent circuit of the transformer.
2. Predetermine the efficiency at different load at UPF and 0.8 Power factor lagging.
3. Predetermine the full load regulation at different power factor.
4. Draw the following curves
   a. Output Vs η%
   b. Power factor Vs %Regulation

9. Sumpner's Test on transformers

Aim

To conduct Sumpner's test on a pair of identical single phase transformers and predetermine performance.

Exercise

1. Study the paralleling process for two identical transformers.
2. Determine the equivalent circuit parameters of each transformer.
3. Predetermine the efficiency at different loads at 0.8 and 1.0 power factors.
4. To predetermine the full load regulation for different power factors.

5. Draw the following graph

   a. Output Vs %η
   b. Power factor Vs %Regulation

10. Separation of No-Load Losses in Single Phase Transformer

Aim

To separate the iron losses of a single phase transformer into its components

   a. Hysterisis losses
   b. Eddy current losses

Exercise

1. Separate the no load losses into hysterisis and eddy current components.

CS 1212 DATA STRUCTURES AND ALGORITHMS LABORATORY 0 0 3 100

AIM

To implement Quene, stack, linked lists and to implement search, sort and traversal technique.

1. Queue implementation using arrays.

2. Stack implementation-using arrays.

3. Singly, doubly and circular liked list implementation and all possible operations on lists.

4. Queue and Stack implementation using linked list

5. Binary search tree implementation using linked list and possible operations on binary search trees.

6. In-order, preorder and post order traversals.

7. Quick sort implementation and its efficiency calculation.

8. Binary Search implementation.

9. Graph implementation using arrays and list structure.

10. Depth first and Breadth first traversal in graphs.

P = 45 Total = 45

Detailed Syllabus

1. **Queue implementation using arrays**

Aim

To implement queue using arrays.

Objective

To represent queue using an array and to perform insert and delete operations in the queue.

Exercises

1. Declare an array Q of size N.
2. Assign F and R to be the front and rear pointers of the queue and assign 0 to F and R.
3. Get the new element Y to be inserted in to the queue
4. If R is less than N, insert Y at the end, by incrementing R by 1. Otherwise display

   queue is full.
5. If F is zero then assign F to be 1.
6. To delete an element check whether F is greater than zero, then delete an element

   pointed by F, otherwise display queue is empty.
7. If F and R are equal the set F = R=0;otherwise F=F+1;
8. Display the queue Q from F to R.

Software Requirements

Turbo C - 30 nodes

Hardware Requirements

PC (preferably P-IV) - 30 nos.

2. Stack implementation using arrays.

Aim

To implement stack using arrays

Objective

To represent stack using an array and to perform push and pop operations in the stack.

Exercises

1. Declare an array S of size N.
2. Assign TOP as a pointer to denote the top element in the stack
3. Get the new element Y to be added in to the stack.

4. If TOP is greater than or equal to N then display stack over flow; otherwise set

   TOP=TOP+1.

5. Set S[TOP] = Y.
6. To delete top element from the stack check if TOP =0,the display stack underflow, otherwise decrement TOP by one, and display S [TOP+1].
7. Display the stack S from 1 to TOP.

Software Requirements

Turbo C - 30 nodes

Hardware Requirements

PC - 30 nos.

3. Singly, Doubly and Circular linked list implementation and all possible operations on lists

Aim

To implement singly, doubly and circular linked list and performing insert, delete and search operations.

Objective

To represent singly, doubly and circular linked list and to perform operations like insertion, deletion and search.

Exercises

SINGLY LINKED LIST:

1. Set a node to contain INFO and LINK fields.
2. Allot memory dynamically for a node and declare it as a header H.
3. To create a singly linked lists get the element N and allot memory for a node S1.
4. Set S1->INFO=N; and S1->LINK=NULL.
5. Repeat the above two steps for all the elements.
6. A node can be inserted at the front, in the middle or at the end of the list.
7. To insert a node X at the front check whether the list is empty, if not set X->LINK=H->LINK and H->LINK=X.

8. To insert a node X at the end travel till the end of the list and assign the last node's LINK value to X.
9. To insert a node X after the specified node Y, travel the list till the node Y is reached. Set X->LINK=Y->LINK and Y->LINK=X
10. A node can be deleted at the front, in the middle or at the end of the list.
11. To delete a node X at the front set H->LINK=H->LINK->LINK.
12. To delete a node X at the end travel the list till the end and assign the previous to last node's LINK value to be NULL.
13. To delete a node X after the specified node Y, travel the list till the node Y is reached Set Y->LINK= Y->LINK->LINK.
14. To search an element E traverse the list until E is found.

DOUBLY LINKED LIST:

1. Set a node to contain INFO and RLINK and LLINK fields.
2. Allot memory dynamically for a node and declare it as a header H.
3. To create a doubly linked list get the element N and allot memory for a node S1.
4. Set S1->INFO=N; and S1->RLINK=NULL, S1->LLINK=H.
5. Repeat the above two steps for all the elements.
6. A node can be inserted at the front, in the middle or at the end of the list.
7. To insert a node X at the front check whether the list is empty, if not set X->RLINK=H->RLINK and H->RLINK=X.
8. To insert a node X at the end travel till the end of the list and assign the last node's RLINK value to X and set X->LLINK=last node's RLINK.
9. To insert a node X after the specified node Y, travel the list till the node Y is reached. Set X->RLINK=Y->RLINK , Y->RLINK=X,X->LLINK=Y and X->RLINK->LLINK=X
10. A node can be deleted at the front, in the middle or at the end of the list.
11. To delete a node X at the front set X->RLINK->LLINK=H,H->RLINK->RLINK= X.

12. To delete a node X at the end travel the list till the end and assign the previous to last node's RLINK value to be NULL.
13. To delete a node X after the specified node Y, travel the list till the node Y is reached Set X->RLINK->LLINK=Y, Y->RLINK= X->RLINK.
14. To search an element E traverse the list until E is found.

CIRCULAR LINKED LIST

1. Set a node to contain INFO and LINK fields.
2. Allot memory dynamically for a node and declare it as a header H.
3. To create a singly linked lists get the element N and allot memory for a node S1.
4. Set S1->INFO=N; and S1->LINK=H.
5. Repeat the above two steps for all the elements.
6. A node can be inserted at the front, in the middle or at the end of the list.
7. To insert a node X at the front check whether the list is empty, if not set X->LINK=H->LINK and H->LINK=X.
8. To insert a node X at the end travel till the end of the list and assign the last node's LINK value to X and X->LINK=H.
9. To insert a node X after the specified node Y, travel the list till the node Y is reached. Set X->LINK=Y->LINK and Y->LINK=X
10. A node can be deleted at the front, in the middle or at the end of the list.
11. To delete a node X at the front set H->LINK=H->LINK->LINK.
12. To delete a node X at the end travel the list till the end and assign the previous to last node's LINK value to be H.
13. To delete a node X after the specified node Y, travel the list till the node Y is reached Set Y->LINK= Y->LINK->LINK.
14. To search an element E traverse the list until E is found.

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

4. Queue and Stack implementation using linked list

Aim

To implement queue and stack using linked list.

Objective

To represent queue and stack operations using linear linked list.

Exercises

STACK

1. Create a singly linked list.
2. To PUSH a node X travel the list until the end is reached. Assign last node's LINK to X.
3. To POP a node X delete the last node and set the previous to last node's LINK to NULL.
4. To display the stack contents traverse the list from the header till the last node.

QUEUE

1. Create a singly linked list.
2. Set first node as F and last node as R.
3. To insert a node X set R->LINK=X;
4. To delete a node X check whether the list is empty, if not set F=F->LINK;
5. To display the queue contents traverse the list from F to R.

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

5. In-order, Pre-order and Post-order Traversals

Aim

To perform In-order, Preorder and Post order traversals in Binary Search Tree

Objective

To perform traversals in binary search tree using In-order, Preorder and Post-order techniques.

Exercises

1. Create the binary search tree
2. To perform in-order traversals
   a. process the left sub tree
   b. process the root
   c. process the right sub-tree
3. To perform preorder traversal
   a. process the root node
   b. process the left
   c. process the right
4. To perform post-order traversal
   a. process the left node
   b. process the right node.
   c. process the root node.

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

6. Binary search tree implementation using linked list and possible operations on binary search trees

Aim

To implement binary search tree using linked list and possible operations on binary search trees.

Objective

To represent binary search tree using linked list and to implement operations like insertion, deletion and search operations

Exercises

1. Create the memory space for the root node and initialize the value to zero.
2. Read the value.
3. If the value is less than the root value ,it is assigned as the left child of the root.

   Else if new value is greater than the root value, it is assigned as the right child

   of the root. Else if there is no value in the root, the new value is assigned as the

   root.
4. The step(2) and (3) is repeated to insert the 'n' number of values.

Search operation

1. Read the value to be searched.
2. Check whether the root is not null.
3. If the value to be searched is less than the root, consider the left sub-tree for searching the particular element else if the value is greater than the root consider the right sub - tree to search the particular element else if the value is equal then return the value that is the value which was searched.

Insertion

1. Read the value to be inserted
2. First perform the search operation to check whether the key values is different from those existing element
3. If the search is unsuccessful, then the key is inserted at the point the search is

   terminated.

Deletion

1. Read the key value to be deleted
2. First perform search operation to get that particular key element
3. If it is, check whether

(a) it is leaf node,

(b) or it has only one sub-tree

(c) or it has exactly 2 sub-trees

4. If the key value is the leaf-node, assign null value to that node ,else if the key contains only one sub-tree either left (or)right sub-tree, if the key is root, it is discarded and the root its single sub-tree becomes the new search tree root. Else if the key is the child node , then we change the pointer from the root of key to the child of the key.

5. If the key contain both left and right sub-tree replace the key with either largest

element is the left sub-tree or smallest element is the right sub-tree.

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

7. Quick sort implementation and it's efficiency calculation

Aim

To implement quick sort and calculate it's efficiency

Objective

To arrange the elements using fastest sorting technique quick sort and the time taken to sort the elements.

Exercises

1. Get N elements which are to be sorted, and store it in the array A.
2. Select the element from A[0] to A[N-1] for middle. This element is the pivot.
3. Partition the remaining elements into the segments left and right so that no elements in left has a key larger than that of the pivot and no elements in right has a key smaller than that of the pivot.
4. Sort left using quick sort recursively.
5. Sort right using quick sort recursively.
6. Display the sorted array A.

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

8. Binary Search implementation

Aim

To implement binary search technique.

Objective

To perform sorting using binary search technique.

Exercises

1. Get N elements and store the elements in the array K in ascending order.
2. Get the element to be searched X.
3. Initialize LOW=1,HIGH=N;
4. Until LOW<= HIGH check whether X <K[MIDDLE], if so
5. HIGH=MIDDLE-1,otherwise check whether X > K[MIDDLE] ,if so LOW=MIDDLE+1,otherwise Display UNSUCCESSFUL SEARCH

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

9. Graph implementation using arrays and list structure

Aim

Graph implementation using arrays and linear linked list.

Objective

To represent Graph using arrays and linked list

Exercises

1. Construct adjacency matrix, such that it has value one if there exists direct path between two vertices and otherwise zero.

2. For linked representation of graph an array H of head nodes each contains one pointer field INFO.

3. If there exists a direct path between i^{th} head node H[I] and the node X , then
H[I]->INFO=X.

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

10. Depth first and Depth first traversal in Graph

Aim

To implement depth first and Breadth first traversal in graphs.

Objective

Depth first and Breadth first traversal implementation in graphs .

Exercises

1. Construct a graph.
2. To traverse a graph in breadth first technique ,label vertex v as reached.
3. Initialize Q to be a queue with only v in it.
4. While Q is not empty, do the following steps
5. Delete a vertex W from the queue
6. Let u be a vertex adjacent from w.
7. While u, if u has not been labeled then add u to the queue label u as reached.
8. Set u = next vertex, that is adjacent from w
9. To traverse a graph in DFS label vertex v as reached.
10. While u is adjacent to v, if u is not reached call DFS recursively

11. Set u as next adjacent vertex of v. Repeat from step 9 till all the nodes are visited.

Software Requirements

Turbo C - 30 nodes.

Hardware Requirements

PC - 30 nos.

MA 1251 NUMERICAL METHODS 3 1 0 100

AIM

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

i. The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.

ii. When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.

iii. The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.

iv. Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

1. SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

9

Linear interpolation methods (method of false position) – Newton's method – Statement of fixed point theorem – Fixed point iteration: $x=g(x)$ method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods - Iterative methods: Gauss Jacobi and Gauss-Seidel methods - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method.

2. INTERPOLATION AND APPROXIMATION

9

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

3. NUMERICAL DIFFERENTIATION AND INTEGRATION
9

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons's rules.

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

9

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

5. BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
9

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. C.F. Gerald and P.O. Wheatley, 'Applied Numerical Analysis', Sixth Edition, Pearson Education Asia, New Delhi, 2002.

2. E. Balagurusamy, 'Numerical Methods', Tata McGraw Hill Pub.Co.Ltd, New Delhi, 1999.

REFERENCE BOOKS

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, ‘Numerical Methods’, S.Chand Co. Ltd., New Delhi, 2003.

2. R.L. Burden and T.D. Faires, ‘Numerical Analysis’, Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.

EE 1251 ELECTRICAL MACHINES - II **3**
1 0 100

AIM

To expose the students to the concepts of synchronous and asynchronous machines and
analyse their performance.

OBJECTIVES

To impart knowledge on

i. Construction and performance of salient and non – salient type synchronous generators.

ii. Principle of operation and performance of synchronous motor.

iii. Construction, principle of operation and performance of induction machines.

iv. Starting and speed control of three-phase induction motors.

v. Construction, principle of operation and performance of single phase induction motors and special machines.

1. SYNCHRONOUS GENERATOR

9

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – e.m.f, m.m.f, z.p.f and A.S.A methods – Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics - Capability curves.

2. SYNCHRONOUS MOTOR

8

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.

3. THREE PHASE INDUCTION MOTOR

12

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque –

Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors – Induction generator – Synchronous induction motor.

4. STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR

7

Need for starting – Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, torque, number of poles and slip – Cascaded connection – Slip power recovery scheme.

5. SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES

9

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

4. Sheila.C.Haran, 'Synchronous, Induction and Special Machines', Scitech Publications, 2001.

EE 1252 TRANSMISSION AND DISTRIBUTION 3
1 0 100

AIM

To become familiar with the function of different components used in Transmission and
Distribution levels of power systems and modelling of these components.

OBJECTIVES

i. To develop expression for computation of fundamental parameters of lines.

ii. To categorize the lines into different classes and develop equivalent circuits for these classes.

iii. To analyse the voltage distribution in insulator strings and cables and methods to improve the same.

1. INTRODUCTION

9

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability, application of HVDC transmission system. FACTS (qualitative treatment only): TCSC, SVC, STATCOM, UPFC.

2. TRANSMISSION LINE PARAMETERS

9

Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors: Symmetrical and unsymmetrical spacing and transposition; application of self and mutual GMD; skin and proximity effects; interference with neighbouring communication circuits. Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

3. MODELLING AND PERFORMANCE OF TRANSMISSION LINES

9

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

4. INSULATORS AND CABLES

9

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

5. SUBSTATION, GROUNDING SYSTEM AND DISTRIBUTION SYSTEM

9

Types of substations; bus-bar arrangements; substation bus schemes: single bus scheme, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breaker-and-a-half with two main buses, double bus-bar with bypass isolators.
Resistance of grounding systems: Resistance of driven rods, resistance of grounding point electrode, grounding grids; design principles of substation grounding system; neutral grounding.

Radial and ring-main distributors; interconnectors; AC distribution: AC distributor with concentrated load; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

L=45 T = 15

Total =60

TEXT BOOKS

1. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003.

2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

REFERENCE BOOKS

1. Luces M.Fualkenberry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.

2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.

3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.

4. 'Tamil Nadu Electricity Board Handbook', 2003.

IC 1251 CONTROL SYSTEMS **3**
1 0 100

AIM

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES

i. To understand the methods of representation of systems and getting their transfer function models.

ii. To provide adequate knowledge in the time response of systems and steady state error analysis.

iii. To give basic knowledge is obtaining the open loop and closed–loop frequency responses of systems.

iv. To understand the concept of stability of control system and methods of stability analysis.

v. To study the three ways of designing compensation for a control system.

1. SYSTEMS AND THEIR REPRESENTATION

9

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

2. TIME RESPONSE

9

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feed back control.

3. FREQUENCY RESPONSE

9

Frequency response – Bode plot – Polar plot – Constant M an N circles – Nichols chart – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

4. STABILITY OF CONTROL SYSTEM

9

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

5. COMPENSATOR DESIGN

9

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. K. Ogata, 'Modern Control Engineering', 4th edition, Pearson Education, New Delhi, 2003 / PHI.

2. I.J. Nagrath & M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

REFERENCE BOOKS

1. B.C. Kuo, 'Automatic Control Systems', Prentice Hall of India Ltd., New Delhi, 1995.

2. M. Gopal, 'Control Systems, Principles & Design', Tata McGraw Hill, New Delhi, 2002.

3. M.N. Bandyopadhyay, 'Control Engineering Theory and Practice', Prentice Hall of India, 2003.

EC 1261 ELECTRONIC CIRCUITS 3
0 0 100

AIM

To introduce the concept of realising circuits using active and passive devices for signal generation and amplification.

OBJECTIVES

i. To expose the students to study the different biasing and configurations of the amplifier circuits.

ii. To study the characteristics of tuned amplifier.

iii. To expose the students to various amplifiers oscillator circuits with feedback concepts.

iv. To learn the wave shaping process and circuits.

v. To learn and analyse the process of AC to DC conversion.

1. SMALL-SIGNAL AND LARGE SIGNAL AMPLIFIERS

9

Fixed and self biasing of BJT & FET – Small signal analysis of CE, CC & Common source amplifiers – Cascade and Darlington connections, transformer coupled class A, B & AB amplifiers – Push-pull amplifiers.

2. DIFFERENTIAL AND TUNED AMPLIFIERS

9

Differential amplifiers – Common mode and differential mode analysis - DC and AC analysis - Characteristics of tuned amplifiers – Single & double tuned amplifier.

3. FEEDBACK AMPLIFIER AND OSCILLATORS

9

Characteristics of negative feedback amplifiers – Voltage / current, series/shunt feedback – Theory of sinusoidal oscillators – Phase shift and Wien bridge oscillators – Colpitts, Hartley and crystal oscillators.

4. PULSE CIRCUITS

9

RC wave shaping circuits – Diode clampers and clippers – Multivibrators – Schmitt triggers – UJT based saw tooth oscillators.

5. RECTIFIERS AND POWER SUPPLY CIRCUITS

9

Half wave & full wave rectifier analysis - Inductor filter – Capacitor filter - Series voltage regulator – Switched mode power supply.

L= 45 Total = 45

TEXT BOOKS

1. David A. Bell, 'Electronic Devices & Circuits', Prentice Hall of India/Pearson Education,
IV Edition, Eighth printing, 2003.

2. Jacob Millman & Christos.C.Halkias, 'Integrated Electronics: Analog and Digital Circuits and System', Tata McGraw Hill, 1991.

REFERENCE BOOKS

1. Robert. L. Boylestad & Lo Nashelsky, 'Electronic Devices & Circuit Theory', Eighth
edition, Pearson Education, Third Indian Reprint, 2002 / PHI.

2. Jacob Millman & Herbert Taub, 'Pulse, Digital & Switching Waveforms', Tata McGraw Hill, Edition 2000, 24th reprint, 2003.

3. Donald L.Schilling and Charles Belove, 'Electronic Circuits', 3rd Edition, Tata McGraw Hill, 2003.

CS 1261 OBJECT ORIENTED PROGRAMMING 3 1 0 100

AIM

To present the concept of object oriented programming and discuss briefly the important elements of object oriented analysis and design of systems.

OBJECTIVES

i. To study the object oriented programming principles, tokens, expressions, control
structures and functions.

ii. To introduce the classes, objects, constructors and Destructors.

iii. To introduce the operator overloading, inheritance and polymorphism concepts in C++.

iv. To introduce constants, variables, data types, operators, classes, objects, methods, arrays and strings in Java.

v. To introduce the programming approach in Java, interfaces and packages, multithreading, managing errors and exceptions and Applet programming.

1. OBJECT ORIENTED PROGRAMMING AND BASICS OF C++

9

Software crisis – Software evolution – A look at procedure oriented programming – Object oriented programming paradigm – Basic concepts of object oriented programming – Benefits of OOP – Object-oriented languages – Applications of OOP - What is C++? – A simple C++ program – More C++ statements – Structure of C++ Program.

Tokens – Keywords – Identifiers and constants – Basic data types – User defined data types – Derived data types – Symbolic constants – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators in C++ – Scope resolution operator – Manipulators – Type cast operator – Expressions and their types – Special assignment expressions – Control structures - The main function – Function prototyping – Call by reference – Return by reference – Inline functions – Default arguments – Function overloading.

2. CLASSES AND OBJECTS

9

Specifying a class – Defining member functions – Private member functions – Arrays within a class – Memory allocation for objects – Static data members –

Static member functions – Arrays of objects – Objects as function arguments – Friendly functions – Returning objects.

Constructors: Parameterized constructors – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Dynamic constructors – Destructors.

3. OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM 9

Defining operator overloading: Overloading unary, binary operators. Manipulation of strings using operators – Rules for overloading operators – Type Conversions - Defining derived classes – Single inheritance – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – Virtual base classes – Abstract classes - Introduction to pointers to objects: This pointer – Pointers to derived classes – Virtual functions – Pure virtual functions.

4. JAVA EVOLUTION, CONSTANTS, VARIABLES, DATA TYPES, OPERATORS, CLASSES, OBJECTS, METHODS, ARRAYS AND STRINGS 9

Java features: How Java differs from C and C++ - Simple Java program – Java program structures – Java tokens – Java statements – Implementing a Java program – Java virtual machine – Command line arguments - Constants – Variables – Data types – Scope of variables – Operators in Java.

Defining a class – Adding variables and methods – Creating objects – Accessing class members – Constructors – Method overloading – Static members – Inheritance: Extending a class – Overriding methods – Final variables and methods – Final classes – Abstract methods and classes – Visibility control - Arrays – One dimensional array – Creating an array – Two-dimensional arrays – Strings – Vectors.

5. PROGRAMMING USING INTERFACES, PACKAGES, MULTITHREADING, MANAGING ERRORS AND EXCEPTIONS AND APPLETS 9

Defining interfaces – Extending interfaces – Implementing interfaces – Accessing interface variables – Java API packages – Using system packages – Creating, accessing and using a package – Adding a class to a package - Creating threads – Extending the thread class – Stopping and blocking a thread – Thread exceptions – Thread priority – Synchronization – Life cycle of a thread – Using thread methods.

Types of errors: Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using

exceptions for debugging. Preparing to write applets – Applet lifecycle – Creating an executable applet – Designing a web page – Applet tag – Adding applet to HTML file – Running the Applet.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. E.Balagurusamy, 'Object Oriented Programming with C++', Second edition, Tata McGraw Hill, 2003.

2. E.Balagurusamy, 'Programming with JAVA – A Primer', Second edition, Tata McGraw Hill, 2003.

REFERENCE BOOKS

1. Herbert Schildt, 'C++ - The Complete Reference', Tata McGraw Hill, 1997.

2. Bjarne Stroustrup, 'The C++ Programming Language', Addison Wesley, 2000.

3. John .R .Hubbard, 'Schaums Outline Programming with C++', Tata McGraw Hill, 2003.

4. Kris Jasma, 'Java Programming – A Complete Reference', Galgotia publication, 1994.

IC 1252 CONTROL SYSTEMS LABORATORY 0 0 3 100

AIM

To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems.

List of Experiments

1. Determination of transfer function parameters of a DC servo motor.
2. Determination of transfer function parameters of AC servo motor.
3. Analog simulation of type-0 and type-1 system.
4. Digital simulation of linear systems.
5. Digital simulation of non-linear systems.
6. Design and implementation of compensators.
7. Design of P, PI and PID controllers.

8. Stability analysis of linear systems.

9. Closed loop control system.

10. Study of synchros.

P = 45 Total = 45

Detailed Syllabus

1. Determination of Transfer Function Parameters of A DC Servo Motor

Aim

To derive the transfer function of the given D.C Servomotor and experimentally determine the transfer function parameters

Exercise

1. Derive the transfer function from basic principles for a separately excited DC motor.

2. Determine the armature and field parameters by conducting suitable experiments.

3. Determine the mechanical parameter by conducting suitable experiments.

4. Plot the frequency response.

Equipment

1.	DC servo motor	: minimum of 100w – field separately excited – loading facility – variable voltage source - 1 No
2.	Tachometer	: 1 No
3.	Multimeter	: 2 Nos
4.	Stop watch	: 1 No

2. Determination Of Transfer Function Parameters Of Ac Servo Motor

Aim

To derive the transfer function of the given A.C Servo Motor and experimentally determine the transfer function parameters

Exercise

1. Derive the transfer function of the AC Servo Motor from basic Principles.
2. Obtain the D.C gain by operating at rated speed.
3. Determine the time constant (mechanical)
4. Plot the frequency response

Equipment

1.	AC Servo Motor	: Minimum of 100w – necessary sources for main winding and control winding – 1 No
2.	Tachometer	: 1 No
3.	Stopwatch	: 1 No
4.	Voltmeter	: 1 No

3. Analog Simulation Of Type-0 And Type-1 System

Aim

To simulate the time response characteristics of I order and II order, type 0 and type-1 systems.

Exercise

1. Obtain the time response characteristics of type – 0 and type-1, I order and II order systems mathematically.
2. Simulate practically the time response characteristics using analog rigged up modules.
3. Identify the real time system with similar characteristics.

Equipment

1. Rigged up models of type-0 and type-1 system using analog components.
3. Variable frequency square wave generator and a normal CRO - 1 No

(or)

DC source and storage Oscilloscope - 1 No

4. Digital Simulation Of Linear Systems

Aim

To digitally simulate the time response characteristics of higher-order MIMO linear systems using state – variable formulation

Exercise

1. Obtain the state variable formulation of the given higher–order MIMO systems.
2. Write a program or build the block diagram model using the given software.
3. Obtain the impulse, step and sinusoidal response characteristics.
4. Identify real time systems with similar characteristics.

Equipment

1. System with MATLAB / MATHCAD (or) equivalent software - minimum 3 user license.

5. Digital Simulation Of Non-Linear Systems

Aim

To digitally simulate the time response characteristics of a linear system with simple non-linearities like saturation and dead zone.

Exercise

1. Obtain the time response characteristics of some simple linear systems without non - linearity for step and sinusoidal inputs.
2. Repeat the time response characteristics in the presence of non-linearity
3. Discuss the effect of non-linearity

Equipment

1. System with MATLAB / MATHCAD (or) other equivalent software - 3 user license.

6. Design And Implementation Of Compensators

Aim

To design and implement suitable compensator for a given linear system to improve the performance.

Exercise

1. Study the time response characteristics of the given linear system without compensator.

2. Design a suitable compensator to improve the performance.

3. Implement the compensator using variable R,L and C boxes to the linear system and visually observe the performance improvement.

Equipment

1. Analog Rigged up modules of a linear system (For closed loop operation)
2. Variable R, L and C boxes – each - 2 Nos
3. Square wave generator and a CRO - 1 No

(or)

DC voltage source and storage oscilloscope - 1 No

7. Design Of P, Pi And Pid Controllers

Aim

To design P, PI and PID controllers for first order systems and implement them
practically.

Exercise

1. Study the time response behaviour of first order system without controller

2. Design a P/PI/PID controller to improve the performance

3. Implement the controller using variable R,L and C boxes to linear system and visually observe the performance improvement.

Equipment

1. Rigged up module of P, PI and PID controller using analog components
   Rigged up module of I order system (with loop closing facility)
   Variable R, L and C boxes – 2 each
   1No
   (or)
   Process control trainer with all the above features

2. CRO and a square wave generator – 1 No
   (or)
   DC source and a storage oscilloscope – 1 No

8. Stability Analysis Of Linear Systems

Aim

To analyse the stability of linear systems using Bode / Root locus / Nyquist plot

Exercise

1. Write a program to obtain the Bode plot / Root locus / Nyquist plot for the given system
2. Access the stability of the given system using the plots obtained
3. Compare the usage of various plots in assessing stability

Equipment

1. System with MATLAB / MATHCAD / equivalent software - 3 user license

9. CLOSED LOOP CONTROL SYSTEM

Aim

To study the behaviour of closed loop control system through practical experimentation.

Exercise

1. Obtain the block diagram representation of the given closed loop control system.

2. Conduct experiments to study the open loop time response behaviour for various set points.

3. Conduct experiments to study the closed loop time response behaviour for various set points.

4. Repeat 3 with a second type of controller and discuss the results.

Equipment

1. A complete closed loop position / speed / Temperature or equivalent system with two detachable controller units.

2. CRO

10. Study of Synchros

Aim

To study the characteristics of synchros as error detector

Exercise

1. Obtain the input-output characteristics of synchro transmitter by giving excitation to the rotor winding and measuring the output voltages across S1 – S2, S2-S3 and S3-S1 of stator windings for different rotor positions

2. Obtain the characteristics of synchro as angular displacement sensor and plot voltage Vs angle characteristics

3. Obtain the characteristic of synchro used as remote angle displacement of receiver tracks that of transmitter

Equipment

1.	Synchronous (transmitter and Receiver)	: 1 set
2.	Rheostat	: 1 No
3.	Multimeter	: 1 No

EC 1262 ELECTRONIC DEVICES AND CIRCUITS LABORATORY 0 0 3 100

AIM

To study the characteristics and to determine the device parameters of various solid-state devices.

1. Static Characteristics of transistor under CE, CB, CC and determination of hybrid parameters.
2. Static characteristics and parameter determination of JFET.
3. Static characteristics of semiconductor diode, zener diode and study of simple voltage regulator circuits.
4. Static characteristics of UJT and its application as a relaxation oscillator.
5. Photodiode, Phototransistor characteristics and study of light activated relay circuit.
6. Static characteristics of Thermistors.
7. Single phase half wave and full wave rectifiers with inductive and capacitive filters.
8. Phase shift oscillators and Wien bridge oscillators.
9. Frequency response of common emitter amplifiers.
10. Differential amplifiers using FET.

P = 45 Total = 45

Detailed Syllabus

1. Static Characteristics of transistor under CE, CB, CC and determination of hybrid parameters

Aim

To determine the static characteristics of transistor under CE, CB, CC mode.

Exercise

a. Plot the BJT CE, CB and CC input and output characteristics.

b. Determine the h-parameters hi, ho, hr and hf for CE, CB and CC characteristics from I/P and O/P characteristics.

2. Static characteristics and parameter determination of JFET

Aim

To determine the static characteristics of JFET

Exercise

1. Plot the JFET drain characteristics from the results obtained

2. Plot the JFET transfer characteristics from the results obtained.

3. From the drain characteristics for $V_{GS} = 0$ determine the value of the r_D and Y_{OS} parameters.

4. From the transfer characteristic, determine the values of the Y_{fs} parameters at V_{GS} =-1 V and V_{GS} = - 4V.

5. Draw horizontal and vertical scales on the drain characteristics plotted by the XY recorder. Identify each characteristic according to the V_{GS} level. Also, print the JFET type number on the characteristics.

3. Static characteristics of semiconductor diode, zener diode and study of simple voltage regulator circuits

Aim

1. To determine the static characteristics of semiconductor diode and zener diode

2. To study the simple voltage regulator circuits as Op-amp voltage regulator, source effect and load effect measurement, use of current limiter.

Exercise

Semiconductor diode

1. Plot the forward characteristic of the low – current diode and rectifier diode from the results obtained.

2. From the forward characteristics, determine the approximate forward voltage drop and dc forward resistance for D_2 and for D_2. Also estimate the ac resistance for each diode.

3. Comment on the results of reverse biased diode current measurements.

Zener diode

a. Plot a graph showing the Zener diode reverse characteristics.

b. From the Zener diode reverse characteristics determine the reverse voltage at I_Z = 20 mA. Also determine the dynamic impedance for the device.

c. Calculate the line regulation, load regulation and ripple reduction factor produced by the Zener diode regulator.

Voltage regulator

1. Analyze the voltage regulator circuit for ripple reduction, source effect and load
effect. Compare the calculated and measured circuit performance.

2. Plot the regulator current limiting characteristics. Analyze the two current limiter circuits and compare the calculated and measured circuit performances.

4. Static characteristics of UJT and its application as a relaxation oscillator

Aim

To determine the static characteristics of UJT.

Exercise

1. Plot the UJT characteristics from the results obtained.

2. Calculate the intrinsic stand – off ratio from the results obtained.

3. Compare the calculated value with the specified value for the UJT.

4. Discuss the waveforms obtained for the UJT relaxation oscillator investigated. Compare the operating frequency with that calculated frequency.

5. Photodiode, Phototransistor characteristics and study of light activated relay circuit

Aim

1. To draw the characteristics of photodiode, phototransistor.

2. To study the light activated relay circuit.

Exercise

Photodiode

1. Plot the photodiode reverse current upon different level of illumination.

2. Draw the dc load line for the circuit and determine the diode currents and voltages at different level of illumination.

Phototransistor

1. Draw the output characteristics I_C / V_{CE} of a phototransistor and determine the output voltage at different illumination levels.

2. Bias Phototransistor as a switch. Illuminate the phototransistor to activate a relay.

6. Static characteristics of Thermistors

Aim

To determine the static characteristics of thermistors.

Exercise

1. Draw the resistance / temperature characteristic of a thermistor and determine the resistance value for variations in temperature.

2. Draw the static voltage / current characteristics of a thermistor and determine whether device resistance remains constant until power dissipation is large enough to produce self-heating.

3. Use the thermistor as a temperature-compensating device by increasing the resistance with increasing temperature.

7. Single phase half wave and full wave rectifiers with inductive and capacitive filters

Aim

To construct half wave and full wave rectifiers and to draw their input and output waveforms.

Exercise

1. Plot the input and output waveforms and explain the difference between the two.

2. Explain the effect of open – circuiting of any one diode.

2. Measure the PIV of two-diode full wave rectifier to the bridge rectifier.

3. Calculate the ripple factor of output waveform of inductive and capacitive filter and compare it with measured practical values.

8. Phase shift oscillators and Wien bridge oscillators

Aim

To construct the phase shift oscillator and Wien bridge oscillators and to draw its output waveforms.

Exercise

1. Discuss the phase shift oscillator and Wien bridge oscillator output waveforms obtained from the experiment. Analyze the circuits and compare the calculated and measured frequencies.

2. Change the capacitor values and discuss the results.

3. Analyze the diode amplitude stabilization circuit for the Wien bridge oscillator and compare the calculated output amplitude to that of the measured values.

9. Frequency response of common emitter amplifiers

Aim

To determine the frequency response of common emitter amplifiers.

Exercise

1. For different values of cut – off frequencies determine suitable values of resistors and capacitors for common emitter amplifiers.

2. Plot the frequency response and determine 3dB bandwidth.

10. Differential amplifiers using FET

Aim

To analyse the characteristics of differential amplifier circuit using FET

Exercise

1. Construct the circuit and
   a. Determine differential gain A_d
   b. Determine common mode gain A_c
   c. Determine the CMRR = A_d / A_c

2. Construct the circuit using common source configuration. Measure i/p – o/p impedance of the circuit.

3. Try the same as common drain circuit (source follower) and check for V_{DD} = 25 V

CS 1262 OBJECT ORIENTED PROGRAMMING LABORATORY 0 0 3 100

AIM

To implement dynamic memory allocation, constructors, destructors, friend function, inheritance and interfaces.

1. String concatenation using dynamic memory allocation concept.

2. Implementation of arithmetic operations on complex numbers using constructor overloading.

3. To read a value of distance from one object and add with a value in another object using friend function.

4. Implementation of + and - operator overloading and implementation of addition operation of octal object with integer using operator overloading.

5. Implementation of addition and subtraction of two polynomial objects using operator overloading.

6. Managing bank account using inheritance concept.

7. To compute the area of triangle and rectangle using inheritance and virtual function.

8. Writing simple programs in Java.

9. Use of interfaces in Java.

10. Developing packages in Java.

P = 45 Total = 45

Detailed Syllabus

1. String concatenation using dynamic memory allocation concept

Aim

To implement the string concatenation function by using dynamic memory allocation concept.

Objective

To concatenate two or more strings into one string by allocating memory to objects at the time of their construction.

Exercises

1. Create class STRING with two constructors. The first is an empty constructor, which allows declaring an array of strings. The second constructor initializes the length of the strings, and allocates necessary space for the string to be stored and creates the string itself.

2. Create a member function to concatenate two strings.

3. Estimate the combined length of the strings to be joined and allocates memory for the combined string using new operator and then creates the same using the string functions strcpy() and strcat().

4. Display the concatenated string.

Software Equipment Required

TURBO C++	- 30 nodes

Hardware Equipment Required

PC (preferably P-IV)	- 30 nos

2. Implementation of arithmetic operations on complex numbers using constructor overloading

Aim

To implement arithmetic operations on complex numbers using constructor overloading

Objective

To represent complex numbers and to perform arithmetic operations on complex numbers using overloaded constructors in a class.

Exercises

1. Create class COMPLEX with three constructor to perform constructor overloading. The first constructor takes no arguments which is used to create objects which are not initialized.the second takes one argument which is used to create objects and initialize them and the third takes two arguments which is also used to create objects and initialize them to specific values.

2. Declare friend function.

4. Overload arithmetic operators +,-,*,/ to perform arithmetic operations on the complex numbers.

5. Display the results of each arithmetic operations.

Software Equipment Required

TURBO C++ - 30 nodes

Hardware Equipment Required

PC - 30 nos

2. To read a value of distance from one object and add with a value in another object using friend function

Aim

To read a value of distance from one object and add with a value in another object using friend function.

Objective

To create two classes and store the values of distance and to read the value from one class and add with a value in another object using friend function.

Exercises

1. Create two classes AB and AC and store the value of distances.
2. Declare friend function.
3. Read the value from the classes.
4. Perform addition to add one object of AB with another object of AC.
5. Display the result of addition.

Software Equipment Required

TURBO C++ - 30 nodes

Hardware Equipment Required

PC - 30 nos

4. Implementation of + and - operator overloading and implementation of addition operation of octal object with integer using operator overloading

Aim

To implement + and – operator overloading and to implement addition operation of octal object with integer using operator overloading.

Objective

To display the number of days between two valid dates and the date after a number of days from a valid date by overloading the operators + and -.
To represent octal numbers and to add an octal object with integer by overloading operator '+'.

Exercises

1. Create a class called DATE and define two member functions get-data and display-result.

2. Accept two valid dates in the form of dd/mm/yyyy using get-data.

3. Overload operators + and – to display the number of days between two valid dates using display-result.

4. Repeat step 3 to display the date after a number of days from a valid date using display-result.

    1. Create class OCTAL for representing octal numbers.

    2. Create a constructor to implement OCTAL h=x where x is an integer.
    3. Overload operator '+' to perform the integer addition with an OCTAL object like int y= h+k (where h is an OCTAL object and k is an integer).

    4. Display the resultant integer value y.

Software Equipment Required

TURBO C++ - 30 nodes

Hardware Equipment Required

PC - 30 nos

5. Implementation of addition and subtraction of two polynomial objects using operator overloading

Aim

To implement addition and subtraction operations of two polynomials and display using << operator overloading.

Objective

To add and subtract two POLYNOMIAL objects and to display results by overloading the operator <<.

Exercises

1. Create a class called POLYNOMIAL with constructors to create polynomial objects and to initialize with specific values.

2. Create member functions to perform addition and subtraction of two polynomials.

3. Overload operator << to display the results of addition and subtraction operations on two polynomials.

4. Display the results.

Software Equipment Required

TURBO C++ - 30 nodes

Hardware Equipment Required

PC - 30 nos

6. Managing bank account using inheritance concept

Aim

To manage the account information of the customer using inheritance concept.

Objective

To maintain and update the customer account specific information using inheritance concept.

Exercises

1. Create a class with the following member variables. Customer name, account number and account type.

2. Create the derived classes with following member variables.
   - for current account information

Balance, Deposit and withdrawal amount

   - for savings account information
     Balance and Deposit amount

3. Write a member function to get the Deposit and withdrawal amount and to update the balance information for current account.

4. Write a member function to get the Deposit amount and to update the balance information for saving account.

5. Write a member function to Display the balance information for respective account type.

Software Equipment Required

TURBO C++ - 30 nodes

Hardware Equipment Required

PC - 30 nos

7. To compute the area of triangle and rectangle using inheritance and virtual function

Aim

To implement derived class and virtual function concepts.

Objective

To calculate the area of triangle and rectangle using derived classes and display the result using virtual function.

Exercises

1. Create a base class SHAPE.

2. Derive two sub classes TRIANGLE and RECTANGLE from the base class SHAPE.

3. Define member functions get_data() and display_area().

4. Find out the area of triangle and rectangle and display the result using display_area().

5. Make display_area() as a virtual function.

Software Equipment Required

TURBO C++ - 30 nodes

Hardware Equipment Required

PC - 30 nos

8. Writing simple programs in Java

Aim

To generate random numbers using simple Java program

Objective

To generate random numbers using built in function random().

Exercises

1. Create a class called rand with variable declaration and includes header file math.

2. Generate random numbers using built in function random().

3. Display the result.

Software Equipment Required

JDK 1.3 - 30 nodes

Hardware Equipment Required

PC - 30 nos

9. Use of Interfaces in Java

Aim

To calculate area of rectangle and circle using interfaces.

Objective

To create two classes and store the values of distance and to read the values from one class and add with a value in another object using friend function

Exercises

1. Create two classes AB and AC and store the value of distances.
2. Declare friend function.
3. Read the value from the classes.
4. Perform addition to one object of AB with another object of AC.
5. Display the result of addition.

Software Equipment Required

JDK 1.3 - 30 nodes

Hardware Equipment Required

PC - 30 nos

10. Developing packages in Java

Aim

To find out the total score of the student using packages.

Objective

To design the packages with interface and to find out the total score of a student using packages.

Exercises

1. Create a package called PACK1 to contain the class STUDENT with member functions to obtain the subject marks.
2. Create another package called PACK2 to contain interface SPORTS with variables and method declaration.

3. Implement the class STUDENT with interface to calculate the total score including sports and subjects.

4. Display the results.

Software Equipment Required

JDK 1.3 - 30 nodes

Hardware Equipment Required

PC - 30 nos

EE 1301 POWER ELECTRONICS 3
0 0 100

AIM

To introduce the application of electronic devices for conversion, control and conditioning of electric power.

OBJECTIVES

i. To get an overview of different types of power semi-conductor devices and their switching characteristics.

ii. To understand the operation, characteristics and performance parameters of controlled rectifiers.

iii. To study the operation, switching techniques and basic topologics of DC-DC switching regulators.

iv. To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.

v. To know the practical application for power electronics converters in conditioning the power supply.

1. POWER SEMI-CONDUCTOR DEVICES

9

Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET and IGBT. Driver and snubber circuits for MOSFET - Turn-on and turn-off characteristics and switching losses.

2. PHASE-CONTROLLED CONVERTERS

9

2-pulse, 3-pulse and 6-pulse converters – Inverter operation of fully controlled converter - Effect of source inductance - Distortion and displacement factor – Ripple factor - Single phase AC voltage controllers.

3. DC TO DC CONVERTERS

9

Step-down and step-up choppers - Time ratio control and current limit control - Switching mode regulators: Buck, boost, buck-boost and cuk converter - Resonant switching based SMPS.

4. INVERTERS

9

Single phase and three phase (both 120^0 mode and 180^0 mode) inverters - PWM techniques: Sinusoidal PWM, modified sinusoidal PWM and multiple PWM - Voltage and harmonic control - Series resonant inverter - Current source inverters.

5. APPLICATIONS

9

Uninterrupted power supply topologies - Flexible AC transmission systems - Shunt and series static VAR compensator - Unified power flow controller- HVDC Transmission.

L = 45 Total = 45

TEXT BOOKS

1. Muhammad H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third edition, 2004 / PHI.

2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.

REFERENCE BOOKS

1. Cyril.W.Lander, 'Power Electronics', McGraw Hill International, Third edition, 1993.

2. Bimal K. Bose, 'Modern Power Electronics and AC Drives', Pearson Education, 2003.

3. Mr. Jaganathan, 'Introduction to Power Electronics', Prentice Hall of India, 2004.

EE 1302 PROTECTION AND SWITCHGEAR 3
0 0 100

AIM

To expose the students to the various faults in power system and learn the various methods of protection scheme

To understand the current interruption in Power System and study the various switchgears.

OBJECTIVES

i. Discussion on various earthing practices usage of symmetrical components to
estimate fault current and fault MVA.

ii. Study of Relays & Study of protection scheme, solid state relays.

iii. To understand instrument transformer and accuracy.

iv. To understand the method of circuit breaking various arc theories Arcing phenomena – capacitive and inductive breaking.

v. Types of circuit breakers.

1. INTRODUCTION

9

Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Power system earthing - Zones of protection and essential qualities of protection – Protection scheme.

2. OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS

9

Electromagnetic relays – Over current, directional, distance and differential, under frequency relays – static relays.

3. APPARATUS PROTECTION

9

Apparatus protection transformer, generator, motor, protection of bus bars, transmission lines – CTs and PTs and their applications in protection schemes.

4. THEORY OF CIRCUIT INTERRUPTION

9

Physics of arc phenomena and arc interruption. Restriking voltage & Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, interruption of capacitive current – DC circuit breaking.

5. CIRCUIT BREAKERS

9

Types of Circuit Breakers – Air blast, Air break, oil SF_6 and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers.

L = 45 Total = 45

TEXT BOOKS

1. B. Ravindranath, and N. Chander, 'Power System Protection & Switchgear', Wiley Eastern Ltd., 1977.

REFERENCE BOOKS

1. Sunil S. Rao, 'Switchgear and Protection', Khanna publishers, New Delhi, 1986 .
2. C.L. Wadhwa, 'Electrical Power Systems', Newage International (P) Ltd., 2000.
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power System Engineering', Dhanpat Rai & Co., 1998.
4. Badri Ram, Vishwakarma, 'Power System Protection and Switchgear', Tata McGraw hill, 2001.
5. Y.G. Paithankar and S.R. Bhide, 'Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003.

EC 1311 COMMUNICATION ENGINEERING 3 0 0 100

AIM

1. To introduce the fundamental techniques of analog, digital and data communication.

2. To explain satellite and fibre optic communication and Networking systems.

OBJECTIVES

i. To understand basic signals, analog modulation, demodulation and radio receivers.

ii. To explain the characteristics and model of transmission medium.

iii. To understand source digitization, digital multiplexing and modulation.

iv. To understand data communication system and techniques.

v. To learn the basics of satellite and optical fibre communication systems.

1. MODULATION SYSTEMS

9

Time and frequency domain representation of signals, amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Pulse width modulation.

2. TRANSMISSION MEDIUM

9

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

3. DIGITAL COMMUNICATION

9

Pulse code modulation, time division multiplexing, digital T-carrier system. Digital radio system. Digital modulation: Frequency and phase shift keying – Modulator and demodulator, bit error rate calculation.

4. DATA COMMUNICATION AND NETWORK PROTOCOL

9

Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

5. SATELLITE AND OPTICAL FIBRE COMMUNICATIONS **9**

Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations; advantages of optical fibre communication - Light propagation through fibre, fibre loss, light sources and detectors.

L= 45 Total = 45

TEXT BOOKS

1. Wayne Tomasi, 'Electronic Communication Systems', Pearson Education, Third Edition, 2001.

2. Roy Blake, 'Electronic Communication Systems', Thomson Delmar, 2nd Edition, 2002.

REFERENCE BOOKS

1. William Schweber, 'Electronic Communication Systems', Prentice Hall of India, 2002.

2. G. Kennedy, 'Electronic Communication Systems', McGraw Hill, 4th edition, 2002.

3. Miller, 'Modern Electronic Communication', Prentice Hall of India, 2003.

EC 1312 DIGITAL LOGIC CIRCUITS 3
1 0 100

AIM

To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

OBJECTIVES

i. To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.

ii. To study implementation of combinational circuits

iii. To study the design of various synchronous and asynchronous circuits.

iv. To expose the students to various memory devices.

1. NUMBER SYSTEM & BOOLEAN ALGEBRA

11

Review of number system; types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method.

2. COMBINATIONAL CIRCUITS

11

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

3. SYNCHRONOUS SEQUENTIAL CIRCUITS

11

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Counters, state diagram; state reduction; state assignment.

4. ASYNCHRONOUS SEQUENCTIAL CIRCUIT

5

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

5. PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES 7

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002.

2. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCE BOOKS

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Floyd, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
3. John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education,
2002.

EC 1313 LINEAR INTEGRATED CIRCUITS 3 0 0 100

AIM

To introduce the concepts for realising functional building blocks in ICs, fabrications & application of ICs.

OBJECTIVES

i. To study the IC fabrication procedure.

ii. To study characteristics; realise circuits; design for signal analysis using Op-amp ICs.

iii. To study the applications of Op-amp.

iv. To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

1. IC FABRICATION

9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging.

2. CHARACTERISTICS OF OPAMP

9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers,

differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator.

3. APPLICATIONS OF OPAMP

9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

4. SPECIAL ICs

9

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

5. APPLICATION ICs

9

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

L = 45 Total = 45

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI.

2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.

2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.

3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997.

GE 1301 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 100

OBJECTIVE

i. To create an awareness on Engineering Ethics and Human Values.

ii. To instill Moral and Social Values and Loyalty

iii. To appreciate the rights of Others

1. HUMAN VALUES
10

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

2. ENGINEERING ETHICS
9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

3 ENGINEERING AS SOCIAL EXPERIMENTATION
9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

4 SAFETY, RESPONSIBILITIES AND RIGHTS

9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

5 GLOBAL ISSUES

8

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

L = 45 Total = 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.

2. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint now available)

2. Charles E Harris, Michael S. Protchard and Michael J Rabins, " Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)

3. John R Boatright, " Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.

4. Edmund G Seebauer and Robert L Barry, " Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001 .

EE 1303 POWER ELECTRONICS LABORATORY 0

0 3 100

AIM

To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.

List of experiments with objectives and exercises

1. Characteristics of SCR
2. Characteristics of TRIAC
3. Characteristics of MOSFET and IGBT
4. Transient characteristics of SCR and MOSFET
5. AC to DC fully controlled converter
6. AC to DC half-controlled converter
7. Step down and step up MOSFET based choppers
8. IGBT based single-phase PWM inverter
9. IGBT based three-phase PWM inverter
10. Resonant dc-to-dc converter

P = 45 Total = 45

Detailed Syllabus

1. Characteristics of SCR

Objectives

1. Obtaining the anode (V_{AK} – I_A) forward conduction characteristics including the measurement of holding and latching currents.
2. Application of single SCR as half-wave rectifier.

Exercise

1. Conduct an experiment and obtain the anode forward conduction characteristics of the given SCR.
2. By conducting an experiment find the latching and holding currents of the given SCR.(high current SCR to be given for this exercise)

3. Demonstrate how a single phase half wave rectifier circuit can be implemented using a given SCR, AC power source and RC firing circuit.

2. Characteristics of TRIAC

Objectives

1. Obtaining the VI characteristics, both forward and reverse conduction.

2. Application of TRIAC along with suitable (R-C firing circuit based or otherwise) firing circuit, as single-phase A.C phase controller for illumination control.

Exercise

1. Obtain the forward conduction characteristics of the given TRIAC.
2. Obtain the reverse conduction characteristics of the given TRIAC.
3. Demostrate how a single- phase AC phase controller can be implemented for controlling the illumination of lamp, using given TRIAC and RC triggering circuit.

3. Characteristics of MOSFET and IGBT

Objective

Obtaining steady state output characteristics of both MOSFET and IGBT.

Exercise

1. Obtain the steady – state output – side characteristics of the given MOSFET, for a specified value of gate – source voltage.

2. Obtain the steady – state output – side characteristics of the given IGBT, for a specified value of gate emitter voltage.

3. Identify whether given switch is MOSFET or IGBT by finding the output – side characteristics.

4. Transient characteristics of SCR and MOSFET

Objective

Studying the switching characteristics, turn-on and turn-off of both SCR and
MOSFET.

Exercise

1. Capture and explain the turn-on characteristics of the given SCR.

2. Capture and explain the turn – off characteristics of the given SCR.

3. Obtain and explain both turning ‘ON’ and turn ‘OFF’ characteristics of given MOSFET.

5. AC to DC fully controlled converter

Objective

Studying the operation of single-phase and three-phase fully controlled converter fed R and R-L (i.e., Rectifier mode only) and determination of typical performance factors: Rectification ratio, form factor, ripple factor.

Exercise

1. Given the input AC voltage and required output DC voltage, theoretically calculate the firing angle required and practically verify the same by implementing a single – phase fully- controlled converter fed R-L load.

2. Theoretically calculate the overlap angle of given single phase fully controlled converter fed R-L load with L_s (source inductance) included practically verify the same by conducting an experiment.

3. Obtain the typical performance factors of the given single phase fully controlled converter fed R and R-L loads.

6. AC to DC half-controlled converter

Objective

1. Studying the operation of a single-phase and three-phase half controlled converter fed R and R-L loads.

1. Determination of typical performance parameters.

2. Comparative study with fully controlled converter.

Exercise

1. Given the input AC voltage and required output DC voltage, theoretically calculate the firing angle required and practically verify the same by implementing a single- phase half controlled converter fed R-L load.

2. Determine the typical performance factors of the given single phase half – controlled converter fed R-L or R load, by conducting a suitable experiment.

3. Given the AC input voltage and output DC voltage required (assumed positive output voltage), compare the performance factors of

   a. fully- controlled converter fed R-L load
   b. Half – controlled converter fed R-L load

   Show the differences practically by conducting a suitable experiment.

7. Step down and step up MOSFET based choppers

Objective

1. Studying the operation and gain characteristics of buck and boost type MOSFET based choppers.

Exercise

1. Obtain the gain characteristics (i.e output voltage Vs input voltage) of given buck or step down type, MOSFET based chopper.

2. Obtain the given characteristics (i.e output voltage Vs input voltage) of given boost or step-up type, MOSFET based chopper.

8. IGBT based single-phase PWM inverter

Objective

1. Studying of high frequency switched IGBT based single-phase PWM inverter.

2. Voltage magnitude control using modulation index.

3. Studying the effects of over modulation.

Exercise

1. Study the output voltage waveform obtained of the given IGBT based single phase PWM inverter and obtain its harmonic spectrum.

2. Demostrate how the rms fundamental output voltage of PWM inverter can be changed by changing the modulation index. For a given DC output voltage and required AC output voltage, theroritically calculate the modulation index and also practically verify the same.

3. Practically show that over modulation of sine – triangle PWM inverter leads to introduction of lower order harmonics into output voltage.

9. IGBT based three-phase PWM inverter

Objective

1. Studying various PWM techniques, like sinusoidal and multiple PWM methodologies , applicable to three-phase voltage source inverter for both UPS and AC drive applications.

Exercise

1. Compare the lower order harmonic contents of sinusoidal PWM and multiple / equal PWM based inverters, theoretically. Also practically demonstrate the same.

2. Show how the output frequency of three phase PWM inverter can be regulated of 50 Hz for UPS applications and how the frequency can be varied for getting variable frequency AC drives applications using the given three phase PWM module.

10. Resonant dc-to-dc converter

Objective

Studying the switching mode power supply (isolated) topologies employing resonant switching, zero current switching and/or zero voltage switching.

Exercise

1. Demonstrate how zero- current switching can be incorporated in a resonant converter, by considering a series loaded series resonant DC to DC converter on switching frequency below half of the resonating frequency.

2. Demonstrate how zero – voltage switching can be incorporated in a resonant converter, by considering a series loaded resonant DC to DC converter on switching frequency above half of the resonating frequency but below the resonant frequency.

EE 1304 ELECTRICAL MACHINES LABORATORY – II 0 0 3 100

AIM

To expose the students to the operation of synchronous machines and induction motors
and give them experimental skill.

1. Regulation of three phase alternator by emf and mmf methods
2. Regulation of three phase alternator by ZPF and ASA methods
3. Regulation of three phase salient pole alternator by slip test
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor test on three-phase induction motor.
8. Separation of No-load losses of three-phase induction motor.
9. Load test on single-phase induction motor
10. No load and blocked rotor test on single-phase induction motor.

P = 45 Total = 45

Detailed Syllabus

1. Regulation of three phase alternator by EMF and MMF methods

Aim

To predetermine the voltage regulation of given three phase alternator by emf and mmf methods.

Exercise

1. Obtain the open circuit and short circuit characteristics of a three phase alternator.

3. Calculate synchronous impedance from the open circuit characteristics and short circuit characteristics

4. Predetermine the full load regulation at different power factor by EMF and MMF methods and draw the graph between regulation Vs Power factor.

5. Draw the phasor diagram for EMF and MMF method.

2. Regulation of three-phase alternator by ZPF and ASA methods

Aim

To predetermine the voltage regulation of given three phase alternator by ZPF and ASA method.

Exercise

a. Obtain the open circuit, short circuit and zero power factor lagging load characteristics.

b. To construct the Potier triangle.

c. Draw the phasor diagram for ZPF and ASA method.

d. Predetermine the full load regulation at different power factor by ZPF and ASA methods.

3. Regulation of three-phase salient pole alternator by slip test

Aim

To predetermine the voltage regulation of a given three phase salient pole alternator.

Exercise

a. Determine the X_d and X_q of the salient pole alternator.

b. To draw the phasor diagram.

c. To predetermine full load regulation at different power factor.

4. Measurements of negative sequence and zero sequence impedances of alternators

Aim

To determine the positive, negative and zero sequence impedance of alternator.

Exercise

a. Determine the positive and negative sequence impedance by suitable test.

b. Determine the zero sequence impedance by suitable test.

5. V And Inverted V Curves Of Three Phase Synchronous Motor

Aim

To determine the V and inverted V curves of three phase synchronous motor.

Exercise

1. Synchronize the synchronous motor to the bus bar.
2. Obtain the V and inverted V curves of the synchronous motor at no load, constant input and constant output.

6. Load Test On Three Phase Induction Motor

Aim

To obtain the load characteristics of three phase induction motor.

Exercise

1. Conduct the load test on a given three-phase induction motor and draw the following curves.
    1. Output Vs % η
    2. Output Vs Speed
2. Output Vs Line current
3. Output Vs Slip
4. Output Vs Power factor
5. T Vs N (on separate graph sheet)

7. No Load And Blocked Rotor Test On Three-Phase Induction Motor

Aim

To conduct no load and blocked rotor test and to draw the equivalent circuit and predetermine the performance.

Exercise

1. Determine the equivalent circuit parameters.

2. Draw the circle diagram and predetermine the efficiency, torque, power factor, slip and line current for three load condition.

3. Predetermine the performance characteristics using the equivalent circuit for three load condition.

8. Separation Of No-Load Losses Of Three Phase Induction Motor

Aim

To separate the constant loss of a three phase induction motor and separate into iron loss and mechanical losses.

Exercise

1. Draw the curve voltage Vs Input and separate the constant losses into iron and mechanical loss.

2. Study the star / delta and autotransformer starters internal circuitry arrangements.

9. Load Test On Single Phase Induction Motor

Aim

To obtain the load characteristics of single phase motor by load test.

Exercise

1. Conduct the load test on given single-phase induction motor and draw the following curves.

1. Output Vs % η
2. Output Vs Speed
3. Output Vs Line current I_B
4. Output Vs Slip
5. Output Vs Power factor

10. No Load And Blocked Rotor Test On Single Phase Induction Motor

Aim

To conduct no load and blocked rotor test on single phase induction motor and predetermine the performance using equivalent circuit.

Exercise

1. Determine the equivalent circuit parameters from no load and blocked rotor test.
2. To predetermine the efficiency, torque, power factor and line current using the equivalent circuit parameters.

EC 1314 INTEGRATED CIRCUITS LABORATORY 0 0 3 100

AIM

To study various digital & linear integrated circuits used in simple system configuration.

1. Study of Basic Digital IC's.
(Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF,
D FF)

2. Implementation of Boolean Functions, Adder/ Subtractor circuits.

3a) Code converters, Parity generator and parity checking, Excess 3, 2s Complement, Binary
to grey code using suitable IC's .

3(b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO,SIPO,PISO,PIPO modes using suitable IC's.

4. Counters: Design and implementation of 4-bit modulo counters as synchronous and
asynchronous types using FF IC's and specific counter IC.

5 Shift Registers:
Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.

6 Multiplex/ De-multiplex
Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer

7 Timer IC application.
Study of NE/SE 555 timer in Astable, Monostable operation.

8. Application of Op-Amp-I
Slew rate verifications, inverting and non-inverting amplifier,
Adder, comparator, Integrater and Differentiator.

9 Study of Analog to Digital Converter and Digital to Analog Converter: Verification of
A/D conversion using dedicated IC's.

10 Study of VCO and PLL ICs
i. Voltage to frequency characteristics of NE/ SE 566 IC.
ii. Frequency multiplication using NE/SE 565 PLL IC.

P = 45 Total = 45

Detailed Syllabus

1. Study of Basic Digital IC's.
(Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS
FF, D FF)

Aim

To test of ICs by using verification of truth table of basic ICs.

Exercise

1. Breadboard connection of ICs with truth table verification using LED's.

2. Implementation of Boolean Functions, Adder/ Subtractor circuits. [Minimisation using K-map and implementing the same in POS, SOP from using basic gates]

Aim

Minimization of functions using K-map implementation and combination Circuit.

Exercise

1. Realization of functions using SOP, POS, form.

2. Addition, Subtraction of atleast 3 bit binary number using basic gate IC' s.

3a) Code converters, Parity genertor and parity checking, Excess 3, 2s Complement, Binary to grey code using suitable IC's .

Aim

Realizing code conversion of numbers of different bar.

Exercise

1 Conversion Binary to Grey, Grey to Binary;
1's. 2's complement of numbers addition, subtraction,

2. Parity checking of numbers using Gates and with dedicated IC's

3b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in

SISO, SIPO,PISO,PIPO modes using suitable IC's.

Exercise

1. Decimal to binary Conversion using dedicated IC's.

2. BCD – 7 Segment display decoder using dedicated decoder IC& display.

4. Counters: Design and implementation of 4-bit modulo counters as synchronous and asynchronous types using FF IC's and specific counter IC

Aim

Design and implementation of 4 bit modulo counters.

Exercise

1. Using flipflop for up-down count synchronous count.
2. Realization of counter function using dedicated ICs.

5. Shift Registers

Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.

Aim

Design and implementation of shift register.

Exercise

1. Shift Register function realization of the above using dedicated IC's For SISO, SIPO, PISO, PIPO, modes of atleast 3 bit binary word.

2. Realization of the above using dedicated IC's.

6. Multiplex/ De-multiplex

Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer

Aim

To demonstrate the addressing way of data channel selection for multiplex De-multiplex operation.

Exercise

1. Realization of mux-demux functions using direct IC's.

2. Realization of mux-demux using dedicated IC's for 4:1, 8:1, and vice versa.

7. Timer IC application. Study of NE/SE 555 timer in Astable, Monostable operation.

Aim

To design a multi vibrater circuit for square wave and pulse generation.

Exercise

1. Realization of Astable multivibrater & monostable multivibrater circuit using Timer IC.
2. Variation of R, C, to vary the frequency, duty cycle for signal generator.

8. Application of Op-Amp-I

Slew rate verifications, inverting and non-inverting amplifier,
Adder, comparator, Integrater and Differentiator.

Aim

Design and Realization of Op-Amp application.

Exercise

1. Verification of Op-Amp IC characteristics.
2. Op-Amp IC application for simple arithmetic circuit.
3. Op-Amp IC application for voltage comparator wave generator and wave shifting circuits.

9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.

Aim

Realization of circuit for digital conversions.

Exercise

1. Design of circuit for analog to digital signal conversion using dedicated IC's.
2. Realization of circuit using dedicated IC for digital analog conversion.

10. Study of VCO and PLL Ics

i). Voltage to frequency characteristics of NE/ SE 566 IC.
ii). Frequency multiplication using NE/SE 565 PLL IC.

Aim

Demonstration of circuit for communication application

Exercise

1. To realize V/F conversion using dedicated IC's vary the frequency of the generated signal.
2. To realize PLL IC based circuit for frequency multiplier, divider.

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GE 1303 COMMUNICATION SKILLS AND TECHNICAL SEMINAR

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

EE 1351 SOLID STATE DRIVES 3
0 0 100

AIM

To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.

OBJECTIVES

i. To understand the stable steady-state operation and transient dynamics of a motor-load system.

ii. To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.

iii. To study and understand the operation of both classical and modern induction motor drives.

iv. To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.

v. To analyze and design the current and speed controllers for a closed loop solid-state d.c motor drive.

1. DRIVE CHARACTERISTICS

9

Equations governing motor load dynamics - Equilibrium operating point and its steady state stability - Mathematical condition for steady state stability and

problems - Multi quadrant dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque characteristics - Acceleration, deceleration, starting and stopping.

2. CONVERTER / CHOPPER FED DC MOTOR DRIVE

9

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive: Continuous and discontinuous conduction mode - Chopper fed D.C drive: Time ratio control and current limit control - Operation of four quadrant chopper.

3. INDUCTION MOTOR DRIVES

9

Stator voltage control - Slip-power recovery drives - Adjustable frequency drives: v/f control, constant slip-speed control and constant air-gap flux control – Basics of voltage/current fed inverters - Block diagram of closed loop drive.

4. SYNCHRONOUS MOTOR DRIVES

9

Open loop volts/hertz control and self-control of synchronous motor: Marginal angle control and power factor control - Permanent magnet synchronous motor.

5. DESIGN OF CONTROLLERS FOR DRIVES

9

Transfer function for dc motor, load and converter – Closed loop control with current and speed feedback - Armature voltage control and field weakening mode control - Design of controllers: Current controller and speed controller - Converter selection and characteristics.

L = 45 Total = 45

TEXT BOOKS

1. R. Krishnan, ‘Electric Motor & Drives: Modelling, Analysis and Control’, Prentice Hall of India, 2001.

2. Bimal K. Bose. ‘Modern Power Electronics and AC Drives’, Pearson Education, 2002.

REFERENCE BOOKS

1. G.K. Dubey, ‘Power Semi-conductor Controlled Drives’, Prentice Hall of India, 1989.

2. S.K. Pillai, ‘A First Course on Electrical Drives’, Wiley Eastern Limited, 1993.

EE 1352 POWER SYSTEM ANALYSIS 3
1 0 100

AIM

To become familiar with different aspects of modeling of components and system and different methods of analysis of power system planning and operation.

OBJECTIVES

i. To model steady-state operation of large-scale power systems and o solve the power flow problems using efficient numerical methods suitable for computer simulation.

ii. To model and analyse power systems under abnormal (fault) conditions.

iii. To model and analyse the dynamics of power system for small-signal and large signal disturbances and o design the systems for enhancing stability.

1. THE POWER SYSTEM – AN OVERVIEW AND MODELLING: (9)

Modern Power System - Basic Components of a power system - Per Phase Analysis Generator model - Transformer model - line model. The per unit system - Change of base.

2. POWER FLOW ANALYSIS: (9)

Introduction - Bus Classification - Bus admittance matrix - Solution of non-linear Algebraic equations - Gauss seidal method - Newon raphson method - Fast decoupled method - Flow charts and comparison of the three methods.

3. FAULT ANALYSIS-BALANCED FAULT (9)

Introduction – Balanced three phase fault – short circuit capacity – systematic fault analysis using bus impedance matrix – algorithm for formation of he bus impedance matrix.

4. FAULT ANALYSIS – SYMMETRICAL COMPONENTS AND UNBALANCED FAULT: (9)

Introduction – Fundamentals of symmetrical components – sequence impedances – sequence networks – single line to ground fault – line fault - Double line to ground fault – Unbalanced fault analysis using bus impedance matrix.

5. POWER SYSTEM STABILITY (9)

Basic concepts and definitions – Rotor angle stability – Voltage stability – Mid Term and Long Term stability – Classification of stability – An elementary view of transient stability – Equal area criterion – Reponses to a short circuit fault- factors influencing transient stability – Numerical integration methods – Euler method – modified Euler method – Runge – Kutta methods.

L = 45, T= 15
Total = 60

TEXT BOOKS:

1. Hadi Saadat " Power system analysis", Tata McGraw Hill Publishing Company, New Delhi, 2002 (Unit I, II, III, IV)
2. P.Kundur, "Power System Stability and Control", Tata McGraw Hill Publishing Company, New Delhi, 1994 (Unit V)

REFERENCE BOOKS:

1. I.J.Nagrath and D.P.Kothari, 'Modern Power System Analysis', Tata McGraw-Hill publishing company, New Delhi, 1990.
2. M.A. Pai, 'Computer Techniques in power system Analysis', Tata McGraw – Hill publishing company, New Delhi, 2003.

EI 1361 MEASUREMENTS AND INSTRUMENTATION 3 0 0 100

AIM

To provide adequate knowledge in electrical instruments and measurements techniques.

OBJECTIVES

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.

i. Introduction to general instrument system, error, calibration etc.

ii. Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.

iii. To have an adequate knowledge of comparison methods of measurement.

iv. Elaborate discussion about storage & display devices.

v. Exposure to various transducers and data acquisition system.

1. INTRODUCTION

9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

2. ELECTRICAL AND ELECTRONICS INSTRUMENTS

9

Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

3. COMPARISON METHODS OF MEASUREMENTS

9

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques.

4. STORAGE AND DISPLAY DEVICES

9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display.

5. TRANSDUCERS AND DATA ACQUISITION SYSTEMS

9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, optical and digital transducers – Elements of data acquisition system – A/D, D/A converters.

L = 45 Total = 45

TEXT BOOKS

1. E.O. Doebelin, 'Measurement Systems – Application and Design', Tata McGraw Hill publishing company, 2003.

2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.

2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2003.

3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 1995.

4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.

5. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2003.

EC 1361 DIGITAL SIGNAL PROCESSING **3**
1 0 100

AIM

To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

OBJECTIVES

i. To classify signals and systems & their mathematical representation.

ii. To analyse the discrete time systems.

iii. To study various transformation techniques & their computation.

iv. To study about filters and their design for digital implementation.

v. To study about a programmable digital signal processor & quantization effects.

1. INTRODUCTION

9

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation, analog to digital conversion.

2. DISCRETE TIME SYSTEM ANALYSIS

9

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

3. DISCRETE FOURIER TRANSFORM & COMPUTATION

9

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

4. DESIGN OF DIGITAL FILTERS

9

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics.

IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

5. PROGRAMMABLE DSP CHIPS

9

Architecture and features of TMS 320C54 signal processing chip – Quantisation effects in designing digital filters.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.

2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.

REFERENCE BOOKS

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete – Time Signal Processing', Pearson Education, New Delhi, 2003.

2. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003.
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing', Tata McGraw Hill, New Delhi, 2003.

4. Texas TMS 320C54X user manual (website).

EC 1362 MICROPROCESSOR AND MICRO CONTROLLER 3 1 0 100

AIM

To introduce Microprocessor Intel 8085 and the Micro Controller 8051

OBJECTIVES

i. To study the Architecture of 8085 & 8051.

ii. To study the addressing modes & instruction set of 8085 & 8051.

iii. To introduce the need & use of Interrupt structure.

iv. To develop skill in simple program writing.

v. To introduce commonly used peripheral / interfacing ICs – To study simple applications.

1. 8085 PROCESSOR 9

Functional block diagram - Signals – Memory interfacing – I/O ports and data transfer concepts – Timing Diagram – Interrupt structure.

2. PROGRAMMING OF 8085 PROCESSOR 9

Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions stack.

3. PERIPHERAL INTERFACING 9

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

4. MICRO CONTROLLER 8051 9

Functional block diagram - Instruction format and addressing modes – Interrupt structure – Timer –I/O ports – Serial communication.

5. MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises key board and display interface – Closed loop control of servo motor-stepper motor control.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Wiley Eastern Ltd., New Delhi, 1995.

2. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The 8051 Micro Controller and Embedded Systems', Pearson Education, 5th Indian reprint, 2003.

REFERENCE BOOKS

1. William Kleitz, 'Microprocessor and Micro Controller Fundamental of 8085 and 8051 Hardware and Software', Pearson Education, 1998.

MG 1351 PRINCIPLES OF MANAGEMENT 3 0 0 100

OBJECTIVE

Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

1 HISTORICAL DEVELOPMENT

9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

2 PLANNING

9

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

3 ORGANISING

9

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

4 DIRECTING

9

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

5 CONTROLLING

9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and

Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

L = 45

Total = 45

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich “Essentials of Management”, Tata Mcgraw Hill,1998.

2. Joseph L Massie “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCE BOOKS

1 Tripathy PC And Reddy PN, “ Principles of Management”, Tata Mcgraw Hill,1999.

2. Decenzo David, Robbin Stephen A, ”Personnel and Human Reasons Management”,
Prentice Hall of India, 1996.

3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education,
Sixth Edition, 2004.

4. Fraidoon Mazda, “ Engineering Management”,Addison Wesley,-2000.

EI 1362 MEASUREMENTS AND INSTRUMENTATION LABORATORY 0

0 3 100

AIM

The aim of this lab is to fortify the students with an adequate work experience in the measurement of different quantities and also the expertise in handling the instruments involved.

OBJECTIVE

To train the students in the measurement of displacement, resistance, inductance, torque and angle etc., and to give exposure to AC, DC bridges and transient measurement.

1. Study of displacement and pressure transducers
2. AC bridges.
3. DC bridges.
4. Instrumentation amplifiers.
5. A/D and D/A converters.
6. Study of transients.
7. Calibration of single-phase energy meter.
8. Calibration of current transformer.
9. Measurement of three phase power and power factor.
10. Measurement of iron loss.

P = 45 Total = 45

Detailed Syllabus

1(a) Study of Displacement Transducer - LVDT

Aim

To study the operation of LVDT

Objectives

1. To study the basic principle of LVDT.
2. Study of signal conditioning circuit.

3. Study of LVDT as transducer.

Exercise

1. Draw the characteristic curve for a given LVDT.
2. Find the residual voltage.
3. Fluid the non-electrical quantity displacement interms of voltage.

Equipment

1. LVDT kit – 1 No
2. Multimeter – 1 No

1(b) Study of Pressure Transducer

Aim

To study the operation of bourdon tube

Objectives

1. To study the basic principle of Bourdon tube.
2. Study of Bourdon tube as transducer.

Exercise

1. Draw the characteristic curve for a given Bourdon tube i.e. pressure vs. o/p (V or I).
2. Measure the non-electrical quantity pressure interms of voltage or current.

Equipment

1. Bourdon pressure transducer kit – 1 No
2. Foot pump – 1 No
3. Voltmeter – 1 No
4. Multimeter – 1 No

2. AC BRIDGES

a) Maxwell's Inductance – Capacitance Bridge

Aim

To find the unknown inductance and Q factor of a given coil.

Objective

1. To find the unknown inductance of the given coil using bridge circuit.
2. To study that Maxwell inductance, capacitance bridge is suitable for the measurement of law Q coils.

Exercise

1. Design a bridge circuit for the given parameters.
2. Fluid Q factor of the coil.
3. Fluid unknown Inductance.

Equipment

1. Maxwell's inductance Capacitance Bridge kit – 1 No
2. Multimeter – 1 No
3. Unknown Inductance – 1 No

b) Schering Bridge

Aim

To measure the unknown capacitance using Schering bridge.

Objective

1. To measure the unknown capacitance.
2. To study about dissipation factor.

Exercise

1. Design a bridge circuit for the given parameters.
2. Find the dissipation factor.
3. Fluid the unknown capacitance.

Equipment

1. Schering Bridge kit – 1 No
2. Multimeter – 1 No

3. Unknown capacitance – 1 No

3. DC Bridges

a) Wheat Stone Bridge

Aim

To measure the given medium resistance using Wheatstone Bridge.

Objective

1. To study the working of bridge under balanced and unbalanced condition.
2. To study the sensitivity of bridge.

Exercise

1. Design a bridge for the given parameters.
2. Find the unknown resistance.
3. Find the sensitivity of Bridge.

Equipment

1. Wheat stone Bridge kit – 1 No
2. Unknown resistance – 1 No
3. Multimeter – 1 No

b) Kelvin's Double bridge

Aim

To measure the given low resistance using Kelvin's double bridge method.

Objective

1. To study the working of bridge under balanced and unbalance condition.
2. To study the sensitivity of bridge.

Exercise

1. Design a bridge for the given parameters.
2. Find the unknown low resistance.
3. Find the sensitivity of bridge.

Equipment

1. Kelvin Double bridge kit – 1 No

2. Unknown resistance – 1 No
3. Multimeter – 1 No

4. Instrumentation Amplifier

Aim

To study the working of instrumentation amplifier.

Objective

1. To study the characteristic of operational amplifier.
2. To study the use of operational amplifier as instrumentation amplifier.

Exercise

1. Measure the output voltage for varying input voltage.
2. Calculate the output voltage theoretically.
3. Calculate the error.

Equipment

1. Operational Amplifier – 1 No
2. Resistors – 1 No
3. RPS – 1 No
4. Voltmeter – 1 No
5. Multimeter – 1 No

5(a) A/D Converter

Aim

To design and test a 4 bit A/D converter

1. Successive approximation type
2. Ramp type

Objective

1. To study the converstion of analog I/P voltage to digital o/p volage.
2. To study the operation and characteristic of operational amplifier

Exercise

1. Given 4 bit analog input is converterd to digital output
2. Verify the practical output with theoretical output

Equipment

1. IC 741 – 1 No
2. DC trainer kit – 1 No
3. RPS – 1 No
4. Resistor – 1 No
5. CRO – 1 No

(b) D/A Converter

Aim

To design and test a 4 bit D/A converter

1. Weighted resistor technique
2. R-2R ladder network

Objective

1. To study the conversion of binary voltage to analog o/p voltage
2. To study the operation and characteristic of operational amplifier

Exercise

1. Given 4 bit binary input is converted to analog output
2. Verify the practical o/p with theoretical o/p

Experiment

1. IC 741 – 1 No
2. DC Trainer kit – 1 No
3. RPS – 1 No
4. Resistor – 1 No
5. CRO – 1 No

6. Study of Transients

Aim

To study the transient response of the given system

Objective

1. To study the transient behaviour of the given system
2. To study the effects of transients

Exercise

1. Draw the response curve for the given system
2. Find the time when the error is minimum

Equipment

1. Resistance – 1 No
2. Capacitance – 1 No
3. RPS – 1 No
4. Voltmeter – 1 No
5. Multimeter – 1 No

7. Calibration of Single-Phase Energy Meter

Aim

To calibrate the given single phase energy meter at unity and other power factors

Objectives

1. To study the working of energy meter
2. Too accurately calibrate the meter at unity and other power factor
3. To study the % of errors for the given energy meters

Exercise

1. Measure the experimental energy consumed
2. Calculate the theoretical energy
3. Calculate the percentage of error
4. Draw the calibration curve

Equipment

1. Energy meter – 1 No
2. Wattmeter – 1 No
3. Stop watch – 1 No
4. M.I Ammeter – 1 No
5. M.I Voltmeter – 1 No

8. Calibration of Current Transformer

Aim

To study the working of current transformer

Objective

1. To study the current transformation concept
2. To study the efficiency of a given current transformer
3. To study the loss components in the circuit

Exercise

1. Draw the curve primary current Vs secondary current
2. Observe the o/p for lamp load
3. Calculate the efficiency

Equipment

1. Current Transformer – 1 No
2. Lamp Load – 1 No
3. Voltmeter – 1 No
4. Ammeter – 1 No

9. Measurement of 3 Phase Power And Power Factor

Aim

To conduct a suitable experiment on a 3-phase load connected in star or delta to measure the three phase power and power factor using 2 wattmeter method.

Objectives

1. To study the working of wattmeter
2. To accurately measure the 3 phase power

3. To accurately measure the powerfactor
4. To study the concept of star connected load and delta connected load

Exercise

1. Measure the real power, reactive power and power factor of 3 phase resistive inductive load.
2. Measure the real power, reactive power and power factor of 3 phase resistive capacitive load.

Equipment

1.	3 phase Auto transformer	– 1 No
2.	M.I Ammeter	– 1 No
3.	M.I Voltmeter	– 1 No
4.	Wattmeter	– 1 No

10. Measurement of Iron Loss (Maxwell Bridge)

Aim

To determine the iron losses in magnetic material using bridge method

Objective

1. To study about hysterisis loss
2. To study about eddy current loss

Exercise

1. Measure the current
2. Calculate iron loss
3. Calculate AC permeability
4. Draw phasor diagram

Equipment

1.	Maxwell bridge set up	– 1 No
2.	Ring specimen	– 1 No
3.	Ammeter	– 1 No
4.	Galvanometer	– 1 No

EC 1363 MICROPROCESSOR AND MICRO CONTROLLER LABORATORY 0 0 3 100

AIM

To understand programming using instruction sets of processors.

8-bit Microprocessor

1. Simple arithmetic operations:
   - Multi precision addition / subtraction / multiplication / division.

2. Programming with control instructions:
   - Increment / Decrement.
   - Ascending / Descending order.
   - Maximum / Minimum of numbers.
   - Rotate instructions.
   - Hex / ASCII / BCD code conversions.

3. Interface Experiments:
   - A/D Interfacing.
   - D/A Interfacing.
   - Traffic light controller.

4. Interface Experiments:
   - Simple experiments using 8251, 8279, 8254.

5. Programming practice on assembler and simulator tools.

8-bit Micro controller

6. Demonstration of basic instructions with 8051 Micro controller execution, including:
   - Conditional jumps, looping
   - Calling subroutines.
   - Stack parameter testing

7. Parallel port programming with 8051 using port 1 facility:
   - Stepper motor and D / A converter.

8. Programming Exercise on
   - RAM direct addressing
   - Bit addressing

9. Programming practice using simulation tools and C - compiler

- Initialize timer
- Enable interrupts.

10. Study of micro controllers with flash memory.

P = 45 Total = 45

REFERENCE BOOKS

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Applications', Wiley Eastern Ltd., New Delhi, 1995.

2. Myke Predko, 'Programming and Customizing the 8051 Microcontroller', Tata McGraw Hill, 1999.

Detailed Syllabus

8-bit Microprocessor

1. Simple arithmetic operations

a. Multi precision addition / subtraction / multiplication / division.

Aim

To perform simple arithmetic operations using assembly language program.

Exercise

1. Write an assembly language program using 8085 instructions set to perform the following arithmetic operations

    1. Addition of two 8 bit numbers
    2. Subtraction of two 8 bit numbers
    3. Multiplication of two 8 bit numbers
    4. Division of two 8 bit numbers

2. Programming with control instructions

a. Increment / Decrement.
b. Ascending / Descending order.
c. Maximum / Minimum of numbers.
d. Rotate instructions.
e. Hex / ASCII / BCD code conversions.

Aim

To write an assembly language program using the control instructions

Exercise

1. Using the control instructions of 8085 microprocessor write assembly language programs to perform the following

    1. Arrange the given array of data in ascending and descending order

    2. Find the maximum and minimum number in a group of data given.

    3. Conversion of the following

        1. ASCII to HEX code
        2. Conversion of HEX to ASCII code
        3. Conversion of BCD to HEX
        4. Conversion of HEX to BCD

3. Interface Experiments

a. A/D Interfacing.
b. D/A Interfacing.
c. Traffic light controller.

Aim

To write an assembly language program to convert Analog input to Digital output and Digital input to Analog output.

Exercise

1. Write an assembly language program (using 8085) to convert Analog input to Digital output
2. Write an assembly language programs to convert digital input into analog signal of following type.

    1. Square wave
    2. Triangular wave
    3. Sawtooth wave

4. Interface Experiments:

    a. Simple experiments using 8251, 8279, 8254.

5. Programming practice on assembler and simulator tools.

8-bit Micro controller

6. Demonstration of basic instructions with 8051 Micro controller execution, including:
   a. Conditional jumps, looping
   b. Calling subroutines.
   c. Stack parameter testing

Aim

To demonstrate use of control logic instructors.

Exercise

1. To write programs which can include instruction sets for jump, loop, cell, return, stack.

2. To observe the change in status registers and various relevant registers.

7. Parallel port programming with 8051 using port 1 facility:

a. Stepper motor and D / A converter.

Aim

To demonstrate the access of parallel port.

Exercise

1. To develop command words on choice of port, addressing of port pins.

2. To vary timing cycle of speed of motor, direction of motor.

3. To demonstrate generation of sine wave saw tooth, triangular wave of various frequency, amplitude.

8. Programming Exercise on

- RAM direct addressing
- Bit addressing

Aim

To write the program to check the content of memory locations using READ / WRITE instructions using different addressing modes.

Exercise

To READ / WRITE the content of RAM registers, bits and the RAM from location 1 to N and check the display with say LEDs.

9. Programming practice using simulation tools and C – compiler

a. Initialize timer
b. Enable interrupts.

Aim

To use the facility of popular Micro controller programming tools like KEIL or RIDE software.

Exercise

1. To study the initializing of timer interrupt with context saving like increasing or decreasing the counter count.

2. To demonstrate use of instruction like cjne, djnz, jb etc.

10. Study of micro controllers with flash memory

Aim

To familiarize of loading and executing on flash memory.

Exercise

1. To write the program to generate sine wave, square wave etc.
2. To vary the frequency, amplitude of the signal.

GE 1351 PRESENTATION SKILLS AND TECHNICAL SEMINAR

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

EE 1401 POWER SYSTEM OPERATION AND CONTROL 3
1 0 100

AIM

To become familiar with the preparatory work necessary for meeting the next day's operation and the various control actions to be implemented on the system to meet the minute-to-minute variation of system load.

OBJECTIVES

i. To get an overview of system operation and control.

ii. To understand & model power-frequency dynamics and to design power-frequency controller.

iii. To understand & model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.

1. INTRODUCTION

9

System load variation: System load characteristics, load curves - daily, weekly and

annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor control, LFC, EDC, AVR, system voltage control, security control.

2. REAL POWER - FREQUENCY CONTROL

8

Fundamentals of speed governing mechanism and modeling: Speed-load characteristics – Load sharing between two synchronous machines in parallel; concept of control area, LFC control of a single-area system: Static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems: Two-area system modeling; static analysis, uncontrolled case; tie line with frequency bias control of two-area system derivation, state variable model.

3. REACTIVE POWER–VOLTAGE CONTROL

9

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between

voltage, power and reactive power at a node; method of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

4. UNIT COMMITMENT AND ECONOMIC DISPATCH

9

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost.

Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. (No derivation of loss coefficients.) Base point and participation factors. Economic dispatch controller added to LFC control.

5. COMPUTER CONTROL OF POWER SYSTEMS

10

Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, inextremis and restorative. State transition diagram showing various state transitions and control strategies.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003.

2. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.

3. P. Kundur, 'Power System Stability & Control', McGraw Hill Publications, USA, 1994.

REFERENCE BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.

2. L.L. Grigsby, ‘The Electric Power Engineering, Hand Book’, CRC Press & IEEE Press, 2001.

EE 1402 HIGH VOLTAGE ENGINEERING 3
0 0 100

AIM

To expose the students to various types of over voltage transients in power system and its effect on power system.

- Generation of over voltages in laboratory
- Testing of power apparatus and system.

OBJECTIVES

i. To understand the various types of over voltages in power system and protection
methods.

i. Generation of over voltages in laboratories.

ii. Measurement of over voltages.

iii. Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics – discussion on commercial insulants.

iv. Testing of power apparatus and insulation coordination

1. OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS

6

Causes of over voltages and its effect on power system – Lightning, switching surges and
temporary over voltages - protection against over voltages.

2. ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS

10

Gaseous breakdown in uniform and non-uniform fields – corona discharges – Vacuum
breakdown - conduction and breakdown in pure and commercial liquids – breakdown
mechanisms in solid and composite dielectrics.

3. GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

10

Generation of High DC, AC, impulse voltages and currents. Tripping and control of

impulse generators.

4. MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

10

Measurement of High voltages and High currents – digital techniques in high voltage measurement.

5. HIGH VOLTAGE TESTING & INSULATION COORDINATION

9

High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – International and Indian standards – Insulation Coordination.

L = 45 Total = 45

TEXT BOOK

1. M.S. Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 3rd Edition, 2004.

REFERENCE BOOKS

1. E. Kuffel and W.S. Zaengl, 'High Voltage Engineering Fundamentals', Pergamon press, Oxford, London, 1986.

2. E. Kuffel and M. Abdullah, 'High Voltage Engineering', Pergamon press, Oxford, 1970.

EE 1403 DESIGN OF ELECTRICAL APPARATUS 3
1 0 100

AIM

To expose the students to the concept of design of various types of electrical machines.

OBJECTIVES

To provide sound knowledge about constructional details and design of various electrical machines.

i. To study mmf calculation and thermal rating of various types of electrical machines.

ii. To design armature and field systems for D.C. machines.

iii. To design core, yoke, windings and cooling systems of transformers.

iv. To design stator and rotor of induction machines.

v. To design stator and rotor of synchronous machines and study their thermal behaviour.

1. MAGNETIC CIRCUITS AND COOLING OF ELECTICAL MACHINES

9

Concept of magnetic circuit – MMF calculation for various types of electrical machines – real and apparent flux density of rotating machines – leakage reactance calculation for transformers, induction and synchronous machine - thermal rating: continuous, short time and intermittent short time rating of electrical machines-direct and indirect cooling methods – cooling of turbo alternators.

2. D.C. MACHINES

9

Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – design of field poles and field coil – design of commutator and brushes – losses and efficiency calculations.

3. TRANSFORMERS

9

Constructional details of core and shell type transformers – output rating of single phase and three phase transformers – optimum design of transformers – design of

core, yoke zand windings for core and shell type transformers – equivalent circuit parameter from designed data – losses and efficiency calculations – design of tank and cooling tubes of transformers.

4. THREE PHASE INDUCTION MOTORS

9

Constructional details of squirrel cage and slip ring motors – output equation – main dimensions – choice of specific loadings – design of stator – design of squirrel cage and slip ring rotor – equivalent circuit parameters from designed data – losses and efficiency calculations.

5. SYNCHRONOUS MACHINES

9

Constructional details of cylindrical pole and salient pole alternators – output equation – choice of specific loadings – main dimensions – short circuit ratio – design of stator and rotor of cylindrical pole and salient pole machines - design of field coil - performance calculation from designed data - introduction to computer aided design.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. A.K. Sawhney, 'A Course in Electrical Machine Design', Dhanpat Rai and Sons, New Delhi, 1984.

2. S.K. Sen, 'Principles of Electrical Machine Design with Computer Programmes', Oxford and IBH Publishing Co.Pvt Ltd., New Delhi, 1987.

REFERENCE BOOKS

1. R.K. Agarwal, 'Principles of Electrical Machine Design', S.K.Kataria and Sons, Delhi, 2002.

2. V.N. Mittle and A. Mittle, 'Design of Electrical Machines', Standard Publications and Distributors, Delhi, 2002.

MG 1401 TOTAL QUALITY MANAGEMENT 3 0 0 100

OBJECTIVE

i. To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.

ii. To understand the statistical approach for quality control.

iii. To create an awareness about the ISO and QS certification process and its need for the industries.

1. INTRODUCTION

9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

2. TQM PRINCIPLES

9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

3. STATISTICAL PROCESS CONTROL (SPC)

9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

4. TQM TOOLS

9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

5. QUALITY SYSTEMS

9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits.

L = 45 Total = 45

TEXT BOOK

1. Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCE BOOKS

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5^{th} Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).

2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.

3. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.

4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.

5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.

EI 1001 FIBRE OPTICS AND LASER INSTRUMENTS 3
0 0 100

AIM

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial & Medical Application.

OBJECTIVES

i. To expose the students to the basic concepts of optical fibres and their properties.

ii. To provide adequate knowledge about the Industrial applications of optical fibres.

iii. To expose the students to the Laser fundamentals.

iv. To provide adequate knowledge about Industrial application of lasers.

v. To provide adequate knowledge about holography & Medical applications of Lasers.

1. OPTICAL FIBRES AND THEIR PROPERTIES

12

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors & splicers – Fibre termination – Optical sources – Optical detectors.

2. INDUSTRIAL APPLICATION OF OPTICAL FIBRES

9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

3. LASER FUNDAMENTALS

9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

4. INDUSTRIAL APPLICATION OF LASERS

6

Laser for measurement of distance, length, velocity, acceleration, current, voltage and

Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

5. HOLOGRAM AND MEDICAL APPLICATIONS

9

Holography – Basic principle - Methods – Helographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumours of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

L= 45 Total = 45

TEXT BOOKS

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.

2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCE BOOKS

1. Donald J.Sterling Jr, 'Technicians Guide to Fibre Optics', 3rd Edition, Vikas Publishing House, 2000.

2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.

3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.

4. Monte Ross, 'Laser Applications', McGraw Hill, 1968

5. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.

6. Mr. Gupta, 'Fiber Optics Communication', Prentice Hall of India, 2004.

CS 1031 VISUAL LANGUAGES AND APPLICATIONS 3 1 0 100

AIM

To study the principles and techniques of windows programming using MFC, procedures, resources, controls and database programming through the visual languages, Visual C++ and Visual Basic.

OBJECTIVES

i. To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.

ii. To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.

iii. To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.

iv. To study about the integrated development programming event driven programming, variables, constants, procedures and basic ActiveX controls in visual basic.

v. To understand the database and the database management system, visual data manager, data bound controls and ADO controls in VB.

1. **FUNDAMENTALS OF WINDOWS AND MFC** **9**

Messages - Windows programming - SDK style - Hungarian notation and windows data types - SDK programming in perspective. The benefits of C++ and MFC - MFC design philosophy - Document/View architecture - MFC class hierarchy - AFX functions. Application object - Frame window object - Message map.

Drawing the lines – Curves – Ellipse – Polygons and other shapes. GDI pens – Brushes - GDI fonts - Deleting GDI objects and deselecting GDI objects. Getting input from the mouse: Client & Non-client - Area mouse messages - Mouse wheel - Cursor. Getting input from the keyboard: Input focus - Keystroke messages - Virtual key codes - Character & dead key messages.

2. RESOURCES AND CONTROLS

9

Creating a menu – Loading and displaying a menu – Responding to menu commands – Command ranges - Updating the items in menu, update ranges – Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus – Cascading menus - Context menus.

The C button class – C list box class – C static class - The font view application – C edit class – C combo box class – C scrollbar class. Model dialog boxes – Modeless dialog boxes.

3. DOCUMENT / VIEW ARCHITECTURE

9

The inexistence function revisited – Document object – View object – Frame window object – Dynamic object creation. SDI document template - Command routing. Synchronizing multiple views of a document – Mid squares application – Supporting multiple document types – Alternatives to MDI. Splitter Windows: Dynamic splitter window – Static splitter windows.

Creating & initializing a toolbar - Controlling the toolbar's visibility – Creating & initializing a status bar - Creating custom status bar panes – Status bar support in appwizard. Opening, closing and creating the files - Reading & Writing – C file derivatives – Serialization basics - Writing serializable classes.

4. FUNDAMENTALS OF VISUAL BASIC

10

Menu bar – Tool bar – Project explorer – Toolbox – Properties window – Form designer – Form layout – Intermediate window. Designing the user interface: Aligning the controls – Running the application – Visual development and event driven programming.

Variables: Declaration – Types – Converting variable types – User defined data types - Lifetime of a variable. Constants - Arrays – Types of arrays. Procedures: Subroutines – Functions – Calling procedures. Text box controls – List box & Combo box controls – Scroll bar and slider controls – File controls.

5. DATABASE PROGRAMMING WITH VB

8

Record sets – Data control – Data control properties, methods. Visual data manager: Specifying indices with the visual data manager – Entering data with the visual data manager. Data bound list control – Data bound combo box – Data bound grid control. Mapping databases: Database object – Table def object, Query def object.

Programming the active database objects – ADO object model – Establishing a connection - Executing SQL statements – Cursor types and locking mechanism – Manipulating the record set object – Simple record editing and updating.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. Jeff Prosise, 'Programming Windows With MFC', Second Edition, WP Publishers & Distributors [P] Ltd, Reprinted 2002.

2. Evangelos Petroutsos, 'Mastering Visual Basic 6.0', BPB Publications, 2002.

REFENENCE BOOKS

1. Herbert Schildt, 'MFC Programming From the Ground Up', Second Edition, Tata McGraw Hill, reprinted 2002.

2. John Paul Muller, 'Visual C++ 6 From the Ground Up Second Edition', Tata McGraw Hill, Reprinted 2002.

3. Curtis Smith & Micheal Amundsen, 'Teach Yourself Database Programming with Visual Basic 6 in 21 days', Techmedia Pub, 1999.

IC 1031 ADVANCED CONTROL SYSTEM 3
0 0 100

AIM

To gain knowledge in analysis of non-linear system and digital control of linear system.

OBJECTIVES

i. To study the description and stability of non-linear system.

ii. To study the conventional technique of non-linear system analysis.

iii. To study the analysis discrete time systems using conventional techniques.

iv. To study the analysis of digital control system using state-space formulation.

v. To study the formulation and analysis of multi input multi output (MIMO) system.

1. NON-LINEAR SYSTEM – DESCRIPTION & STABILITY

9

Linear vs non-linear – Examples – Incidental and Intentional – Mathematical description - Equilibria and linearisation - Stability – Lyapunov function – Construction of Lyapunov function.

2. PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS

9

Construction of phase trajectory – Isocline method – Direct or numerical integration – Describing function definition – Computation of amplitude and frequency of oscillation.

3. Z-TRANSFORM AND DIGITAL CONTROL SYSTEM

9

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot.

4. STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM

9

State equation – Solutions – Realization – Controllability – Observability – Stability –

Jury's test.

5. MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM:

9

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control.

L = 45 Total = 45

TEXT BOOKS

1. Benjamin C. Kuo, 'Digital Control Systems', Oxford University Press, 1992.

2. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

REFERENCE BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

2. Raymond T. Stefani & Co., 'Design of feed back Control systems', Oxford University, 2002.

3. William L. Luyben and Michael L. Luyben, 'Essentials of Process Control', McGraw Hill International Editions, Chemical Engineering Series, 1997.

EC 1031 TELECOMMUNICATION SWITCHING AND NETWORKS 3 0 0 100

AIMS

1. To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access.

2. To introduce a mathematical model for the analysis of telecommunication traffic.

OBJECTIVES

1. To introduce the concepts of Frequency and Time division multiplexing.

2. To introduce digital multiplexing and digital hierarchy namely SONET / SDH

3. To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
3. To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
4. To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
5. To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
6. To characterize blocking probability holding service time distributions for in speech and data networks.

1. MULTIPLEXING
9

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing : Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings.
SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

2. DIGITAL SWITCHING
9

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SSN07 signaling.

3. NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT
9

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

4. DIGITAL SUBSCRIBER ACCESS
9

ISDN: ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

5. TRAFFIC ANALYSIS 9

Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

Total = 45

TEXT BOOK

1. Bellamy John, “Digital Telephony”, John Wily & Sons, Inc. 3rd edn. 2000.

REFERENCES BOOKS

1. Viswanathan. T., “Telecommunication Switching System and Networks”, Prentice Hall of India Ltd., 1994.

EE 1001 SPECIAL ELECTRICAL MACHINES 3
0 0 100

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

i. Construction, principle of operation and performance of synchronous reluctance motors.

ii. Construction, principle of operation and performance of stepping motors.

iii. Construction, principle of operation and performance of switched reluctance motors.

iv. Construction, principle of operation and performance of permanent magnet brushless D.C. motors.

v. Construction, principle of operation and performance of permanent magnet synchronous motors.

1. SYNCHRONOUS RELUCTANCE MOTORS

9

Constructional features – Types – Axial and radial air gap motors – Operating principle – Reluctance – Phasor diagram - Characteristics – Vernier motor.

2. STEPPING MOTORS

9

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi stack configurations – Theory of torque predictions – Linear and non-linear analysis – Characteristics – Drive circuits.

3. SWITCHED RELUCTANCE MOTORS

9

Constructional features – Principle of operation – Torque prediction – Power controllers – Non-linear analysis – Microprocessor based control - Characteristics – Computer control.

4. PERMANENT MAGNET BRUSHLESS D.C. MOTORS

9

Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations – Power controllers – Motor characteristics and control.

5. PERMANENT MAGNET SYNCHRONOUS MOTORS

9

Principle of operation – EMF and torque equations – Reactance – Phasor diagram – Power controllers - Converter - Volt-ampere requirements – Torque speed characteristics - Microprocessor based control.

L = 45 Total = 45

TEXT BOOKS

1. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.

2. P.P. Aearnley, 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus, London, 1982.

REFERENCE BOOKS

1. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.

EI 1351 BIO–MEDICAL INSTRUMENTATION 3 0 0 100

AIM

The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced.

OBJECTIVES

i. To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.

ii. To introduce the student to the various sensing and measurement devices of electrical origin.

iii. To provide the latest ideas on devices of non-electrical devices.

iv. To bring out the important and modern methods of imaging techniques.

v. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

1. PHYSIOLOGY AND TRANSDUCERS

9

Cell and its structure – Action and resting – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell – Synapse – Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Transducers – Different types – Piezo-electric, ultrasonic, resistive, capacitive, inductive transducers – Selection criteria.

2. ELECTRO – PHYSIOLOGICAL MEASUREMENTS

9

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier.

ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms.

3. NON-ELECTRICAL PARAMETER MEASUREMENTS

9

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of Co_2, o_2 in exhaust air - PH of blood, ESR, GSR measurements – Plethysmography.

4. MEDICAL IMAGING AND PMS

9

X-ray machine - Radio graphic and fluoroscopic techniques – Computer tomography
– MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

5. ASSISTING AND THERAPEUTIC EQUIPMENTS

9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dializers.

L = 45 Total = 45

TEXT BOOKS

1. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II Edition, Pearson Education, 2002 / PHI.

2. R.S.Khandpur, 'Handbook of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.

REFERENCE BOOKS

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.

3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.

4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

CS 1032 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS 3 0 0 100

AIM

To present the concepts of intelligent agents, searching, knowledge and reasoning, planning, learning and expert systems.

OBJECTIVES

i. To study the idea of intelligent agents and search methods.

ii. To study about representing knowledge.

iii. To study the reasoning and decision making in uncertain world.

iv. To construct plans and methods for generating knowledge.

v. To study the concepts of expert systems.

1. INTRODUCTION

9

Introduction to AI: Intelligent agents – Perception – Natural language processing – Problem – Solving agents – Searching for solutions: Uniformed search strategies – Informed search strategies.

2. KNOWLEDGE AND REASONING

9

Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents: Propositional logic – First order logic – Syntax and semantics – Using first order logic – Inference in first order logic.

3. UNCERTAIN KNOWLEDGE AND REASONING

8

Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.

4. PLANNING AND LEARNING

9

Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic domains – Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

5. EXPERT SYSTEMS

10

Definition – Features of an expert system – Organization – Characteristics – Prospector – Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN.

L=45 Total = 45

TEXT BOOKS

1. Stuart Russel and Peter Norvig, 'Artificial Intelligence A Modern Approach', Second Edition, Pearson Education, 2003 / PHI.

2. Donald A.Waterman, 'A Guide to Expert Systems', Pearson Education.

REFERENCE BOOKS

1. George F.Luger, 'Artificial Intelligence – Structures and Strategies for Complex Problem Solving', Fourth Edition, Pearson Education, 2002.

2. Elain Rich and Kevin Knight, 'Artificial Intelligence', Second Edition Tata McGraw Hill, 1995.

3. Janakiraman, K.Sarukesi, 'Foundations of Artificial Intelligence and Expert Systems', Macmillan Series in Computer Science.

4. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India, 2003.

CS 1033 DATA COMMUNICATION AND NETWORKS 3 0 0 100

AIM

To study the details regarding communication of voice and video, networks and its functions, data conversions, controlling of errors, switching information and its devices, internetworking device and different layers of TCP/IP.

OBJECTIVES

i. To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.

ii. To study the detection and correction of errors, link control and link protocols of data link layer.

iii. To study the access method, electrical specification and implementation of different networks, types of switching.

iv. To study about the standardized data interface and it's working principle.

v. To study the logic of link mechanisms used in networks and different layers of TCP/IP.

1. DATA COMMUNICATION

9

Introduction: Networks – Protocols and standards – Standards organizations – Line configurations – Topology – Transmission mode – Categories of networks – Inter networks.

OSI model: Functions of the layers.

Encoding and modulating: Digital-to-digital conversion – Analog-to-digital conversion – Digital-to-analog conversion – Analog-to-analog conversion.

Transmission media: Guided media – Unguided media – Transmission impairment – Performance.

2. ERROR CONTROL AND DATA LINK PROTOCOLS

9

Error detection and correction: Types of errors – Detection – Vertical Redundancy Check (VRC) – Longitudinal Redundancy Check (LRC) – Cyclic Redundancy Check (CRC) – Check sum – Error correction.

Data link control: Line discipline – Flow control – Error control.

Data link protocols: Asynchronous protocols – Synchronous protocols – Character oriented protocols – BIT oriented protocols – Link access procedures.

3. NETWORKS AND SWITCHING

9

LAN: Project 802 – Ethernet – Token bus – Token ring – FDDI.

MAN: IEEE 802.6 (DQDB) – SMDS.

Switching: Circuit switching – Packet switching – Message switching.

4. X.25, FRAME RELAY, ATM AND SONET/ SDH

9

X.25: X.25 Layers.

Frame relay: Introduction – Frame relay operation – Frame relay layers – Congestion control – Leaky bucket algorithm – Traffic control.

ATM: Design goals – ATM architecture – ATM layers – ATM applications.

SONET / SDH: Synchronous transport signals – Physical configuration – SONET layers – Applications.

5. NETWORKING DEVICES AND TCP / IP PROTOCOL SUITE

9

Networking and internetworking devices: Repeaters – Bridges – Gateways – Other devices – Routing algorithms – Distance vector routing – Link state routing.

TCP / IP protocol suite: Overview of TCP/IP.

Network layers: Addressing – Subnetting – Other protocols and network layers.

Application layer: Domain Name System (DNS) – Telnet – File Transfer Protocol (FTP) – Trivial File Transfer Protocol (TFTP) – Simple Mail Transfer Protocol (SMTP) – Simple Network Management Protocol (SNMP).

L = 45 Total = 45

TEXT BOOK

1. Behrouz A.Forouzan, ‘Data Communication and Networking’, Second Edition, Tata McGraw Hill, 2000.

REFERENCE BOOKS

1. William Stallings, 'Data and Computer Communication', 8th Edition, Pearson Education, 2003 / PHI.

2. Andrew Tannenbaum.S. 'Computer Networks', Pearson Education, 4th Edition, 2003 / PHI.

EE 1002 POWER SYSTEM DYNAMICS 3
0 0 100

AIM

To become familiar with the modelling of components and system for carrying out transient and dynamic stability analysis of large scale power system.

OBJECTIVES

i. To study detailed modeling of synchronous machine and its excitation and speed-governing controllers.

ii. To study transient stability simulation of multimachine power system.

iii. To study small signal stability analysis of a single-machine infinite bus system with excitation system and power system stabilizer.

1. INTRODUCTION

4

Concept and importance of stability in power system operation and design; distinction between transient and dynamic stability; complexity of stability problem in large system: Need for reduced models; stability of interconnected systems.

2. MACHINE MODELLING

12

Park's transformation; flux linkage equations, current space model, per unit conversion, normalizing the equations, equivalent circuit, flux linkage state space model, sub transient and transient inductances and time constants. Simplified models (one axis and constant flux linkage), steady state equations and phasor diagrams.

3. MACHINE CONTROLLERS

9

Exciter and voltage regulators, function of excitation systems, types of excitation systems, typical excitation system configuration, block diagram and state space representation of IEEE type 1 excitation system, saturation function, stabilizing circuit.

Function of speed governing systems, block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

4. TRANSIENT STABILITY

8

State equation for multimachine simulation with one axis model, transient stability simulation of multimachine power system with one axis machine model including excitation system and speed governing system using R-K method of fourth order (Gill's technique), power system stabilizer.

5. DYNAMIC STABILITY

12

System response to small disturbances: Linear model of the unregulated synchronous machine and its modes of oscillation, regulated synchronous machine, distribution of power impact, linearization of the load equation for the one machine problem – Simplified linear model, effect of excitation on dynamic stability, approximate system representation; supplementary stabilizing signals, dynamic performance measure, small signal performance measures.

L = 45 Total = 45

TEXT BOOKS

1. P.M. Anderson and A.A.Fouad, 'Power System Control and Stability', Galgotia Publications, New Delhi, 2003.

2. P.Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 1994.

REFERENCE BOOK

1. M.A.Pai and W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.

CS 1034 COMPUTER ARCHITECTURE 3 1 0 100

AIM

To Study the structure and behavior of processors, memories and input and output units and to study their interactions.

OBJECTIVES

i. To study the various representations of data, register transfer language for micro-
operations and organization and design of a digital computer.

ii. To teach the concept of micro-programmed control unit, the central processing
unit, stack and instruction formats.

iii. To Study the various arithmetic operation's algorithms and their hardware implementations and concept of pipelining and vector processing.

iv. To illustrate the techniques to communicate with input and output devices.

v. To study the organization and operation of various memories and memory management hardware.

1. DATA REPRESENTATION, MICRO-OPERATIONS AND ORGANIZATION AND DESIGN

13

Data representation: Data types, complements, fixed–point representation, floating-point representation, other binary codes, error detection codes.

Register transfer and micro operations: Register transfer language, register transfer, bus and memory transfers, arithmetic micro-operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit.
Basic computer organization and design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input-output and interrupt. Complete computer description, design of basic computer, design of accumulator logic.

2. CONTROL AND CENTRAL PROCESSING UNIT

8

Micro programmed control: Control memory, address sequencing, micro-program example, design of control unit.

Central processing unit: General register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer.

3. COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING

8

Computer arithmetic: Addition and subtraction, multiplication algorithms, division algorithms, floating-point arithmetic operations, decimal arithmetic unit, decimal arithmetic operations.

Pipeline and vector processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing array processors.

4. INPUT-OUTPUT ORGANIZATION

8

Input-output organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access, input-output processor, serial communication.

5. MEMORY ORGANIZATION

8

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

L = 45 T=15 Total = 60

TEXT BOOK

1. Morris Mano, 'Computer System Architecture', 3rd Edition, Pearson Education, 2002 / PHI.

REFERENCE BOOKS

1. Vincent P.Heuring and Harry F.Jordan, 'Computer Systems Design and Architecture', Pearson Education Asia Publications, 2002.

2. John P.Hayes, 'Computer Architecture and Organization', Tata McGraw Hill, 1988.

3. Andrew S.Tanenbaum, 'Structured Computer Organization', 4th Edition, Prentice Hall of India/Pearson Education, 2002.

4. William Stallings, 'Computer Organization and Architecture', 6th Edition, Prentice Hall of India/Pearson Education, 2003.

CS 1035 OPERATING SYSTEMS 3 1 0 100

AIM

To introduce the basic concepts of operating systems, process management, storage management, I/O systems and distributed systems.

OBJECTIVES

i. To study the basic concepts of operating system, computer system structures and operating system structures.

ii. To study about processes, threads, CPU scheduling, process synchronization and deadlocks.

iii. To study about memory management, virtual memory, file system interface and file system implementation.

iv. To study about I/O systems and mass-storage structure.

v. To study about distributed system structures, distributed file systems and distributed coordination.

1. OPERATING SYSTEMS – AN OVERVIEW

8

What is an OS? – Mainframe systems – Desktop systems –Multiprocessor systems – Distributed systems – Clustered systems – Real time systems – Handheld systems.

Computer system operation – I/O structure – Storage structure – Storage hierarchy – Hardware protection – Network structure.

System components – Operating system services – System calls – System programs – System structure – Virtual machines – System design and implementation – System generation.

2. PROCESS MANAGEMENT

10

Process concept – Process scheduling – Operations on processes – Cooperating processes – Inter process communication – Communication in client-server systems. Threads - Overview - Multithreading models – Threading issues.

Basic concepts – Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Process scheduling models. The

critical section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – Atomic transactions. System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

3. STORAGE MANAGEMENT

10

Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with Paging. Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing.

File concept: Access methods – Directory structure – File system mounting – File sharing – Protection. File system structure – File system implementation – Directory implementation – Allocation methods – Free-space management – Efficiency and performance – Recovery.

4. I/O SYSTEMS

8

I/O hardware – Application I/O interface – Kernel I/O subsystem – Transforming I/O to hardware operations – Streams – Performance.

Disk structure – Disk scheduling – Disk management – Swap-space management – RAID structure – Disk attachment – Stable – Storage implementation – Tertiary storage structure.

5. DISTRIBUTED SYSTEMS

9

Background – Topology – Network types – Communication – Communication protocols – Robustness – Design issues. Naming and transparency – Remote file access – Stateful versus stateless service – File replication.

Event ordering – Mutual exclusion – Atomicity – Concurrency control – Deadlock handling – Election algorithms – Reaching agreement.

L = 45 T=15 Total = 60

TEXT BOOK

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ‘Operating System Concepts’, Sixth Edition, Windows XP update, John Wiley & Sons (ASIA) Pvt. Ltd, 2002.

REFERENCE BOOKS

1. Harvey M. Deitel, 'Operating Systems', Second Edition, Pearson Education Pvt. Ltd., 2002.

2. Andrew S. Tanenbaum, 'Modern Operating Systems', 2nd Edition, Pearson Education, 2000 / PHI.

3. William Stallings, 'Operating System', Pearson Education, 4th Edition, 2003 / PHI.

EE 1003 POWER SYSTEM TRANSIENTS 3 0 0 100

AIM

To understand generation of switching and lighting transients, their propagation, reflection and refraction a on the grid ad their impact on the grid equipment.

OBJECTIVES

i. To study the generation of switching transients and their control using circuit – theoretical concept.

ii. To study the mechanism of lighting strokes and the production of lighting surges.

iii. To study the propagation, reflection and refraction of travelling waves.

iv. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

1. INTRODUCTION AND SURVEY

5

Source of transients, various types of power systems transients, effect of transients on power systems, importance of study of transients in planning.

2. SWITCHING TRANSIENTS

10

Introduction, circuit closing transients: RL circuit with sine wave drive, double frequency transients, observations in RLC circuit and basic transforms of the RLC circuit. Resistance switching: Equivalent circuit for the resistance switching problems, equivalent circuit for interrupting the resistor current. Load switching: Equivalent circuit, waveforms for transient voltage across the load, switch; normal and abnormal switching transients. Current suppression, current chopping, effective equivalent circuit. Capacitance switching, effect of source regulation, capacitance switching with a restrike, with multiple restrikes, illustration for multiple restriking transients, ferro resonance.

3. LIGHTNING TRANSIENTS

10

Causes of over voltage, lightning phenomenon, charge formation in the clouds, rate of charging of thunder clouds, mechanisms of lighting strokes, characteristics of lightning strokes; factors contributing to good line design, protection afforded by ground wires, tower footing resistance. Interaction between lightning and power system: Mathematical model for lightning.

4. TRAVELLING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS

10

Computation of transients: Transient response of systems with series and shunt lumped parameters and distributed lines. Travelling wave concept: step response, Bewely's lattice diagram, standing waves and natural frequencies, reflection and refraction of travelling waves.

5. TRANSIENTS IN INTEGRATED POWER SYSTEM

10

The short line and kilometric fault, distribution of voltage in a power system: Line dropping and load rejection; voltage transients on closing and reclosing lines; over voltage induced by faults; switching surges on integrated system; EMTP for transient computation.

L = 45 Total = 45

TEXT BOOKS

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Interscience, New York, 2nd edition 1991.

2. R.D.Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

REFERENCE BOOK

1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 2nd edition, 2000.

CS 1036 INTERNETWORKING TECHNOLOGY 3
0 0 100

AIM

To present the concepts of Networking, Internetworking, IP protocol, TCP protocol and
Internet applications

OBJECTIVES

i. To study the basic concepts of networking.

ii. To study about interconnection of networks.

iii. To study the IP protocol and it's routing.

iv. To introduce the TCP protocol.

v. To study the Internet applications and security.

1. COMPUTER NETWOKS

9

Introduction to networks – Network topology – Types of networks – Network architecture – Layering – Design issues – Client/Server model – Protocols – Bridges – Routers – Repeaters – Switches.

2. BASICS OF INTERNETWORKING

9

Introduction to internetworking – Internetworking concepts and architectural model – Internet addressing – Domain Name System (DNS) – Address Resolution Protocol (ARP) – Reverse Address Resolution Protocol (RARP).

3. INTERNET PROTOCOL AND ITS ROUTING

9

Introduction to IP protocol – Virtual networks – Concept of unreliable delivery – Connectionless delivery system – Purpose on internet protocol – Internet data gram – Data gram options.

Introduction to routing - IP data gram – Direct and indirect delivery- Table driven IP routing – Next hop routing.

4. TRANSMISSION CONTROL PROTOCOL

9

Introduction to TCP – Properties of reliable delivery service – TCP protocol – TCP segment format – TCP connection – TCP state machine – Silly window syndrome.

5. INTERNETWOKING APPLICATIONS

9

Simple Mail Transfer Protocol (SMTP) - Post Office Protocol (POP) - File Transfer Protocol (FTP) – Telnet – Simple Network Management Protocol (SNMP) – Internet security and firewall design.

L = 45 Total = 45

TEXT BOOKS

1. Douglas E. Comer, 'Internetworking with TCP/IP Volume 1', Third Edition, Prentice Hall, 2001.

2. Andrew S.Tananbaum, 'Computer Networks', Fourth Edition, Prentice Hall of India/Pearson Education, 2003.

REFERENCE BOOKS

1. Bechrouz A. Forouzan, 'TCP/IP Protocol Suite', Second Edition, Tata McGraw Hill,
2000.

2. William Stallings, 'Data and Computer Communications', Seventh Edition, Prentice Hall
of India/Pearson Education, 2003.

EC 1032 EMBEDDED SYSTEM DESIGN **3**
0 0 100

AIM

To introduce to the functional building blocks of an embedded system for developing a real time system application.

OBJECTIVES

i. Introduce to features that build an embedded system.

ii. To help the understanding of the interaction that the various components within an embedded system have with each other.

iii. Techniques of inter facing between processors & peripheral device related to embedded processing.

iv. To enable writing of efficient programs on any dedicated processor.

v. To present in lucid manner the basic concepts of systems programming like operating system, assembler compliers etc and to understand the management task needed for developing embedded system.

1. INTRODUCTION TO EMBEDDED SYSTEM

9

Introduction to functional building blocks of embedded systems – Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

2. PROCESSOR AND MEMORY ORGANIZATION

6

Structural units in a processor; selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management – Cache mapping techniques, dynamic allocation - Fragmentation.

3. DEVICES & BUSES FOR DEVICES NETWORK

9

I/O devices; timer & counting devices; serial communication using I^2C, CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system – Serial port & parallel port.

4. I/O PROGRAMMING SCHEDULE MECHANISM

12

Intel I/O instruction – Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts.

Multi threaded programming – Context switching, premature & non-premature multitasking, semaphores.

Scheduling – Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

5. REAL TIME OPERATING SYSTEM (RTOS)

9

Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS – Interrupt handling, task scheduling; embedded system design issues in system development process – Action plan, use of target system, emulator, use of software tools.

L = 45 Total = 45

TEXT BOOKS

1. Rajkamal, 'Embedded System – Architecture, Programming, Design', Tata McGraw Hill, 2003.

2. Daniel W. Lewis 'Fundamentals of Embedded Software', Prentice Hall of India, 2004.

REFERENCE BOOKS

1. David E. Simon, 'An Embedded Software Primer', Pearson Education, 2004.
2. Frank Vahid, 'Embedded System Design – A Unified Hardware & Software Introduction', John Wiley, 2002.
3. Sriram V. Iyer, Pankaj Gupte, 'Embedded Real Time Systems Programming', Tata McGraw Hill, 2004.
4. Steve Heath, 'Embedded System Design', II edition, Elsevier, 2003.

EC 1451 MOBILE COMMUNICATION 3
0 0 100

AIM

To understand the mobile channel environment, communication techniques and wireless standards for mobile communication.

OBJECTIVES

i. To learn cellular concept including handoff mechanism, cell coverage and capacity.

ii. To understand the mobile radio propagation models for indoor and outdoor conditions.

iii. To study the digital modulation and equalization techniques suitable for mobile communication.

iv. To learn speech coding and multiple access techniques for mobile communication.

v. To familiarize with the international wireless network standards.

1. CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS

9

Introduction to wireless communication: Evolution of Mobile Communications, mobile radio systems – Examples, trends in cellular radio and personal communications.

Cellular concept: Frequency reuse, channel assignment hand off, interference and system capacity, tracking and grade of service, improving coverage and capacity in cellular systems.

2. MOBILE RADIO PROPAGATION

9

Free space propagation model, reflection, diffraction, scattering, link budget design, outdoor propagation models, indoor propagation models, small scale multipath propagation, impulse model, small scale multipath measurements, parameters of mobile multipath channels, types of small scale fading.

3. MODULATION TECHNIQUES AND EQUALIZATION

9

Modulation techniques: Minimum shift keying, Gaussian MSK, M-ary QAM, performance of MSK modulation in slow-flat fading channels.
Equalization: Survey of equalization techniques, linear equalization, non-linear equalization, algorithms for adaptive equalization. Diversity Techniques, RAKE receiver.

4. CODING AND MULTIPLE ACCESS TECHNIQUES

9

Coding: Vocoders, linear predictive coders, selection of speech coders for mobile communication, GSM coders.
Multiple access techniques: FDMA, TDMA, CDMA, SDMA, capacity of cellular CDMA.

5. WIRELESS SYSTEMS AND STANDARDS

9

Second generation and third generation wireless network and standards, WLL, blue tooth, GSM, IS- 95 and DECT.

L = 45 Total = 45

TEXT BOOKS

1. T.S. Rappaport, 'Wireless Communications: Principles and Practice', Second Edition, Prentice Hall of India/Pearson Education, Third Indian Reprint 2003.

REFERENCE BOOKS

1. R.Blake, 'Wireless Communication Technology', Thomson Delmar, 2003.

2. W.C.Y. Lee, 'Mobile Communications Engineering: Theory and Applications', Second Edition, McGraw Hill International, 1998.

3. Stephen G.Wilson, 'Digital Modulation and Coding', Pearson Education, 2003.

EE 1004 POWER QUALITY **3**
0 0 100

AIM

To study the various issues affecting Power Quality, their production, monitoring and suppression.

OBJECTIVES

i. To study the production of voltages sags, overvoltages and harmonics and methods of control.

ii. To study various methods of power quality monitoring.

1. INTRODUCTION TO POWER QUALITY

3

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

2. VOLTAGE SAGS AND INTERRUPTIONS

7

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

3. OVERVOLTAGES

10

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP.

4. HARMONICS

12

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

5. POWER QUALITY MONITORING

13

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

L = 45 Total = 45

REFERENCE BOOKS

1. Roger.C.Dugan, Mark.F.McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003.

2. PSCAD User Manual.

IC 1002 ADAPTIVE CONTROL 3
0 0 100

AIM

To gain knowledge on adaptive control of systems through parameter identification and
controller retuning.

OBJECTIVES

i. To study the definition of adaptive control and methods of adaptation.

ii. To study the parameter identification of systems.

iii. To study the self-tuning of PID controllers based on parameter identification.

iv. To study the model reference adaptive control.

v. To study the practical application through case studies.

1. INTRODUCTION

9

Introduction to adaptive control - Effects of process variations – Adaptive control schemes – Adaptive control problem – Non-parametric identification – Step response method – Impulse response method – Frequency response method.

2. PARAMETRIC IDENTIFICATION

9

Linear in parameter models - ARX – ARMAX – ARIMAX – Least square estimation – Recursive least square estimation – Extended least square estimation – Maximum likelihood estimation – Introduction to non-linear systems identification - Pseudo random binary sequence.

3. SELF-TUNING REGULATOR

9

Deterministic in-direct self-tuning regulators – Deterministic direct self-tuning regulators – Introduction to stochastic self-tuning regulators – Stochastic indirect self-tuning regulator.

4. MODEL REFERENCE ADAPTIVE CONTROLLER

9

The MIT rule – Lyapunov theory – Design of model reference adaptive controller using MIT rule and Lyapunov theory – Relation between model reference adaptive controller and self-tuning regulator.

5. TUNING OF CONTROLLERS AND CASE STUDIES

9

Design of gain scheduling controller - Auto-tuning of PID regulator – Stability analysis of adaptive controllers – Application of adaptive control in chemical reactor, distillation column and variable area tank system.

L = 45 Total = 45

TEXT BOOK

1. Karl J. Astrom & Bjorn Wittenmark, ‘Adaptive Control’, Pearson Education (Singapore), Second Edition, 2003.

REFERENCE BOOKS

1. T. C.H.A. Hsia, ‘System Identification’, Lexington books, 1974.

2. Stephanopoulis G. ‘Chemical Process Control’, Prentice Hall of India, New Delhi, 1990.

EE 1006 OPERATIONS RESEARCH 3 0 0 100

UNIT – I

Operations Research Models – Operations Research Techniques – Art of Modeling – Construction of LP Model – Graphical LP solution – Graphical Sensitivity Analysis – The Simplex Algorithm – The M- method – The two phase method – degeneracy – Alternative optima – unbounded solutions – infeasible solution – redundancies – LP packages.

UNIT – II

Definition of the Dual problem – primal-dual relationship – Economic interpretation of duality – Dual simplex method – primal dual computation – post optimal or sensitivity analysis – Changes affecting feasibility – Changes affecting optimality – Revised simplex method – LP packages.

UNIT – III

Definition of Transportation model – The transportation algorithm – Determination of the starting solution – Iterative computations of the Algorithm – The Assignment Model – The Hungarian method – The Transshipment model – Inter programming problem – Cutting plane Algorithm.

UNIT – IV

Scope of Network Applications – Network solution – Minimal spanning tree Algorithm – Shortest Route problem – Examples – Shortest Route Algorithm – Maximal flow model – Minimum cost capacitated flow problems.

UNIT – V

Network diagram representation – Critical path method – Time estimates – Crashing – Time charts – PERT and CPM for project scheduling – Resource planning – Case studies.

TEXT BOOK

1. Handy A. Taha, "Operation Research – An Introduction", 7th Edition, Pearson Education,
   Asia, 2002.

REFERENCE BOOKS

1. Ronald. L. Rardin, "Optimization in Operation Research", Person Education, Asia, 2002.

2. JIT.S Chandran, Mahendran P. Kawatra Ki Ho Kim, "Essential of Linear Programming", Vikas Publishing House Pvt.Ltd., New Delhi, 1994.

3. Hiller F.S Liberman G.J, "Introduction to Operation Research", 6th Edition, McGraw Hill, 1995.

4. R.Panneer Selvam, “Operations Research”, Prentice Hall of India, 2002.

5. P.C. Tulsin, “Quantitative Technique : Theory and Problem”, Pearson Education, 2002.

6. Ravindran, Phillips, Solberg, “Operation Research Principles and Practice”, Second Edition, John wiley, 1987.

EC 1461 VLSI DESIGN 3
0 0 100

AIM

To introduce the technology & concepts of VLSI.

OBJECTIVES

i. To introduce MOS theory / Manufacturing Technology.

ii. To study inverter / counter logic / stick / machine diagram / sequential circuits.

iii. To study address / memory / arithmetic circuits.

iv. To introduce FPGA architecture / principles / system design

v. To get familiarised with VHDL programming behavioural/Structural/concurrent/ process.

1. BASIC MOS TRANSISTOR

9

Enhancement mode & Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – second order effects – MOS Transistor Model.

2. NMOS & CMOS INVERTER AND GATES

9

NMOS & CMOS inverter – Determination of pull up / pull down ratios – stick diagram – lamda based rules – super buffers – BiCMOS & steering logic.

3. SUB SYSTEM DESIGN & LAYOUT **9**

Structured design of combinational circuits – Dynamic CMOS & clocking – Tally circuits – (NAND-NAND, NOR-NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter.

4. DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAY LOGIC **9**

NMOS PLA – Programmable Logic Devices - Finite State Machine PLA – Introduction to FPGA.

5. VHDL PROGRAMMING **9**

RTL Design – combinational logic – Types – Operators – Packages – Sequential circuit – Sub programs – Test benches. (Examples: address, counters, flipflops, FSM, Multiplexers / Demltiplexers).

L = 45 Total = 45

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2003.

2. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 1990.

REFERENCE BOOKS

1. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Education, India, 2002.

2. Charles H.Roth, 'Fundamentals of Logic Design', Jaico Publishing House, 1992.
3. Zainalatsedin Navabi, 'VHDL Analysis and Modelling of Digital Systems', 2nd Edition, Tata McGraw Hill, 1998.

4. Douglas Perry, 'VHDL Programming By Example', Tata McGraw Hill, 3rd Edition.

IC 1403 NEURAL NETWORK AND FUZZY LOGIC CONTROL 3 0 0 100

AIM

To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.

OBJECTIVES

i. To expose the students to the concepts of feed forward neural networks.

ii. To provide adequate knowledge about feed back neural networks.

iii. To teach about the concept of fuzziness involved in various systems. To provide adequate knowledge about fuzzy set theory.

iv. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.

v. To provide adequate knowledge of application of fuzzy logic control to real time systems.

1. ARCHITECTURES

9

Introduction – Biological neuron – Artificial neuron – Neuron modeling – Learning rules – Single layer – Multi layer feed forward network – Back propagation – Learning factors.

2. NEURAL NETWORKS FOR CONTROL

9

Feed back networks – Discrete time hop field networks – Transient response of continuous time networks – Applications of artificial neural network - Process identification – Neuro controller for inverted pendulum.

3. FUZZY SYSTEMS

9

Classical sets – Fuzzy sets – Fuzzy relations – Fuzzification – Defuzzification – Fuzzy rules.

4. FUZZY LOGIC CONTROL

9

Membership function – Knowledge base – Decision-making logic – Optimisation of membership function using neural networks – Adaptive fuzzy system – Introduction to genetic algorithm.

5. APPLICATION OF FLC

9

Fuzzy logic control – Inverted pendulum – Image processing – Home heating system – Blood pressure during anesthesia – Introduction to neuro fuzzy controller.

L = 45

Total = 45

TEXT BOOKS

1. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home, 2002.

2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Tata McGraw Hill, 1997.

REFERENCE BOOKS

1. Laurance Fausett, Englewood cliffs, N.J., 'Fundamentals of Neural Networks', Pearson Education, 1992.

2. H.J. Zimmermann, 'Fuzzy Set Theory & its Applications', Allied Publication Ltd., 1996.

3. Simon Haykin, 'Neural Networks', Pearson Education, 2003.

4. John Yen & Reza Langari, 'Fuzzy Logic – Intelligence Control & Information', Pearson
Education, New Delhi, 2003.

EE 1152 ELECTRIC CIRCUITS LABORATORY 0 0 3 100

OBJECTIVE

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response.

1. Verification of Kirchoff's voltage and current laws, Thevenin's and Norton's Theorems.
2. Study of oscilloscope and measurement of sinusoidal voltage, frequency and power factor.
3. Measurement of time constant of series R-C electric circuits.
4. Frequency response of RC and RL circuits.
5. Resonant frequency and frequency response of a series RLC circuit.
6. Study of the effect of Q on frequency response and bandwidth of series and parallel resonant circuits.
7. Study of low pass and high pass filters.
8. Measurement of real power, reactive power, power factor and impedance of RC, RL and RLC circuits using voltmeters and ammeters.
9. Power measurement in a three phase circuit by two Wattmeters.
10. Study of first and second order circuit transients by digital simulation.

P = 45 Total = 45

REFERENCE BOOK

1. Paul B.Zbar, Gordon Rockmaker and David J.Bates, 'Basic Electricity', A text – Lab Manual, McGraw Hill, Seventh Edition - 2001.

Detailed Syllabus

1. Verification of Kirchoff's voltage and current laws, Thevenin's and Norton's Theorems

Aim

To verify Kirchchoff's voltage and current laws, Thevenin's and Norton's Theorems.

Exercises

1. Verify the Kirchoff's voltage and current law in a series circuit and in a circuit with series and parallel combination.

2(a) Determine the Thevenin equivalent voltage V_{TH} and resistance R_{TH} of a DC circuit with a single voltage source.

(b) Verify experimentally the values of V_{TH} and R_{TH} in solving a series – parallel circuit.

3. Determine the values of Norton's constant – current source I_N and Norton's current – source resistance R_N in a DC circuit containing one or two voltage sources.

2. Study of Oscilloscope and Measurement of sinusoidal voltage, frequency and power factor

Aim

To study the dual trace oscilloscope controls and to AC voltage values, time and frequency of A.C voltage with the oscilloscope.

Exercises

1. Learn the dual trace oscilloscope controls, safety precautions, probe compensation and the procedure to measure A.C. voltage and phase angle measurement.

2. Measure peak-to – peak A.C. voltage waveform using the oscilloscope.

3. Measure time for one cycle of an A.C signal and the corresponding frequency using the oscilloscope.

4. Measure the phase angle difference between two A.C signals using dual trace oscilloscope.

3. Measurement of time constant of series R-C electric circuits

Aim

To determine experimentally the time taken by a capacitor to charge and discharge through a resistance.

Exercises

a. Determine experimentally the time it takes a capacitor to charge through a resistor and obtain a plot between voltage across capacitor and time.

b. Determine experimentally the time it takes a capacitor discharge through a resistor and obtain a plot between voltage across capacitor and time.

c. Experimentally verify that the current and voltage in a capacitive circuit are out of phase using dual trace oscilloscope.

3. Frequency response of RC and RL circuits

Aim

1. To study the effect on impedance and current of a change in frequency in a series RL circuit.

2. To study the effect on impedance and current of a change in frequency in a series RC circuit.

Exercises

1. Conduct suitable experiment and draw the following graphs for an RL circuit.
   a. Impedance Vs frequency
   b. Current Vs frequency
   c. X_L Vs f
2. Conduct suitable experiment with a RC circuit and draw the following graphs.
   i. Xc Vs f
   ii. Z Vs f
   iii. I Vs f

4. Resonant frequency and frequency response of a series R L C circuit

Aim

1. To determine experimentally the resonant frequency f_R of a series RLC circuit.

2. To verify that the resonant frequency of a series RLC circuit is given by the formula

$$f_R = 1 / 2\pi\sqrt{LC}.$$

3. To develop experimentally the frequency – response curve of a series RLC circuit

Exercises

1. Draw the frequency response curve of a RLC circuit (V_L Vs f, V_C Vs f)
2. Experimentally show the following
   a. Resonant frequency $f_r = 1 / 2\pi \sqrt{LC}$
   b. The impedance at resonance Z = R

5. Study of the effect of Q on frequency response and bandwidth of series and parallel resonant circuits

Aim

To measure the effect of circuit Q on frequency response and on bandwidth at the half – power points.

Exercises

1. Experimentally study the effect of Q on frequency response and bandwidth of RLC resonant circuit and obtain the following for three values of Q.

   i. I Vs frequency

   ii. Half power points

   iii. Bandwidth

   iv. V_e Vs f

   v. V_L Vs f

2. Experimentally determine the resonant frequency in a parallel resonant circuit. Draw current versus frequency in parallel resonant circuit.

6. Study of Low Pass and High Pass Filters

Aim

To determine experimentally the frequency response of a low and high pass filters.

Exercises

1. Determine the frequency response of passive low pass (RL) and high pass (RC) filter circuits.

2. Determine the frequency response of active low pass and high pass filter circuits.

7. Measurement of real power, reactive power, power factor and impedance of RC, RL and RLC circuits using voltmeters and ammeters.

Aim

To measure real power, reactive power, apparent power, power factor and impedance in A.C circuits using ammeters and three voltmeters.

Exercises

1. Experimentally determine the power factor, real power, reactive power, apparent power and impedance in a RL series circuit using voltmeter and ammeter. Draw the phasor diagram using the measurements.

2. Experimentally determine the power factor, real power, reactive power, apparent power and impedance in a RC circuit. Draw the phasor diagram using the measurements.

3. Experimentally determine the power factor, real power, reactive power, apparent power and impedance in a RLC series circuit using voltmeters and ammeters. Draw the phasor diagram using the measurements.

9. Power Measurement in a three phase circuit by two Wattmeters

Aim

To measure power in a three phase circuit by two wattmeter method.

Exercises

1. Measure the real and reactive power input and power factor to a three phase induction motor at different load condition using two watt- meters

10. Study of first and second order circuit transients by digital simulation

Aim

To study the first and second order circuit transients by digital simulation.

Exercises

1. Obtain the response for the following cases using MATLAB software or any other equivalent.

   a. Source free or zero input response of RL and RC circuit.

   b. D.C or step response of RL and RC circuits using available software.

   c. Obtain the source free and step response of RLC circuit using available softwares.