ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025

AFFILIATED INSTITUTIONS
CURRICULUM 2008

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

3 & 4 SEMESTERS CURRICULUM AND SYLLABI

SEMESTER III

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MA 2211	Transforms and Partial Differential Equations	3	1	0	4
2.	EE 2201	Measurements & Instrumentation	3	0	0	3
3.	EE 2202	Electromagnetic Theory	3	1	0	4
4.	GE 2211	Environmental Science and Engineering	3	0	0	3
5.	EE 2203	Electronic Devices & Circuits	3	0	0	3
6.	EE 2204	Data Structures and Algorithms	**3**	**1**	**0**	**4**
PRACTICAL						
1.	**EE 2207**	**Electron Devices and Circuits Laboratory**	0	0	3	2
2.	EE 2209	Data Structures and Algorithms Laboratory	0	0	3	2
3	EE 2208	Measurements & Instrumentation Laboratory	0	0	3	2
		TOTAL	**18**	**3**	**9**	**27**

SEMESTER IV

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MA 2264	Numerical Methods	3	1	0	4
2.	EE 2251	Electrical Machines – I	3	1	0	4
3.	EE 2252	Power Plant Engineering	3	1	0	4
4.	EE 2253	Control Systems	3	1	0	4
5.	EE 2254	Linear Integrated Circuits and Applications	3	0	0	3
6.	EE 2255	Digital Logic Circuits	3	1	0	4
PRACTICAL						
1.	EE 2257	Control Systems Laboratory	0	0	3	2
2.	EE 2258	Linear and Digital Integrated Circuits Laboratory	0	0	3	2
3.	EE 2259	Electrical Machines Laboratory – I	0	0	3	2
		TOTAL	**18**	**5**	**9**	**29**

MA2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS 3 1 0 4
(Common to all branches)

OBJECTIVES

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differtial Equations. 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.

1. 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.

2. 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.

3. PARTIAL DIFFERENTIAL EQUATIONS 9

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

4. APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat equation (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

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.

TUTORIALS= 15
Total = 60

TEXTBOOKS

1. Grewal B.S, 'Higher Engineering Mathematics', 39th Edition, Khanna Publishers, Delhi, 2007

REFERENCE BOOKS

1. Bali.N.P. and Manish Goyal 'A Textbook of Engineering Mathematics', Seventh Edition, Laxmi Publications (P) Ltd.

2. Ramana.B.V. 'Higher Engineering Mathematics' Tata Mc-GrawHill Publishing Company Limited, New Delhi.

3. Glyn James ' ADVANCED MODERN ENGINEERING MATHEMATICS', Third edition – Pearson education – 2007.

4. ERWIN KREYSZIG ' ADVANCED ENGINEERING MATHEMATICS' Eighth Edition – WILEY INDIA – 2007.

EE2201 MEASUREMENTS AND INSTRUMENTATION 3 0 0 3

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 – Data Loggers

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 – Smart sensors.

L = 45 Total = 45 Periods

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, 2007.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004.
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.

EE2202 ELECTROMAGNETIC THEORY 3 1 0 4

AIM

This subject aims to provide the student an understanding of 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.

1. INTRODUCTION 8

Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems- vector calculus – Gradient, Divergence and Curl - 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 – Electric potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectric -Dielectric polarization - Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations – Capacitance- Energy density.

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 – Forces and Energy in quasi-stationary Electromagnetic Fields - 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 – Transmission lines – Line equations – Input impedances – Standing wave ratio and power.

L = 45 T = 15 Total : 60 Periods

TEXT BOOKS

1. Mathew N. O. SADIKU, 'Elements of Electromagnetics', Oxford University press Inc. First India edition, 2007.
2. Ashutosh Pramanik, 'Electromagnetism – Theory and Applications', Prentice-Hall of India Private Limited, New Delhi, 2006.

REFERENCE BOOKS

1. Joseph. A.Edminister, 'Theory and Problems of Electromagnetics', Second edition, Schaum Series, Tata McGraw Hill, 1993.
2. William .H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill edition, 2001.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 1999.

GE2211 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

(Common to EEE, EIE, ICE, Biotech, Chemical, Fashion, Plastic, Polymer & Textile)

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.

OBJECTIVES

- 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.

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Definition, Scope and Importance – Need For Public Awareness – Forest Resources:- Use and Over - Exploitation, Deforestation, Case Studies, Timber Extraction, Mining, Dams and their Ground Water, Floods, Drought, Conflicts Over Water, Dams - Benefits and Problems – Mineral Resources:- Use Effects on Forests and Tribal People – Water Resources:- Use and Over-Utilization of Surface 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.

ECOSYSTEMS AND BIODIVERSITY 9

Concepts 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 and Birds - Field Study of Simple Ecosystems – Pond, River, Hill Slopes, etc.

ENVIRONMENTAL POLLUTION **9**

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

SOCIAL ISSUES AND THE ENVIRONMENT **9**

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.

HUMAN POPULATION AND THE ENVIRONMENT **9**

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 PERIODS

TEXT BOOKS

1. Masters, G.M., “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., 2nd Edition, 2004.
2. Miller, T.G. Jr., “Environmental Science”, Wadsworth Pub. Co.
3. Townsend C., Harper, J. and Begon, M., “Essentials of Ecology”, Blackwell Science, 2003.
4. Trivedi, R.K., and Goel, P.K., “Introduction to Air Pollution”, Techno- Science Publications.

REFERENCE BOOKS

1. Erach, B., “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., Ahmedabad, India.
1. Trivedi, R.K., “Handbook of Environmental Law’s, Rules, Guidelines,Compliances and Standards”, Vol - I and II, Envio Media.
2. Cunningham., Cooper, W.P. and Gorhani, T.H., “Environmental Encyclopedia”, Jaico Publishing House, Mumbai, 2001.
4. Wages, K.D., “Environmental Management”, W.B. Saunders Co., Philadelphia, USA, 1998.

EE2203 ELECTRONIC DEVICES AND CIRCUITS 3 0 0 3

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. PN DIODE AND ITS APPLICATIONS 9

PH junction diode-VI characteristics – Rd, temperature effects – Drift ad diffusion currents – switching – Rectifiers: HWR, FWR, BR, filters-Zener diode – VI characteristics, Regulators (series and shunt), LED, LCD characteristics and applications.

2. BJT AND ITS APPLICATIONS 9

Junction transistor – Transistor construction – Input and output characteristics – CE, CB and CC configurations – hybrid model – Analytical expressions – switching – RF application – Power transistors – Opto couplers.

3. FET AND ITS APPLICATIONS 9

FET – VI characteristics, VP, JFET – small signal model – LF and HF equivalent circuits – CS and CD amplifiers –cascade and cascade – Darlington connection – MOSFET - Characteristics – enhancement and depletion

4. AMPLIFIERS AND OSCILLATORS 9

Differential amplifiers: CM and DM – condition for ofc-feedback amplifiers – stability – Voltage / current, series / shunt feedback – oscillators – LC, RC, crystal

5. PULSE CIRCUITS 9

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

TOTAL : 45 PERIODS

TEXT BOOK

1.Paynter, “Introductory lectronic devices and circuits, 2006, PHI
2.David Bell “Electronic Devices and Circuits” 2007, PHI

REFERENCES

1.Theodre F.Boghert, “Electronic Devices & Circuits” Pearson Education, VI Edition, 2003
2. Rashid, “Microelectronic circuits” Thomson Publication, 1999
3. B.P.Singh & Rekha Sing, “Electronic Devices and Integrated Circuits” Pearson Education, 2006.

EE2204 DATA STRUCTURES AND ALGORITHMS 3 1 0 4

(Common to EEE, EIE & ICE)

Aim: To master the design and applications of linear, tree, and graph structures. To understand various algorithm design and analysis techniques.

UNIT I LINEAR STRUCTURES 9

Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists – Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues

UNIT II TREE STRUCTURES 9

Need for non-linear structures – Tree ADT – tree traversals – left child right sibling data structures for general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT

UNIT III BALANCED SEARCH TREES AND INDEXING 9

AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear probing

UNIT IV GRAPHS 9

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – biconnectivity – euler circuits – applications of graphs

UNIT V ALGORITHM DESIGN AND ANALYSIS 9

Greedy algorithms – Divide and conquer – Dynamic programming – backtracking – branch and bound – Randomized algorithms – algorithm analysis – asymptotic notations – recurrences – NP-complete problems

L : 15 TOTAL : 45 PERIODS

TEXT BOOKS

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education Asia, 2002.
2. ISRD Group, “Data Structures using C”, Tata McGraw-Hill Publishing Company Ltd., 2006.

REFERENCES

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
2. R. F. Gilberg, B. A. Forouzan, “Data Structures: A Pseudocode approach with C”, Second Edition, Thomson India Edition, 2005.
3. Sara Baase and A. Van Gelder, “Computer Algorithms”, Third Edition, Pearson Education, 2000.
4. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition, Prentice Hall of India Ltd, 2001.

EE2207	ELECTRON DEVICES AND CIRCUITS LABORATORY (B.E. (EEE), B.E. (E&I) and B.E. (I & C) (Revised)	L T P C 0 0 3 2

1. Characteristics of Semiconductor diode and Zener diode.
2. Characteristics of Transistor under common emitter, common collector and common base configurations.
3. Characteristic of FET.
4. Characteristic of UJT.
5. Characteristics of SCR, DIAC and TRIAC.
6. Photo diode, phototransistor Characteristics and study of light activated relay circuit.
7. Static characteristics of Thermistors.
8. Single phase half wave and full wave rectifiers with inductive and capacitive filters.
9. Differential ampliers using FET.
10. Study of CRO.
11. Series and Parallel reasonance circuits.
12. Realization of Passive filters.

P: 45 Total : 45

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
1.	Regulated Power Supply	15		
2.	Dual Tree CRO (20 MHz)	15		
3.	Function Generator	15		
4.	$3^{1/2}$ Digit digital multimeter	10		
5.	Bread Boards	40		
6.	Transistor	25 Nos.		
7.	JFET	10 Nos.		
8.	Diode	10 Nos.		
9.	Zener Diode	5 Nos.		
10.	UJT	5 Nos.		
11.	Photo Diode	5 Nos.		
12.	Photo Transistor	5 Nos.		
13.	Thermistors	5 Nos.		
14.	OP-amp	10 Nos.		
15.	Milli Ammeter (0-100mA)	15 Nos.		
16.	Micro Ammeter (0-50μA)	10 Nos.		
17.	Low range voltmeter (0-30V)	10 Nos.		
18.	Resistor of various ranges	50 Nos.		
19.	Capacitors of various ranges	50 Nos.		
20.	Connecting wires	Sufficient Nos		

EE2209 DATA STRUCTURES AND ALGORITHMS LABORATORY 0 0 3 2

(Common to EEE, EIE& ICE)

Aim:

To develop skills in design and implementation of data structures and their applications.

1. Implement singly and doubly linked lists.
2. Represent a polynomial as a linked list and write functions for polynomial addition.
3. Implement stack and use it to convert infix to postfix expression
4. Implement array-based circular queue and use it to simulate a producer-consumer problem.
5. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
6. Implement binary search tree.
7. Implement insertion in AVL trees.
8. Implement priority queue using heaps
9. Implement hashing techniques
10. Perform topological sort on a directed graph to decide if it is acyclic.
11. Implement Dijkstra's algorithm using priority queues
12. Implement Prim's and Kruskal's algorithms
13. Implement a backtracking algorithm for Knapsack problem
14. Implement a branch and bound algorithm for traveling salesperson problem
15. Implement any randomized algorithm.

TOTAL : 45 PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
	Hardware Required			
1.	Computer(Pentium 4)	40 Nos with one server		
2.	Dot matrix printer	3 Nos		
3.	Laser Printer	2 Nos		
4.	UPS (5 KVA)	2		
	Software Required			
5.	Turbo C	40 Nodes		

EE2208 MEASUREMENTS AND INSTRUMENTATION LABORATORY 0 0 3 2

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

MA2264 **NUMERICAL METHODS** **3 1 0 4**

(Common to Civil, Aero & EEE)

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

Solution of equation - Fixed point iteration: x=g(x) method – Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods - Iterative methods - Gauss-Seidel methods - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

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

Differentiation using interpolation formulae –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 methods for First 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. VEERARJAN,T and RAMACHANDRAN.T, 'NUMERICAL MEHODS with programming in 'C' Second Edition Tata McGraw Hill Pub.Co.Ltd, First reprint 2007.
2. SANKAR RAO K' NUMERICAL METHODS FOR SCIENTISITS AND ENGINEERS –3rd Edition Princtice Hall of India Private, New Delhi, 2007.

REFERENCE BOOKS

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, 'Numerical Methods', S.Chand Co. Ltd., New Delhi, 2003.
2. GERALD C.F. and WHEATE, P.O. 'APPLIED NUMERICAL ANALYSIS'… Edition, Pearson Education Asia, New Delhi.

EE 2251 ELECTRICAL MACHINES – I 3 1 0 4

AIM

To expose the students to the basic principles of Electro mechanical Energy Conversion in Electrical Apparatus and the operation of Transformers and DC Machines.

OBJECTIVES

i. To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
ii. To introduce the principles of electromechanical energy conversion in singly and multiply excited systems.
iii. To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
iv. To study the working principles of DC machines as Generator and Motor, types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
v. To estimate the various losses taking place in D.C. machines and to study the different testing methods to arrive at their performance.

1. INTRODUCTION 6

Electrical machine types – Magnetic circuits – Inductance – Statically and Dynamically induced EMF - Torque – Hysteresis- Core losses - AC operation of magnetic circuits.

2. TRANSFORMERS 10

Construction – principle of operation – equivalent circuit – losses – testing – efficiency and voltage regulation – auto transformer – three phase connections – parallel operation of transformers – tap changing.

3. ELECTROMECHANICAL ENERGY CONVERSION 9

Energy in magnetic systems – field energy, coenergy and mechanical force – singly and multiply excited systems.

4. BASIC CONCEPTS IN ROTATING MACHINES 9

Generated voltages in ac and dc machines, mmf of distributed windings – magnetic fields in rotating machines – rotating mmf waves – torque in ac and dc machines.

5. DC MACHINES 11

Construction – EMF and torque – circuit model – armature reaction – commutation – methods of excitation – characteristics of generators – characteristics of motors – starting and speed control – testing and efficiency – parallel operation.

L = 45 T = 15 Total = 60

TEXT BOOK

1. Nagrath I. J and Kothari D. P. 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 1990.
2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCES

1. Fitzgerald.A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', McGraw Hill Books Company, 1992.
2. P. C. Sen., 'Principles of Electrical Machines and Power Electronics', John Wiley&Sons, 1997.
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

EE2252 POWER PLANT ENGINEERING 3 1 0 4

AIM

Expose the students to basics of various power plants so that they will have the comprehensive idea of power system operation.

OBJECTIVES

To become familiar with operation of various power plants.

1 THERMAL POWER PLANTS

Basic thermodynamic cycles, various components of steam power plant-layout-pulverized coal burners- Fluidized bed combustion-coal handling systems-ash handling systems- Forced draft and induced draft fans- Boilers-feed pumps-super heater-regenerator-condenser- dearearators-cooling tower

2 HYDRO ELECTRIC POWER PLANTS

Layout-dams-selection of water turbines-types-pumped storage hydel plants

3 NUCLEAR POWER PLANTS

Principles of nuclear energy- Fission reactions-nuclear reactor-nuclear power plants

4 GAS AND DIESEL POWER PLANTS

Types, open and closed cycle gas turbine, work output & thermal efficiency, methods to improve performance-reheating, intercoolings, regeneration-advantage and disadvantages- Diesel engine power plant-component and layout

5 NON-CONVENTIONAL POWER GENERATION

Solar energy collectors, OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation, thermionic power generation

TEXT BOOKS

1. A Course in Power Plant Engineering by Arora and Domkundwar, Dhanpat Rai and Co.Pvt.Ltd., New Delhi.

2. Power Plant Engineering by P.K. Nag, Tata McGraw Hill, Second Edition , Fourth reprint 2003.

REFERENCES

1. Power station Engineering and Economy by Bernhardt G.A.Skrotzki and William A. Vopat- Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002.
2. An introduction to power plant technology by G.D. Rai-Khanna Publishers, Delhi-110 005.
3. Power Plant Technology, M.M. El-Wakil McGraw Hill 1984.

EE2253 **CONTROL SYSTEMS** **3 1 0 4**

(Common to EEE, EIE & ICE)

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 to desire their transfer function models.

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

iii To accord basic knowledge in 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 – 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. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

REFERENCE BOOKS

1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.

EE2254 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS 3 0 0 3

(Common to EEE, EIE & ICE)

AIM

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

OBJECTIVES

i. To study the IC fabrication procedure.
ii. To study characteristics; realize 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. Fabrication of diodes, capacitance, resistance and FETs.

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. (2000)
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

EE2255 DIGITAL LOGIC CIRCUITS 3 1 0 4

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.
v. To introduce digital simulation techniques for development of application oriented logic circuit.

1. BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS 9

Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method, Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers.

2. SYNCHRONOUS SEQUENTIAL CIRCUITS 9

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

3. ASYNCHRONOUS SEQUENCTIAL CIRCUIT 9

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

4. PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES 9

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

5. VHDL

RTL Design – combinational logic – Types – Operators – Packages – Sequential circuit – Sub programs – Test benches. (Examples: adders, counters, flipflops, FSM, Multiplexers / Demltiplexers).

L = 45 T = 15 Total = 60

TEXT BOOKS

1. Raj Kamal, ' Digital systems-Principles and Design', Pearson education 2nd edition, 2007
2. M. Morris Mano, 'Digital Design', Pearson Education, 2006.
3. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCES

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Floyd and Jain, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
3.John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.
4. Tocci, "Digital Systems : Principles and aopplications, 8th Edition" Pearson Education.

EE2257 CONTROL SYSTEM LABORATORY **0 0 3 2**

1. Determination of transfer function of DC Servomotor
2. Determination of transfer function of AC Servomotor.
3. Analog simulation of Type - 0 and Type – 1 systems
4. Determination of transfer function of DC Generator
5. Determination of transfer function of DC Motor
6. Stability analysis of linear systems
7. DC and AC position control systems
8. Stepper motor control system
9. Digital simulation of first systems
10. Digital simulation of second systems

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	: 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.
2. Variable frequency square wave generator and a normal CRO - 1 No

   (or)

   DC source and storage Oscilloscope - 1 No

4. Determination of Transfer function of DC Generator

Aim

To determine the transfer function of DC generator

Exercise

1. Obtain the transfer function of DC generator by calculating τ and gain

Equipment

1. DC Generator
2. Tachometer
3. Various meters
4. Stop watch

5. Determination of Transfer function of DC Motor

Aim

To determine the transfer function of DC motor

Exercise

1. Obtain the transfer function of DC motor by calculating τ and gain

Equipment

1. DC Motor
2. Tachometer
3. Various meters
4. Stop watch

6. 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

7. DC and AC position Control system

Aim

To study the AC and DC position control system and draw the error characteristics between setpoint and error.

Exercise

1. To study various positions and calculate the error between setpoint and output. position
2. To measure outputs at various points (between stages)

Equipment

1. AC and DC position control kit with DC servo motor.
2. Power transistor
3. Adder

8. Stepper Motor Control System

Aim

To study the working of stepper motor

Exercise

1. To verify the working of the stepper motor rotation using microprocessor.

Equipment

1. Stepping motor
2. Microprocessor kit
3. Interfacing card
4. Power supply

9. Digital Simulation of First order System

Aim

To digitally simulate the time response characteristics of first -order system

Exercise

1. Write a program or build the block diagram model using the given software.
2. Obtain the impulse, step and sinusoidal response characteristics.
3. Identify real time systems with similar characteristics.

Equipment

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

10. Digital Simulation of Second order Systems

Aim

To digitally simulate the time response characteristics of second -order system

Exercise

1. Write a program or build the block diagram model using the given software.
2. Obtain the impulse, step and sinusoidal response characteristics.
3. Identify real time systems with similar characteristics.

Equipment

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

EE2258 LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY 0 0 3 2

(Common to EEE, EIE & ICE)

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

2. Implementation of Boolean Functions, Adder/ Subtractor circuits.
[Minimizations 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 ICs .

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 ICs.

Exercise
1. Decimal to binary Conversion using dedicated ICs.
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.

Requirement for a batch of 30 students

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
1.	Interface such as, A/D, D/A converter, DMA, PIC Serial, Interface, Temperatures controller, Stepper motor, Key board	4 each		
2.	CRO and function generator	3 each		
3.	IC trainer Kit	15		
4.	Analog AC trainer kit	4		
5.	Components and bread boards	10 each		
6.	Chips IC – 7400	10		
7.	Chips IC – 7402	10		
8.	Chips IC – 7408	10		
9.	Chips IC – 7432	10		

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
10.	Chips IC – 7410	25		
11.	Chips IC – 555	10		
12.	Chips IC – 741	10		
13.	Chips IC – 74153	10		
14.	Chips IC – 7474	10		
15.	Chips IC – 7490	10		
16.	Chips IC – 7447	10		
17.	Chips IC – 7476	10		
18.	Chips IC – 7420	10		
19.	Chips IC – 7404	15		
20.	Chips LM – 317	10		
21.	Chips LM – 723	10		
22.	Chips MA – 7840	10		
23.	Chips LM – 380	10		
24.	Chips ICL - 8038	10		
25.	Traffic light control kit	2		
26.	VDU	2		
27.	7 segment Display	5		
28.	Interfacing card such as keyboard etc.	3 each		
29.	Work tables	15		

EE2259 ELECTRICAL MACHINES LABORATORY – I 0 0 3 2

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 separately and self excited DC shunt generators.
2. Load characteristics of DC compound generator with differential and cumulative connection.
3. Load characteristics of DC shunt and compound motor.
4. Load characteristics of DC series motor.
5. Swinburne's test and speed control of DC shunt motor.
6. Hopkinson's test on DC 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.

TOTAL: 45 PERIODS

Requirement for a batch of 30 students

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
1.	D.C motor – Generator set D.C motor – Shunt Generator D.C motor – Compound Generator	 2 set 2 set		
2.	D.C. Shunt Motor	2 Nos.		
3.	D.C. Series Motor	1 No.		
4.	D.C. Compound Motor	1 No.		
5.	Single phase transformers	7 Nos.		
6.	Three phase transformers	2 Nos.		
7.	D.C. Motor – Alternator set	4 sets		
8.	Three phase Induction Motor (Squirrel cage)	3 Nos.		
9.	Three phase slip ring Induction Motor	1 No.		
10.	Single phase Induction Motor	2 Nos.		
11.	Resistive load 3 phase – 2 , single phase - 3	5 Nos.		
12.	Inductive load	1 No.		
13.	Single phase Auto transformer	5 Nos.		
14.	Three phase Auto transformer	3 Nos.		

15.	Moving Coil Ammeter of different ranges	20 Nos.		
16.	Moving Coil Voltmeter of different ranges	20 Nos.		
17.	Moving Iron Ammeter of different ranges	20 Nos.		
18.	Moving Iron voltmeter of different ranges	20 Nos.		
19.	Wire wound Rheostats of different ratings	30 Nos.		
20.	Tachometers	10 Nos.		
21.	Single element wattmeters of different ranges UPF / LPF	20 Nos.		
22.	Double element wattmeters of different ranges	4 Nos.		
23.	Power factor meter	2 Nos.		
24.	Digital multimeter	5 Nos.		
25.	Three point starter, four point starter,DOL starter, manual star / delta starter, semi automatic and fully automatic star / delta starter	1 No each for study experiment		