DIPLOMA(ELECTRICAL)			
Sr. No.	**Code**	**Name of Paper**	
		Semester - III	
1	EL31	APPLIED ELECTRONICS	
2	EL32	ELECTRICAL TECHNOLOGY	
3	EL33	ELECTRICAL ENGINEERING MATERIAL	
4	EL34	NON CONVENTIONAL ENERGY SOURCE	
5	EL35	ELECTRICAL INSTRUMENTS AND MEASUREMENT	
6	EL36	ELECTRICAL WORKSHOP-1	
7			
		Semester – IV	
1	EL41	ELECTRICAL MACHINE-1	
2	EL42	ELECTRICAL CIRCUIT THEORY	
3	EL43	GENERATION OF ELECTRICAL ENERGY	
4	EL44	ELECTRICAL ESTIMATING AND COSTING	
5	EL45	INSTRUMENTATION	
6	EL46	ELECTRICAL DESIGN AND DRAWING	
7	EL47	ELECTRICAL WORKSHOP-2	
		Semester - V	
1	EL51	ELECTRICAL MACHINE-2	
2	EL52	POWER ELECTRONICS	
3	EL53	TRANSMISSION & DISTRIBUTION	
4	EL54	UTILIZATION OF ELECTRIC POWER	

5	EL55	ELECTRIC TRACTION SYSTEM
	EL56	ELECTROMAGNETIC FIELD THEORY
6	EL56	'C' PROGRAMMING
		Semester - VI
1	EL61	ELECTRICAL MACHINE-3
2	EL62	MICROPROCESSOR AND ITS APPLICATION
3	EL63	SWITCHGEAR AND ITS PROTECTION
4	EL64	ELECTRICAL INTALLATION AND DESIGN
5	EL65	CONTROL SYSTEM ENGINEERING
		ELECTIVE – III
6	EL661	POWER SYSTEM ANALYSIS
6	EL662	ELECTRICAL MACHINE DESIGN
		ELECTIVE – IV
7	EL671	MANAGEMENT
7	EL672	ENTREPRENEURSHIP DEVELOPMENT
7	EL673	PRODUCTION SYSTEM MANAGEMENT

Code	Name of Paper	Lecture	Tutorial
EE31	**APPLIED ELECTRONICS**	3	-

CONTENTS

1. Semiconductors :

1.1 Basic idea of semiconductors. N and P type semi-conductors
1.2 Potential barrier and temperature effect on barrier potential
1.3 Concept of energy band diagram for intrinsic and extrinsic semiconductors

2. Semi Conductor Diode :

2.1 P-N junction diode
2.2 P-N junction diode in forward and reverse bias
2.3 V-I characteristics of forward and reverse bias diodes
2.4 V-I characteristics of zener diode and its applications
2.5 Semiconductor diode as half wave rectifier, its efficiency and ripple factor

2.6 Semiconductor diode as full wave rectifier, its efficiency and ripple factor
2.7 Bridge rectifier, Overall comparison between half wave and other full wave rectifiers
2.8 Peak inverse voltage (PIV)
2.9 Use of filter circuit in rectifiers

2.9.1 L filter
2.9.2 C filter
2.9.3 LC section filter
2.9.4 p section filter

3. Bi-Polar Junction Transistor :

3.1 Concept of transistor
3.2 Types of transistor and their working in forward and reverse bias
3.3 Constants of transistor (a,b,g)
3.4 Analysis of transistor amplifier, load line
3.5 Operating point and biasing
3.6 Input - output characteristics in CB, CC and CE configuration
3.7 Low frequency small signal hybrid equivalent circuit of transistor
3.8 Derivation of voltage, current and power gain, input and output impedance of CE configuration

4. R-C Coupled and Power Amplifier :

4.1 Gain at low, mid and high frequency range, cut off frequencies
4.2 Concept of power amplifiers
4.4 Types of power amplifier
4.5 Class A power amplifier, output power analysis
4.6 Push-pull amplifier.
4.7 Class - B power amplifier

5. Special Devices :

5.1 Construction, operation, equivalent circuit and characteristics of

5.1.1 JFET, MOSFET, CMOS
5.1.2 Semiconductor photo devices such as LED, LDR, photo transistor
5.1.3 Varactor diode

6. Feed Back and Oscillators :

6.1 Basic concept of feedback and types of feedback
6.2 Advantages and disadvantages of negative feedback for gain, stability, frequency and nonlinear distortion
6.3 Voltage series, shunt and current series and shunt feed back circuit
6.4 Use of positive feedback for oscillators
6.5 Barkhausen criteria
6.6 Principles of RC phase shift, Wein bridge oscillator
6.7 Principle of Hartely, Colpits oscillator
6.9 Crystal oscillator and its frequency stability criteria

REFERENCE BOOKS :

1. Integrated Electronics : Millman & Halkias (TMH)
2. Electronics Principle : V.K.Mehta (Student Pub.)

3. Electronics Devices & Circuits : A. Mottershead (PHI)
4. Electronics Principle : Malvino (TMH)
5. Electronics Devices & Circuits : Sanjeev Gupta

Code	Name of Paper	Lecture	Tutorial	Practical
EE32	**ELECTRICAL TECHNOLOGY**	3	2/2	2

CONTENTS

1. D.C. Circuits :

1.1 Resistance, specific resistance, Ohm's law, Resistance in series, parallel and series parallel circuits.
1.2 Kirchhoff's laws
1.3 Application of Kirchhoff's laws

2. Capacitance :

2.1 Capacitor
2.2 Capacitance of an isolated sphere
2.3 Parallel plate capacitor
2.4 Special cases of parallel plate capacitor
2.5 Cylindrical capacitor
2.6 Capacitor in series and parallel
2.7 Capacitor with compound dielectric
2.8 Energy stored in capacitor
2.9 Charging and discharging of a capacitor, time constant
2.10 Different types of capacitor used in various electrical applications.

3. Magnetic Circuits :

3.1 Introduction
3.2 Comparison between magnetic circuit and electric circuits
3.3 Behavior of magnetic circuits
3.4 Composite magnetic circuits
3.5 Parallel magnetic circuits
3.6 B-H curve
3.7 Rise of current in inductive circuit
3.8 Decay of current in inductive circuit
3.9 Eddy current and Eddy current loss

4. Phasor Algebra :

4.1 Mathematical representation of a vector
4.2 Symbolic notation
4.3 Significance of operator-j
4.4 Conjugate complex number
4.5 Trigonometrical form of vector representation
4.6 Exponential form of vector representation
4.7 Polar form of vector representation
4.8 Addition and subtraction of vector

4.9 Multiplication and division of vector quantity
4.10 120o operator

5. A.C. Circuits :

5.1 Alternating quantity and its equation
5.2 Maximum, Average and RMS values.
5.3 Form factor
5.4 Behaviour of R, L and C in A.C. circuits with phasor diagrams
5.5 A.C. through R-L circuit, power factor, active and reactive component of current, power
5.6 Q-factor of a coil
5.7 A.C. through R-C circuit, dielectric loss and power factor of a capacitors
5.8 Solving series R-L-C circuits
5.9 Solving A.C. parallel circuit by phasor diagram and phasor algebra
5.10 Solving A.C. series and parallel circuits.

6. Polyphase System :

6.1 Need and advantage of 3-phase system
6.2 Generation of 3-phase voltage
6.3 Phase sequence
6.4 Star-Delta connections
6.5 Phase and Line relations of voltage and current in star -delta connections (for balanced load)
6.6 Expression of power in 3-phase circuits (for balanced load)

7. Battery :

7.1 Types of storage batteries
7.2 Construction and working of Lead acid batteries and Ni-Fe batteries
7.3 Discharging and recharging of Lead acid batteries
7.4 Care of Lead acid batteries
7.5 Ampere and watt-hour efficiencies

REFERENCE BOOKS :

1. Electrical Engineering(Hindi & English) : K.D.Sharma
2. Electrical Technology : B.L.Theraja
3. Electrical Engineering (Part-I) : D.R.Nagpal
4. Electrical Technology : J.B.Gupta
5. Basic Electrical Engg. : V.N. Mittal
6. Basic Electrical Engg. : Nagrath & Kothari

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Code	Name of Paper	Lecture	Tutorial	Practical
EE33	**ELECTRICAL ENGINEERING MATERIALS**	3	2/2	-

CONTENTS

1. Classification :

1.1 General requirement of electrical engineering materials,
1.2 Classification of materials into conducting, semi-conducting and insulating materials through a brief reference to atomic structure

2. Conducting Materials :

2.1 Resistivity
2.2 Factors affecting resistivity such as

- 2.2.1 Temperature
- 2.2.2 Alloying
- 2.2.3 Aging effect

2.3 Classification of conducting materials into -

- 2.3.1 Low resistivity materials
- 2.3.2 High resistivity materials

3. Low Resistivity Materials :

3.1 General properties of copper, aluminium and steel as conductors

- 3.1.1 Resistivity
- 3.1.2 Temperature coefficient
- 3.1.3 Contact resistance
- 3.1.4 Melting point
- 3.1.5 Density

3.2 Mechanical properties of hard and annealed copper, aluminium and low and high tensile steel

- 3.2.1 Mechanical strength
- 3.2.2 Resistance to corrosion
- 3.2.3 Ductility
- 3.2.4 Solderability etc.

3.3 Use of copper, aluminium with steel as a conductors and their comparison

4. High Resistivity Materials :

4.1 General properties, composition and use of high resistivity materials as

- 4.1.1 Nichrome
- 4.1.2 Eureka
- 4.1.3 Manganin
- 4.1.4 German silver
- 4.1.5 Tungsten
- 4.1.6 Platinum

4.2 Materials for lamp filaments and their properties

5. Contact Materials :

5.1 General properties and uses of contact materials such as

- 5.1.1 Silver
- 5.1.2 Tungsten
- 5.1.3 Copper

6. Brush Materials :

6.1 General properties and uses of brush materials such as

6.1 Carbon
6.2 Electro graphite
6.3 Metal graphite

7. Insulating Materials :

7.1 Electrical properties

7.1.1 Volume resistivity
7.1.2 Surface resistance
7.1.3 Dielectric strength
7.1.4 Dielectric constant

7.2 Physical properties

7.2.1 Specific gravity
7.2.2 Viscosity
7.2.3 Hygroscopicity

7.3 Thermal properties

7.3.1 Heat resistance
7.3.2 Thermal conductivity
7.3.3 Ignitibility
7.3.4 Thermal expansion and contraction
7.3.5 Thermal stability of composition

7.4 Chemical properties

7.4.1 Solubility
7.4.2 Chemical resistance
7.4.3 Weatherability

7.5 Classification of insulating materials on the basis of temperature limit
7.6 Composition, properties and applications of

7.6.1 Fibrous materials
7.6.2 Ceramics
7.6.3 Mica and mica products
7.6.4 Asbestos and asbestos products
7.6.5 Glass and glass products
7.6.6 Natural and synthetic rubber
7.6.7 PVC
7.6.7 Bakelite

7.7 Properties of liquid insulating materials such as

7.7.1 Transformer oils
7.7.2 Mineral insulating oils

7.8 Properties of gaseous insulating materials such as

7.8.1 Hydrogen
7.8.2 Air
7.8.3 SF6

8. Magnetic Materials :

8.1 Terminology and classification

8.1.1 Diamagnetic material
8.1.2 Paramagnetic material
8.1.3 Ferromagnetic material

8.2 Effect of Curie temperature
8.3 Hysteresis loop
8.4 Soft and hard magnetic materials
8.5 Different magnetic materials such as

8.5.1 Soft ferrites
8.5.2 Silicon steel
8.5.3 Nickel Iron alloys
8.5.4 Cobalt steel
8.5.5 Tungsten steel
8.5.6 ALNICO
8.5.7 ALNI

9. Semiconducting Materials and their Properties :
10. Special Purpose Materials :

10.1 Metals/ alloys for fuses with their properties composition & uses
10.2 Composition and properties of soldering materials
10.3 Materials for thermocouple
10.4 Materials for bimetal
10.5 Super conductivity and super conducting materials application and recent trend in this field.

REFERENCE BOOKS :

1. Electrical Engineering Materials : T.T.T.I. Madras
2. Electrical Engineering Materials : Raina, Bhattacharya
3. Electrical Engg. Materials : B.R. Sharma

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Code	Name of Paper	Lecture	Tutorial	Practical
EE34	**NON-CONVENTIONAL ENERGY SOURCES**	3	2/2	-

CONTENTS

1. Sources of Energy :

1.1 Different sources
1.2 Application of sources with reference to Rajasthan

2. Solar Energy :

2.1 Application
2.2 Unit of solar power and solar energy
2.3 Historical review and future prospects
2.4 Schematic diagram of a solar thermal power plant
2.5 Solar central receiver thermal power plant
2.6 Solar pond thermal plant
2.7 Solar thermal power supply system for space station
2.8 Introduction to photo voltaic system
2.9 Merits and limitation of solar PV system
2.10 Principle of photo voltaic cell
2.11 V-I characteristics of solar cell
2.12 Efficiency of a solar cell
2.13 Transparent, insulating and absorbing materials
2.14 Building heating by active and passive system
2.15 Solar still, solar dryer and solar cooker
2.16 Solar seasoning of timber

3. Wind Energy :

3.1 Introduction to wind energy
3.2 Merits and demerits of wind energy
3.3 Wind power and energy pattern factor
3.4 Wind machine

3.4.1 Horizontal axis wind machine
3.4.2 Vertical axis wind machine

3.5 Site selection of a wind machine
3.6 Maintenance of a wind machine
3.7 Efficiency of a wind machine
3.8 Application of a wind machine

4. Bio-Gas Energy :

4.1 Introduction to bio-gas energy
4.2 Properties of bio-gas
4.3 Principle of bio-gas production
4.4 Chemical and microbiological processors
4.5 Factors which affects bio-gas production
4.6 Different feed stocks for bio-gas production
4.7 Classification of bio-gas plant

4.7.1 Fixed dome type
4.7.2 Floating type

4.8 Comparison between fixed dome and floating type bio-gas plant
4.9 Site selection of bio-gas plant
4.10 Selection of size and specification of bio-gas plant
4.11 Water removing devices

4.12 Maintenance of bio-gas plants
4.13 Bio gas lamp and chulha
4.14 Bio gas storage and transportation
4.15 Purification of bio-gas
4.16 Environmental effect of bio-gas plant
4.17 Visit to a bio-gas plant
4.18 Preparation of a project report on a bio-gas plant

5. Ocean Energy :

5.1 Introduction to ocean energy
5.2 Types of ocean energy

5.2.1 Open cycle
5.2.2 Closed cycle

6. Appropriate Technology :

6.1 Introduction to appropriate technology
6.2 Concepts of appropriate technology
6.3 Need of appropriate technology
6.4 Merits and demerits
6.5 Comparison between appropriate and modern technology
6.6 Application

REFERENCE BOOKS :

1. Energy technology : S.Rao & B.B. Parulekar
2. Non-conventional Energy Sources : A.N. Mathur & N.S.Rathore
3. Non-conventional Sources of energy and appropriate technology : D.M. Agrawal & S.K. Bhatnagar
4. Non-conventional Energy Sources : G.D.Rai
5. Solar Energy : Garg & Prakash

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Code	Name of Paper	Lecture	Tutorial	Practical
EE35	**ELECTRICAL INSTRUMENTS AND MEASUREMENT**	2	-	2

CONTENTS

1. Classification of Measuring Instruments :

1.1 Indicating, recording and integrating instruments
1.2 Accuracy and sensitivity
1.3 Types of errors
1.4 Deflecting, controlling and damping torque
1.5 Construction, working principle and operation of PMMC, moving iron (MI), dynamometer type ammeter and voltmeter.
1.6 Rectifier type instruments

1.7 Electrostatic voltmeter
1.8 Range extension using shunts and multipliers

2. Wattmeters and Energy Meters :

2.1 Construction, operation and working principles

2.1.1 Dynamometer type wattmeter
2.1.2 Induction type wattmeter

2.2 Blondels theorem and measurement of power by two wattmeter method in 3-phase circuits
2.3 Single phase and three phase induction type energy meter
2.4 Testing of single phase induction type energy meter by direct and phantom loading.
2.5 Adjustments of single phase induction type energy meter
2.6 Brief study of static energy meter (single and 3 phase)

3. Measurement of Resistance :

3.1 Classification of resistance
3.2 Measurement of low resistance by Kelvin's double bridge
3.3 Measurement of medium resistance by Ammeter and Voltmeter, Whetstone's bridge, Substitution methods
3.4 Measurement of high resistance and insulation resistance
3.5 Megger, Earth tester and Ohmmeter

4. Potentiometers :

4.1 Types of A.C. and D.C. potentiometers
4.2 Construction
4.3 Standardisation
4.4 Applications

5. A.C. Bridges :

5.1 General equation for bridge balance
5.2 Maxwell's inductance bridge
5.3 Maxwell's inductance - capacitance bridge
5.4 Anderson's bridge
5.5 Schering bridge
5.6 Wein's bridge for frequency measurements

6. Brief study of:

6.1 CRO
6.2 Electronic voltmeter

REFERENCE BOOKS :

1. Electrical Measurement & Instrumentation : A.K.Sawhney
2. Electrical Measurement & Instruments : J.B.Gupta
3. Electrical Measurement : E.W.Golding
4. Electrical Measurement : D.R.Nagpal

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Code	Name of Paper	Lecture	Tutorial	Practical

EE36	**ELECTRICAL WORKSHOP - I**	2	-	6

CONTENTS

1. Wiring :

1.1 System of wiring
1.2 Types of wiring and their application

2. Wire Joints :

2.1 Different types of joints
2.2 Their uses

3. Wiring Diagram of Different Lamp Control Circuits and Their Working :

3.1 Bell indicator
3.2 Fluorescent tube (single and double)
3.3 Mercury vapour lamp
3.4 Sodium vapour lamp
3.5 Neon sign lamp
3.6 Flasher

4. Study the Following Circuit :

4.1 Emergency light
4.2 Voltage stabilizer
4.3 Domestic refrigerator

5. Fault Investigation and Testing :

5.1 Specification, wiring, dismantling, fault investigation, repairing, assembling and testing the following electrical appliances -

5.1.1 Electric heater
5.1.2 Electric immersions heater
5.1.3 Room heater
5.1.4 Electric kettle
5.1.5 Electric soldering iron

6. Automobile Electrical System :

6.1 Dynamo
6.2 Self starter
6.3 Voltage regulator
6.4 Ignition coil
6.5 Lighting circuit

6.5.1 Four wheeler
6.5.2 Two wheeler

Code	Name of Paper	Lecture	Tutorial	Practical

EE41	**ELECTRICAL MACHINES - I**	2	2/2	2

CONTENTS

1. D.C. Generator :

1.1 Construction of D.C. machine
1.2 Lap and wave winding (Brief idea)
1.3 Principle of D.C. generator
1.4 Excitation methods and different types of D.C. Generator
1.5 E.M.F. equation
1.6 D.C. generator characteristics
1.7 Losses
1.8 Efficiency and condition for maximum efficiency
1.9 Concept of armature reaction
1.10 Effect of armature reaction on commutation and generated voltage.

2. D.C. Motor :

2.1 Different types of D.C. motor
2.2 Principle of D.C. motor
2.3 Concept of back emf
2.4 Torque, speed and power relations
2.5 Starters for D.C. shunt and compound motors
2.6 Characteristics of D.C. motor
2.7 Speed control of D.C. motor
    2.7.1 Field control
    2.7.2 Armature control
    2.7.3 Series parallel control
2.8 Testing of D.C. machine by
    2.8.1 Direct loading
    2.8.2 Swineburn's test
    2.8.3 Hopkinson's test and
    2.8.4 Calculation of efficiency as a generator and motor from above test

3. Transformer :

3.1 Construction of single phase and three phase transformer
3.2 Principle of operation
3.3 Emf equation and Turn ratio
3.4 Idea of leakage reactance
3.5 Transformer phasor diagram
    3.5.1 At no load
    3.5.2 At load (Lagging, Leading and UPF)
3.6 Equivalent circuit of single phase transformer
3.7 Losses, efficiency and regulation
3.8 Condition for maximum efficiency

3.9 All day efficiency
3.10 Transformer testing

3.10.1 By direct loading
3.10.2 By open circuit and short circuit test

3.10.2.1 Determination of equivalent circuit parameters

3.10.3 Back to back test

3.11 Parallel operation of single-phase transformer with equal and unequal voltage ratio.
3.12 Off load and on load tap changers
3.13 Auto transformer
3.14 Poly phase connection (Descriptive study)

3.14.1 Scott connection
3.14.2 Open-Delta connection
3.14.3 Star-Star connection
3.14.4 Delta - Delta connection

3.15 Parallel operation of 3-phase transformer

Code	Name of Paper	Lecture	Tutorial	Practical
EE42	**ELECTRICAL CIRCUIT THEORY**	2	2/2	-

CONTENTS

1. Network Parameters :

1.1 Active and passive
1.2 Linear and non-linear
1.3 Unilateral and bilateral
1.4 Lumped and distributed
1.5 Time varying and time invariant parameters
1.6 Voltage and current sources (ideal and practical)
1.7 Dependent and Independent sources
1.8 Source conversion techniques

2. Network Theorems :

2.1 Kirchhoff's law, node and mesh analysis, Solution by Kramer's rule up to three variables
2.2 Superposition theorem
2.3 Thevenin's theorem
2.4 Norton's theorem
2.5 Maximum power transfer theorem
2.6 Tellegen's theorem
2.7 Star-delta transformation
2.8 Millman's theorem

3. Resonance :

3.1 Series resonance
3.2 Parallel resonance
3.3 Q-factor, bandwidth, selectivity, half power frequencies, graphical representations
3.4 Importance of resonance

4. Circuit Transients :

4.1 Introduction to Laplace transform and inverse Laplace transformations
4.2 Laplace transformation of following functions

- 4.2.1 Unit impulse function
- 4.2.2 Unit step function
- 4.2.3 Exponential function
- 4.2.4 Ramp function
- 4.2.5 Sinusoidal function
- 4.2.6 Derivative function
- 4.2.7 Integral function

4.3 Laplace transformation theorem

- 4.3.1 Shifting Theorem
- 4.3.2 Shift in 's' domain theorem
- 4.3.3 Complex differentiation theorem
- 4.3.4 Final value theorem
- 4.3.5 Initial value theorem
- 4.3.6 Complex integration theorem

4.4 Solution of series RL, RC and RLC circuits by Laplace transformation

5. Two Port Network :

5.1 z-parameters
5.2 y-parameters
5.3 h-parameters
5.4 ABCD- parameters
5.5 Inter relation among z,y,h and ABCD parameters.
5.6 Special types of network such as T, p, Bridge - T, Parallel-T and Lattice.

6. Complex Frequency and Pole-Zero Diagram :

6.1 Concept of complex frequency
6.2 Poles and zeros of simple function
6.3 Ploting of poles and zero diagram of a simple function (up to second order)
6.4 Necessary conditions of pole and zero locations of driving point functions.

REFERENCE BOOKS :

1. Electrical Networks : Soni & Gupta
2. Electrical Network Analysis : Umesh Sinha
3. Electrical Network Analysis : G.K.Mithal
4. Text Book of Circuit Theory : G.S. Verma
5. Electrical Circuit : M.E. Valvenkerberg

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Code	Name of Paper	Lecture	Tutorial	Practical
EE43	**GENERATION OF ELECTRICAL ENERGY**	2	2/2	-

CONTENTS

1. Introduction :

1.1 Electrical energy demand and electrical energy growth in India
1.2 Electrical energy growth in India
1.3 Electrical energy sources
1.4 Fossil fuels and nuclear fuels
1.5 Preesent status of electrical demand in Rajasthan

2. Load and Load Curves :

2.1 Types of load
2.2 Variation in demand, chronological load curve
2.3 Load duration curve, energy load curve
2.4 Load factor, capacity factor, diversity factor, connected load, maximum demand, utilisation factor etc.
2.5 Base load and peak load plants

3. Tariffs and Power Factor Improvement :

3.1 Objectives of tariff
3.2 General tariff form and types of tariff

3.2.1 Flat rate
3.2.2 Straight meter rate
3.2.3 Block meter rate
3.2.4 Hopkinson demand tariff
3.2.5 Doherty demand rate
3.2.6 Wright demand rate
3.3 Present tariff pattern in Rajasthan

4. Power Factor Improvement :

4.1 Meaning of power factor
4.2 Causes of low power factor
4.3 Effects of low power factor
4.4 Advantages of power factor improvement
4.5 Methods of power factor improvement
4.6 Location of shunt capacitors

5. Thermal Power Station :

5.1 Selection of plant location
5.2 Block diagram of plant and its working
5.3 Coal handling plant
5.4 Pulverising plant

5.5 Draft system
5.6 Boilers
5.7 Ash handling plant
5.8 Turbine
5.9 Different types of condensers
5.10 Cooling towers and ponds
5.11 Feed water heater
5.12 Economiser
5.13 Super heater and reheater
5.14 Air preheater

6. Hydro Electric Power Plants :

6.1 Selection of site
6.2 Advantages and disadvantages of hydro power plant
6.3 Hydrology
6.4 Classification based on

6.1.1 Water flow regulations
6.1.2 Load
6.1.3 Head

6.5 Element of hydro power plant and their functions

6.5.1 Dam
6.5.2 Storage reservoir
6.5.3 Fore bay
6.5.4 Surge tank
6.5.6 Pen stocks
6.5.7 Spill way
6.5.8 Head race and tailrace
6.5.9 Types of turbines
6.5.10. Specific speed

6.6 Brief idea about small and mini hydro plants
6.7 Pumped storage plant

7. Nuclear Power Station :

7.1 Introduction and selection of site
7.2 Block diagram of plant and its working
7.3 Main components and their function
7.4 Energy mass relationship
7.5 Energy due to fission and fusion
7.6 Nuclear chain reaction
7.7 Multiplication factor and critical size
7.8 Moderators materials
7.9 Fissile and fertile materials
7.10 Classification of Nuclear reactor, main parts and their functions
7.11 Safety measures required in nuclear plant
7.12 Disposal of nuclear waste

8. Diesel Power Plants :

8.1 Main components and working of diesel power plant with the help of block diagram
8.2 Advantage and disadvantage of diesel power plant
8.3 Application of diesel power plant
8.4 Principle and operation of gas turbine plants
8.5 Comparison of different power stations
8.6 Inter connection of power stations

REFERENCE BOOKS :

1. Generation of Electrical Energy : B.R. Gupta
2. Power Plant Engg. : Domkundwar
3. A course in Electrical Power : Soni, Gupta, Bhatnagar

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Code	Name of Paper	Lecture	Tutorial	Practical
EL45	**INSTRUMENTATION AND CONTROL SYSTEM**	3	-	2

EF 45

CONTENTS

1. Basic Concept of Measurement :

1.1. Introduction.
1.2. Generalized configuration of measuring system.
1.3. Characteristics of measuring devices
    1.3.1. Accuracy.
    1.3.2. Resolution.
    1.3.3. Precision.
    1.3.4. Expected Value.
    1.3.5. Error (Gross, Systematic and Random error).
    1.3.6. Sensitivity.
    1.3.7. Linearity.
    1.3.8. Hysterisis.
    1.3.9. Repeatability.
    1.3.10. Threshold
1.4. Calibration of measuring devices.

2. Transducers :

2.1 Concept of Primary and Secondary transducers.
2.2 Difference between active and passive transducer.
2.3 Difference between analog and digital transducer.
2.4 Construction and working of the following transducers and measurement of quantities such

as Displacement (Linear and angular), Strain, Stress, Temperature, Pressure, Flow level, pH value.

2.4.1 Potentiometers
2.4.2 Strain gauge (resistance and semiconductor type)
2.4.3 Resistance Temperature detectors (RTD)
2.4.4 Thermo couples, thermistor.
2.4.5 Linear variable differential transformer (LVDT).
2.4.6 Capacitive transducer
2.4.7 Load Cell
2.4.8 Piezo Electric Transducer
2.4.9 Photo Cells
2.4.10 Photo Voltaic Cell
2.4.11 Techogenerator
2.4.12 Ultrasonic method for level measurement
2.4.13 Electro magnetic flow meter.
2.4.14 pH electrodes

3. Signal Conditioning :

3.1 Introduction.
3.2 DC Signal Conditioning.
3.3 AC Signal Conditioning.
3.4 Brief idea of data acquisition system

DEE46 ELECTRICAL MACHINE DESIGN

2L+IT **MM: 100** **Exam. Hrs. : 3**

1. **General:** Basic Principles of electrical machine design. Factors and limitations in design, main dimensions, output equations and output co-efficient, classification of magnetic materials and allowable flux densities. Calculation of magnetic circuits, magnetizing, current, coils for given ampere-turns, real and apparent flux densities. Tapered teeth. Carter's co-efficient, leakage fluxes reactances. Classification of insulation materials and their temperature ranges.
1. **Armature winding:** General features of armature windings, single layer and double layer and commutator windings, integral and fractional slot windings, winding factors.
1. **Heating cooling and ventilation:** Heat dissipation, heat flow, heating cooling curves. Heating cooling cycles, estimation of maximum temperature rise, cooling media. Quantity of cooling media. Types of enclosures, ratings, heat dissipation. Methods of ventilation.

Recommended books:

1. A.K. Sahney – Electrical machine design
1. V.M. Mittle – Electrical Machine design
1. R.K. Agrawal – Electrical Machine design

Code	Name of Paper	Lecture	Tutorial	Practical

EE51	**ELECTRICAL MACHINES - II**	3	2/2	2

CONTENTS

1. Induction Motor :

1.1 Production of rotating magnetic field by two phase and three-phase supply
1.2 Construction of slip ring and squirrel cage motors
1.3 Principle of operation
1.4 Slip
1.5 Torque Production

1.5.1 Gross torque and shaft torque
1.5.2 Starting torque
1.5.3 Running torque
1.5.4 Maximum torque
1.5.5 Full load torque
1.5.6 Relation between starting, maximum and full load torque

1.6 Torque-slip characteristics
1.7 Power stages and efficiency
1.8 Equivalent circuit: approximate and exact
1.9 Phasor diagram
1.10 No-load and blocked rotor tests
1.11 Circle diagram
1.12 Methods of starting
1.13 Speed control of induction motors

1.13.1 Rotor resistance control
1.13.2 Stator voltage control
1.13.3 Frequency control
1.13.4 Pole changing method
1.13.5 Cascade control
1.14 Cogging and crawling
1.15 Double cage induction motor
1.16 Industrial applications

2. Single Phase Induction Motor :

2.1 Double revolving field and cross-filed theory
2.2 Different types and their construction
2.3 Methods of starting
2.4 Characteristics of single-phase motors
2.5 Industrial applications

3. Alternators :

3.1 Constructional features
3.2 Principle of operation
3.3 Winding factors
3.4 EMF equation
3.5 Idea of leakage reactance (cylindrical rotor) and armature reaction
3.6 Synchronous impedance

3.7 Phasor diagram at different power factors
3.8 Voltage regulation
3.9 Open circuit and short circuit tests
3.10 Calculation of regulation by synchronous impedance and m.m.f methods
3.11 Parallel operation of three phase alternators
3.12 Effect of variation in excitation and prime mover power on the performance of alternator

4. Synchronous Motors :

4.1 Construction and principle of operation
4.2 Phasor diagram at no load and on load (cylindrical rotor)
4.3 Power equation
4.4 V - curves and inverted V- curves
4.5 Methods of starting
4.6 Synchronous motor operation at

4.6.1 Constant input power and variable excitation
4.6.2 Constant excitation and Variable input power

4.7 Synchronous condenser
4.8 Comparison of induction motor and synchronous motor
4.9 Application of synchronous motor

Code	Name of Paper	Lecture	Tutorial	Practical
EE52	**POWER ELECTRONICS**	2	-	3

CONTENTS

1. Introduction :

1.1 Principles, construction ,characteristics and ratings of

1.1.1 SCR
1.1.2 DIAC
1.1.3 TRIAC
1.1.4 UJT
1.1.5 LASCR

1.2 Series connection of SCR
1.3 Parallel connection of SCR
1.4 UJT as a relaxation oscillator
1.5 Snubber circuit
1.6 Transistor analogy of SCR
1.7 Comparison of SCR and TRIAC
1.8 Over voltage and over current protection circuit for SCR.

2. Power Control Rectification :

2.1 Phase control of SCR
2.2 Different phase controlling circuits

2.2.1 R
2.2.2 RC

2.2.3 UJT(Ramp)
2.2.4 UJT (Pedestal and Ramp)
2.2.5 Transformer circuit

2.3 Different methods of turn off of SCR

2.4 Single-phase and three-phase half wave and full wave rectifier using SCR

2.4.1 With resistive load
2.4.2 With inductive load
2.4.3 With flywheel diode

3. Inverters :

3.1 Basic principle of inverter
3.2 Series inverter
3.3 Parallel inverter
3.4 Single phase voltage source inverter
3.5 Three phase bridge inverter
3.6 Applications

4. Practical Application of SCR :

4.1 Chopper
4.2 Cyclo converter
4.3 UPS
4.4 SMPS

4.4.1 Types of SMPS
4.4.2 Protection circuits
4.4.3 Merits and demerits of SMPS

5. AC Stabilizers :

5.1 Introduction
5.2 Working and basic circuits of

5.2.1 Resonator stabilizer
5.2.2 Electro-mechanical stabilizer
5.2.3 Electronic stabilizer

6. Electronic Motor Speed Control :

6.1 Introduction
6.2 Speed control using SCR for

6.2.1 D.C. shunt motor and series motor
6.2.2 Single phase and three phase induction motor
6.2.3 Slip ring induction motor

7. Timers :

7.1 Types of timer circuits
7.2 Principles and operation
7.3 Electronic timers
7.4 D.C. operated timer
7.5 A.C. operated timer

8. High Frequency Heating :

8.1 Introduction (heating and welding)
8.2 Principle of induction and dielectric heating
8.3 Sources of high frequencies
8.4 Power requirement and application
8.5 Resistance welding types

Code	Name of Paper	Lecture	Tutorial	Practical
EE53	**TRANSMISSION AND DISTRIBUTION**	3	2/2	-

CONTENTS

1. Transmission and Distribution :

1.1 Need and basic flow diagram of power system
1.2 Relative advantages and disadvantages of A.C and D.C transmission
1.3 Selection of transmission voltage
1.4 Comparison of A.C. 1-phase, A.C. 3-phase 3 wire and A.C. 3-phase 4 wire on the basis of cost, line efficiency and reliability of supply
1.5 Comparison of D.C. 2-wire and D.C. 3-wire system on the basis of copper volume.

2. Materials used in Overhead Lines :

2.1 Need, requirement, construction and special feature of line supports
2.2 Types of conductors : hollow, stranded and relative merits and demerits
2.3 Selection of size of conductor, general rules used in RSEB for calculation
2.4 Types of insulators, their construction and application
2.5 Potential distribution over a string of insulators
2.6 String efficiency and methods of improving string efficiency

3. Mechanical Design :

3.1 Sag and span
3.2 Sag calculation in overhead lines with same and different level supports
3.3 Effect of wind, ice and temperature on loading of conductors
3.4 Effect of sag on overhead conductor configuration and their spacing
3.5 Effect of length of span on sag
3.6 Stringing chart
3.7 Transposition of conductors

4. Electrical Design of Lines :

4.1 Overhead line constants
4.2 Classification of lines
4.3 R,L,C, of over head lines (formula without proof)
4.4 Skin and Ferranti effect
4.5 Corona, its effect, suppression, advantages and disadvantage
4.6 Calculation of efficiency and regulation for short and medium transmission lines by T and p methods
4.7 Causes of low line efficiency and its improvement

5. Distribution Systems :

5.1 Layout of distribution system, feeders, distributors and service mains
5.2 Radial and ring main distributors
5.3 Voltage drop calculation for LT and HT lines in A.C. and D.C. distributors

6. Construction of Underground Distribution Lines :

6.1 Underground cables - types, construction
6.2 Selection of LT and HT cables
6.3 Laying of underground cables
6.4 Comparison of underground distribution systems
6.5 Cable grading and its analysis

7. Construction of Overhead Distribution Lines :

7.1 Survey of LT lines
7.2 Planning of construction work
7.3 Methods of erection of supports
7.4 Erection of conductors - laying out conductors
7.5 Raising and setting of poles, guys, stays
7.6 Fixing of insulators and cross arms
7.7 Guarding.

REFERENCE BOOKS :

1. Electrical Power Soni,Gupta & Bhatnager
2. Electrical Power J.B.Gupta
3. Power System V.K. Mehta
4. Transmission & Distribution Raina & Bhattacharyaof Electrical Power
5. Electrical Power S.L. Uppal

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Code	Name of Paper	Lecture	Tutorial	Practical
EE54	**UTILIZATION OF ELECTRICAL POWER**	3	2	-

CONTENTS

1. Industrial Utilisation :

1.1 Advantages of electrical drives over mechanical drives
1.2 Group and individual drives
1.3 Characteristics and application of various types of electric motors
1.4 Selection of electrical motors for

1.4.1 Domestic uses - Fans, sewing machines, refrigerators, air conditioners, coolers, mixers and grinders, washing machines, hair dryer
1.4.2 Industrial uses - Lathes, drilling machine, elevators, cranes lift, conveyors, textile and paper mills.

2. Electric Heating :

2.1 Principle of electric heating
2.2 Advantages of electric heating
2.3 Methods of heating

2.3.1 Resistance heating
2.3.2 Induction heating
2.3.3 Dielectric heating

3. Electric Welding :

3.1 Principle of electrical welding
3.2 Classification of electric welding
3.3 Resistance welding

3.3.1 Spot welding
3.3.2 Butt welding
3.3.3 Seam welding

3.4 Arc Welding

3.4.1 Metal arc welding
3.4.2 Carbon arc welding

3.5 Comparison between resistance and arc welding

4. Illumination :

4.1 Terms used in illumination
4.2 Law of illumination

4.2.1 Inverse square law
4.2.2 Lambert's cosine law

4.3 Electrical sources of light

4.3.1 Design of lighting schemes for domestic, commercial and industrial premises based upon illumination level required for various works.

4.4 Types of lamps
4.5 Comparison of fluorescent tubes and filament lamps
4.6 Requirement of good lighting
4.7 Lighting schemes for flood light

5. Electric Traction :

5.1 Advantages and disadvantages of electric traction
5.2 Comparison between A.C. and D.C. track electrification
5.3 Block diagram of A.C. locomotives
5.4 Traction effort
5.5 Crest speed, average speed and schedule speed
5.6 Factor affecting schedule speed
5.7 Simplified speed time trapezoidal curve
5.8 Mechanics of train movement

REFERENCE BOOKS :

1. Electric Drives G.K. Dubbey
2. Art & Science of Utilisation of H. PartabElectrical Energy
3. Electrical Power J.B.Gupta
4. Utilization of Electrical Power G.C. Garg & Electric Traction

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Code	Name of Paper	Lecture	Tutorial	Practical
EE55	**ELECTROMAGNETIC FIELD THEORY**	2	2	-

CONTENTS

1. Introduction :

1.1 Various co-ordinate system
1.2 Coulomb's law and electric field intensity
1.3 Gauss's law
1.4 Divergence and divergence theorem
1.5 Potential and potential difference
1.6 Potential field of a system of charge
1.7 Potential gradient
1.8 Energy density in electrostatic field

2. Conductors in Electric Field :

2.1 Point form of Ohm's law
2.2 Boundary condition for conductors
2.3 Capacitance
2.4 Dielectric material and polarisation
2.5 Spontaneous polarisation
2.6 Piezo electric materials
2.7 Boundary condition between perfect dielectric
2.8 Poisson's and Laplace's equation
2.9 Uniqueness theorem and its significance
2.10 Solution of Poisson's and Laplace's equation

3. Steady Magnetic Fields :

3.1 Bio-Savart law
3.2 Ampere's circuital law
3.3 Curl
3.4 Stoke's theorem
3.5 Magnetic flux density
3.6 Vector magnetic potential
3.7 Potential energy of magnetic field

4. Time Varying Fields :

4.1 Maxwell's equation (point and integral form) and its application
4.2 Laws of circuit theory

4.3 Skin effect
4.4 Wave equations

REFERENCE BOOKS :

1. Electro Magnetic Field Theory Hayt
2. Electro Magnetic Kraus
3. Electro Magnetic Gupta & Seth

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Code	Name of Paper	Lecture	Tutorial	Practical
EE56	**ELECTRICAL TRACTION SYSTEM**	2	2	-

CONTENTS

1. Traction Systems :

1.1 Ideal traction system
1.2 Different systems of traction
1.3 Systems of electric traction
1.4 Systems of track electrification
1.5 Comparison between D.C. and A.C. systems of railway electrification form the point of view of main line and suburban line railway service.

2. Train Movement and Energy Consumption :

2.1 Speed time curves
2.2 Typical speed time curves
2.3 Definition of crest speed, average speed and schedule speed
2.4 Factors affecting schedule speed
2.5 Simplified quadrilaterals speed time curves
2.6 Tractive effort for propulsion of train
2.7 Determination of specific energy output using simplified speed time curves
2.8 Factors affecting energy consumption
2.9 Definition of dead weight, accelerating weight and adhesion weight

3. Electric Traction Motors :

3.1 General features of traction motor
3.2 Characteristics of D.C. Motors
3.3 D.C. Series motor
3.4 D.C. shunt motor
3.5 A.C. Series motor
3.6 Rating and ventilation

4. Power Supply :

4.1 System of supply of power for electric traction
4.2 Current collector for overhead systems
4.3 Overhead construction for tramways trolley buses and railway

4.4 Sag and tension calculation for a trolley wire
4.5 Transmission lines to feed substations
4.6 Location of substations
4.7 Feeding and distribution systems
4.8 Protective device

REFERENCE BOOKS :

1. A Course in Electrical Power J .B. Gupta
2. Utilisation of Electric Power & Electric traction G.C. Gay
3. Art & Science of utilisation of Electrical Energy H. Partab
4. Electrical Utilization & Traction Yash & Basant

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Code	Name of Paper	Lecture	Tutorial	Practical
EE61	**ELECTRICAL MACHINES - III**	3	2	-

CONTENTS

1. Special Machines :

1.1 Basic principles, operation and characteristics of -

1.1.1 Linear induction motor
1.1.2 Reluctance motor
1.1.3 Hysteresis motor
1.1.4 Stepper motor
1.1.5 Induction regulator
1.1.6 Brush less D.C. motor

1.2 Industrial applications

2. Cross Field Machines :

2.1 Construction and working of -

2.1.1 Metadyne
2.1.2 Amplidyne

2.2 Operating characteristics
2.3 Applications of amplidyne and metadyne

3. A.C. Commutator Motors :

3.1 Action of commutator in an A.C. machines
3.2 Functions of brushes
3.3 Concept of phase advancing
3.4 The e.m.f. of a single phase commutator motor

3.4.1 e.m.f. produced by rotating field
3.4.2 e.m.f. produced by pulsating field

3.5 Commutation in A.C. machines
3.6 The single phase A.C. series motor

3.6.1 Constructional features
3.6.2 Torque equation
3.6.3 Phasor diagram
3.6.4 Characteristics and Applications

3.7 Repulsion motor

3.7.1 Mechanics of torque production
3.7.2 Compensated repulsion motor
3.7.3 Vector diagram

3.8 Repulsion induction motor
3.9 Schrage motor

3.9.1 Construction
3.9.2 Characteristics
3.9.3 Application

4. D.C. Machines :

4.1 Load sharing in parallel operation of D.C. shunts generators
4.2 Load sharing in parallel operation of D.C. Compound generators
4.3 Load sharing in parallel operation of D.C. series generators

5. Synchronous Machines :

5.1 Transient behaviour
5.2 Reactance
5.3 Symmetrical short circuit
5.4 Power angle (cylindrical rotor) characteristics
5.5 Swing equation and curve, M and H constants
5.6 Steady state stability
5.7 Transient stability
5.8 Equal area criterion of stability

5.8.1 One of the parallel lines suddenly switched off
5.8.2 System fault and subsequent circuit isolation

5.9 Hunting phenomenon in synchronous machines

REFERENCE BOOKS :

1. Generalised Theory of Electrical Machines P.S.Bhimbra
2. A.C. Commutator Machines A.E.Clayton

*****

Code	Name of Paper	Lecture	Tutorial	Practical
EE62	**MICROPROCESSOR AND ITS APPLICATION**	3	-	2

CONTENTS

4.3.1 Over current relay
4.3.2 Impedance relay
4.3.3 Reactance relay
4.3.4 MHO relay
4.3.5 Directional relay

4.4 Measurement of Electrical Quantities :

4.4.1 Frequency measurement
4.4.2 Phase angle and power factor measurement
4.4.3 Voltage and current measurement
4.4.4 Power and energy measurement

4.5 Measurement of Physical Quantities :

4.5.1 Temperature measurement
4.5.2 Deflection measurement
4.5.3 Water level indicator
4.5.4 Angular speed

4.6 Traffic Control.

	Name of Paper	Lecture	Tutorial	Practical
EE63	**SWITCHGEAR AND PROTECTION**	3	2	-

CONTENTS

3.5 Drop out fuse
3.6 Advantage and disadvantage of fuses

4. Circuit Breakers :

4.1 Basic construction of circuit breaker
4.2 Arc phenomenon
4.3 Arc extinction methods
4.4 Interruption of capacitive current
4.5 Current chopping
4.6 Resistance switches
4.7 Construction, working and application of

4.7.1 Oil circuit breaker

4.7.1.1 Bulk oil C.B.
4.7.1.2 Minimum oil C.B.

4.7.2 Air Circuit breaker
4.7.3 Air blast circuit breaker
4.7.4 Vacuum circuit breaker
4.7.5 SF6 circuit breaker

4.8 Ratings of circuit breakers

5. Protection :

5.1 Principle of protection systems
5.2 Basic requirement of relays
5.3 Classification of relays according to construction, uses and operating time
5.4 Types o f relays (construction, setting and applications)

5.4.1 Thermal relay
5.4.2 Electromagnetic relay
5.4.3 Induction type relay
5.4.4 Differential type relay
5.4.5 Distance relay

5.5 Over current, reverse power and earth leakage protection
5.6 Static relays

5.6.1 Basic elements
5.6.2 Applications

6. Protection of Alternator :

6.1 Field failure
6.2 Field earth fault
6.3 Over current
6.4 Phase unbalance and insulation protection
6.5 Differential and restricted earth fault schemes
6.6 Protection against prime mover failure

7. Transformer Protection :

7.1 Over current
7.2 Earth fault
7.3 Differential protection
7.4 Buchholz relay
7.5 Differential scheme for the protection of generator - transformer units.

8. Line Protection :

8.1 Differential pilot wire systems
8.2 Time graded directional over current and earth fault protection
8.3 Elements of distance protection and power line carrier protection

9. Over Voltage Protection :

9.1 Causes of over voltage
9.2 Lightning surges
9.3 Protection of line against over voltage
9.4 Function of ground wire
9.5 Horn gap
9.6 Lightening arrestors
9.7 Insulation coordination

REFERENCE BOOKS :

1. Switchgear & Protection Sunil S.Rao
2. A Course in Electrical Power Soni, Gupta & Bhatnagar
3. Switchgear & Protection M.Chander & Ravindranath
4. Electrical Power System C.L. Wadhwa.

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Code	Name of Paper	Lecture	Tutorial	Practical
EE64	**ELECTRICAL INSTALLATION AND DESIGN**	2	-	6

CONTENTS

1. Design of Distribution Mains :

1.1 Design and estimate the material required for the following with specifications -

1.1.1 L.T. Overhead distribution main.
1.1.2 11 KV H.T. Overhead distribution main.
1.1.3 11 KV H.T. underground distribution main.

2. Sub Station :

2.1 Classification of substations

2.1.1 Indoor and Outdoor substation
2.1.2 Pole mounted substation
2.1.3 Platform type substation
2.1.4 Industrial substation

2.2 Selection of site for distribution substation
2.3 Estimation of required materials of distribution substation

3. Description and Layout of Grid Substation 33/11 and 220/132 KV :

3.1 Selection of site
3.2 Equipment used in G.S.S. with specification
3.3 Layout of G.S.S.
3.4 Single line diagram
3.5 Connection diagram of 33/11 and 220/132 KV G.S.S.
3.6 Estimate of materials
3.7 Determination of cost as per given rate schedule
3.8 G.S.S. Earthing

4. Design of a Distribution Scheme for a Small Colony :

4.1 Load survey
4.2 Load curve
4.3 Rating of sub-station transformer
4.4 Conductor size
4.5 Arrangement of street lighting
4.6 Arrangement of conductors on poles
4.7 Plan of distribution route

Code	Name of Paper	Lecture	Tutorial	Practical
EE65	**CONTROL SYSTEM ENGINEERING**	3	2	-

CONTENTS

1. Control System :

1.1 Basic definition
1.2 Open loop and Closed loop systems
1.3 Transfer function
1.4 Transfer function of physical system (RC ladder network)
1.5 Block diagram and its reduction technique
1.6 Signal flow graph and Mason's gain formula

2. Control System Components :

2.1 D.C. Servo motor
2.2 A.C. Servo motor
2.3 Synchro pair
2.4 Tachogenerator

3. Time Domain Analysis :

3.1 Impulse response function
3.2 First and second order systems
3.3 Step response of second order system

3.4 Stability of control system
3.5 Routh's stability criterion
3.6 Static and dynamic error coefficients

4. Frequency Response :

4.1 Frequency domains analysis
4.2 Frequency response representation
4.3 Bode plot
4.4 Polar plots
4.5 Nyquist stability criterion

5. Root Locus :

5.1 Introduction
5.2 Rules for constructing root loci
5.3 Root locus plots
5.4 Effect of Zeros and Poles on root locus

REFERENCE BOOKS :

1. Control System Engg. Nagrath & Kothari
2. Control System B.C. Kuo
3. Control System Engg. Ogata

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Code	Name of Paper	Lecture	Tutorial	Practical
EE66	**ELECTRICAL MACHINES DESIGN**	2	2	-

CONTENTS

1. Basic Design Principles :

1.1 Basic considerations
1.2 Limitations in design
1.3 Electrical conductive materials (Aluminum, copper and super conductor)
1.4 Magnetic materials (Diamagnetic, Paramagnet, ferromagnetic and CROS)
1.5 Insulating materials (Fibrous materials, Liquid insulating materials, ceramic, adhesive and enameled)

2. Heating, Cooling and Ventilation of Electrical Machines :

2.1 Mode of heat transfer

2.1.1 Conduction
2.1.2 Convection
2.1.3 Radiation

2.2 Equation of Heating and Cooling of Machine
2.3 Heating and cooling time constant
2.4 Types of enclosures
2.5 Methods of ventilation and cooling

2.7 Cooling air circuit

2.7.1 Radial
2.7.2 Axial
2.7.3 Combined
2.7.4 Multiple inlet

2.8 Closed circuit hydrogen cooling
2.9 Quantity of coolants required
2.10 Electric machine duty cycles
2.11 Calculation of motor rating

2.11.1 Average loss method
2.11.2 Equivalent current method
2.11.3 Equivalent power method

2.12 Characteristics of different cooling media like oil, air, hydrogen and water

3. D.C. Machine Design :

3.1 Choice of specific magnetic and specific electric loading
3.2 Output equation (Armature Design)
3.3 Calculation of main dimensions
3.4 Output coefficients
3.5 Choice of number of poles
3.6 Design of shunt field winding

4. 3-Phase Induction Motor Design :

4.1 Choice of specific magnetic and specific electric loading
4.2 Output equations
4.3 Calculation of main dimensions
4.4 Relation between D and L
4.5 Effect of length of air gap on motor performance
4.6 Calculation of no load current

5. 3-Phase Alternator Design :

5.1 Choice of specific magnetic and specific electric loading
5.2 Output equation
5.3 Calculation of main dimensions
5.4 Cooling of alternator

6. Transformer Design :

6.1 Choice of specific magnetic and specific electric loading
6.2 Output equation for 3-phase transformer
6.3 Main dimensions of 3-phase transformer
6.4 Winding design
6.5 Magnetising current calculation
6.6 Design of tank and cooling tubes

7. Design of Motor Starters :

7.1 D.C. shunt motor starter
7.2 D.C. series motor starter

REFERENCE BOOKS :

1. Electrical Machine Design R.K. Agarwal
2. Design of Electrical Machines V.N. Mittle & A. Mittal
3. A Course in Electrical Machine Design A.K. Sawhney

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Code	Name of Paper	Lecture	Tutorial	Practical
EE663	**POWER SYSTEM ANALYSIS**	2	2	-

CONTENTS

1. Economic Aspects of Generation :

1.1 Factor affecting the cost of generation
1.2 Cost reduction by power station inter connection
1.3 Load curves, load duration curves, calculation of cost per unit
1.4 Need of improvement of power factor
1.5 Incremental rate of generation and condition for economic loading

2. Combined Operation of Power Stations :

2.1 Advantage of interconnection
2.2 Base load, peak load and load allocation among different power station
2.3 Effect of change in excitation and change in fuel supply on load sharing of alternator
2.4 Load frequency control

3. Voltage Regulation in Power System :

3.1 Control of generator voltage
3.2 Tap changing transformer
3.3 Shunt capacitors and synchronous phase modifier
3.4 Series capacitors, shunt reactors and static VAR compensators

4. Power System Stability :

4.1 Power angle diagram and maximum steady state power
4.2 Steady state stability and its improvement
4.3 Transient stability, swing equation and introduction to equal area criterion

5. EHV Transmission :

5.1 Requirement and design consideration of EHV lines
5.2 Selection and spacing of conductor
5.3 Corona and radio interference
5.4 Insulation requirement

6. HVDC Transmission :

6.1 Limitation of high voltage ac transmission
6.2 Advantages and limitation of HVDC transmission

6.3 Principal parts of generating station
6.4 Application of HVDC system
6.5 HVDC system in India

REFERENCE BOOKS :

1. Generation of Electrical Power B.R. Gupta
2. Power System Design M.V. Despandey
3. Electrical Power System Nagrath & Kothari
4. Elements of Power system Stevension

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Code	Name of Paper	Lecture	Tutorial	Practical
CE671	**MANAGEMENT**	2	2	-

Common for All Branches of Engineering

CONTENTS

1. Principles of Management :

1.1 Management, administration and organisation, difference between them.
1.2 Scientific management : Meaning, characteristics, object and advantage : Taylor's scientific management - Fayol's principles of management, functions of management
1.3 Types of ownership, sole trading, partnership, joint stock, co-operative and public enterprise
1.4 Types of organisation, different types and their charts.
1.5 Importance of human relation professional ethics
1.6 Need for leadership, leadership qualities
1.7 Motivation

2. Human Resources Development :

2.1 Introduction, object and functions of human resource development department
2.2 Recruitment, sources and methods of selection, need for effective training, method of training, duties of supervisor / Formen, role of HRD in industries.

3. Wages and Incentives :

3.1 Definition and requirements of a good wage system methods of wage payment
3.2 Wage incentives - type of incentive, difference in wage incentive and bonus, incentive to supervisor.

4. Material Management :

4.1 Purchasing Functions and duties of purchase department organisation of purchase department, methods of purchasing, purchase order contracts, legality of contracts types of contracts i.e. piece work contract, lumpsum contract, item rate contract, percentage contract, merits and limitation of each contract system, departmental execution of works, rate contract - D.G.S & D and C.S.P.O. tender, necessity, types of tenders, tendering procedure, earnest money and security money

4.2 Store and store keeping : Functions and duties of store department, location and layout of store, bin cards, store ledger, receipt and issue procedure of materials, physical verification of stores, disposal method of unserviceable articles and protection of stores.
4.3 Sales : function and duties of sales department sales promotion advertisement service after sales.

5. Financial Management :

5.1 Function and duties of finance department
5.2 Brief idea of journal, ledger, trial balance, trading account, profit and loss account, balance sheet.
5.3 Cheques (crossed and bearer), draft, promissory note, letter of credit, brief idea of cost accounting.
5.4 Numerical problems.

6. Marketing Management :

6.1 Concept of Marketing
6.2 Problems of Marketing
6.3 Pricing policy
6.4 Distribution channels and methods of marketing

7. Tax System and Insurance :

7.1 Idea of income tax, sales tax, excise duty and custom duty
7.2 Industrial and fire insurance, procedure for industrial insurance.

8. Labour Legislation and Pollution Control Acts :

8.1 Industrial acts : factory act 1948
8.2 Workmen's compensation act 1923
8.3 Apprentices act 1961
8.4 Water pollution contract act 1974 and 1981
8.5 Air pollution contract act 1981
8.6 Environmental protection act 1986
8.7 Forest (animal conservation act 1972)
8.8 Pollution control provisions in motor vehicle act.

9. Entrepreneurship Development :

9.1 Role of entrepreneurship and its advantages
9.2 Distinction between an entrepreneur and a manager
9.3 Project identification and selection
9.4 Project formulation
9.5 Project appraisal

REFERENCE BOOKS :

1. Industrial Management V.K. Sharma & O.P. Harkut
2. Industrial Engg. & Management O.P. Khanana
3. Industrial Engg. & Management T.R. Banga

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Code	Name of Paper	Lecture	Tutorial	Practical
EF55	**LINEAR INTEGRATED ELECTRONIC CIRCUITS**	3	-	3

EL 55

CONTENTS

1. IC Fabrication :

1.1 Basic monolithic integrated circuit
1.2 General IC processing steps
    1.2.1 Epitaxial growth
    1.2.2 Masking and etching
    1.2.3 diffusion of impurity
    1.2.4 Metallization
1.3 Transistor for monolithic circuit
1.4 Monolithic diode
1.5 Integrated resistor
1.6 Integrated capacitor
1.7 Concept of SSI, MSI, LSI and VLSI

2. Operational Amplifier :

2.1 OP AMP, symbol, equivalent circuit and characteristics.
2.2 Differential amplifier and its configurations
2.3 Working of emitter coupled differential amplifier
2.4 Characteristics of ideal and practical OP-AMP
2.5 Block diagram of OP AMP
2.6 Inverting and non-inverting OP AMP
2.7 OP AMP parameters and their measurements
2.8 Off set null techniques
2.9 OP AMP applications as :
    2.9.1 Adder, subtractor, differential amplifier and instrumentation amplifier
    2.9.2 Differentiator and integrator
    2.9.3 Peak detector, precision rectifier
    2.9.4 Log and anti log amplifier
    2.9.5 Wein bridge and RC phase-shift oscillator
    2.9.6 Pulse, square, triangular and sawtooth wave generator
    2.9.7 Comparator and Schmitt trigger
    2.9.8 Active filters (single order) - LPF and HPF
    2.9.9 Sample and hold circuit
    2.9.10 Frequency selective amplifiers

3. Timer Chip 555 :

3.1 Functional block diagram and working
3.2 555 Applications as :

3.2.1 Saw tooth generator
3.2.2 BMV, AMV and MMV
3.2.3 PWM and PPM

4. Voltage Regulation :

4.1 Need of voltage stabilisation
4.2 Transistor series voltage regulator - open loop and close loop
4.3 Short circuit and overload protection circuit
4.4 Functional diagram of IC voltage regulator chip (fixed and variable) 723 and 78XX, 79XX
4.5 Voltage regulator using OP-AMP

Code	Name of Paper	Lecture	Tutorial	Practical
CH572	**COMPUTER IN BUSINESS SYSTEMS**	2	-	2

Common for All Branches of Engineering except CS & IT

CONTENTS

1 Business Data Processing :

1.1 Business System
1.2 Management Functions
1.3 Levels of Management
1.4 Information Requirement
1.5 Basic tasks in business data processing
1.6 Examples of business data processing Payroll, Financial, Accounting, Inventory

2 Business Files :

2.1 Files, Records, Fields, Elements
2.2 Fixed and Variable Length Records
2.3 Master File, Transaction File
2.4 Record Updating in Sequential File and Direct File

3 Design, Analysis and Development of :

3.1 Computerized Invoicing

3.1.1 Data Entry Screens
3.1.2 Validations
3.1.3 Receipt Data Entry
3.1.4 Reports

3.2 Computerized Payroll

3.2.1 Factors Involved in Payroll
3.2.2 Exposure to structure, processing and reports
3.2.3 File maintenance

3.3 Computerized Inventory Control

3.3.1 Introduction and Aim of Inventory
3.3.2 Inventory Costs
3.3.3 Inventory Control Process

3.3.4 Inventory transactions
3.3.5 Inventory reports

4 FoxPro (A tool for Business System) :

4.1 Starting FoxPro
4.2 FoxPro Menus and Menu Options, Elementary Level
4.3 Creating Data Base File (DBF)
4.4 Adding and Editing Records : Browse, Append
4.5 Viewing Records
4.6 SET commands : Talk, Date, Century, Default, Printer, Deleted, Safety
4.7 Querying DBF : Simple and RQBE
4.8 Updating, Deleting and recalling records
4.9 Sorting, Indexing and Searching
4.10 Screen, Label, Menu, Report Generator

Diploma (Electronics & Communication Engg.)

Semester Ist:

Sr.No.	Code	Name of Subject	L	P	U
1	DECE 111	English & Communication Techniques-I	**4**	**0**	**4**
2	DECE 121	Engineering Physics – I	**3**	**2**	**4**
3	DECE 131	Engineering Chemistry – I	**3**	**2**	**4**
4	DECE 141	Engineering Mathematics – I	**4**	**0**	**4**

5	DECE 151	Computer Fundamentals	**3**	**2**	**4**
6	DECE 161	Engineering Mechanics – I	**3**	**2**	**4**
7	DECE 171	Computer aided Engineering Drawing – I	**3**	**2**	**4**
8	DECE 181	Workshop Practice – I	**0**	**4**	**4**

Semester IInd

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	DECE 112	English & Communication Techniques-II	**4**	**0**	**4**
2	DECE 122	Engineering Physics – II	**3**	**2**	**4**
3	DECE 132	Engineering Chemistry – II	**3**	**2**	**4**
4	DECE 142	Engineering Mathematics – II	**4**	**0**	**4**
5	DECE 152	Information Technology Fundamentals	**3**	**2**	**4**
6	DECE 162	Engineering Mechanics – II	**3**	**2**	**4**
7	DECE 172	Computer Aided Engineering Drawing – II	**3**	**2**	**4**
8	DECE 182	Workshop Practice – II	**0**	**4**	**4**

Semester IIIrd

Sr.No.	Code	Name of Subject	L	P	U
1	DECE 211	ELECTRONIC COMPONENTS AND SHOP PRACTICE	**3**	**2**	**4**
2	DECE 221	ELECTRICAL ENGINEERING AND MEASUREMENT	3	-	2
3	DECE 231	NETWORK ANALYSIS	3	2	-
4	DECE 241	ELECTRONIC DEVICES AND CIRCUITS	3	-	2
5	DECE 251	DIGITAL ELECTRONICS	3	-	2
6	DECE 261	BASIC COMMUNICATION ENGINEERING	3	-	2
7	DECE 271	ELECTRONIC INSTRUMENTS	3	-	2

Semester IVth

Sr.No.	Code	Name of Subject	L	P	U
1	DECE 212	ELECTRONICS WORKSHOP	2	-	4

2	DECE 222	ELECTRONIC CIRCUITS	3	-	2
3	DECE 232	PULSE AND WAVE SHAPING CIRCUITS	3	-	2
4	DECE 242	DIGITAL INSTRUMENTS	3	-	2
5	DECE 252	INSTRUMENTATION AND CONTROL SYSTEM	3	-	2
6	DECE 262	TRANSMISSION LINES AND WAVE PROPAGATION	3	2	
7	DECE 272	MICROPROCESSOR	3	-	2

Semester Vth

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	DECE 311	AUDIO AND VIDEO SYSTEM	3	-	3
2	DECE 321	POWER AND INDUSTRIAL ELECTRONICS	3	-	3
3	DECE 331	COMPUTER ARCHITECTURE AND ORGANISATION	3	-	3
4	DECE 341	COMMUNICATION SYSTEM	3	-	2
5	DECE 351	LINEAR INTEGRATED ELECTRONIC CIRCUITS	3	-	3

6	DECE 361	MICROWAVE ENGINEERING	3	2	-
7	DECE 371	'C' PROGRAMMING	2	-	2
8		PRACTICAL TRAINING(30 Days)			

Semester VIth

Sr.No.	Code	Name of Subject	L	P	U
1	DECE 312	TELEVISION ENGINEERING	3	2	-
2	DECE 322	ADVANCED MICROPROCESSOR	3	-	3
3	DECE 332	BIO - MEDICAL INSTRUMENTATION	3	-	2
4	DECE 342	ADVANCE COMMUNICATION SYSTEM	3	-	3
5	DECE 352	ELECTRONICS CIRCUITS DESIGN	3	-	3
6	DECE 362	RADAR AND NAVIGATION	4	0	4

Code	Name of Paper	Lecture	Tutorial	Practical
DECE 211	ELECTRONIC COMPONENTS AND SHOP PRACTICE	2	-	4

Semester – III

CONTENTS

1. Resistors :

1.1 Classification of resistors
1.2 Colour coding , tolerance and various parameters related with resistor
1.3 Constructional details, specifications, applications of various types of resistors

1.3.1 Fixed - carbon composition, metal film, carbon film, wire wound, alloy
1.3.2 Semi-variable - carbon (vertical and horizontal type) presets cermet, multiturn trimpot
1.3.3 Variable - carbon and wire wound (log and linear) with and without switch, multi turn pot and ganged pot,
1.3.4 Special resistors - LDR, VDR, Thermistor, Sensistors, Fusible resistors.

1.4 Failures in resistors

2. Capacitors :

2.1 Classification of capacitors
2.2 Constructional detail, specification, application of various types of capacitors-

2.2.1 Fixed capacitor - mica, paper, ceramic, plastic film and electrolytic
2.2.2 Variable capacitor - Gang (Air and PVC). Trimmer and padder

2.3 Failures in capacitor
2.4 Identification marking on capacitor (colour coding)

3. Inductors :

3.1 Classification of inductor
3.2 Construction detail, specification, application of fixed and variable inductors - Aircore, Iron core and Ferrite core inductors

4. Electronic Hardwares:

4.1 Construction, working, specification and application of electronic hardwares such as

4.1.1 Switches - Slide, toggle, push button type
4.1.2 Band switches - Rotary wafer type , slide type, push button type
4.1.3 Relay - construction, symbol, contacts
4.1.4 Connectors - Rack and panel, printed circuit, co-axial, tape cable, and plate connectors
4.1.5 Miscellaneous - Crocodile clips, indicator (mains), jacks, plugs, socket, heatsinks and component preformer

4.2 Loud speaker (PM type), Tweeter and woofer
4.3 Microphone - Carbon type, electrodynamic type, condenser and crystal microphone
4.4 Construction of soldering iron, soldering station and desoldering station
4.5 Different tools used in electronic workshop such as:- Nose plier, Cutter, Wire stripper, Tweezer, Screw driver etc.,

5. Soldering and De-Soldering Techniques :

5.1 Soldering - connection, flux alloy, different soldering materials and problems
5.2 Different soldering methods - hand, wave, dip and ultrasonic
5.3 De-soldering technique

PRACTICALS

1. Identification of different type of resistors and study of their colour coding
2. Identification of different type of capacitors and study of their colour coding
3. Identification of different type of switches and their mechanism of operation
4. Study of different tools used in electronics workshop
5. Use and application of component preformer
6. Study of analog and digital multimeters and their uses for measuring voltage, current and resistance
7. Testing of electronic components. Such as: Switches, resistors, capacitors, inductors, diode and transistors
8. To study and read the component data manual
9. Identification of different type of connectors
10. Use of CRO for various measurements
11. Use of function generator for different waveform generation.
12. Study of relay and contacts.
13. Soldering and de-soldering of different components on PCB by soldering iron
14. Preparation of sketches of different electrical and electronic component as per international standards on drawing sheets

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REFERENCE BOOKS :

1. Electronics Component & Shop Practice K.R. Nahar
2. Hand Book of Philips Component
3. Maintenance of Electronic Equipments K.S. Jamwal

4. Electronic Shop Practice. Madhavia Joshi.
5. Electrical & Electronic Materials M.L.Gupta

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 221	**ELECTRICAL ENGINEERING AND MEASUREMENT**	3	-	2

EF 32/ IE 32

CONTENTS

5. Measuring Instruments :

5.1 Classification of measuring instruments
5.2 General consideration of torques employed in indicating type instrument (deflection torque, control torque, damping torque)
5.3 Construction and working of voltmeter and ammeter

5.3.1 Moving iron type
5.3.2 Moving coil type
5.3.3 Rectifier type
5.3.4 Dynamometer type

5.4 Construction and working of wattmeter

5.4.1 Dynamometer type
5.4.2 Induction type

5.5 Induction type energy meter
5.6 Ohmmeter

5.6.1 Series type
5.6.2 Shunt type

6. Range Extension and Calibration :

6.1 Significance of range extension
6.2 Use of series and shunt multipliers
6.3 Instrument transformer for range extension
6.4 Working principle of potentionmeter
6.5 Calibration method of ammeter and voltmeter (D.C.) by potentiometer
6.6 Multirange ammeter and voltmeter
6.7 Simple problems
6.8 Vector impedance meter
6.9 Magger
6.10 Cable fault locator

PRACTICALS

1. Study of D.C. motor parts
2. Study the load characteristics of D.C. shunt and series motor
3. Study of induction motor
4. Study of synchronous motor
5. Study of stepper motor
6. Study of construction of moving coil, moving iron type instruments
7. Study of Maxwell's impedance, capacitive bridge.
8. Study of Hay's bridge
9. Study of Schering's bridge
10. Study of De-sauty's bridge and Wein bridge
11. Use of series multiplier for voltmeter range extension
12. Use of shunt multiplier for ammeter range extension
13. Calibration of voltmeter and ammeter (D.C.) using potentiomeor

14. Measurement of insulation resistance by megger
15. Study of induction type energy meter

REFERENCE BOOKS :

1. A Course in Elect. Engg. K.D. Sharma
2. Electrical Technology S.L. Uppal
3. Electrical Technology J.B. Gupta
4. A Course in Electrical & Electronics Measurements & Measuring Instruments A.K. Sawhrey
5. Electrical Machine I.J. Nagpal
6. Electrical Technology B.L. Thareja

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 231	NETWORK ANALYSIS	3	2	-

EF 33/ IE 33

CONTENTS

1. General Network Concept :

1.1 Network Elements (Definition and examples)

1.1.1 Active and passive, Linear and non-linear, Unilateral and bilateral, Lumped and distributed circuit parameters

1.2 Initial conditions in elements
1.3 Mutual inductance (coupling coefficient and dot rule)
1.4 Voltage and current sources (ideal and practical)
1.5 Dependent and independent sources
1.6 Accompanied and unaccompanied sources
1.7 Classification of networks (Definition and examples)

1.7.1 One port network
1.7.2 Two port network

1.8 Network configuration (No formula derivation)

1.8.1 Balanced and unbalanced T section
1.8.2 Symmetrical and Asymmetrical (Pie) section
1.8.3 L section
1.8.4 Lattice section
1.8.5 Bridge

1.8.6 Bridge T section
1.8.7 ladder network

2. Mesh and Nodal Analysis :

2.1 Definition of branch, node, mesh, loop and tree.
2.2 Kirchhoff's laws
2.3 Voltage and current equations for simple meshes and nodes
2.4 Cramer's Rule
2.5 Simple problems upto three variable using Cramer's rules (for DC circuits only)

3. Laplace Transformation :

3.1 Introduction to Laplace transformation
3.2 Solution of first order and second order differential equations (no initial condition)
3.3 Laplace transform of -

3.3.1 Unit step function
3.3.2 Ramp function
3.3.3 Exponential function
3.3.4 Impulse function
3.3.5 Sinusoidal functions
3.3.6 Parabolic function
3.3.7 Derivative of function
3.3.8 Integral of function

3.4 Laplace transform theorems

3.4.1 Shifting theorem
3.4.2 Initial and final value theorem

3.5 Inverse Laplace transformation for simple, multiple and conjugate complex roots.
3.6 Application of Laplace transformation for simple RL, RC and RLC series circuits
3.7 D.C. transients in RL, RC and RLC circuits

3.7.1 Determination of initial condition
3.7.2 Determination of final condition
3.7.3 Simple numerical problems

4. Network Theorems :

4.1 Statement, proof, application and numerical problems (DC circuit only) related to

4.1.1 Superposition theorem
4.1.2 Reciprocity theorem
4.1.3 Thevenin's theorem
4.1.4 Norton's theorem
4.1.5 Millman's theorem
4.1.6 Maximum power transfer theorem
4.1.7 Tellegen's theorem (Only statements)
4.1.8 Star Delta conversion

5. Two Port Networks :

5.1 Introduction
5.2 Open circuit impedance parameters
5.3 Short circuit admittance parameters
5.4 Hybrid (h) parameters
5.5 Transmission parameters
5.6 Inter-relationship between Z and Y parameters
5.7 Equivalent models of Z and Y parameters
5.8 Reciprocity and symmetry of two port networks
5.9 Equivalent T and (Pie) section representation
5.10 Determination of Z and Y parameters for some special networks (T, p, lattice, bridge T)
5.11 Idea of image impedance, characteristics impedance for two port networks

6. Resonance :

6.1 Series resonance in uncoupled circuits

6.1.1 Definition, reactance curves, resonance condition, selectivity and bandwidth

6.2 Parallel resonance in uncoupled circuits

6.2.1 Circuit and phasor diagram
6.2.2 Derivation of resonance conditions
6.2.3 Selectivity and bandwidth

6.3 Q factor, Q factor on energy basis

REFERENCE BOOKS :

1. Network Analysis Arumugan & Prem Kumar
2. Network Analysis Dhar & Gupta
3. Network Analysis Ven Valenburg
4. A Course in Circuit Analysis Soni & Gupta
5. A Course in Circuit Analysis Umesh & Sinha
6. Circuit Theory Iyer
7. Electric Circuits Josheep Edminster
8. Network Analysis Suba Rao & Prasad
9. Circuit Analysis Hayt

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 241	**ELECTRONIC DEVICES AND CIRCUITS**	3	-	2

CS34 / EF34 / EL34 / IE34

CONTENTS

3.3 Configuration of transistor (CB, CE and CC)
3.4 Behavior of BJT in Active, Cut off and Saturation regions

3.4.1 Transistor as a switch
3.4.2 Transistor as an amplifier

4. Transistor Biasing and Bias Stability :

4.1 D.C. and A.C. Load line.
4.2 Operating point and its stability
4.3 Factors affecting bias stability
4.4 Stability factors
4.5 Bias stabilization
4.6 Calculation of operating point and stability factor for

4.6.1 Fixed Bias Circuit.
4.6.2 Collector to base biasing.
4.6.3 Voltage Divider biasing (Self bias)

4.7 Bias Compensation techniques using

4.7.1 Diode.
4.7.2 Thermistor and Sensistor.

4.8 Thermal stability and Thermal runaway

5. Small Signal Transistor Amplifier :

5.1 CB, CE and CC amplifier and their low frequency small signal equivalent circuit using hybrid parameters.
5.2 Calculation of voltage gain, current gain, input impedance, output impedance and power gain for resistive loads. (Av, Ai, Zi, Zo, Avs, Ais, and Ap)
5.3 Analysis of emitter follower circuit
5.4 Approximate analysis of CE amplifier with and without RE , Emitter follower circuits
5.5. Classification of amplifiers

6. Field Effect Transistor :

6.1 Construction, operation and characteristics of JFET , E and D MOSFET
6.2 Biasing of FET
6.3 Small signal model of JFET
6.4 Terminology used with JFET
6.5 Precaution for handling of MOSFETs

7. Rectifiers and Power Supplies :

7.1 Working of rectifiers

7.1.1 Half wave rectifier
7.1.2 Centre tape full wave rectifier
7.1.3 Bridge rectifier

7.2 Analysis of rectifiers (for all type)

7.2.1 Calculations for average and RMS values
7.2.2 PIV of diodes
7.2.3 Ripple factor
7.2.4 Regulation and efficiency

7.3 Calculation of ripplefactor and working of following filters:

7.3.1 Capacitance filter
7.3.2 Inductance filter
7.3.3 L-C and (Pie) filters

7.4 Voltage Multipliers
7.5 Regulated power supply using zener diode

7.5.1 Simple problems on zener regulator.

PRACTICALS

1. To plot the V-I characteristics of P-N diode and LED.
2. To plot the V-I characteristics of zener diode and study of zener diode regulator circuit
3. To plot the V-I characteristics of PNP transistor in CB, CE and CC configuration
4. To plot the V-I characteristics of NPN transistor in CB, CE and CC configuration and calculate h-parameter for CE configuration.
5. Study of the different biasing circuits and observe the effect of component variation on operating point
6. Study of half wave and full wave rectifiers.
7. Study of bridge rectifier.
8. To study the filter circuits and measure the ripple factor.
9. To plot the V-I characteristics of JFET
10. To plot the V-I characteristics of MOSFET.
11. To study the voltage multipliers.
12. To Study Emitter follower circuits and measure its input and output impedances
13. To study the behavior of Cds photo conductive, photo voltaic cell and photo conductors

REFERENCE BOOKS :

1. Electronic Devices & Circuits : Millman & Halkias
2. Electronic Devices & Circuits : G.K. Mittal
3. Electronic Devices & Circuits : A.Mottershed
4. Functional Electronics : K.V. Ramanan
5. Electronic Devices & Circuits : Mathur, Kulshrestha & Chadda
6. Electronic Devices & Circuits : Sanjeev Gupta

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 251	**DIGITAL ELECTRONICS**	3	-	2

CONTENTS

1. Introduction :

1.1 Digital signal and its representation
1.2 Advantages of digital techniques

2. Number System :

2.1 Decimal, binary, octal and hexa-decimal number system
2.2 Conversion of a number from one system to another system
2.3 Binary addition, subtraction and multiplication
2.4 Representation of positive and negative numbers
2.5 1's complement and 2's complement
2.6 Subtraction using 2's complement
2.7 Parity bit
2.8 Binary codes (Gray, Excess -3, Hamming codes), ASCII code
2.9 Floating point number

3. Logic Gates :

3.1 Introduction
3.2 Symbol and truth table of NOT, AND, OR, NAND, NOR, EX-OR and EX-NOR gates
3.3 Universal gates
3.4 Positve, negative and tristate logic

4. Logic Families :

4.1 Classification of digital ICs.
4.2 Characteristics of digital ICs.
4.3 RTL/RCTL
4.4 DTL
4.5 TTL logic - Operation of TTL NAND gate, open collector and totem - pole output, characteristics of TTL, TTL subfamilies
4.6 Concept of ECL and I2 L.
4.7 PMOS, NMOS and CMOS (NAND, NOR, NOT) Circuits.
4.8 Comparison of logic families
4.9 Interfacing TTL with CMOS family

5. Boolean Algebra :

5.1 Historical review - logical statements, logical constants and variables, truth table
5.2 Boolean operators

5.3 Postulates of Boolean algebra
5.4 Laws of Boolean algebra
5.5 Duality theorem
5.6 De' Morgan's theorem
5.7 Simplification of Boolean expressions
5.8 Verification of Boolean expressions using truth table

6. Minimization Techniques (K-Mapping) :

6.1 Representation of Boolean expression - min. and max. term SOP, POS
6.2 Conversion of truth tables in POS and SOP form
6.3 Karnaugh map upto 4 variables - implication of logic function with and without don't care conditions
6.4 Realization of logic diagrams using NAND/NAND, NOR/NOR gate

7. Combinational Logic Design :

7.1 Binary half and full adder
7.2 Binary half and full subtractor
7.3 Binary serial, parallel and BCD adder
7.4 Parity bit generator and checker
7.5 Binary comparator
7.6 Multiplexer

7.6.1 4 to 1 multiplexer
7.6.2 16 to 1 multiplexer

7.7 Demultiplexer

7.7.1 1 to 4 Demultiplexer
7.7.2 1 to 16 Demultiplexer

7.8 Encoder

7.8.1 Decimal to BCD

7.9 Decoder

7.9.1 BCD to Decimal
7.9.2 BCD to seven segment

8. Sequential Systems :

8.1 Introduction
8.2 Symbol, logic circuit, truth table of R-S, J-K, M/S J-K,D,T flip-flops
8.3 Edge and level triggering
8.4 Shift registers

8.4.1 Left, right and bi-direction
8.4.2 Series and parallel
8.4.3 Universal shift register

8.5 Asynchronous and synchronous counters - up, down and up-down
8.6 Mod counters - Mod 5, Mod 9, decade counter

8.7 Ring counters, Johnson counter
8.8 Programmable counters
8.9 Use of shift register for simple binary multiplication and division.

PRACTICALS

1. Verify the truth tables of NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates
2. Design a NOT, AND, OR, EX-OR, EX-NOR gates using universal gates
3. Design a binary half and full adder
4. Design a binary half and full subtractor
5. Study of BCD to 7 segment decoder
6. Verify the truth table of RS, D, J-K, M/S J-K,D,T flip-flops.
7. Study of asynchronous binary ripple up, down and up-down and different mod counters
8. Study of synchronous counters
9. Study of decade counter
11. Study of programmable counter
12. Study of a shift register using flip flops
13. Study of ring counter using flip flops

REFERENCE BOOKS :

1. Digital Principles & Applications : Malvino Leach.
2. Integrated Electronics : Millman & Halkias
3. Digital Electronics : T.C. Bartee
4. Digital Electronics Practice Using IC's : R.P. Jain.
5. Modern Digital Electronics : R.P. Jain
6. Digital Electronics : L. Solanki
7. Digital Intregrated Circuit : K.R. Botker
8. Digital Design : Flloyd
9. Digital Logic Design : Morris Mano.

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 261	**BASIC COMMUNICATION ENGINEERING**	3	-	2

CS36 / EF36 / EL36

CONTENTS

1. Introduction :

1.1 Basic component of communication
1.2 Definition of modulation
1.3 Need of modulation in communication
1.4 Definition of AM, FM, PM, PAM, PPM, PWM and PCM

2. Noise and Cross Talk :

2.1 Classification of noise

2.1.1 Atmospheric noise
2.1.2 Shot noise
2.1.3 Thermal noise
2.1.4 Transit time noise
2.1.5 Miscellaneous noise

2.2 Noise figure
2.3 Concept of cross talk
2.4 Cross-talk elimination techniques

3. Amplitude Modulation :

3.1 Derivation of AM wave equation
3.2 Modulation index for sinusoidal AM
3.3 Frequency spectrum for sinusoidal AM
3.4 Total power in AM wave.
3.5 Effective voltage and current for sinusoidal AM
3.6 BJT collector amplitude modulator
3.7 General idea of carrier and sideband suppression
3.8 Balance modulator circuits

3.8.1 Using diode
3.8.2 Using FET

3.9 SSB generation by filter and phase shift methods
3.10 Block diagram of AM transmitter

4. Frequency Modulation :

4.1 Derivation of FM wave equation
4.2 Modulation index and frequency deviation for FM
4.3 Frequency spectrum for sinusoidal FM
4.4 FET reactance and varactor diode FM modulator circuits
4.5 Block diagram of FM transmitter using direct and indirect method (Armstrong method)
4.6 Comparison of AM and FM system

5. Radio Receivers :

5.1 Various types of receivers
5.2 Receiver characteristics and their measurements
5.3 Electronic tuning system
5.4 AM demodulator - envelope detection, product demodulator (SSB detection circuit)
5.5 FM demodulator - balance slope, Foster Seely and ratio detector circuit

5.6 Block diagram of Super heterodyne AM receiver and circuit of each stage
5.7 Block diagram of FM receiver

PRACTICALS

1. Generation of AM and measurement of the modulation index.
2. Perform the AM demodulation (Envelope detector)
3. Generation of F.M.
4. Operation of standard R.F. signal generator.
5. Measurement of selectivity, sensitivity, fidility of radio receiver
6. Study of F.M. demodulation.
7. Assembling of two band radio receiver.
8. Alignment and tunning of a transistor radio receiver.
9. Fault finding exercise in a radio receiver.

REFERENCES BOOKS

1. Communication System. : George Kannedy.
2. Radio Engg. : G.K. Mithal.
3. Electronic Communications. : Roddy & Coolen.
4. Carrier Communication : N.N. Biswas

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 271	**ELECTRONIC INSTRUMENTS**	3	-	2

EF 37

CONTENTS

1. Performance Characteristics of Measuring Devices and Errors :

1.1 Accuracy and precision
1.2 Resolution, drift
1.3 Linearity and hysteresis
1.4 Threshold
1.5 Response time and calibration
1.6 Repeatability and maintainability
1.7 Span
1.8 Errors - Gross, Systematic and Random Errors
1.9 Sensitivity

2. Multimeter :

2.1 Principle of measurement of

2.1.1 D.C. Voltage and current
2.1.2 A.C. Voltage and current
2.1.3 Resistance

2.2 Calculation of shunt and multiplier for range extension
2.3 AC and D.C. sensitivity
2.4 Loading effect
2.5 Specifications and limitations of multimeter.

3. Electronic Voltmeter :

3.1 Characteristics of different analog electronic voltmeter
3.2 Circuits for D.C. voltmeter using BJTs and FETs (single device and balanced bridge type)
3.3 Theory and operation of circuits for average, peak, peak to peak and RMS responding A.C. electronic voltmeters
3.4 Comparison of amplifier rectifier type and rectifier amplifier type electronic voltmeter

4. Cathode Ray Oscilloscope (C.R.O) :

4.1 Construction of CRT and deflection sensitivity
4.2 Block diagram of CRO
4.3 Various controls of CRO
4.4 Detail of X-Y section and delay line
4.5 Horizontal sweep section
4.6 Synchronization of sweep and triggered sweep
4.7 Measurement of voltage, current, frequency and phase angle using CRO
4.8 CRO probes
4.9 Construction and working of dual trace and dual beam CROs

5. Working Principle and Application of :

5.1 Q-meter
5.2 AF/RF signal generators
5.3 Harmonic distortion analyzers.
5.4 Transistor Tester
5.5 Curve Tracer
5.6 LCR bridge
5.7 Output power meter (AF)

6. Digital Displays :

6.1 Construction and Working Principle of different type of displays. Such as Diode Matrix, 7-segment using LED and LCD, Dot matrix using LED
6.2 Comparison of different type of displays

PRACTICALS

1. Measurement of D.C. voltage and current by multimeter
2. Measurement of A.C. voltage and current by multimeter
3. Measurement of resistance by multimeter
4. Complete study of multimeter and specification.
5. Study of electronic voltmeter
6. Study and use of CRO for voltage, frequency and phase angle measurement
7. Measurement of phase and frequency using lissajous figure by CRO
8. Testing of transistors using transistor tester
9. Study of seven segment display (LED and LCD)
10. Measurement of Harmonic distortions of on Amplifier using harmonic distortions Analyzer
11. Measurement of output power of an Audio Amplifier using AF power meter
12. Measurement of L, C, and R by LCR Bridge/ meter
13. Measurement of Q factor of a coil / capacitor by Q meter

REFERENCE BOOKS :

1. A Course in Electrical and Electronics Measurement & Instrumental A.K. Sawhney
2. Modern Electronic Instrumentation and Measurement Techniques Cooper
3. Electronic Instrumentation Fundamentals Malvino
4. Electronic Measurement Terman Pettit
5. Electronic Instruments David Bell

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Semester – IV

EF 41

Code	Name of Paper	Lecture	Tutorial	Practical
DECE 212	**ELECTRONICS WORKSHOP**	**2**	**-**	**4**

CONTENTS

1. Printed Circuit Board Fabrication :

1.1 Introduction
1.2 Types and specification of PCB
1.3 Basic steps of fabrication

1.3.1 Master art preparation
1.3.2 Resist Coating (tape resist, resist paint, silk screen, photographic)
1.3.3 Etching technique
1.3.4 Resist removal

1.3.5 Drilling
1.3.6 Lacquer coating

1.4 Advantage and limitation of PCB
1.5 Safety recommendation
1.6 Block diagram of PCB plant
1.7 Preparation of PCB art work for

1.7.1 Battery eliminator circuit
1.7.2 Audio amplifier circuit
1.7.3 R.C. phase shift oscillator
1.7.4 Multivibrators (using IC 555, 741)
1.7.5 Half adder and full adder circuits

2. Semiconductor Device Fabrication :

2.1 Introduction
2.2 Intrirsic semiconductor fabrication

2.2.1 Floating zone apparatus
2.2.2 Crystal pulling apparatus

2.3 Semiconductor diode and transistor fabrication

2.3.1 Point contact techniques
2.3.2 Grown junction techniques
2.3.3 Alloy junction techniques
2.3.4 Diffused junction techniques
2.3.5 Epitaxial growth techniques

3. Transformer :

3.1 Principle of transformer
3.2 Voltage, current and turn ratio relationship
3.3 Construction details of following transformers.

3.3.1 Core type
3.3.2 Shell type
3.3.3 Auto transformer

3.4 Design procedure of iron core small transformers and numerical problems
3.5 Constructional details of transformers winding machine .

4. Coils and IFTs :

4.1 Classification of Coils according to frequency range
4.2 Classification of coils according to type of winding
4.3 Important terms related to coils

4.3.1 Skin effect.
4.3.2 Dielectric losses.
4.3.3 Distributed capacitance.
4.3.4 Quality factors.

4.4 Imperical formulae for designing of coils with numerical examples
4.5 Toroids - brief idea
4.6 Intermediate frequency transformer (IFT) -

4.6.1 Construction of IFT
4.6.2 IFT details for radio receiver

5. Impregnation Plants :

5.1 Need of impregnation plant
5.2 Diagram of impregnation plant schematic
5.3 Working procedure of Impregnation Plants.
5.4 Safety precautions
5.5 Limitations and advantages
6. Use and practices of an electronics work bench and circuit maker for basic circuits.

PRACTICALS

1. Study of transformer
2. Study of coil winding machine
3. Familiarization with different type of stampings and bobin
4. To design winding and test small transformer of single and tapped secondary
5. To design winding and test the transformer of multiple secondary
6. Preparing and testing IFT
7. Familiarization with various wires used in coil
8. Winding of two band radio transistor Antenna coils for MW and SW
9. Study of PCB plant equipment
10. To design and prepare PCB using tape resist method
11. To design and prepare PCB using resist paint method
12. To design and prepare PCB using silk screen method
13. To design and prepare PCB using photographic method
14. Study of process camera
15. Fabrication and testing of gadgets as mentioned in article 1.7
16. To design PCB using PC software (circuit maker / Easy PC)
17. Use and practice on electronic work bench for basic electronic circuits.

REFERENCE BOOKS :

1. Coil Winding & Fabrication Practice K.R. Nahar
2. Transformer & Coil BPB Publication
3. PCB - Design & Technology W.C. Bosshort

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Code	Name of Paper	Lecture	Tutorial	Practical

DECE 222	**ELECTRONIC CIRCUITS**	3	-	2

EF 42 3 -- 2

CONTENTS

1. JFET and MOSFET Amplifiers:

1.1 The common source CS amplifier its A.C. equivalent circuits and voltage gain calculation at low and high frequency
1.2 The common drain CD amplifier its A.C. equivalent circuits and voltage gain calculation at low and high frequency

2. Multistage Amplifier:

2.1 Different types of coupling

2.1.1 Direct coupling
2.1.2 R.C. coupling
2.1.3 Transformer coupling

2.2 Distortion in amplifiers
2.3 Frequency response of an amplifier
2.4 Effect of cascading on gain and bandwidth
2.5 Simple calculation for gain and bandwidth for RC coupled amplifier
2.6 Measurement of input and output impedance of an amplifier
2.7 Square wave testing of an amplifier
2.8 Comparison and application of coupled amplifiers
2.9 Design analysis of a RC coupled amplifier for given parameters

3. Power Amplifier:

3.1 Classification of power amplifier
3.2 Class A large signal amplifier and its analysis for output power
3.3 Second harmonic distortion
3.4 Transformer coupled audio power amplifiers
3.5 Efficiency and conversion efficiency
3.6 Push pull amplifiers
3.7 Class B power amplifier and its efficiency
3.8 Class AB operation and cross over distortion
3.9 Complementary symmetry push-pull amplifier
3.10 Idea of phase inverter

4. Feedback Amplifier:

4.1 Basic concept of feedback
4.2 Classification of feedback amplifier
4.3 Advantages of negative feedback on gain stability, distortion, frequency response, noise reduction,

input impedance and output impedance
4.4 Analysis of various Negative feedback amplifier circuits.
4.5 Comparison of negative voltage feedback and negative current feedback

5. Oscillators:

5.1 Positive feedback concept
5.2 Barkhausen criterion
5.3 Working and calculation of frequency (no formula derivation) for Hartley (series and shunt) , Colpitt's, Clapp, tuned collector, R-C phase shift, Wein bridge, Crystal and beat frequency oscillator

6. Tuned Amplifier:

6.1 Need of tuned amplifier and its design consideration
6.2 Classification of tuned amplifier - Single, double and stagger tuned.
6.3 Single tuned amplifier and its analysis
6.4 Double tuned amplifier and its analysis
6.5 Tuned drain amplifier and tuned collector amplifier
6.6 Applications

7. Transistor at High Frequency and Special Circuit:

7.1 High frequency small signal p model of transistor
7.2 Current gain, alpha cut off frequency (fa)
7.3 fT , fb and their relationship
7.4 Darlington pair and bootstrapping
7.5 Cascode amplifier

PRACTICALS

1. Study of JFET amplifier and plot its frequency response
2. Study of depletion and enhancement MOSFET amplifier and plot its frequency response
3. Plot the frequence response of two stage R-C coupled amplifier and measure its bandwidth
4. Plot the frequence response of transformer coupled amplifier
5. Plot the frequency response of direct coupled amplifier
6. Study of transistor push-pull amplifier
7. Study of complimentary transistor power amplifier
8. Study of phase inverter
9. Study of Dartington pair
10. Plot the frequency response of negative feedback amplifier and observe the effect of negative feed back
11. Plot the frequency response of single tuned and double tuned voltage amplifiers
12. Study of Hartley oscillator and calculate frequency of oscillation
13. Study of Colpitt's oscillator and calculate frequency of oscillation
14. Study of RC phase shift oscillator
15. Study of a Wein bridge oscillator and calculate frequency of oscillation.
16. Study of crystal oscillator
17. Study of clapp oscillator

REFERENCE BOOKS :

1. Electronic Devices & Circuits Millman Halkias
2. Integrated Electronics Millman Halkias
3. Electronic Devices & Circuits Allen Mottershed.
4. Electronic Principles Malvino
5. Electronic Devices & Circuits Sanjeev Gupta
6. Applied Electronics G.K. Mithal
7. Electronic Devices & Circuits Mathus, Kulshresta & Chadda

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 232	**PULSE AND WAVE SHAPING CIRCUITS**	3	-	2

EF 43

CONTENTS

1. Linear Wave Shaping Circuits:

1.1 R-C circuit as high pass and low pass circuit
1.2 High pass circuit as a differentiator
1.3 Response for step, pulse and square wave input
1.4 Calculation of percentage tilt
1.5 Low pass circuit as an integrator
1.6 Calculation of Rise time
1.7 Response of low pass circuit for step, pulse and square wave input

2. Non Linear Wave Shaping:

2.1 Various clipping circuits using ideal diode
2.2 Transfer characteristics
2.3 Transistor clippers
2.4 Clamping circuit and its application as a staircase wave formgenerator
2.5 Clamping circuit theorem

3. Multivibrator:

3.1 Transistor as a switch and switching times.
3.2 Bistable Multivibrator (BMV)

3.2.1 Fixed bias and self bias BMV and their working
3.2.2 Calculation of voltage at different points in fixed bias BMV

3.2.3 Symmetrical and unsymmetrical triggering
3.2.4 Working of Schmitt trigger
3.2.5 Hysterisis elimination

3.3 Monostable Multivibrator (MMV)

3.3.1 Working of MMV (collector coupled)
3.3.2 Calculation of time duration
3.3.3 Wave shape at different points and calculation of voltage at different points
3.3.4 Working of emitter coupled MMV
3.3.5 Comparison of collector coupled MMV with emitter coupled MMV

3.4 Astable Multivibrator (AMV)

3.4.1 Working of collector coupled AMV
3.4.2 Wave shapes at different points
3.4.3 Working of emitter coupled AMV
3.4.4 Calculation of free running frequency for collector coupled AMV
3.4.5 Comparison of collector coupled with emitter coupled AMV

3.5 Application of Multivibrators

4. Blocking Oscillator:

4.1 Need of blocking oscillator
4.2 Working of Mono stable and Astable Blocking oscillator and their wave shape at different points:
4.3 Blocking oscillator as sawtooth generator
4.4 Calculation of pulse repeating frequency
4.5 Synchronization of blocking oscillator

5. Time Base Generators (Sweep circuits):

5.1 Need of time base generator
5.2 General features of time base signals
5.3 Methods of generating time base waveforms
5.4 Principle and working of Miller sweep and bootstrap sweep time base generating circuit

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PRACTICALS

1. Design a RC high pass filter for a given frequency

1.1 Plot its frequency response
1.2 Measures the percentage tilt
1.3 Observe it as a differentiator (for different time constant)

2. Design a RC low pass filter for a given frequency

2.1 Plot its frequency response
2.2 Measure its rise time
2.3 Observe it as an integrator (for the different time constant)

3. Observe the wave forms of various clipping circuit
4. Observe the wave forms of various clamping circuits
5. Study of Bistable multivibrator and measure voltages at different points
6. Observe the voltage wave forms at different points of MMV and measure its pulse width.
7. Observe the voltage waveforms at different points of AMV and measure its free running frequency.
8. Observe the output wave form of a schmitt trigger and measure LTP and UTP.
9. Observe the output waveform of a staircase generator
10. Observe the waveform of a blocking oscillator.
11. Observe the waveform of a transistorized Sweep circuit.

REFERENCE BOOKS :

1. Pulse & Wave Shaping Circuits. Millman & Taub.
2. Pulse Circuits Rajul Singhal
3. Pulse & Digital Circuits K.K. Agarwal
4. Electronic Devices & Circuits G.K. Mithal
5. Wave Shaping & Digital Circuits Agarwal & Rai

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 242	**DIGITAL INSTRUMENTS**	3	-	2

EF 44

.CONTENTS

2.2.4 Dual slope type
2.2.5 Successive approximation type

3. Digital Voltmeter (DVM) :

3.1 Types of digital voltmeter

3.1.1 Ramp DVM
3.1.2 Integrating DVM
3.1.3 Successive approximation DVM

3.2 General characteristics of DVM
3.3 Advantage of DVM
3.4 Automation in DVM

3.4.1 Automatic polarity indication
3.4.2 Auto ranging
3.4.3 Auto zeroing

3.5 Organisation of digital parts of DVM

4. Digital Multimeter :

4.1 DC voltage attenuator
4.2 Current to voltage convertor
4.3 AC/DC convertor
4.4 Resistance to voltage convertor
4.5 HF to LF voltage converter
4.6 Accuracy of DMM

4.6.1 Sources of errors in D.C. voltage measurement
4.6.2 Sources of errors in DC/AC currents
4.6.3 Sources of errors in AC/DC conversion

4.7 RMS detector in DMM and DMM specifications

5. Digital Frequency Counter :

5.1 Block diagram and working

5.1.1 Basic circuit
5.1.2 Time base
5.1.3 Start stop gate

5.2 Errors in measurements
5.3 Block diagram of universal counter

5.3.1 Measurements of period, frequency, time interval and ratio

6. General Purpose Digital Instruments:

6.1 Basic block diagram, working and applications of -

6.1.1 Signal generator
6.1.2 Function generator
6.1.3 Digital storage CRO

6.1.4 Digital phase meter
6.1.5 Logic analyser
6.1.6 Signature analyser
6.1.7 Logic probe
6.1.8 Logic pulser

7. Guarding Techniques:

7.1 Safety guard and signal ground.
7.2 Ground loops and ground currents.
7.3 Common mode and series mode voltage.
7.4 Avoiding parasitic voltage.

PRACTICALS

1. Assembling and Testing of 3/4 bit DAC using Resistive network divider
2. Assembling and Testing of 3/4 bit DAC using resistive ladder network
3. Design of 2/3 bit simultaneous type A/D converter
4. Study of Ramp type A/D converter
5. Study of Successive Approximation type ADC
6. Study of different digital multimeters
7. Measurement of current, voltage and resistance by digital multimeters
8. Study of logic probes
9. Study and operation of digital frequency counter
10. Study of digital IC tester and testing of IC
11. Study and operation of logic analyser
12. Study and operation of signature analyser

REEFERENCE BOOKS :

1. Digital Instrumentation Bouwen
2. Electronic Instrumentation Kalsi
3. Electronic Measurement & Instrumentation A.K. Sawhni
4. Electronic Measurement & Instrumentation Cooper Helfric

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 252	**INSTRUMENTATION AND CONTROL SYSTEM**	3	-	2

EF 45

CONTENTS

1. Basic Concept of Measurement :

1.1. Introduction.
1.2. Generalized configuration of measuring system.
1.3. Characteristics of measuring devices

1.3.1. Accuracy.
1.3.2. Resolution.
1.3.3. Precision.
1.3.4. Expected Value.
1.3.5. Error (Gross, Systematic and Random error).
1.3.6. Sensitivity.
1.3.7. Linearity.
1.3.8. Hysterisis.
1.3.9. Repeatability.
1.3.10. Threshold

1.4. Calibration of measuring devices.

2. Transducers :

2.1 Concept of Primary and Secondary transducers.
2.2 Difference between active and passive transducer.
2.3 Difference between analog and digital transducer.
2.4 Construction and working of the following transducers and measurement of quantities such as Displacement (Linear and angular), Strain, Stress, Temperature, Pressure, Flow level, pH value.

2.4.1 Potentiometers
2.4.2 Strain gauge (resistance and semiconductor type)
2.4.3 Resistance Temperature detectors (RTD)
2.4.4 Thermo couples, thermistor.
2.4.5 Linear variable differential transformer (LVDT).
2.4.6 Capacitive transducer
2.4.7 Load Cell
2.4.8 Piezo Electric Transducer
2.4.9 Photo Cells
2.4.10 Photo Voltaic Cell
2.4.11 Techogenerator
2.4.12 Ultrasonic method for level measurement
2.4.13 Electro magnetic flow meter.
2.4.14 pH electrodes

3. Signal Conditioning :

3.1 Introduction.
3.2 DC Signal Conditioning.
3.3 AC Signal Conditioning.
3.4 Brief idea of data acquisition system

4. Control System :

4.1 Concept of open loop and close loop system
4.2 Automatic control system

4.3 Transfer function
4.4 Block diagram reduction techniques
4.5 Concept of feedback control and its effects

5. Control System Components :

5.1 Working principle and construction of -

5.1.1 Synchro Transmitter
5.1.2 Synchro receiver
5.1.3 Control transformer
5.1.4 DC and A.C. servo motors

5.2 Characteristics of servo amplifier for A.C. and D.C. error signals

6. Position Control System :

6.1 Introduction.
6.2 Study position control in small/large system with the help of block diagrams of -

6.2.1 Pen recorder
6.2.2 Real drive
6.2.3 Machine tool control
6.2.4 Level Control
6.2.5 Temperature Control

PRACTICALS

1. To measure the linear and angular displacement by

1.1 LVDT.
1.2 Potentiometer.
1.3 Capacitive transducer.

2. Measurement of speed of the shaft by contact and non contact methods.

2.1 Photo electric transducer.
2.2 Magnetic transducer
2.3 Techogenerator

3. Measurement of force by strain gauge bridge
4. Measurement of pH value using pH meter
5. Error detection by synchro pair
6. Measurement of temperature and draw the characteristics of following -

6.1 Thermocouple.
6.2 RTD
6.3 Thermister

7. To draw the torque and speed curve for servo motor.
8. Measurement of level by capacitive transducer.
9. To observe the output wave form of synchro transmitter on CRO and find the electrical zero.

REFERENCE BOOKS :

1. Automatic Control System B.C. Kuo.
2. Control System Engineering I.J. Nagrath & Gopal
3. A Course in Electrical & Electronics A.K. Shawney.Measurement & Instrumentation.
4. Instrumentation Measurement and Feed Back Barry E Jones.
5. Instrumentation Devices and System C.S. Ranga, Sharma, Mani.
6. Instrumentation. R.K. Jain.
7. Control Engineering N.M. Morris
8. Measurement Systems Application & Design. E.O. Deoblin.
9. Electronic Instruments Helpric Cooper

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 262	**TRANSMISSION LINES AND WAVE PROPAGATION**	3	2	-

EF 46

CONTENTS

1. Electromagnetic Theory :

1.1. Maxwell's Equations.
1.2. Electromagnetic Wave Equation for free space.
1.3. Propagation of uniform plane wave.
1.4. Reflection Refraction and polarisation of electromagnetic waves. (Simple description - no derivation)

2. EM Wave Propagation :

2.1. Ground Wave propagation and effect of curvature of the earth.
2.2. Space Wave Propagation

2.2.1. Line of sight distance.
2.2.2. Effect of Atmosphere and Obstacles. (no derivation)

2.3. Sky Wave Propagation

2.3.1. Ionospheric and its characteristics
2.3.2. Critical frequency
2.3.3. Effect of the Earth's magnetic field on ionospheric propagation
2.3.4. MUF and Skip distance.
2.3.5. Ionospheric absorption and disturbances.
2.3.6. Atmospheric noise.
2.3.7. Scatter propagation.
2.3.8. Fading of Radio Waves. (no derivation)

3. Transmission Lines :

3.1. Fundamentals of Transmission Line

3.1.1. Transmission Line Equation.
3.1.2. Characteristic Impedance.
3.1.3. Terminated Loss-less Line.
3.1.4. Standing Wave Ratio V.S.W.R. and its measurement
3.1.5. Behaviour of quarter and half wave line

4. Antennas :

4.1. Principle of Radiation.
4.2. Resonant and non resonant antennas.
4.3. Radiation Pattern of l/2, l and 3l/2 dipoles. Effect of ground on l/2 dipole.
4.4. Radiation pattern of grounded l/4, l/2, and l dipole.
4.5. Radiation resistance, total resistance, efficiency, beam width, gain, aperture area of an antenna. (no derivation)
4.6. Antenna Array -

4.6.1. Principle of Pattern Multiplication
4.6.2. Broad Side array
4.6.3. End Frire array

4.7. Folded dipole and Rhombic antenna.
4.8. Yagi antenna and parasitic elements
4.9. Log Periodic and Loop antenna.
4.10. Parabolic antennas and Horn antenna
4.11. Measurement of antenna impedance and field pattern

REFERENCE BOOKS :

1. Electronic Communication System Kennedy
2. Radio Engineering Terman
3. Electro Magnetic Waves and Jordan Balman.Radiating Systems
4. Antennas Kraus
5. Radio Engineering G.K Mithal
6. Antenna & Wave Propagation KD Prasad
7. Transmission Lines & Networks Umesh Sinha

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 272	**MICROPROCESSOR**	3	-	2

EF 47/ IE 47

CONTENTS

5.4 I/O read and write cycle
5.5 Interrupt acknowledge cycle
5.6 Bus idle cycle
5.7 DMA cycle
5.8 Machine cycle with wait states.
5.9 Programs using delays and counters

6. Limitation of 8 bit Microprocessor.

PRACTICALS

1. Study of 8085 microprocessor kit
2. Addition of two 8 bit numbers with and without carry
3. Subtraction of two 8 bit numbers with and without borrow
4. Multiplication of two 8 bit number using successive addition and resistor shifting method
5. Program to find out square of a number.
6. Programs involving data arrays

6.1 Generating odd numbers.
6.2 Data transfer schemes
6.3 Sorting of odd/even numbers.
6.5 Finding largest and smallest numbers.
6.6 Arrange data array in ascending / descending order

7. Programs using stack
8. Programs using subroutine.
9. Debugging of programs using single stepping on kit

REFERENCE BOOKS :

1. Microprocessor Architecture, Programming & Application Gaonkar
2. Fundamentals of Microprocessors B.Ram & MicroComputers
3. Assembly Language Programming A.Leventhal, Osborn
4. Theory & Problems of Tokhein Microprocessor Fundamentals
5. Microprocessor & Peripheral Hand book INTEL
6. Computer Architecture & org. J.P Hayes
7. Digital Computer Fundamentals T.C.Bartee
8. An Introduction to Microprocessors A.P.Mathur

*****

Semester – V

Code	Name of Paper	Lecture	Tutorial	Practical
DECE 311	**AUDIO AND VIDEO SYSTEM**	3	-	3

CONTENTS

2. HI-FI and Stereophony :

2.1 Meaning of Hi-Fi
2.2 Basic components
2.3 Fundamental of sound harmonics
2.4 Loudness
2.5 Pitch
2.6 Timbre
2.7 Sensitivity
2.8 Stereophony recording
2.9 Broadcasting of stereophony and its reproduction
2.10 Active and passive audio circuits

2.10.1 Volume control
2.10.2 Tone control
2.10.3 Bass and treble control
2.10.4 Graphic equaliser

2.11 Basic idea about audio pre amplifier and power amplifiers

3. Magnetic Tape (Video System) :

3.1 Basic principle
3.2 Video tape transport mechanism
3.3 Video head drum assembly
3.4 Different tape threading system and formats

3.4.1 VHS
3.4.2 Betamax
3.4.3 Comparison

3.5 Azimuth recording techniques
3.6 Signal processing

3.6.1 Recording system
3.6.2 Play back system

3.7 Servo mechanism

3.7.1 Need of servo control
3.7.2 Basic principle

3.8 Block diagram and functioning of VCR

4. Basic Concept of New Trends :

4.1 Audio CD player
4.2 Audio conferencing
4.3 Video CD player
4.4 Digital versatile disk (DVD)
4.5 Video Home Entertainment Centre (VHEC)
4.6 Video Test Data Terminal
4.7 Simple audio and video compression techniques

PRACTICALS

1. Study of Audio tape transport system.
2. Study of signal processing of Audio tape recorder
3. Maintenance of Audio tape recorder
4. Study of different audio circuits volume, tone, bass, treble and equaliser
5. Alignment of audio tape recorder head
6. Study of video tape transport mechanism
7. Operating procedure of video tape recorder
8. Study of different sections of VCR
9. Alignment of internal controls of VCR
10. Fault finding of VCR
11. Study of audio CD player
12. Study of Video CD player

REFERENCE BOOKS :

1. Audio & Video Systems A.K. Saxena & K.K. Saxena
2. Hand Book of Magnetic Recording D. Jorgen
3. A Course in Electrical & Electronic Measurement & Instruments A.K. Sawhney
4. VCR - Principles, Maintenance & Repair S.P. Sharma
5. Basic TV & Video System Bernard Grob
6. VCR Trainee Manual

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 321	**POWER AND INDUSTRIAL ELECTRONICS**	3	-	3

EL 52/IE 52 3 -- 3

CONTENTS

1. Introduction :

1.1 Principle, Construction and characteristics of SCR, TRIAC, DIAC, UJT, PUT, Power MOSFET, LASCR.
1.2 Ratings of SCR
1.3 "Turn on" and "Turn off" mechanism of SCR
1.4 Series and parallel connections of SCR
1.5 Snubber circuits
1.6 UJT as a relaxation oscillator

2. Power Control and Rectifiers :

2.1 Phase control circuit of SCR

2.1.1 Simple R-C circuit
2.1.2 Transformer circuit
2.1.3 UJT circuit
2.1.4 Ramp and Pedestal circuit

2.2 Different methods of turning off SCRs
2.3 SCR Half Wave rectifier (single phase)

2.3.1 SCR with resistive load
2.3.2 SCR with inductive load (with and without free wheeling diode)

2.4 TRIAC as a power control circuit
2.5 Three phase HW and FW rectifier using PN junction diode

2.5.1 Calculation of RMS value
2.5.2 Average value
2.5.3 Ripple factor
2.5.4 PIV
2.5.5 TUF

3. Inverters and Converters :

3.1 Basic principle of inverters
3.2 Ringing choke inverter
3.3 Push pull type inverter using transistor
3.4 Series and parallel inverter circuits using SCR (Single phase)
3.5 Basic idea of PWM inverter

4. AC Stabilizer and Power Supply :

4.1 Resonant stabilizer
4.2 Electro mechanical stabilizer (using relay and servo motor)
4.3 Electronic stabilizer
4.4 Block diagram of UPS (OFF line and ON line)
4.5 Switched mode power supply (SMPS)

4.5.1 Block diagram and basic principle
4.5.2 Types of SMPS
4.5.3 Merits and demerits of SMPS

5. Timer Circuit :

5.1 Using transistor
5.2 Using SCR

6. Speed Control of D.C. Motor :

6.1 Concept of motor speed control
6.2 Speed torque relation for motor
6.3 Armature voltage control method (using SCR)
6.4 Speed control method (using techo-generator)

7. Heating, Welding and their Application :

7.1 Principle and application of induction heating
7.2 Principle and application of dielectric heating
7.3 Principle of resistance welding
7.4 Type of resistance welding
7.5 Sequential timing circuit

PRACTICALS

1. To plot V-I characteristics of SCR
2. To plot V-I characteristics of TRIAC
3. To plot V-I characteristics of UJT
4. To plot V-I characteristics of DIAC
5. Observe the various waveforms of UJT relaxation oscillator
6. Study of half wave rectifier using SCR with resistive load and inductive load.
7. Application of TRIAC as light dimmer/fan regulator
8. Study of phase inverter circuit using transistor
9. Study of inverter circuit using SCR
10. Study of electronic-mechanical/electronic A.C. stabilizer
11. Study of UPS
12. Study of SMPS
13. Study of electronic timers using transistor
14. Study of electronic timers using 555/transistor
15. Study of speed control of D.C. motor
16. Study of resistance welding
17. Assembling and testing of manual stabilizer with auto cut facility.

REFERENCE BOOKS :

1. An Introduction to Thyristor M. Ramamoorthy & their Application
2. Industrial Electronics G.K. Mithal
3. Industrial Electronics O. Cage
4. Thyristor Engineering M.S. Berde
5. Thyristor & its Application H.C. Rai
6. Electronics in Industry Chute & Chute
7. ikWoj ,.M bfUMLVªh;y bysDVªksfuDl ¼fgUnh½ tykU/kjk] ekFkqj
8. Industrial Electronics & Control Biswanth Paul
9. Power Electronics P.C. Sen
10. Power Electronics P.S. Bhimbhara

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 331	**COMPUTER ARCHITECTURE AND ORGANISATION**	3	-	3

EL 53/IE 53 3 -- 3

CONTENTS

1. Introduction :

1.1 Block diagram of computer
1.2 Register transfer
1.3 Arithmetic micro - operation
1.4 Logical micro-operation
1.5 Control function

2. Processor Design :

2.1 Introduction

2.1.1 Simple accumulator based CPU
2.1.2 CPU with register organisation

2.2 Instruction sets

2.2.1 Instruction format
2.2.2 Addressing mode
2.2.3 Instruction type

2.3 Fixed Point Arithmetic :

2.3.1 n bit two's complement adder and subtractor
2.3.2 Two's complement multiplier
2.3.3 Combinational array multipliers
2.3.4 Division by sequential n bit binary adder
2.3.5 Division by repeated multiplication

2.4 ALU Design

2.4.1 Structure of a basic fixed point ALU
2.4.2 Basic of floating point ALU

3. Control Design :

3.1 Introduction

3.1.1 Instruction sequencing
3.1.2 Instruction interpretation

3.2 Hard wired control (Basic Concept)
3.3 Micro programmed Control

3.3.1 Microinstruction
3.3.2 Micro programme
3.3.3 Basic concept of micro programmed control unit
3.3.4 Wilkes's design

4. Memory and its Organizations :

4.1 Types of Memory

4.1.1 Magnetic tape, floppy disk, hard disk, and bubble memory
4.1.2 Optical
4.1.3 CCD
4.1.4 Semiconductor
4.1.5 Flash memory

4.2 Memory Mapping

4.2.1 Virtual
4.2.2 Associative and set-associative
4.2.3 Cache mapping

5. IO Devices :

5.1 Keyboard and Mouse
5.2 Floppy drive
5.3 CD ROM drive
5.4 Printer - Dot Matrix, inkjet, Laser
5.5 Monitor and Plotter

6. Parallel Processing :

6.1 Introduction of pipeline structure
6.2 Introduction of RISC processor and CISC processor

REFERENCE BOOKS :

1. Computer System Architecture Morris Mano
2. Computer Architecture & Organisation John P. Hayes
3. Computer Architecture & Organisation Stalling (PHI)
4. Structure Computer Organisation Tanenbaum (PHI)
5. Computer Organisation & Design Paul Choudhary (PHI)
6. Computer Architecture & Organisation Hamacher & Zaky

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 341	**COMMUNICATION SYSTEM**	3	-	2

CONTENTS

1. Telephony :

1.1 Basic idea of automatic exchange
1.2 Various tone used in automatic telephone exchange
1.3 Electronic telephone hand set
1.4 Block diagram of cordless phone system
1.5 Brief idea of EPABX

2. PLCC System :

2.1 Concept of PLCC
2.2 Coupling equipments
2.3 Mode of coupling to power lines
2.4 Power level
2.5 Modulation method
2.6 Frequency assignment
2.7 Advantage and limitations of PLCC

3. Pulse Modulation :

3.1 General description of PAM, PWM, PPM
3.2 Pulse code modulation

3.2.1 Sampling and sampling theorem
3.2.2 Quantization - uniform and non uniform (definition, different between them)
3.2.3 Quantization noise
3.2.4 PCM reconstruction

3.3 Basic principle and block diagram of Delta modulation

4. Digital Communication :

4.1 Block diagram of Digital Communication system
4.2 Multiplexing - FDM, TDM

4.2.1 Basic concept of synchronisation

4.3 Basic idea of digital modulation techniques

4.3.1 ASK
4.3.2 FSK
4.3.3 PSK, QPSK

4.4 Simple idea of MODEM
4.5 Circuit switching and packet switching

4.6 Brief idea of ISDN
4.7 Comparison of analog and digital communication

5. Facsimile System :

5.1 Introduction
5.2 Use of facsimile
5.3 Facsimile transmitter
5.4 Facsimile receiver

5.4.1 Synchronization
5.4.2 Phasing
5.4.3 Photographic recording
5.4.4 Directing recording

6. Phase Locked Loop :

6.1 Block diagram, working and uses of PLL
6.2 Application for frequency multiplication translation and division
6.3 FM demodulation

PRACTICALS

1. Study of various parts of electronic telephone set
2. Study of EPABX
3. Verification of various tones of automatic telephony system
4. Study of cordless phone system
5. Visit of station employing PLCC system
6. Visit of local telephone exchange
7. Study of multiplexing techniques
8. Study of PCM generation and reconstruction
9. Study of FAX machine
10. Study of MODEM.
11. Calculate the free running frequency of a 565 PLL and measure its lock range and capture range
12. Study a PLL 565 as a FM demodulator

REFERENCE BOOKS :

1. Telegraphy N.N. Biswas
2. Telephony N.N. Biswas
3. Telephony P.N. Das
4. Telegraphy J. Atkinson
5. Communication System George Kennedy
6. Radio Engineering G.K. Mithal
7. Electronic Communication Roddy & Coolen
8. Principle of Electronic Communication Taub, Schilling
9. Communication System Simon Haykin
10. Model Communication System B.P. Lathi
11. Telecommunication Switching Networks Thyagarajan

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 351	**LINEAR INTEGRATED ELECTRONIC CIRCUITS**	3	-	3

EL 55

CONTENTS

1. IC Fabrication :

1.1 Basic monolithic integrated circuit
1.2 General IC processing steps

1.2.1 Epitaxial growth
1.2.2 Masking and etching
1.2.3 diffusion of impurity
1.2.4 Metallization

1.3 Transistor for monolithic circuit
1.4 Monolithic diode
1.5 Integrated resistor
1.6 Integrated capacitor
1.7 Concept of SSI, MSI, LSI and VLSI

2. Operational Amplifier :

2.1 OP AMP, symbol, equivalent circuit and characteristics.
2.2 Differential amplifier and its configurations
2.3 Working of emitter coupled differential amplifier
2.4 Characteristics of ideal and practical OP-AMP
2.5 Block diagram of OP AMP
2.6 Inverting and non-inverting OP AMP
2.7 OP AMP parameters and their measurements
2.8 Off set null techniques
2.9 OP AMP applications as :

2.9.1 Adder, subtractor, differential amplifier and instrumentation amplifier
2.9.2 Differentiator and integrator
2.9.3 Peak detector, precision rectifier
2.9.4 Log and anti log amplifier
2.9.5 Wein bridge and RC phase-shift oscillator
2.9.6 Pulse, square, triangular and sawtooth wave generator
2.9.7 Comparator and Schmitt trigger
2.9.8 Active filters (single order) - LPF and HPF
2.9.9 Sample and hold circuit
2.9.10 Frequency selective amplifiers

3. Timer Chip 555 :

3.1 Functional block diagram and working
3.2 555 Applications as :

3.2.1 Saw tooth generator
3.2.2 BMV, AMV and MMV
3.2.3 PWM and PPM

4. Voltage Regulation :

4.1 Need of voltage stabilisation
4.2 Transistor series voltage regulator - open loop and close loop
4.3 Short circuit and overload protection circuit
4.4 Functional diagram of IC voltage regulator chip (fixed and variable) 723 and 78XX, 79XX
4.5 Voltage regulator using OP-AMP

PRACTICALS

1. Study of IC 741 OP AMP
2. Design and test the null circuit for OP AMP
3. Design and test an adder and subtractor circuits using OP AMP
4. Design and test an integrator and differentiator circuit using OP AMP
5. Wein bridge and RC phase shift oscillator using OP AMP
6. Design and test a Schmitt trigger circuit using OP AMP
7. Assemble and test a square wave generator and pulse generator circuit using OP AMP
8. Assemble and test a triangular wave generator circuit using OP AMP
9. Design and test a BMV and Schmitt trigger circuits using 555
10. Design and test a MMV and precision timing circuit using 555.
11. Design and test a AMV and a square wave generator circuit using 555
12. Assemble and test high and low voltage regulator using 723 IC
13. Assemble and test a fixed positive and negative voltage regulator using 78XX, 79XX ICs.

REFERENCE BOOKS :

1. OP AMP & Linear ICs Gyakwar
2. Integrated Circuits Botkar
3. Interested Circuits Millman Halkias

4. OP AMP & Linear ICs Caughlin & Driscoll
5. Pulse Circuit Rajul Singhal
6. Linear Integrated Circuit & Application Dr. Y. Venkataramani (ISTE)

Code	Name of Paper	Lecture	Tutorial	Practical
DECE 361	**MICROWAVE ENGINEERING**	3	2/2	-

CONTENTS

1. Microwave :

1.1 Introduction
1.2 Microwave region and bands
1.3 Advantage and applications

2. Microwave Vacuum Tube Devices :

2.1 Construction, working principle and application of :

2.1.1 Klystron
2.1.2 Reflex klystron
2.1.3 Magnetron
2.1.4 Travelling wave tube

3. Microwave Solid State Devices :

3.1 Construction, working principles and application of :

3.1.1 PIN Diode
3.1.2 Tunnel Diode
3.1.3 Gunn Diode
3.1.4 IMPATT Diode

4. Microwave Components :

4.1 Rectangular and circular wave guides
4.2 T junction
4.3 Magic TEE
4.4 Couplers
4.5 Duplexer
4.6 Rotating joints
4.7 Wave guide terminations
4.8 Attenuators
4.9 Wave guide bends, Corners and Twist
4.10 Wave guide irises

4.11 Post and tuning screws
4.12 Coupling probes and coupling loops

5. Microwave Measurements :

5.1 Introduction
5.2 Measurement of frequency and wavelength
5.3 Measurement of power

5.3.1 Calorimeter
5.3.2 Bolometer

5.4 Measurement of VSWR
5.5 Q Measurement
5.6 Noise Figure measurement

6. Introduction of Propagation modes in wave-guides.

REFERENCE BOOKS :

1. Microwave Engineering Chatterjee
2. Microwave Engineering A. Das & S.K. Das
3. Microwave Devices & Circuits Liao
4. Microwave Principles Herbert J. Reich
5. Microwave Components & Measurement A.J. Wheller
6. Electronic Communication System G. Kennedy
7. Microwave Engineering Collins
8. Introduction to Radar System Skolnik

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 371	**'C' PROGRAMMING**	2	-	2

Common for All Branches of Engineering except CS & IT

CONTENTS

1. Introduction :

1.1 Scope of 'C' Language
1.2 Distinction and similarities with other HLLs
1.3 Special features and Application areas

2. Elements of 'C' :

2.1 Character set
2.2 Key words
2.3 Data types
2.4 Constants and Variables
2.5 Operators: unary, binary, ternary
2.6 Operator precedence

3. Console Input-Output :

3.1 Types of I-O
3.2 Console I-O
3.3 Unformatted console I-O: getchar(),putchar(), gets(), puts(), getch(),getche()
3.4 Formatted I-O: scanf(), printf()

4. Control Flow :

4.1 Statements and blocks
4.2 if
4.3 switch
4.4 Loops: for, while, do-while
4.5 goto and labels
4.6 break, continue, exit
4.7 Nesting control statements

5. Arrays :

5.1 Basic concepts
5.2 Memory representation
5.3 One dimensional array
5.4 Two dimensional array

6. Functions :

6.1 Basic concepts
6.2 Declaration and prototypes
6.3 Calling
6.4 Arguments
6.5 Scope rules
6.6 Recursion
6.7 Storage classes types
6.8 Library of functions: math, string, system

7. Pointers :

7.1 Basic concepts
7.2 &, * operator
7.3 Pointer expression: assignment, arithmetic, comparison
7.4 Dynamic memory allocation
7.5 Pointer v/s Arrays

8. Structure and Enumerated Data Types :

8.1 Basic concepts
8.2 Declaration and memory map
8.3 Elements of structures
8.4 Enumerated data types : typedef, enum
8.5 Union

PRACTICALS

1. Problems based on arithmetic expression, fixed mode arithmetic.
2. Problems based on conditional statements and control structures.
3. Problems based on arrays (1-D, 2-D), functions and pointers.
4. Problems based on Engineering applications.

REFERENCE BOOKS :

1. 'C' Programming Stephen Kochan
2. Programming with 'C' Schaum's Series
3. 'C' Programming V.Balguru Swami
4. 'C' Programming Kernighan & Ritchie
5. Let us 'C' Yashwant Kanetkar

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Semester – VI

Code	Name of Paper	Lecture	Tutorial	Practical
DECE 312	**TELEVISION ENGINEERING**	3	2	-

CONTENTS

5.4.6 Sync processing and AFC Circuit
5.4.7 Vertical deflection Circuit
5.4.8 Horizontal deflection Circuit
5.4.9 Sound signal separation
5.4.10 Sound section
5.4.11 Power Supply - EHT.

5.5 Balun and its construction

6. Colour T.V. :

6.1 Colour T.V. Essentials.
6.2 Compatibility.
6.3 Colour perception and three colour theory
6.4 Luminance, hue, saturation, chroma
6.5 Colour difference signal
6.6 Colour picture tube

6.6.1 Delta gun
6.6.2 Precision in line (PIC)
6.6.3 Trinitron

6.7 Colour Signal Transmission (frequency inter leaving technique)
6.8 Band width for Colour Signal Transmission.
6.9 Modulation of Colour Signals
6.10 Weighting factor
6.11 Elementary idea for NTSC, PAL, SECAM systems, their merits and demerits.

7. Concept of Alignment and troubleshooting procedure.

PRACTICALS

1. Installation and study of different TV receiving antennas.
2. Study of controls of monochrome and colour TV.
3. Study of picture tubes for monochrome and colour TV.
4. Study of different sections of monochrome TV.
5. Study of different sections of Colour TV and observe the waveform.
6. Study of setting up and alignment/adjustment of following using pattern generator.

6.1 Sound IF, picture IF
6.2 Vertical height adjustment, vertical linearity adjustment
6.3 Horizontal linearity and size adjustment
6.4 Tuner adjustment

7. I.F. alignment of TV receiver using Wobbuloscope
8. Trouble shooting of monochrome and colour TV receiver
9. Study of UHF to VHF converter.
10. Colour adjustment of Colour TV
11. Visit of TV studio/Telecasting station.
12. Various faults of colour and B/W receivers and their remedies

REFERENCE BOOKS :

1. Monochrome & Colour TV System R.R. Gulati.
2. Colour TV Principle & Practice R.R. Gulati.
3. T.V. Engineering A.M. Dhake
4. T.V. Engg. Theory & Service Kiver Kaufman
5. Basic TV Principles Bernard Grob

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 322	**ADVANCED MICROPROCESSOR**	3	-	3

CONTENTS

1. 8086 Microprocessor :

1.1 Internal architecture - Bus interface unit, execution unit, internal registers and flags.
1.2 Instruction execution sequence
1.3 Addressing modes
1.4 Modes of operation
1.5 Comparison with 8088

2. 8086 Instructions and Programming :

2.1 Data transfer instructions
2.2 Arithmetic instructions
2.3 Logic, shift and rotate instructions
2.4 Processor control instructions
2.5 String operation instructions
2.6 Writing simple assembly language programs
2.7 System bus timing

3. I/O Data Transfer Schemes :

3.1 Classification of IO schemes
3.2 Programmed data transfer - IO mapped and memory mapped IO
3.3 Asynchronous data transfer and synchronous data transfer
3.4 Interrupt driven data transfer

3.4.1 Interrupt process
3.4.2 Multiple interrupts and priorities
3.4.3 Enabling, disabling and masking of interrupts

3.5 DMA data transfer scheme
3.6 Serial data transfer scheme

4. Peripheral Devices and their Interfacing with 8085 :

4.1 Programmable peripheral interfaces - 8255 and its applications.
4.2 DMA controller - 8257
4.3 Programmable interrupt controller - 8259
4.4 Programmable communication interface - 8251
4.5 Programmable TIMER - 8253.
4.6 Programmable keyboard and display interface 8279
4.7 Brief idea of CRT controller, dot-matrix printer controller and floppy disk controller

5. Bus Standards :

5.1 RS 232 C
5.2 IEEE 488

PRACTICALS

1. Study of 8086 trainer kit
2. Assembly language programming in 8086

2.1 Storing an immediate operand in a register/memory
2.2 Copying contents of a register to memory location and vice-versa
2.3 Exchanging controls of two memory locations
2.4 Addition/subtraction of two numbers
2.5 Sorting of odd/even no.
2.6 Arrange data arrays in ascending and descending.
2.7 Programs using stack subroutine.
2.8 Convert ASCII code into packed BCD
2.9 Program for case conversion of letters

3. Interfacing 8255 with 8085
4. Interfacing ADC with 8085
5. Interfacing DAC with 8085
6. Interfacing stepper motor with 8085.
7. Temperature monitoring system using 8085 microprocessor

REFERENCE BOOKS :

1. The 8086 Microprocessor Walter A. TriebelArchitecture
2. Software & Interfacing Techniques Avtar Singh2. Micro Computer Systems Liu & Gibson The 8086/8088 Family
3. An Introduction to Microprocessors A.P. Mathur

4. Microprocessor Architecture & Gaonkar Organization
5. Introduction to 8086/8088 Microprocessor Douglus V. Hall

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 332	**BIO - MEDICAL INSTRUMENTATION**	3	-	2

IE 63

CONTENTS

1. Introduction to Physiology :

1.1 Physiological systems of the human body
1.2 Nerve physiology
1.3 Mechanism of respiration
1.4 Generation, propagation and distribution of action potentials

2. Medical Electrodes :

2.1 Introduction
2.2 Bio-electrode theory
2.3 Types of electrodes and implantation

2.3.1 Microelectrode
2.3.2 Body surface electrode
2.3.3 Needle electrode

3. Bio Medical Recording System :

3.1 Introduction
3.2 Construction of centre type PMMC Galvanometer
3.3 Recording mechanism
3.4 Writing techniques and recorder problems
3.5 Constructional features of strip chart recorder
3.6 Recorder electronics
3.7 Stylus protection technique
3.8 X-Y recorder

4. Electro Cardiograph (E.C.G.) :

4.1 Electrical activity of heart and its construction
4.2 Block diagram of E.C.G. machine
4.3 ECG electrodes
4.4 Lead configuration
4.5 ECG electronics
4.6 ECG controls
4.7 Heart rate measurement
4.8 Artefacts and troubleshooting
4.9 Principle of recording other bioelectric events like EEG and EMG

5. Pace Makers :

5.1 Need
5.2 Classification
5.3 Block diagram of Demand pacemaker
5.4 Basic circuit of fixed rate and synchronous pacemaker

6. Blood Pressure Monitoring :

6.1 Blood circulation system
6.2 Blood pressure waveform
6.3 Blood pressure measurement techniques

6.3.1 Direct
6.3.2 Indirect

6.4 Circuit diagram of B.P. processor to indicate diastolic - systolic blood pressure

7. Defibrillator :

7.1 Need
7.2 Types of defibrillator

7.2.1 A.C. defibrillator
7.2.2 D.C. defibrillator

7.3 Basic defibrillator circuits and control circuits
7.4 Lawn waveform and its synchronization
7.5 Operating controls and precautions

8. Biomedical Instructions :

8.1 Blood Gas analyser
8.2 Densitometer
8.3 Flame photometer
8.4 Blood flow meter
8.5 Skin and systemic body temperature measurement
8.6 X- Ray machine

8.6.1 Tube construction and housing
8.6.2 High voltage power source
8.6.3 Block diagram of X-Ray machine
8.6.4 Image intensifier

8.7 Concept of Sonography
8.8 Concept of CT Scan
8.9 Concept of Magnetic Resonance Indication (MRI)

9. Bed Patient Monitoring System :

9.1 Introduction
9.2 ICU/ CCU systems

10. Electrical Safety :

10.1 Types of Hazard
10.2 Safety precautions

PRACTICALS

1. Study of different types of electrodes
2. Study of different types of recorders
3. Study of ECG machine
4. Measurement of blood pressure using indirect method.
5. Study of blood pressure amplifier
6. Measurement of skin systemic temperature
7. Study of pacemakers
8. Visit to clinical laboratory or hospital
9. Visit to a hospital for X-ray machine / Sonography / CT scan.
10. Visit to ICU/ CCU of hospital

REFERENCE BOOKS :

1. Bio Medical Instrumentation K.R. Nahar
2. Bio Medical Instrumentation Chrompbell
3. Electronics for Medical Personnel Buckstein
4. Servicing Medical & Bioelectronics Equipments Carl J.J.
5. Medical Electronics Khandpur

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 342	**ADVANCE COMMUNICATION SYSTEM**	3	-	3

CONTENTS

4.3 Operating frequency consideration of cellular telephone system
4.4 Basic concept of frequency reuse technique
4.5 General formula for mobile radio propagation (Path characteristics - no derivation)
4.6 Hand off mechanism
4.7 Consideration of the components of cellular system

PRACTICALS

1. Study of satellite receiver.
2. Visit of satellite earth station.
3. Study of various types of optical fibres
4. Plot the characteristics of LED.
5. Study of laser diode.
6. Study of PIN diode.
7. Study of Avalanche photo diode.
8. Study of optical fibre bench.
9. Study of cellular telephone hand set.
10. Visit of Cellular Base station.

REFERENCE BOOKS :

1. Electronic Communication Roddy & Coolen
2. Electronic Communication A.B. Carlson
3. Analog & Digital Communication B.P. Lathi
4. Satellite Communication Prett & Bostian
5. Communication Satellite System J. Martin
6. Optical Communication System C.P. Sandbank
7. Optical Communication System Subir Kumar Sarkar
8. Optical fibre Communication System Senior
9. Mobile Cellular Telecommunication C.Y. Lee
10. Communication System II IMPACT (TTTI,Chandigarh)
11. Information Theory Hancock

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 352	**ELECTRONICS CIRCUITS DESIGN**	3	-	3

CONTENTS

1. Power Supply Design for Rated Voltage, Current and Regulation :

1.1 Using Zener diode
1.2 Emitter follower
1.3 Transistorised series feed back regulator with short circuit protection

2. Design of Transistor biasing circuits for the various class - A,B, AB,C

3. Design of Transistor Amplifiers

3.1 CE amplifier (with & without emitter bypass capacitor)
3.2 Direct coupled CE Amplifier (two stages)
3.3 R-C coupled CE Amplifier (two stages)
3.4 Emitter follower
3.5 Push Pull Amplifier

4. Design of Time Delay Relay Circuits :

4.1 Using transistor and SCR
4.2 Using IC 555
4.3 Using IC 741
4.4 Design of long duration timer using suitable ICs

5. Design of Wave Generator :

5.1 Wein bridge oscillator using transistor and IC (741)
5.2 Phase shift oscillator using transistor and IC (741)
5.3 Square wave and triangular wave generators using IC (741 and 555)

6. Design of Digital Circuits :

6.1 2 bit simultaneous analog to digital converter
6.2 Multi range DVM using suitable IC
6.3 Design of Digital Clock
6.4 Design of 2-digit low frequency counter
6.5 Design of traffic light controller using ICs

PRACTICALS

Note : Assemble and test all the designed circuit mentioned in theory.

REFERENCE BOOKS :

1. Integrated Electronics Milliman Halkias
2. Electronic Devices & Circuits Allen Mottershed
3. Transistor Design Williams
4. Digital Principles & Applications Malvino Leach
5. Digital Electronics Practice Using IC's R.P. Jain
6. Integrated Electronic K.R. Botkar
7. Data Manual of Diode, Transistor & IC's A. K. Maini

8. Data Manual of Different Devices
9. Electronics Devices & Circuits Cherlin
10. Basic Electronics & Linear Circuits Bhargava, Kulshershtha & Gupta

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Code	Name of Paper	Lecture	Tutorial	Practical
DECE 362	**RADAR AND NAVIGATION**	3	-	3

Unit-I Introduction of radar system

Unit-II Continuous Wave radar system

Unit –III Pulse Wave radar system

Unit –IV Navigation

REFERENCE BOOKS :

1. A Course in Elect. Engg. K.D.Prashad

B. Tech. (Electrical Engg.)

Semester I

Sr.No.	Code	Name of Subject	L	P	U
1	CA1101	General English	4	0	4
2	CA1102	General Biology	4	0	4
3	CA1103	Chemistry-I	3	2	4
4	CA1104	Math's – I	4	0	4
5	CA1105	Physics – I	3	2	4
6	CA1106	Computer aided Engineering Graphics	3	2	4

Semester II

Sr.No.	Code	Name of Subject	L	P	U
1	CA1201	Probability & Statistics	4	0	4
2	CA1202	Chemistry – II	3	2	4
3	CA1203	Math's – II	4	0	4
4	CA1204	Physics – II	3	2	4
5	CA1205	Workshop Practice	0	8	4
6	CA1206	Computer Programming – I	3	2	4

Semester III

Sr.No.	Code	Name of Subject	L	P	U
1	CA2101	Electrical Science – I	**4**	**0**	**4**
2	CA2102	Maths – III	**4**	**0**	**4**
3	CA2103	Computer Programming – II	**3**	**2**	**4**
4	CA2104	Mechanics of Solids	**4**	**0**	**4**
5	CA2105	Principal of Management	**4**	**0**	**4**
6	CA2106	Measurement Techniques	**3**	**2**	**4**
7	CA2107	Technical Report Writing			

Semester IV

Sr.No.	Code	Name of Subject			L		P		U
1	CA2201	Structure and Properties of Materials			**4**		**0**	**4**	
2	CA2202	Electrical Science - II			**3**		**2**	**4**	
3	CA2203	Measurement Techniques - II			**3**		**2**	**4**	
4	ECE2009	Microprocessor Programming & Interfacing			**4**		**0**	**4**	
5	ECE2011	Discrete Structure for Computer Science			**3**		**2**	**4**	
6	CA2107	Technical Report Writing-II							

Semester Vth

Sr.No.	Code	Name of Subject	L	P	U

1	CA3101	Optimization	**4**	**0**	**4**
2	CA3102	Numerical Analysis	**3**	**2**	**4**
3	EE3103	Electrical Machine-1	**4**	**0**	**4**
4	EE3104	Electrical Engineering Material	**3**	**2**	**4**
5	EE3105	Generation of Electrical Power	**4**	**0**	**4**
6	EE3106	Electronic Fields & Waves	**4**	**0**	**4**

Semester VIth

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	CA3201	Operation Research	**4**	**0**	**4**
2	CA3202	Control System	**3**	**2**	**4**
3	EE3203	Power Electronics-1	**3**	**2**	**4**
4	EE3204	Electrical Machine-2	**4**	**0**	**4**
5	EE3205	Transmission & Distribution	**4**	**0**	**4**
6	EE3206	Non Conventional Energy Source	**4**	**0**	**4**

Semester VIIth

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	BTEE4101	Power Electronics-2	**4**	**0**	**4**
2	BTEE4102	Switch Gear & Protection	**4**	**0**	**4**
3	BTEE4103	Power System Engineering	**4**	**0**	**4**
4	BTEE4104	Power system Analysis	**4**	**0**	**4**
5	BTEE4105	Electric Drive & Their Control	**4**	**0**	**4**
6	BTEE4106	Utilization of Electric Power	**4**	**0**	**4**

Industrial training

Semester VIIIth

Sr.No.	Code	Name of Subject	L	P	U
1	BTEE4201	Practical Training for 6 Month 2. Project 3. Seminar			

Semester I

CA1101 General Biology

Living systems and their properties; major biological compounds; basic physiological processes; introduction to genetics; environment and evolution.

CA1102 Chemistry 1st

This is the first of a sequence of a sequence of two courses aimed at providing an integrated overview of chemistry. Topic to be discussed will include : nuclear chemistry : electronic structure of atoms : molecular structure and chemical bonding : chemical thermodynamics: phase and chemical equilibrium electrochemistry: chemical : phase and chemical equilibrium: electrochemistry; chemical kinetics

CA1103 Thermodynamics

Concepts and laws of thermodynamics; macroscopic thermodynamics properties; application to closed and open system; microscopic approach to entropy; equations of state; thermodynamics of nonreacting mixtures.

CA1104 Mathematics 1

Functions and graphs; limit and continuity; applications of derivative and integral. Conics; polar coordinates; convergence of sequences and series. Maclaurin and Taylor series. Partial derivatives. Vector calculus in R^n; vector analysis; theorems of Green, Gauss and Stokes.

CA1105 Physics 1

Conservation Principles; Rotational Dynamics, Oscillations, Wave Motion, Reflection and Refraction, Interference, Diffraction Ploaristion.

CA1106 Engineering Graphics

Forms; Proportion and presentations; orthographic views; auxiliary views; lines and planes; intersection and development; free hand sketching; working drawing of simple machine parts.

Semester II

CA1201 Probability and Statistics

Probability spaces; conditional probability and independence; random variables and probability distributions; marginal and conditional distributions; independent random variables; mathematical expectation; mean and variance; binomial, Poisson and normal distributions; sum of independent random variables; law of large numbers; central limit theorem (without proof); sampling distribution and test for mean using normal and student's t-distribution; test of hypothesis; correlation and linear regression.

CA1202 Chemistry-2nd

Representative topics from inorganic and organic chemistry will be discussed to expose the student to the logic and systematics of these areas, keeping in view the general principles introduced in the first course. Topics will include: stereoisomerism: important classes of organic reactions such as nucleophilic aliphatic substitution, elimination, electrophonic addition, free radical addition; organic synthesis; chemistry of selected main group elements; coordination chemistry.

CA1203 Maths-2nd

Complex numbers, analytic functions, Cauchy's theorems; elementary functions; series expansions; calculus of residues and applications. Vector space; basis and dimension; linear transformation; range and kernel of a linear transformation; row reduction method and its application to linear system of equations.

CA1204 Physics 2nd

Electric Field, Magnetic Field, Electric Current, Electromagnetic induction, Maxwell's Equations; Electromagnetic waves, Bohr Atom, Atomic spectra Wave Practicle Duality, Uncertainty Principle.

CA1205 Workshop Practice

Casting; metal forming; forging, welding and brazing; metal cutting machines e.g. lathe shaper and planer; drilling, milling and grinding; laboratory exercises involving machining, fitting and joining.

CA1206 Computer Programming I

Introduction to computers; building blocks of computers, I/O devices concept of auxiliary and main memory and memory devices; introduction to number system and information representation inside computer; introduction to UNIX; problem analysis, solution design and program coding using structured programming language.

Semester III

CA2101 Electrical Science-1st

Introduction; basic circuit elements; sources (dependent and independent); Kirchoff's current and voltage law, source representation and conversion; Behaviors of R,L,C components, Network theorems; response of RL, RC and RLC circuits; Mesh, Nodal analysis, A.C. circuits, Single Phase circuit, , Phase angle, Phase difference, Vector Analysis, Different representation of vectors, Transformer- Principle, Construction & efficiency.

CA2102 Maths-3rd

Eigen-values and eigen-vectors. Inner product space and orthonormal bases. Elementary differential equations. Hyper geometric equations, LENGENDRE Polynomials, Bessel functions; Fourier series; Sturm-Liouville problem , series solution for differential equation, systems of first order equations; Laplace transformation and application to differential equations; one dimensional wave equation, one dimensional heat equation and laplace equation in rectangular form.

CA2103 Computer Programming-II

Shell programming in Unix; use of advanced filters and other tools like sed and awk; system calls; advanced programming concepts; macro definition and usage, recursion and problem solving; concept of pointers, dynamic data structure using pointers, advanced usage of pointers; bit operations; handling command line arguments, dynamic memory allocation and management; file management; problem solving using simple data structures like stacks, queues, linked lists and binary trees. This course will focus on non-trivial problem solving using the various programming tools available in Unix and the C programming language.

CA2104 Mechanics of Solids

Fundamental principles of mechanics; introduction of mechanics of deformable bodies; forces and moments transmitted by slender members; stress and strain; stress-strain-temperature relations; torsion; stresses and defections due to bending; stability of equilibrium.

CA2105 Principal of Management

Fundamental concepts of management – planning; organizing ; staffing; directing and controlling ; production, financial; personnel legal and marketing functions; accounting and budgeting , balance sheets.

CA2106 Measurement Techniques

A laboratory course that covers the lab. Components associated with six core science courses in the integrated first degree structure. While the exact component and assignments may vary from time to time the assignments would invariably be illustrative of the theory covered in this portion as well as aim to emphasize the aspects of measurement as a theme in experimental science.
This course is a compulsory requirement for all students who have to compulsorily do the six core science courses. Other students may be permitted to register in this course with prior approval.

CA2107 Technical Report Writing

Elements of effective writing; art of condensation; business letter writing; mamos; formal reports; technical proposals; conduction and participating, meetings; notices, agenda and minutes; strategies for writing technical descriptions, definitions and classifications; oral presentation; use of graphic and audio-visual aids; editing.

Semester IV

CA2201 Structure and Properties of Materials

Study of the basic properties of materials in relation to their molecular structure; emphasis on the structure of metallic, polymeric and ceramic materials in relation to their mechanical, electrical, electronic and chemical properties, methods of imparting desirable properties to materials by inducing changes in molecular structure; property requirements and material selection, criteria for widely ranging service conditions.

CA2202 Electrical Sciences-II

Introduction; sinusoidal steady state analysis of circuits; three phase circuits; magnetic circuits; transformers; basics of rotating machines; DC machines; synchronous machine; induction machine.

CA2203 Measurement Techniques-II

Measurement of basic electrical and non-electrical quantities; system performance measurements; analysis of experimental data. The course shall aim to train the student in this skill of operation of instruments in the electrical and electronics, chemical, civil and mechanical engineering applications, Precise lab. Exercises will be prescribed from time to time.

CA2204 Microprocessor Programming & Interfacing

Elements of digital electronics; PC organization; 80X86 as CPU : Instruction set register set, timing diagrams, modular assembly programming using procedures & macros, assembler, linker & loader concepts; concept of interrupts: hardware interrupts, software interrupts, BIOS and DOS interrupts; disk

organization: boot sector, boot partition, root directory & FAT; memory interfacing & timing diagrams; I/O interfacing; programmable I/O devices such as 8255, 8253, 8259, etc.

CA2205 **Discrete Structure for Computer Science**

Introduction to discrete mathematical structures; formal logic and predicate calculus; sets, relations and functions; proof techniques; graphs and trees; primes, factorization, greatest common divisor residues and application to cryptology; Boolean algebra; permutations, combinations and partitions; recurrence relations and generating functions; introduction to error correcting codes; formal languages and grammars, finite state machines.

CA2107 Technical Report Writing

Semester V

1 CA **3101** **Optimization**

Introduction to optimization; linear programming; simplex methods; duality and sensitivity analysis; transportation model and its variants; integer linear programming nonlinear programming; multi-objective optimization; evolutionary computation techniques

2 CA **3102** **Numerical Analysis**

Solution of non linear algebraic equations, Interpolation & Approximation, differentiation & integration, system of linear equations, Eigen values & Eigen vectors problems, round off and conditioning.

3 EE3103 ELECTRICAL MACHINES – I

2. **Electromechanical Energy conversion:** Basic principles of electro-mechanical energy conversion. Basic aspects and physical phenomena involved in energy conversion. Energy balance. Basic principles of operation of electric generators and motors.
3. **D.C. Machines:** Fundamentals of D.C. machine, construction, armature windings : ring and drum windings. Simple lap and wave windings. Chording, Equalizing, connections. Generated voltage,Armature Reaction,Commutation.,interpoles,DC Generators**:** Type of D.C. generators. No load and load characteristics of D.C. generators. Parallel operation,.DC Motors**:** Principles of operation, production of torque, back emf, torque-current and torque-speed characteristics of motors, Starting of motors. Speed control by variation of armature voltage, field current and Ward Leonard method.. Losses and efficiency, direct and indirect tests, Swinburne's test, Hopkinson's test, Field test, separation of losses, Rosenberg Generator.
4. **Transformers:** Constructional features, emf equation. No load and load conditions. No load current wave shapes. Ideal transformer. Equivalent circuit. Vector diagrams. O.C. and S.C. tests. Sumpner's back to back test. Efficiency. Voltage regulation. Effect of frequency. Parallel operation, auto-transformers, Separation of losses,.Polyphase Transformers**:** Single unit or bank of single-phase units, polyphase connections. Open delta and V connections. Phase conversion : 3 to 6 phase and 3 to 2 phase conversions. Effect of 3-phase winding connections on harmonics. 3-phase winding transformers, tertiary winding.

4 EE 3104 ELECTRICAL ENGINEERING MATERIALS

2. **Conductor Materials:** Electrical, thermal and mechanical properties of conductive and resistive materials. Important characteristics and applications of specific conductor materials like copper, aluminium, AAC, ACSR, Silver, gold, platinum and tungsten, study of important resistance materials, carbon and nicrome, standard resistance materials. Soldering alloys.
3. **Super-conducting Materials:** Introduction, critical field and critical current density, type I and type II superconductors, intermediate state, penetration depth and thin films. Superconductivity at high frequencies, application of superconductivity. Advancements in super-conducting materials
4. **Dielectric materials:** Dielectric behaviour of materials under static and dynamic field. Polarisation, induced and permanent dipole moments. Surface resistivity. Breakdown processes. Thermal properties. Electrical properties of important dielectric materials including plastics and ceramics, Ferro-electric and piezo-electric materials.
5. **Magnetic Materials:** Characteristics of Diamagnetic, paramagnetic, ferro-magnetic, ferrimagnetic and anti-ferromagnetic materials. Properties and applications of common non-retentive and retentive magnetic materials including various alloys, ferrites and powder cores. Eddy current and hysteresis losses, Curie point.
6. (a) **Semiconductor materials:** Electric properties of semi-conducting elements and compounds and their application. Zone refining and crystal growth.

7. (b) **Miscellaneous Materials:** Important electronic properties of electron emitting materials, photosensitive materials and luminescent materials.

5. BTEE3105 GENERATION OF ELECTRICAL POWER

2. **Method of bulk energy generation:** Introduction to thermal, hydel, nuclear and gas power plants with their layouts. Concept of co-generation. Impact of thermal, hydro and nuclear stations on environment.
3. **New Energy sources:** Elementary ideas of electric energy generation by wind, solar, tidal and geothermal energy. Open and closed cycle M.H.D. power generation
4. **Load and Load curves:** Types of load, chronological load curves, load duration curve, energy load curve, mass curve Maximum demand, demand factor, load factor, capacity factor, utilization factor, diversity factor.
5. **Power plant economics:** Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics. Off peak energy utilization. Energy cost reduction
6. **Tariffs:** Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate, block meter rate, two part tariffs, power factor dependent tariffs, three parts tariff. Spot (time differentiated) pricing.
7. **Power Factor Improvement:** Causes and effects of low power factor, advantages of power factor improvement, power factor improvement using shunt capacitors and synchronous condensers. Calculation of most economic power factor when (a) KW demand is constant (b) KVA demand is constant
8. **Selection of Power Plant:** Comparative study of thermal, hydel, nuclear and gas power plants. Base load and peak load plants. Size of generating units, types of reserve and size of plant. Selection and location of power plants

6

EE3106 ELECTROMAGNETIC FIELD THEORY

2. **Introduction:** Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient, Divergence and curl, Green's Stoke's and Helmholz theorems
3. **Electrostatics:** Electric field vectors-electric field intensity, flux density & polarization. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. Field determination by method of images, boundary conditions. Field mappings and concept of field cells
4. **Magnetostatics:** Magnetic field vector, Magnetic field intensity, flux density & magnetization. Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field mappings and concept of field cells.

5. **Time varying fields:** Faraday's law, Displacement currents and equation of continuity. Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflections, refraction and polarization of UPW, standing wave ratio. Pointing vector and power considerations.

Semester 6

1 **CA 3201** **Operation Research**

Introduction to operations research; dynamic programming; network models- including CPM and PERT; probability distributions; inventory models; queuing systems; decision making – under certainty, risk, and uncertainty; games theory; simulation techniques, systems reliability.

2 **CA 3202** **Control System**

Mathematical models of physical systems, feedback characteristics of control contro system components, time response analysis, stability, frequency sponse, state space analysis, compensation.

EE3203 – POWER ELECTRONICS – I

2L+IT **MM : 100** **Exam. Hrs. : 3**

2. **Semiconductor power devices:** Characteristics of Power Diodes. Power Transistor, Triac, Diac and UJT.
3. **SCR:** Construction and characteristics, specification and ratings, pulse transformer, optical isolators, methods of turn on R, RC, UIT relaxation oscillator, blocking oscillator and flipflop firing. Rating extension by series and parallel connections, string efficiency. Protection of SCR: Protection against over voltage, over current, dv/dt, di/dt, switching surges, over heating, Gate protection
4. **Converters:** Half wave converters for single, two, three, six phase. Single phase and three phase full wave converter with R, RL, and RLE loads. Performance factors for line commutated converters. Firing circuits for line commutated converters. Inversion operation. Semi converters, dual converter.

Effect of source impedance. Microprocessor based firing scheme for three-phase fully controlled bridge converter

5. **Choppers:** Principle of chopper operation. Control strategies. Step up/down Copper. Chopper configuration. Chopper commutation. AC Chopper. Source filter. Multiphase Chopper. Chopper firing circuit.

EE3204 ELECTRICAL MACHINES – II

1. **Introduction:** General equation of inducted emf. Effect of distribution, chording and skewing on induced emf. Armature emf. Armature and field mmfs – Effect of power factor and magnitudes of current on armature mmf. Harmonics caused by winding, distribution and saturation, Rotating fields.
2. **Induction motors:** Construction, basic principles, flux and mmf waves, induction motor as a transformer. Equivalent circuits.,. Torque-slip curves. Effect of rotor resistance. Cogging crawling. Starting, speed control and braking of induction motors. Losses and efficiency. Testing. Induction Generator. Induction regulator. Single – phase induction motor. Revolving field theory. Starting methods.
3. **Synchronous machines:** Construction, Basic principles, Flux and EMF waves. Theory of cylindrical rotor and salient pole machines. Two reactance theory. O.C. and S.C and Zero power factor characteristics. Potier triangle and ASA method of finding regulation. V-curves, Parallel operation. Synchronizing. Hunting and its prevention. Starting of synchronous motors. Single phase synchronous motor. Single phase series and repulsion motor.

EE3205 TRANSMISSION & DISTRIBUTION

3L + IT **MM: 100** **Exam. Hrs. : 3**

1. **Supply systems:** Basic Network of power systems. Effect of system voltage on size of conductor and losses, comparison of dc 2-wire, dc –3 wire, 1 –phase ac and 3 phase (3 wire and 4 wire) ac systems, transmission voltages.
2. **Distribution automation:** Types of primary & secondary distribution system, voltage drop, Kelvin's law, Lamp flicker. Distribution automation, project planning, communication, sensors, supervisory control and data acquisition, consumer information service, introduction to automation systems.
3. **Insulators:** Pin, shackle, suspension, post and strain insulators, bushing, voltage distribution over an insulator string, grading and methods of improving string efficiency, pollution flashover.
4. **Mechanical features of overhead lines:** Different types of conductor materials with special reference to their mechanical properties. Line support, cross arms and stays, spacing and arrangement of conductors. Conductors' vibration and its prevention, sag tension, calculation for various conditions. Sag templates. Conductor erection and stringing.
5. **Parameters of transmission lines:** Resistance inductance and capacitance of overhead lines. Effect of earth. Line transposition. Geometric mean radius and distance. Inductance and capacitance of line with symmetrical and unsymmetrical spacing. Inductance and capacitance of double circuit lines. Skin and proximity effects.

6. **Performance of transmission lines:** Steady state analysis short, medium and long lines. Generalized ABCD line constant. Receiving end & sending end power circle diagrams. Ferranti effect. Interference with communication circuits.
7. **CORONA:** Electric stress between parallel conductors. Disruptive critical voltage and visual critical voltage. Calculation for 3-phase overhead line corona power loss. Factors affecting corona. Effect of corona.

BTEE3206 – NON-CONVENTIONAL ENERGY SOURCES

1. **Introduction:** Energy crisis; demand and generation gap; energy management systems, alternative resources of energy & their utilization
2. **Solar energy:** Principles, scope and applications, solar radiation, its measurement & prediction, flat plate collectors-design & theory, solar water heating, solar dryers, solar stills, solar cooling and refrigeration. Solar cells, thermal storage, street lighting, solar power generation
3. **Wind energy:** Wind energy potential measurement, suitable sites, aero-foil design, and windmill and wind electrical generator.
4. **Geothermal energy:** Hot spring and steam ejection, site selection, power plant, advanced concepts.
5. Mini & Micro hydro-plants
6. Tidal energy.

Semester 7

EE4101 –POWER ELECTRONICS –II

1. **Converters:** Performance measures of single and three-phase converters, discontinuous conduction in two quadrant converters, Power factor improvements: Extinction angle control, symmetrical angle control, pulse width modulation control, and sinusoidal pulse width modulation control.
2. **Switching mode regulators:** Buck, boost, buck-boost and Cuk regulators
3. **AC voltage controllers:** Single phase AC controllers with R and RL load, sequence control of AC controllers, three phase AC controllers
4. **Inverters:** Inverter classification, series and parallel inverters, self commutated inverters, single and three phase bridge inverters, voltage and current source inverter, pulse width modulated inverter, Voltage control of inverters.
5. **Cyclo-converters:** Basic principle of operation, single phase to single phase, three phase to three phase and three phase to single phase cyclo-converters. Output equation, Control circuit.

EE4102 – SWITCH GEAR & PROTECTION

1. **Introduction:** Causes and consequences of dangerous currents; fault, overloads and switching over currents. Basic idea of an over current relay, sensitivity, reliability of relay. Fastness of operation. Current grading. Time grading.. Primary and backup protection. Pick up and reset values.
2. **Construction and operation of relay:** Construction and operation of electromagnetic over current and directional relays. Directional element to be realized from rectifier bridge circuits. Connection of directional element and their operating characteristics. Earth fault relay. Directional Relay Connections
3. **Distance protection of transmission lines:** Construction and characteristics of impedance relay, C.T. and P.T. connection for performance. Reactance and mho relay characteristics. Transmission line protection
4. **Protection of synchronous generators and transformers:** Faults in stator winding of alternators, differential protection. Effect of resistance in the star point earthling. Single and multiple ground faults on the rotor. Protection against excitation failure and prime mover failure. Negative sequence protection. Differential protection of generator transformer unit., methods for minimizing the effects. Buchholtz protection. CT connections.
5. **Bus bar protection:** Frame leakage and circulating current protection.
6. **Circuit breakers:** Electric arc, arc characteristics, theories of current interruption, energy balance, resistance switching, current chopping,. Circuit breaker ratings.,Construction and operation of bulk oil, minimum oil and air blast circuit breakers.,sulpher hexa fluoride, vacuum circuit breakers, principle of DC circuit breaking, testing of circuit breakers.

EE4103 POWER SYSTEM ENGINEERING

1. **Economic operation of power systems:** Input –output curves, heat rate and incremental rate curves of generating units. Economic distribution of load between generating units within a plant. Economic distribution of load between power stations, transmission loss equation. Unit commitment and dynamic programming method. Introduction to power system security.
2. **Power system stability:** Power angle equations and power angle curves under steady. State and transient conditions. Rotor dynamics and swing equation (solution of swing equation not included). Steady state, dynamic and transient stability. Synchronizing power coefficient, and stability limits. Introductory explanation of equal area criterion and its application. Critical clearing angle and critical cleaning time of circuit breaker use of auto-reclosing circuit breakers. Factors affecting stability and methods to improve stability.
3. **Excitation systems:** Types of excitation systems. D.C. excitation system, automatic voltage regulator, use of amplidyne and magnetic amplifier. A.C. excitation systems: Shunt excitation system, separate excitation system and brush less excitation system. Solid –state automatic voltage regulator (description of block diagram only).
4. **Interconnected power systems:** Reserve capacity of power station, spinning and maintenance reserves. Advantages and problems of interconnected power systems. Power system interconnection in India.
5. **Voltage control:** Tap changing transformer, phase angle control and phase shifting transformers. Series compensation of transmission lines, Location and Protection of series capacitors, advantages and problems.

EE4104 POWER SYSTEM ANALYSIS

1. Percent and Per unit quantities. Single line diagram for a balanced 3-phase system.

2. **Symmetrical fault analysis:** Transient in R-L Circuit. Symmetrical and asymmetrical short circuit currents in synchronous generator. Equivalent circuits of synchronous machine under sub transient, transient and steady state conditions. Analysis of three phase faults.
3. **Symmetrical components:** Fortescue theorem, symmetrical component transformation. Phase shift in star-delta transformer. Sequence impedances of synchronous machine, transformers and transmission lines. Zero sequence networks of transformers and transmission lines. Construction of sequence networks of a power system.
4. **Unsymmetrical fault analysis:** Signal line to ground, line-to-line and double line to ground faults, connection of sequence networks under fault conditions. Analysis of unsymmetrical faults using symmetrical components.
5. **Load flow analysis:** Static load flow equations (SLFE). System variables. Solution of SLFE. Bus admittance matrix. Bus classification. Load flow problems. Gauss Seidel, Newton Raphson, decoupled and fast decoupled methods for load flow analysis. Comparison of methods.

EE4105 ELECTRIC DRIVES AND THEIR CONTROL

1. **Characteristics of electric motors:** Characteristic of dc motors, three phase induction motors and synchronous motors.
2. **Dynamics of electric drives:** Fundamental torque equations, speed torque conventions and multi-quadrant operation, equivalent values of drive parameters, components of load torques, nature and classification of load torques, calculation of time and energy loss in transient operations, steady state stability, load equalization.
3. **Control of DC drives:** Basic machine equation, operating modes: motoring, and breaking modes. Schemes for dc motor speed control single-phase drive, three phase drive, chopper drive, close loop control, phase-locked-loop control and microcomputer control. Braking operation of rectifier controlled and chopper controlled dc drives.
4. **Control of AC drives:** Induction motor drives: Basic principle of operation, stator voltage control, rotor voltage control, frequency control, voltage and frequency control, current control, voltage, current and frequency control, Close-loop control, Synchronous motor drive: Cylindrical rotor, salient pole, reluctance, permanent magnet and switch reluctance motors Close loop control of synchronous motors. Brushless DC and AC drives.

EE4106 UTILIZATION OF ELECTRIC POWER INCLUDING TRACTION

1. **Electrical heating & welding:** Different methods of electric heating. Principle of high frequency induction and di-electric heating. Construction, operation, performance and applications of arc furnace and induction furnace. Classification of electric welding Electric arc welding. Electric supply for arc welding: welding transformers. Resistance welding.
2. **Electric drives:** Characteristics of load, Reviews of starting and running characteristics of various D.C. A.C. industrial motors. Relative study of efficiency, power factor, size and costs. Starting and speed control of motors. Electric braking, plugging, Rheostatic braking, regenerative braking. Behaviour of motor during starting, acceleration, braking and reversing operations. Speed time relations, Load equalization. Use of flywheels. Determination of motor rating for intermittent loads. Drives for machine tools, lift and cranes, paper mills, printing machinery, rolling for intermittent. Loads.
3. **Electric Traction:** Systems of electric traction, power supply systems for track electrification – comparison and application of different systems.,Traction Methods: Types of services, speed time

and speed distance curves, average and schedule speed. Tractive effort. Estimation of power and energy requirements: specific energy consumption, Mechanics of train movement. Co-efficient of adhesion, Adhesive weight, effective weight.,Traction motor control**:** D.C. and A.C. traction motors, special requirements of selection of type. Speed torque /current characteristics. Various methods of starting and speed control and D.C. A.C. drives used in traction. Series parallel starting. Shunt and bridge transition, drum and contacted type controllers. Metadyne control. Multiple unit control, Master controllers. Methods of electric braking of traction motors.

Semester 8

Industrial Training

B. Tech. (Electronics & Communication Engg.)

Semester I

Sr.No.	Code	Name of Subject	L	P	U
1	CA1101	General English	**4**	**0**	**4**
2	CA1102	General Biology	**4**	**0**	**4**
3	CA1103	Chemistry-I	**3**	**2**	**4**
4	CA1104	Math's – I	**4**	**0**	**4**
5	CA1105	Physics – I	**3**	**2**	**4**
6	CA1106	Computer aided Engineering Graphics	**3**	**2**	**4**

Semester II

Sr.No.	Code	Name of Subject	L	P	U
1	CA1201	Probability & Statistics	**4**	**0**	**4**
2	CA1202	Chemistry – II	**3**	**2**	**4**
3	CA1203	Math's – II	**4**	**0**	**4**
4	CA1204	Physics – II	**3**	**2**	**4**
5	CA1205	Workshop Practice	**0**	**8**	**4**
6	CA1206	Computer Programming – I	**3**	**2**	**4**

Semester III

Sr.No.	Code	Name of Subject	L	P	U
1	CA2101	Electrical Science – I	**4**	**0**	**4**
2	CA2102	Maths – III	**4**	**0**	**4**
3	CA2103	Computer Programming – II	**3**	**2**	**4**
4	CA2104	Mechanics of Solids	**4**	**0**	**4**
5	CA2105	Principal of Management	**4**	**0**	**4**
6	CA2106	Measurement Techniques	**3**	**2**	**4**
7	CA2107	Technical Report Writing			

Semester IV

Sr.No.	Code	Name of Subject		L		P		U	
1	CA2201	Structure and Properties of Materials		**4**		**0**		**4**	
2	CA2202	Electrical Science - II		**3**		**2**		**4**	

3	CA2203	Measurement Techniques - II		**3**		**2**		**4**	
4	ECE2009	Microprocessor Programming & Interfacing		**4**		**0**		**4**	
5	ECE2011	Discrete Structure for Computer Science		**3**		**2**		**4**	
6	CA2107	Technical Report Writing-II							

Semester V

Sr.No.	Code	Name of Subject	L	P	U
1	CA3101	Optimization	4	0	4
2	CA3102	Numerical Analysis	3	2	4
3	ECE 3103	Analog electronics II	3	2	4
4	ECE 3104	Communication System I	3	2	4
5	ECE 3105	Data Structure & Algorithms	4	0	4
6	ECE 3106	Digital Electronics & Computer Organization	4	0	4
7	ECE 3107	EMFT & Microwave Engg.	4	0	4

Semester VI

Sr.No.	Code	Name of Subject	L	P	U
1	CA3201	Operation Research	4	0	4
2	CA3202	Control System	3	2	4
3	ECE 3203	Digital Communication	3	2	4
4	ECE 3204	Microelectronic Circuits	4	0	4
5	ECE 3205	Modern Communication technologies	4	0	4
6	ECE 3206	Multimedia Computing	3	2	4

Semester VII

Sr.No.	Code	Name of Subject	L	P	U
1	ECE 4101	Satellite communication	4	0	4

2	ECE 4102	Communication Networks II	**4**	**0**	**4**
3	ECE 4103	Digital Signal Processing	**4**	**0**	**4**
4	ECE 4104	Analog and Digital VLSI Design	**3**	**2**	**4**
5	ECE 4105	Information Theory & Coding			
6	ECE 4106	Telecommunication Switching Systems Networks	**4**	**0**	**4**

Semester VIII

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	ECE 4201	Industrial Training -II			

Syllabus

B.TECH

(Electronics & Communication Engg.)

Semester I

CA1101 General Biology

Living systems and their properties; major biological compounds; basic physiological processes; introduction to genetics; environment and evolution.

CA1102 Chemistry 1st

This is the first of a sequence of a sequence of two courses aimed at providing an integrated overview of chemistry. Topic to be discussed will include : nuclear chemistry : electronic structure of atoms : molecular structure and chemical bonding : chemical thermodynamics: phase and chemical equilibrium electrochemistry: chemical : phase and chemical equilibrium: electrochemistry; chemical kinetics

CA1103 Thermodynamics

Concepts and laws of thermodynamics; macroscopic thermodynamics properties; application to closed and open system; microscopic approach to entropy; equations of state; thermodynamics of nonreacting mixtures.

CA1104 Mathematics 1

Functions and graphs; limit and continuity; applications of derivative and integral. Conics; polar coordinates; convergence of sequences and series. Maclaurin and Taylor series. Partial derivatives. Vector calculus in R^n; vector analysis; theorems of Green, Gauss and Stokes.

CA1105 Physics 1

Conservation Principles; Rotational Dynamics, Oscillations, Wave Motion, Reflection and Refraction, Interference, Diffraction Ploaristion.

CA1106 Engineering Graphics

Forms; Proportion and presentations; orthographic views; auxiliary views; lines and planes; intersection and development; free hand sketching; working drawing of simple machine parts.

Semester II

CA1201 Probability and Statistics

Probability spaces; conditional probability and independence; random variables and probability distributions; marginal and conditional distributions; independent random variables; mathematical expectation; mean and variance; binomial, Poisson and normal distributions; sum of independent random variables; law of large numbers; central limit theorem (without proof); sampling distribution and test for mean using normal and student's t-distribution; test of hypothesis; correlation and linear regression.

CA1202 Chemistry-2nd

Representative topics from inorganic and organic chemistry will be discussed to expose the student to the logic and systematics of these areas, keeping in view the general principles introduced in the first course. Topics will include: stereoisomerism: important classes of organic reactions such as nucleophilic aliphatic substitution, elimination, electrophonic addition, free radical addition; organic synthesis; chemistry of selected main group elements; coordination chemistry.

CA1203 Maths-2nd

Complex numbers, analytic functions, Cauchy's theorems; elementary functions; series expansions; calculus of residues and applications. Vector space; basis and dimension; linear transformation; range and kernel of a linear transformation; row reduction method and its application to linear system of equations.

CA1204 Physics 2nd

Electric Field, Magnetic Field, Electric Current, Electromagnetic induction, Maxwell's Equations; Electromagnetic waves, Bohr Atom, Atomic spectra Wave Practicle Duality, Uncertainty Principle.

CA1205 Workshop Practice

Casting; metal forming; forging, welding and brazing; metal cutting machines e.g. lathe shaper and planer; drilling, milling and grinding; laboratory exercises involving machining, fitting and joining.

CA1206 Computer Programming I

Introduction to computers; building blocks of computers, I/O devices concept of auxiliary and main memory and memory devices; introduction to number system and information representation inside computer; introduction to UNIX; problem analysis, solution design and program coding using structured programming language.

Semester III

CA2101 Electrical Science-1st

Introduction; basic circuit elements; sources (dependent and independent); Kirchoff's current and voltage law, source representation and conversion; Behaviors of R,L,C components, Network theorems; response of RL, RC and RLC circuits; Mesh, Nodal analysis, A.C. circuits, Single Phase circuit, , Phase angle, Phase difference, Vector Analysis, Different representation of vectors, Transformer- Principle, Construction & efficiency.

CA2102 Maths-3rd

Eigen-values and eigen-vectors. Inner product space and orthonormal bases. Elementary differential equations. Hyper geometric equations, LENGENDRE Polynomials, Bessel functions; Fourier series; Sturm-Liouville problem , series solution for differential equation, systems of first order equations; Laplace transformation and application to differential equations; one dimensional wave equation, one dimensional heat equation and laplace equation in rectangular form.

CA2103 Computer Programming-II

Shell programming in Unix; use of advanced filters and other tools like sed and awk; system calls; advanced programming concepts; macro definition and usage, recursion and problem solving; concept of pointers, dynamic data structure using pointers, advanced usage of pointers; bit operations; handling command line arguments, dynamic memory allocation and management; file management; problem solving using simple data structures like stacks, queues, linked lists and binary trees. This course will focus on non-trivial problem solving using the various programming tools available in Unix and the C programming language.

CA2104 Mechanics of Solids

Fundamental principles of mechanics; introduction of mechanics of deformable bodies; forces and moments transmitted by slender members; stress and strain; stress-strain-temperature relations; torsion; stresses and defections due to bending; stability of equilibrium.

CA2105 Principal of Management

Fundamental concepts of management – planning; organizing ; staffing; directing and controlling ; production, financial; personnel legal and marketing functions; accounting and budgeting , balance sheets.

CA2106 Measurement Techniques

A laboratory course that covers the lab. Components associated with six core science courses in the integrated first degree structure. While the exact component and assignments may vary from time to time the assignments would invariably be illustrative of the theory covered in this portion as well as aim to emphasize the aspects of measurement as a theme in experimental science.
This course is a compulsory requirement for all students who have to compulsorily do the six core science courses. Other students may be permitted to register in this course with prior approval.

CA2107 Technical Report Writing

Elements of effective writing; art of condensation; business letter writing; mamos; formal reports; technical proposals; conduction and participating, meetings; notices, agenda and minutes; strategies for writing technical descriptions, definitions and classifications; oral presentation; use of graphic and audio-visual aids; editing.

Basics of Electronics

Section-A

Semiconductor Physics : Basic concepts, Intrinsic and extrinsic semiconductors, diffusion and drift currents, p-n junction under opencircuit, reverse bias and forward-bias conditions, p-n junction in the breakdown region, Ideal diode, terminal characteristics of junction diode.

Amplifiers : Introduction of different types of amplifiers and theircharacteristics, Principle of amplifition, Frequency response of RC coupled amplifiers, bandwith and Concept of Cascaded Amplifiers, Feedback amplifiers, Effect of positive and negative feedback on amplifier gain and bandwidth.

Section-B

Oscillators : Criteria for oscillations, Qualitative analysis of LC, RC and Crystal Oscillators, Study of Wein Bridge Oscillators.

Operational Amplifiers : Op-amps, its characteristics and its applications.

Power Suppliers : Introduction and Working of Switched Mode Power Supply (SMPS), Voltage Regulator, Introduction to Inverters and UPS.

Section-C

Digital Electronics : Binary, Octal and Hexadecimal number system and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT) NAND, NOR as universal gates, Difference between combinational circuits and sequential circuits, Introduction to flip-flops (S-R & J-K).

Electronics Intruments : Role, importance and applications of genera;- purpose test instruments viz Multimeter Digital & Analog, Cathode

Ray Oscilloscope (CRO), Function/Signal Generator.

Section-D

Display : Seven segment display, Fourteen segment display, Dot matrix display

LED Display : Introduction, Construction, Advantage of LEDs in electronics display

LCD Display : Introduction, Types of LCD display- Dynamic scattering and field effect type; Types of liquid crystal cells :- Transmitting type and reflective type; Advantage and disadvantage of LCD display

Semester IV

CA2201 Structure and Properties of Materials

Study of the basic properties of materials in relation to their molecular structure; emphasis on the structure of metallic, polymeric and ceramic materials in relation to their mechanical, electrical, electronic and chemical properties, methods of imparting desirable properties to materials by inducing changes in molecular structure; property requirements and material selection, criteria for widely ranging service conditions.

CA2202 Electrical Sciences-II

Introduction; sinusoidal steady state analysis of circuits; three phase circuits; magnetic circuits; transformers; basics of rotating machines; DC machines; synchronous machine; induction machine.

CA2203 Measurement Techniques-II

Measurement of basic electrical and non-electrical quantities; system performance measurements; analysis of experimental data. The course shall aim to train the student in this skill of operation of instruments in the electrical and electronics, chemical, civil and mechanical engineering applications, Precise lab. Exercises will be prescribed from time to time.

CA2204 Microprocessor Programming & Interfacing

Elements of digital electronics; PC organization; 80X86 as CPU : Instruction set register set, timing diagrams, modular assembly programming using procedures & macros, assembler, linker & loader concepts; concept of interrupts: hardware interrupts, software interrupts, BIOS and DOS interrupts; disk

organization: boot sector, boot partition, root directory & FAT; memory interfacing & timing diagrams; I/O interfacing; programmable I/O devices such as 8255, 8253, 8259, etc.

CA2205 Discrete Structure for Computer Science

Introduction to discrete mathematical structures; formal logic and predicate calculus; sets, relations and functions; proof techniques; graphs and trees; primes, factorization, greatest common divisor residues and application to cryptology; Boolean algebra; permutations, combinations and partitions; recurrence relations and generating functions; introduction to error correcting codes; formal languages and grammars, finite state machines.

CA2206 Technical Report Writing-II

Semester V

1 CAE **3101** **Optimization**

Introduction to optimization; linear programming; simplex methods; duality and sensitivity analysis; transportation model and its variants; integer linear programming nonlinear programming; multi-objective optimization; evolutionary computation techniques

2 CA **3102** **Numerical Analysis**

Solution of non linear algebraic equations, Interpolation & Approximation, differentiation & integration, system of linear equations, Eigen values & Eigen vectors problems, round off and conditioning.

3 ECE 3103 ANALOG ELECTRONICS.

Introduction & application of various analog & mixed signal IC's. It includes discret & IC amplifier basics; linear & nonlinear OPAMP's ckts. Nonlinear IC's;precision ckts ;comparators; Schmitt triggers; nonsinusoidal & sinusoidal waveform generator

S;phaselocked loops;analog switches;IC power amplifiers; RF/IF amplifiers; switched capacitor circuits; data converters; IC sensors and systems. Laboratory and computer simulation experiments in analysis, design and characterization of electronic circuits

.

4 ECE3104 <u>Communication Systems I:-</u>

Principles of modern analog and digital communication with more emphasis on digital communication. Amplitude and Angle modulation,sampling, PCM,DM,ADPCM, pulse shaping, digital modulation: FSK,PSK,DPSK,QPSK etc.; information theory, source coding & channel coding, Shannon capacity theorems; emerging trends in communication systems. Experiments in analog and digital communication.

5 ECE3105 Data Structures and Algorithms

Introduction to software design principles, modularity abstract , data types, data structures and algorithms analysis of algorithms; linear data structure –stacks, arrays, lists, queue and linked representations , pre-fix, in-fix and fix expressions; recursions set operations, hashing and hash functions; binary and other trees. Traversal algorithms Huffman codes, search trees, priority queues, heaps and balanced trees; sorting techniques; graphs and digraphs, Algorithmic design techniques; data strictures for external multi-way store search and B-trees.

6 ECE3106 Digital Electronics and Computer Organization

Number systems and machine representation, Boolean algebra combinational and synchronous sequential circuits, logic minimization, programmable logic devices state diagrams, digital integrated

circuits, asynchronous circuits, arithmetic operations and algorithms, introduction to computer organization and algorithms, introduction to computer organization and architecture, speed considerations, memory organizations, I/O design, implementation issues. The course will also consist of laboratory practice

7. ECE3107 Electromagnetic Fields & Microwave Engineering

Electromagnetic waves,Maxwell's equations; Poynting theorem and wave equations; propagation of EM waves; transmission lines; microstrip lines; wave guides; cavities and antennas; microwave generators, microwave amplifiers; measurement at microwave frequencies.

Semester VI

1 CA 3201 Operation Research

Introduction to operations research; dynamic programming; network models- including CPM and PERT; probability distributions; inventory models; queuing systems; decision making – under certainty, risk, and uncertainty; games theory; simulation techniques, systems reliability.

2 CA 3202 Control System

Mathematical models of physical systems, feedback characteristics of control contro system components, time response analysis, stability, frequency sponse, state space analysis, compensation.

1. **ECE 3203 <u>Digital Communication</u>**

Introducation, the modling and characterization of information sources,algorithms for source coding and encoding of analog outpout sources; Information transmission through AWGN

Channels using digital modulation methods and BER estimation

Digitalcommunicationthrough band limited Gaussion noise channels;

Channel coding and decoding; Wireless communication channels its characterization

And modulation schemes for such channels; emerging trends in the above field.

4 ECE 3204 Microelectronic Circuits:-

Basic single and tow transistor amplifier configurations; current mirrors & current sources; Active loads; biasing in discrete and integrated circuit amplifiers; voltage sources and voltage References; differential and multistage amplifiers; frequency response of amplifiers; Frequency compensation; output stages and power amplifiers; filters and tuned amplifiers; signal sources and communication circuits etc, illustrative example of analog integrated circuits. The course will emphasize MOS/CMOS and bipolar transistor circuits. Computer simulation exercise using SPICE and other software packages will be prescribed.

5 ECE 3205 Modern communication technology

Modern communication system overview, Digital modulation techniques, channel capacity & coding, Digital link improve techniques, digital receiver design and performance analysis, Wireless communication system: wireless channel modes and link improvement techniques, multiple access schemes. Basic concept of mobile network, Optical Communication System Transmitters, receivers and other optical Communication subsystem, Optical wireless system

.

6 ECE 3206 Multimedia Computing:

Introduction to multimedia;

Media & data Streams;

Image, video & audio file formats;

Image & video processing, synthesis of sound signal;

Image coding & compression, video & audio codecs, low bit rate video telephony;

Audio-visual integration, lip reading, faces animation;

Augmented reality;

Multimedia search services, content based image & video indexing;

Access to multimedia, human-machine interfaces, spoken language interface; algorithm vs. architecture based approaches, multimedia processors, performance quantification;

Case studies, vision 2010.

Semester VII

1 ECE 4101 Satellite Communication

Review of microwave communications and LOS systems; the various satellite orbits like GEO,MEO,LEO; the satellite link analysis and design; the communication transponder system like INSAT, INELSAT etc. the earth segment and earth station engineering; the transmission of analog and digital signals through satellite and various modulation techniques employed the multiple access techniques like FDMA, TDMA, CDMA, DADMA, etc; the INSAT program; salient features of INSAT- systems and services offered; satellite service offered by INTELSAT, INMARSAT and feature satellites like IRIDIUM etc; future trend in satellite communications

2 ECE 4102 Communication Networks

Packet switching and circuit switching; layered network architecture(OSI model), point to point protocols and link:physical layer, error detection and correction, ARQ retransmission strategy, framing, X.25 standard , queuing theory and delay analysis:Little's theorem, analytical treatment of M/M/1 and M/M/m queuing systems, simulation of queuing system, dealy analysis for ARQ system, multi-access protocol sand techniques :Aloha systems, CSMA, IEEE-802 standards, routing and flow control. TCP/IP protocols, ISDN, ATM, network security, design of a LAN systemwith commercially available functional units. Wireless LAN: adhoc network, security issues.

3 ECE 4103 Digital Signal processing:-

Introduction ; design of analog filters; design of digital filters(IIR and FIR); structures for the realization of digital filters; random signals and random processes; linear estimation and prediction; wiener filters; DSP Processor architecture; DSP algorithms for different applications.

4 ECE 4104 Analog & Digital VLSI Design

Physics and models of MOS transistors, basic IC building blocks, MOS operational amplifiers; Analog system design applications; Digital circuits- MOS & CMOS inverters, logic gates, PLA and storage circuits etc; Introduction to analog and digital VLSI design; CAD for IC design and CAD applications in circuit simulation and layout generation.

5 ECE 4105 ECE 393 Information Theory & Coding

Random variables and random processes; Information sourcwe and source coding theorem, Kraft inequality, Shanno-Franno codes, Huffman codes, Arithmetic codes,

Lempel-Ziv-Welch algorithm, universal source codes; channel capacity; noisy channel coding theorem for discrete memoryless channel ;channel capacity with feedback; continuous and Gaussian channels; error control coding; linear block codes and their properties , hard decision decoding, convolution codes and the viterbi decoding algorithm, iterative decoding; turbo codes and low density parity check codes; rate distortion theory: rate distortion function, Random source codes; joint source channel coding and the separation theorem; cryptography: basic concepts on cryptography and cryptoanalysis, security issues; private key encryption algorithm- stream ciphers, block ciphers, Shannon's theory; introduction to number theory-modular arithmetic .exponentiation and discrete logarithms in Galois field; public key encryption algorithm-Diffie-Hellman public key distribution scheme, public key cryptosystem: message authentication, hashing function, digital signatures.

6 ECE 4106 Telecommunication Switching Systems & Networking

Introduction, electromechanical switching, pulse dialing and DTMF dialing, stored program control, space division switching, speech digitization and transmission, time division switching, fundamentals of traffic engineering, telephone networks, signaling, data networks, layered architecture and protocols, LANs, packet switching networks, TCP/IP, ISDN, ATM networks.

Semester VIII

ECE 4201

Industrial Training -II

B. Tech. (ECE) Integrated

1st sem.

Subjects

4. **Physics – I**
5. **Chemistry – I**
6. **Maths – I**
7. **English**
8. **Engineering Drawing**
9. **Computer Fundamental**
10. **Workshop Technology**
11. **Workshop (practical)**

For Electronics

2nd Sem.

Subjects

1.Physics – II

2.Chemistry – II

3. Maths – II

4. Workshop Technology

5.Workshop (practical)

For Electronics

III Sem.

Semester IIIrd

Sr.No.	Code	Name of Subject	L	P	U
1	BTIECE 211	Electronic Components & Shop Practice	**3**	**2**	**4**
2	BTIECE 221	Network Analysis	**4**	**0**	**4**
3	BTIECE 231	Electrical Engg. & Measurement	**4**	**0**	**4**
4	BTIECE 241	Electronic Devices and Circuits	**3**	**2**	**4**
5	BTIECE 251	Digital Electronics	**3**	**2**	**4**
6	BTIECE 261	Basic Communication Engineering	**3**	**2**	**4**
7	BTIECE 271	Electronic Instruments	**3**	**2**	**4**

Semester IVth

Sr.No.	Code	Name of Subject	L	P	U
1	BTIECE 212	Electronic Workshop	**3**	**2**	**4**
2	BTIECE 222	Electronic Circuit	**3**	**2**	**4**
3	BTIECE 232	Pulse and Wave Shaping Circuit	**4**	**0**	**4**
4	BTIECE 242	Digital Instruments	**4**	**0**	**4**

5	BTIECE 252	Instrumentation and Control System	**3**	**2**	**4**
6	BTIECE 262	Transmission Line and Wave Propagation	**4**	**0**	**4**
7	BTIECE 272	Microprocessor	**3**	**2**	**4**

Semester Vth

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	BTIECE 311	Audio and Video System	**3**	**2**	**4**
2	BTIECE 321	Power and Industrial Electronics	**4**	**0**	**4**
3	BTIECE 331	Computer Architecture and Organization	**4**	**0**	**4**
5	BTIECE 341	Linear Integrated Electronic Circuits	**3**	**2**	**4**
6	BTIECE 351	Microwave Engineering	**4**	**0**	**4**
7	BTIECE 351	C Programming Practical Training (24 Days)			

Semester VIth

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	BTIECE 312	Television Engineering	**4**	**0**	**4**
2	BTIECE 322	Advance Microprocessor	**4**	**0**	**4**

3	BTIECE 332	Biomedical Instrumentation	**4**	**0**	**4**
4	BTIECE 342	Advance Communication System	**3**	**2**	**4**
5	BTIECE 352	Electronic Circuit Design	**3**	**2**	**4**
6	BTIECE 362	Radar and Navigation	**4**	**0**	**4**
7	BTIECE 372	Management Practical Training (24 Days)			

Semester VIIth

Sr.No.	Code	Name of Subject	L	P	U
1	BTIECE 311	Computer Programming –II	**3**	**2**	**3**
2	BTIECE 312	Analog Electronics II	**3**	**2**	**4**
3	BTIECE 313	Electrical Science II	**3**	**2**	**4**
4	BTIECE 314	Optimization	**4**	**0**	**4**
5	BTIECE 315	Electromagnetic Fields & Waves	**4**	**0**	**4**
6	BTIECE 316	Data Structure & Algorithm	**3**	**2**	**4**

Semester VIIIth

Sr.No.	Code	Name of Subject	L	P	U

1	BTIECE 321	Circuit & Signals	**4**	**0**	**4**
2	BTIECE 322	Numerical Analysis	**3**	**2**	**4**
3	BTIECE 323	Computer networks	**3**	**2**	**4**
4	BTIECE 324	Control System	**4**	**0**	**4**
5	BTIECE 325	Antenna & Wave Propagation	**4**	**0**	**4**
6	BTIECE 326	Practical Training for 45 Days	**3**	**2**	**4**

Semester IXth

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	BTIECE 411	Wireless Communication	**4**	**0**	**4**
2	BTIECE 412	Digital Signal Processing	**4**	**0**	**4**
3	BTIECE 413	Analog and Digital VLSI Design	**4**	**0**	**4**
4	BTIECE 414	Satellite communication	**3**	**2**	**4**
5	BTIECE 415	Telecommunication switching systems network..	**4**	**0**	**4**

Semester Xth

Sr.No.	**Code**	**Name of Subject**	**L**	**P**	**U**
1	421	Practical Training for 6	**4**	**0**	**4**

		Month 5. Project 6. Seminar			

Detailed Syallabus
3rd Sem.

Electronic Components & Shop Practice

CONTENTS

1. Resistors :

1.1 Classification of resistors
1.2 Colour coding , tolerance and various parameters related with resistor
1.3 Constructional details, specifications, applications of various types of resistors

1.3.1 Fixed - carbon composition, metal film, carbon film, wire wound, alloy
1.3.2 Semi-variable - carbon (vertical and horizontal type) presets cermet, multiturn trimpot
1.3.3 Variable - carbon and wire wound (log and linear) with and without switch, multi turn pot and ganged pot,
1.3.4 Special resistors - LDR, VDR, Thermistor, Sensistors, Fusible resistors.

1.4 Failures in resistors

2. Capacitors :

2.1 Classification of capacitors
2.2 Constructional detail, specification, application of various types of capacitors-

2.2.1 Fixed capacitor - mica, paper, ceramic, plastic film and electrolytic
2.2.2 Variable capacitor - Gang (Air and PVC). Trimmer and padder

2.3 Failures in capacitor
2.4 Identification marking on capacitor (colour coding)

3. Inductors :

3.1 Classification of inductor
3.2 Construction detail, specification, application of fixed and variable inductors - Aircore, Iron core and Ferrite core inductors

4. Electronic Hardwares:

4.1 Construction, working, specification and application of electronic hardwares such as

4.1.1 Switches - Slide, toggle, push button type
4.1.2 Band switches - Rotary wafer type , slide type, push button type

4.1.3 Relay - construction, symbol, contacts
4.1.4 Connectors - Rack and panel, printed circuit, co-axial, tape cable, and plate connectors
4.1.5 Miscellaneous - Crocodile clips, indicator (mains), jacks, plugs, socket, heatsinks and component preformer

4.2 Loud speaker (PM type), Tweeter and woofer
4.3 Microphone - Carbon type, electrodynamic type, condenser and crystal microphone
4.4 Construction of soldering iron, soldering station and desoldering station
4.5 Different tools used in electronic workshop such as:- Nose plier, Cutter, Wire stripper, Tweezer, Screw driver etc.,

5. Soldering and De-Soldering Techniques :

5.1 Soldering - connection, flux alloy, different soldering materials and problems
5.2 Different soldering methods - hand, wave, dip and ultrasonic
5.3 De-soldering technique

PRACTICALS

1. Identification of different type of resistors and study of their colour coding
2. Identification of different type of capacitors and study of their colour coding
3. Identification of different type of switches and their mechanism of operation
4. Study of different tools used in electronics workshop
5. Use and application of component preformer
6. Study of analog and digital multimeters and their uses for measuring voltage, current and resistance
7. Testing of electronic components. Such as: Switches, resistors, capacitors, inductors, diode and transistors
8. To study and read the component data manual
9. Identification of different type of connectors
10. Use of CRO for various measurements
11. Use of function generator for different waveform generation.
12. Study of relay and contacts.
13. Soldering and de-soldering of different components on PCB by soldering iron
14. Preparation of sketches of different electrical and electronic component as per international standards on drawing sheets

Network Analysis

CONTENTS

1. General Network Concept :

1.1 Network Elements (Definition and examples)

1.1.1 Active and passive, Linear and non-linear, Unilateral and bilateral, Lumped and distributed circuit parameters

1.2 Initial conditions in elements
1.3 Mutual inductance (coupling coefficient and dot rule)
1.4 Voltage and current sources (ideal and practical)
1.5 Dependent and independent sources
1.6 Accompanied and unaccompanied sources
1.7 Classification of networks (Definition and examples)

1.7.1 One port network
1.7.2 Two port network

1.8 Network configuration (No formula derivation)

1.8.1 Balanced and unbalanced T section
1.8.2 Symmetrical and Asymmetrical (Pie) section
1.8.3 L section
1.8.4 Lattice section
1.8.5 Bridge
1.8.6 Bridge T section
1.8.7 ladder network

2. Mesh and Nodal Analysis :

2.1 Definition of branch, node, mesh, loop and tree.
2.2 Kirchhoff's laws
2.3 Voltage and current equations for simple meshes and nodes
2.4 Cramer's Rule
2.5 Simple problems upto three variable using Cramer's rules (for DC circuits only)

3. Laplace Transformation :

3.1 Introduction to Laplace transformation
3.2 Solution of first order and second order differential equations (no initial condition)
3.3 Laplace transform of -

3.3.1 Unit step function
3.3.2 Ramp function
3.3.3 Exponential function
3.3.4 Impulse function
3.3.5 Sinusoidal functions
3.3.6 Parabolic function
3.3.7 Derivative of function
3.3.8 Integral of function

3.4 Laplace transform theorems

3.4.1 Shifting theorem
3.4.2 Initial and final value theorem

3.5 Inverse Laplace transformation for simple, multiple and conjugate complex roots.
3.6 Application of Laplace transformation for simple RL, RC and RLC series circuits
3.7 D.C. transients in RL, RC and RLC circuits

3.7.1 Determination of initial condition
3.7.2 Determination of final condition
3.7.3 Simple numerical problems

4. Network Theorems :

4.1 Statement, proof, application and numerical problems (DC circuit only) related to

4.1.1 Superposition theorem
4.1.2 Reciprocity theorem
4.1.3 Thevenin's theorem
4.1.4 Norton's theorem
4.1.5 Millman's theorem
4.1.6 Maximum power transfer theorem
4.1.7 Tellegen's theorem (Only statements)
4.1.8 Star Delta conversion

5. Two Port Networks :

5.1 Introduction
5.2 Open circuit impedance parameters
5.3 Short circuit admittance parameters
5.4 Hybrid (h) parameters
5.5 Transmission parameters
5.6 Inter-relationship between Z and Y parameters
5.7 Equivalent models of Z and Y parameters
5.8 Reciprocity and symmetry of two port networks
5.9 Equivalent T and (Pie) section representation
5.10 Determination of Z and Y parameters for some special networks (T, p, lattice, bridge T)
5.11 Idea of image impedance, characteristics impedance for two port networks

6. Resonance :

6.1 Series resonance in uncoupled circuits

6.1.1 Definition, reactance curves, resonance condition, selectivity and bandwidth

6.2 Parallel resonance in uncoupled circuits

6.2.1 Circuit and phasor diagram
6.2.2 Derivation of resonance conditions
6.2.3 Selectivity and bandwidth

6.3 Q factor, Q factor on energy basis

Electrical Engg. & Measurement

CONTENTS

1. D.C. Machine :

1.1 Principle of D.C. motor
1.2 Construction of D.C. motor
1.3 Back e.m.f., speed, torque and power relationship
1.4 Characteristics of D.C. motor
1.5 Type and application of D.C. motor
1.6 Simple idea of motor starter

2. A.C. Machine :

2.1 Brief construction and working of single phase induction motor
2.2 Brief construction and working of synchronous motor
2.3 Construction and working of stepper motor

3. Polyphase Circuit :

3.1 Star delta connection
3.2 Current, voltage and power relation for star delta connection
3.3 Advantage and disadvantage of polyphase circuit
3.4 Simple problem on star delta circuit

4. A.C. Bridges :

4.1 Generalized treatment of four arm A.C. bridges
4.2 Sources and detectors
4.3 Maxwell's inductance and capacitance bridges
4.4 Hay's bridge
4.5 Anderson bridge
4.6 Heaviside bridge
4.7 Schersing bridge
4.8 De-sauty's bridge and Wein's bridge

5. Measuring Instruments :

5.1 Classification of measuring instruments
5.2 General consideration of torques employed in indicating type instrument (deflection torque, control torque, damping torque)
5.3 Construction and working of voltmeter and ammeter

5.3.1 Moving iron type
5.3.2 Moving coil type
5.3.3 Rectifier type
5.3.4 Dynamometer type

5.4 Construction and working of wattmeter

5.4.1 Dynamometer type
5.4.2 Induction type

5.5 Induction type energy meter
5.6 Ohmmeter

5.6.1 Series type
5.6.2 Shunt type

6. Range Extension and Calibration :

6.1 Significance of range extension
6.2 Use of series and shunt multipliers
6.3 Instrument transformer for range extension
6.4 Working principle of potentionmeter
6.5 Calibration method of ammeter and voltmeter (D.C.) by potentiometer
6.6 Multirange ammeter and voltmeter
6.7 Simple problems
6.8 Vector impedance meter
6.9 Magger
6.10 Cable fault locator

PRACTICALS

1. Study of D.C. motor parts
2. Study the load characteristics of D.C. shunt and series motor
3. Study of induction motor
4. Study of synchronous motor
5. Study of stepper motor
6. Study of construction of moving coil, moving iron type instruments
7. Study of Maxwell's impedance, capacitive bridge.
8. Study of Hay's bridge
9. Study of Schering's bridge
10. Study of De-sauty's bridge and Wein bridge
11. Use of series multiplier for voltmeter range extension
12. Use of shunt multiplier for ammeter range extension
13. Calibration of voltmeter and ammeter (D.C.) using potentiomeor
14. Measurement of insulation resistance by megger
15. Study of induction type energy meter

8.

Electronic Devices and Circuits

1. Vacuum Tubes :

1.1 Types of emissions.
1.2 Brief idea of construction, characteristics, working and applications of

1.2.1 Diode Valve.
1.2.2 Triode Valve.
1.2.3 Tetrode Valve.
1.2.4 Pentode Valve.
1.2.5 Photo Tube.

2. Semiconductor and PN Junction :

2.1. Metal, non metals and semiconductors and their Energy Band Diagram.
2.2 Intrinsic and Extrinsic Semiconductors.
2.3 Effect of temperature on extrinsic semiconductor
2.4 Energy band diagram of extrinsic semiconductor
2.5 Fermi Level and fermi dirac distribution
2.6 Drift and diffusion current
2.7 Hall effect
2.8 P-N Junction Diode

2.8.1 Space charge region, Barrier potential and effect of temperature
2.8.2 Energy band diagram
2.8.3 Biasing of diode.
2.8.4 V-I characteristics
2.8.5 Static and dynamic resistance
2.8.6 Transition and diffusion capacitance
2.8.7 Zenner and Avalanche breakdown

2.9 Working, characteristics and application of

2.9.1 Tunnel diode
2.9.2 Zener diode
2.9.3 Varactor diode
2.9.4 Photo diode
2.9.5 Light emitting diode (LED)

2.10 Photo conductors
2.11 Cds photo conductive cells and photo voltaic cell.

3. Bipolar Junction Transistor (BJT) :

3.1 Constructional details of PNP and NPN transistors
3.2 Working of a transistor

3.2.1 Charge transport phenomenon
3.2.2 Transistor amplifying action
3.2.3 Relation between different currents in a transistor
3.2.4 Simple problems

3.3 Configuration of transistor (CB, CE and CC)
3.4 Behavior of BJT in Active, Cut off and Saturation regions

3.4.1 Transistor as a switch
3.4.2 Transistor as an amplifier

4. Transistor Biasing and Bias Stability :

4.1 D.C. and A.C. Load line.
4.2 Operating point and its stability
4.3 Factors affecting bias stability
4.4 Stability factors
4.5 Bias stabilization
4.6 Calculation of operating point and stability factor for

4.6.1 Fixed Bias Circuit.
4.6.2 Collector to base biasing.
4.6.3 Voltage Divider biasing (Self bias)

4.7 Bias Compensation techniques using

4.7.1 Diode.
4.7.2 Thermistor and Sensistor.

4.8 Thermal stability and Thermal runaway

5. Small Signal Transistor Amplifier :

5.1 CB, CE and CC amplifier and their low frequency small signal equivalent circuit using hybrid parameters.
5.2 Calculation of voltage gain, current gain, input impedance, output impedance and power gain for resistive loads. (Av, Ai, Zi, Zo, Avs, Ais, and Ap)
5.3 Analysis of emitter follower circuit
5.4 Approximate analysis of CE amplifier with and without RE , Emitter follower circuits
5.5. Classification of amplifiers

6. Field Effect Transistor :

6.1 Construction, operation and characteristics of JFET , E and D MOSFET
6.2 Biasing of FET
6.3 Small signal model of JFET
6.4 Terminology used with JFET
6.5 Precaution for handling of MOSFETs

7. Rectifiers and Power Supplies :

7.1 Working of rectifiers

7.1.1 Half wave rectifier
7.1.2 Centre tape full wave rectifier
7.1.3 Bridge rectifier

7.2 Analysis of rectifiers (for all type)

7.2.1 Calculations for average and RMS values
7.2.2 PIV of diodes
7.2.3 Ripple factor
7.2.4 Regulation and efficiency

7.3 Calculation of ripplefactor and working of following filters:

7.3.1 Capacitance filter
7.3.2 Inductance filter
7.3.3 L-C and (Pie) filters

7.4 Voltage Multipliers
7.5 Regulated power supply using zener diode

7.5.1 Simple problems on zener regulator.

PRACTICALS

1. To plot the V-I characteristics of P-N diode and LED.
2. To plot the V-I characteristics of zener diode and study of zener diode regulator circuit
3. To plot the V-I characteristics of PNP transistor in CB, CE and CC configuration
4. To plot the V-I characteristics of NPN transistor in CB, CE and CC configuration and calculate h-parameter for CE configuration.
5. Study of the different biasing circuits and observe the effect of component variation on operating point
6. Study of half wave and full wave rectifiers.
7. Study of bridge rectifier.
8. To study the filter circuits and measure the ripple factor.
9. To plot the V-I characteristics of JFET
10. To plot the V-I characteristics of MOSFET.
11. To study the voltage multipliers.
12. To Study Emitter follower circuits and measure its input and output impedances
13. To study the behavior of Cds photo conductive, photo voltaic cell and photo conductors

Digital Electronics

1. Introduction :

1.1 Digital signal and its representation
1.2 Advantages of digital techniques

2. Number System :

2.1 Decimal, binary, octal and hexa-decimal number system
2.2 Conversion of a number from one system to another system
2.3 Binary addition, subtraction and multiplication
2.4 Representation of positive and negative numbers
2.5 1's complement and 2's complement
2.6 Subtraction using 2's complement
2.7 Parity bit
2.8 Binary codes (Gray, Excess -3, Hamming codes), ASCII code
2.9 Floating point number

3. Logic Gates :

3.1 Introduction
3.2 Symbol and truth table of NOT, AND, OR, NAND, NOR, EX-OR and EX-NOR gates
3.3 Universal gates
3.4 Positve, negative and tristate logic

4. Logic Families :

4.1 Classification of digital ICs.
4.2 Characteristics of digital ICs.
4.3 RTL/RCTL
4.4 DTL
4.5 TTL logic - Operation of TTL NAND gate, open collector and totem - pole output, characteristics of TTL, TTL subfamilies
4.6 Concept of ECL and I2 L.
4.7 PMOS, NMOS and CMOS (NAND, NOR, NOT) Circuits.
4.8 Comparison of logic families
4.9 Interfacing TTL with CMOS family

5. Boolean Algebra :

5.1 Historical review - logical statements, logical constants and variables, truth table
5.2 Boolean operators
5.3 Postulates of Boolean algebra
5.4 Laws of Boolean algebra
5.5 Duality theorem
5.6 De' Morgan's theorem
5.7 Simplification of Boolean expressions
5.8 Verification of Boolean expressions using truth table

6. Minimization Techniques (K-Mapping) :

6.1 Representation of Boolean expression - min. and max. term SOP, POS
6.2 Conversion of truth tables in POS and SOP form
6.3 Karnaugh map upto 4 variables - implication of logic function with and without don't care conditions
6.4 Realization of logic diagrams using NAND/NAND, NOR/NOR gate

7. Combinational Logic Design :

7.1 Binary half and full adder
7.2 Binary half and full subtractor
7.3 Binary serial, parallel and BCD adder
7.4 Parity bit generator and checker
7.5 Binary comparator
7.6 Multiplexer

7.6.1 4 to 1 multiplexer
7.6.2 16 to 1 multiplexer

7.7 Demultiplexer

7.7.1 1 to 4 Demultiplexer
7.7.2 1 to 16 Demultiplexer

7.8 Encoder

7.8.1 Decimal to BCD

7.9 Decoder

7.9.1 BCD to Decimal
7.9.2 BCD to seven segment

8. Sequential Systems :

8.1 Introduction
8.2 Symbol, logic circuit, truth table of R-S, J-K, M/S J-K,D,T flip-flops
8.3 Edge and level triggering
8.4 Shift registers

8.4.1 Left, right and bi-direction
8.4.2 Series and parallel
8.4.3 Universal shift register

8.5 Asynchronous and synchronous counters - up, down and up-down
8.6 Mod counters - Mod 5, Mod 9, decade counter
8.7 Ring counters, Johnson counter
8.8 Programmable counters
8.9 Use of shift register for simple binary multiplication and division.

PRACTICALS

1. Verify the truth tables of NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates
2. Design a NOT, AND, OR, EX-OR, EX-NOR gates using universal gates
3. Design a binary half and full adder
4. Design a binary half and full subtractor
5. Study of BCD to 7 segment decoder
6. Verify the truth table of RS, D, J-K, M/S J-K,D,T flip-flops.
7. Study of asynchronous binary ripple up, down and up-down and different mod counters
8. Study of synchronous counters
9. Study of decade counter
11. Study of programmable counter
12. Study of a shift register using flip flops
13. Study of ring counter using flip flops

Basic Communication Engineering

1. Introduction :

1.1 Basic component of communication
1.2 Definition of modulation
1.3 Need of modulation in communication
1.4 Definition of AM, FM, PM, PAM, PPM, PWM and PCM

2. Noise and Cross Talk :

2.1 Classification of noise

2.1.1 Atmospheric noise
2.1.2 Shot noise
2.1.3 Thermal noise
2.1.4 Transit time noise
2.1.5 Miscellaneous noise

2.2 Noise figure
2.3 Concept of cross talk
2.4 Cross-talk elimination techniques

3. Amplitude Modulation :

3.1 Derivation of AM wave equation
3.2 Modulation index for sinusoidal AM
3.3 Frequency spectrum for sinusoidal AM
3.4 Total power in AM wave.
3.5 Effective voltage and current for sinusoidal AM
3.6 BJT collector amplitude modulator
3.7 General idea of carrier and sideband suppression
3.8 Balance modulator circuits

3.8.1 Using diode
3.8.2 Using FET

3.9 SSB generation by filter and phase shift methods
3.10 Block diagram of AM transmitter

4. Frequency Modulation :

4.1 Derivation of FM wave equation
4.2 Modulation index and frequency deviation for FM
4.3 Frequency spectrum for sinusoidal FM
4.4 FET reactance and varactor diode FM modulator circuits
4.5 Block diagram of FM transmitter using direct and indirect method (Armstrong method)
4.6 Comparison of AM and FM system

5. Radio Receivers :

5.1 Various types of receivers
5.2 Receiver characteristics and their measurements
5.3 Electronic tuning system
5.4 AM demodulator - envelope detection, product demodulator (SSB detection circuit)
5.5 FM demodulator - balance slope, Foster Seely and ratio detector circuit
5.6 Block diagram of Super heterodyne AM receiver and circuit of each stage
5.7 Block diagram of FM receiver

PRACTICALS

1. Generation of AM and measurement of the modulation index.
2. Perform the AM demodulation (Envelope detector)
3. Generation of F.M.
4. Operation of standard R.F. signal generator.
5. Measurement of selectivity, sensitivity, fidility of radio receiver
6. Study of F.M. demodulation.
7. Assembling of two band radio receiver.
8. Alignment and tunning of a transistor radio receiver.
9. Fault finding exercise in a radio receiver.

9.

Electronic Instruments

1. Performance Characteristics of Measuring Devices and Errors :

1.1 Accuracy and precision
1.2 Resolution, drift
1.3 Linearity and hysteresis
1.4 Threshold
1.5 Response time and calibration
1.6 Repeatability and maintainability
1.7 Span
1.8 Errors - Gross, Systematic and Random Errors
1.9 Sensitivity

2. Multimeter :

2.1 Principle of measurement of

2.1.1 D.C. Voltage and current
2.1.2 A.C. Voltage and current
2.1.3 Resistance

2.2 Calculation of shunt and multiplier for range extension
2.3 AC and D.C. sensitivity
2.4 Loading effect
2.5 Specifications and limitations of multimeter.

3. Electronic Voltmeter :

3.1 Characteristics of different analog electronic voltmeter
3.2 Circuits for D.C. voltmeter using BJTs and FETs (single device and balanced bridge type)
3.3 Theory and operation of circuits for average, peak, peak to peak and RMS responding A.C. electronic voltmeters
3.4 Comparison of amplifier rectifier type and rectifier amplifier type electronic voltmeter

4. Cathode Ray Oscilloscope (C.R.O) :

4.1 Construction of CRT and deflection sensitivity
4.2 Block diagram of CRO

4.3 Various controls of CRO
4.4 Detail of X-Y section and delay line
4.5 Horizontal sweep section
4.6 Synchronization of sweep and triggered sweep
4.7 Measurement of voltage, current, frequency and phase angle using CRO
4.8 CRO probes
4.9 Construction and working of dual trace and dual beam CROs

5. Working Principle and Application of :

5.1 Q-meter
5.2 AF/RF signal generators
5.3 Harmonic distortion analyzers.
5.4 Transistor Tester
5.5 Curve Tracer
5.6 LCR bridge
5.7 Output power meter (AF)

6. Digital Displays :

6.1 Construction and Working Principle of different type of displays. Such as Diode Matrix, 7-segment using LED and LCD, Dot matrix using LED
6.2 Comparison of different type of displays

PRACTICALS

1. Measurement of D.C. voltage and current by multimeter
2. Measurement of A.C. voltage and current by multimeter
3. Measurement of resistance by multimeter
4. Complete study of multimeter and specification.
5. Study of electronic voltmeter
6. Study and use of CRO for voltage, frequency and phase angle measurement
7. Measurement of phase and frequency using lissajous figure by CRO
8. Testing of transistors using transistor tester
9. Study of seven segment display (LED and LCD)
10. Measurement of Harmonic distortions of on Amplifier using harmonic distortions Analyzer
11. Measurement of output power of an Audio Amplifier using AF power meter
12. Measurement of L, C, and R by LCR Bridge/ meter
13. Measurement of Q factor of a coil / capacitor by Q meter

4^{th} Sem.

Electronic Workshop

1. Printed Circuit Board Fabrication :

1.1 Introduction
1.2 Types and specification of PCB
1.3 Basic steps of fabrication

1.3.1 Master art preparation
1.3.2 Resist Coating (tape resist, resist paint, silk screen, photographic)
1.3.3 Etching technique
1.3.4 Resist removal
1.3.5 Drilling
1.3.6 Lacquer coating

1.4 Advantage and limitation of PCB
1.5 Safety recommendation
1.6 Block diagram of PCB plant
1.7 Preparation of PCB art work for

1.7.1 Battery eliminator circuit
1.7.2 Audio amplifier circuit
1.7.3 R.C. phase shift oscillator
1.7.4 Multivibrators (using IC 555, 741)
1.7.5 Half adder and full adder circuits

2. Semiconductor Device Fabrication :

2.1 Introduction
2.2 Intrirsic semiconductor fabrication

2.2.1 Floating zone apparatus
2.2.2 Crystal pulling apparatus

2.3 Semiconductor diode and transistor fabrication

2.3.1 Point contact techniques
2.3.2 Grown junction techniques
2.3.3 Alloy junction techniques
2.3.4 Diffused junction techniques
2.3.5 Epitaxial growth techniques

3. Transformer :

3.1 Principle of transformer
3.2 Voltage, current and turn ratio relationship
3.3 Construction details of following transformers.

3.3.1 Core type
3.3.2 Shell type
3.3.3 Auto transformer

3.4 Design procedure of iron core small transformers and numerical problems
3.5 Constructional details of transformers winding machine .

4. Coils and IFTs :

4.1 Classification of Coils according to frequency range
4.2 Classification of coils according to type of winding
4.3 Important terms related to coils

4.3.1 Skin effect.
4.3.2 Dielectric losses.
4.3.3 Distributed capacitance.
4.3.4 Quality factors.

4.4 Imperical formulae for designing of coils with numerical examples
4.5 Toroids - brief idea
4.6 Intermediate frequency transformer (IFT) -

4.6.1 Construction of IFT
4.6.2 IFT details for radio receiver

5. Impregnation Plants :

5.1 Need of impregnation plant
5.2 Diagram of impregnation plant schematic
5.3 Working procedure of Impregnation Plants.
5.4 Safety precautions
5.5 Limitations and advantages
6. Use and practices of an electronics work bench and circuit maker for basic circuits.

PRACTICALS

1. Study of transformer
2. Study of coil winding machine
3. Familiarization with different type of stampings and bobin
4. To design winding and test small transformer of single and tapped secondary
5. To design winding and test the transformer of multiple secondary
6. Preparing and testing IFT
7. Familiarization with various wires used in coil
8. Winding of two band radio transistor Antenna coils for MW and SW
9. Study of PCB plant equipment
10. To design and prepare PCB using tape resist method
11. To design and prepare PCB using resist paint method

12. To design and prepare PCB using silk screen method
13. To design and prepare PCB using photographic method
14. Study of process camera
15. Fabrication and testing of gadgets as mentioned in article 1.7
16. To design PCB using PC software (circuit maker / Easy PC)
17. Use and practice on electronic work bench for basic electronic circuits.

Electronic Circuit

1. JFET and MOSFET Amplifiers :

1.1 The common source CS amplifier its A.C. equivalent circuits and voltage gain calculation at low and high frequency
1.2 The common drain CD amplifier its A.C. equivalent circuits and voltage gain calculation at low and high frequency

2. Multistage Amplifier :

2.1 Different types of coupling

2.1.1 Direct coupling
2.1.2 R.C. coupling
2.1.3 Transformer coupling

2.2 Distortion in amplifiers
2.3 Frequency response of an amplifier
2.4 Effect of cascading on gain and bandwidth
2.5 Simple calculation for gain and bandwidth for RC coupled amplifier
2.6 Measurement of input and output impedance of an amplifier
2.7 Square wave testing of an amplifier
2.8 Comparison and application of coupled amplifiers
2.9 Design analysis of a RC coupled amplifier for given parameters

3. Power Amplifier :

3.1 Classification of power amplifier
3.2 Class A large signal amplifier and its analysis for output power
3.3 Second harmonic distortion
3.4 Transformer coupled audio power amplifiers
3.5 Efficiency and conversion efficiency
3.6 Push pull amplifiers
3.7 Class B power amplifier and its efficiency
3.8 Class AB operation and cross over distortion
3.9 Complementary symmetry push-pull amplifier
3.10 Idea of phase inverter

4. Feedback Amplifier :

4.1 Basic concept of feedback
4.2 Classification of feedback amplifier

4.3 Advantages of negative feedback on gain stability, distortion, frequency response, noise reduction, input impedance and output impedance
4.4 Analysis of various Negative feedback amplifier circuits.
4.5 Comparison of negative voltage feedback and negative current feedback

5. Oscillators :

5.1 Positive feedback concept
5.2 Barkhausen criterion
5.3 Working and calculation of frequency (no formula derivation) for Hartley (series and shunt) , Colpitt's, Clapp, tuned collector, R-C phase shift, Wein bridge, Crystal and beat frequency oscillator

6. Tuned Amplifier :

6.1 Need of tuned amplifier and its design consideration
6.2 Classification of tuned amplifier - Single, double and stagger tuned.
6.3 Single tuned amplifier and its analysis
6.4 Double tuned amplifier and its analysis
6.5 Tuned drain amplifier and tuned collector amplifier
6.6 Applications

7. Transistor at High Frequency and Special Circuit :

7.1 High frequency small signal p model of transistor
7.2 Current gain, alpha cut off frequency (fa)
7.3 fT , fb and their relationship
7.4 Darlington pair and bootstrapping
7.5 Cascode amplifier

PRACTICALS

1. Study of JFET amplifier and plot its frequency response
2. Study of depletion and enhancement MOSFET amplifier and plot its frequency response
3. Plot the frequence response of two stage R-C coupled amplifier and measure its bandwidth
4. Plot the frequence response of transformer coupled amplifier
5. Plot the frequency response of direct coupled amplifier
6. Study of transistor push-pull amplifier
7. Study of complimentary transistor power amplifier
8. Study of phase inverter
9. Study of Dartington pair
10. Plot the frequency response of negative feedback amplifier and observe the effect of negative feed back
11. Plot the frequency response of single tuned and double tuned voltage amplifiers
12. Study of Hartley oscillator and calculate frequency of oscillation
13. Study of Colpitt's oscillator and calculate frequency of oscillation
14. Study of RC phase shift oscillator
15. Study of a Wein bridge oscillator and calculate frequency of oscillation.

16. Study of crystal oscillator
17. Study of clapp oscillator

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Pulse and Wave Shaping Circuit

1. Linear Wave Shaping Circuits :

1.1 R-C circuit as high pass and low pass circuit
1.2 High pass circuit as a differentiator
1.3 Response for step, pulse and square wave input
1.4 Calculation of percentage tilt
1.5 Low pass circuit as an integrator
1.6 Calculation of Rise time
1.7 Response of low pass circuit for step, pulse and square wave input

2. Non Linear Wave Shaping :

2.1 Various clipping circuits using ideal diode
2.2 Transfer characteristics
2.3 Transistor clippers
2.4 Clamping circuit and its application as a staircase wave formgenerator
2.5 Clamping circuit theorem

3. Multivibrator :

3.1 Transistor as a switch and Switching times.
3.2 Bistable Multivibrator (BMV)

3.2.1 Fixed bias and self bias BMV and their working
3.2.2 Calculation of voltage at different points in fixed bias BMV
3.2.3 Symmetrical and unsymmetrical triggering
3.2.4 Working of Schmitt trigger
3.2.5 Hysterisis elimination

3.3 Monostable Multivibrator (MMV)

3.3.1 Working of MMV (collector coupled)
3.3.2 Calculation of time duration
3.3.3 Wave shape at different points and calculation of voltage at different points
3.3.4 Working of emitter coupled MMV
3.3.5 Comparison of collector coupled MMV with emitter coupled MMV

3.4 Astable Multivibrator (AMV)

3.4.1 Working of collector coupled AMV
3.4.2 Wave shapes at different points
3.4.3 Working of emitter coupled AMV
3.4.4 Calculation of free running frequency for collector coupled AMV
3.4.5 Comparison of collector coupled with emitter coupled AMV

3.5 Application of Multivibrators

4. Blocking Oscillator :

4.1 Need of blocking oscillator
4.2 Working of Mono stable and Astable Blocking oscillator and their wave shape at different points :
4.3 Blocking oscillator as sawtooth generator
4.4 Calculation of pulse repeating frequency
4.5 Synchronization of blocking oscillator

5. Time Base Generators (Sweep circuits) :

5.1 Need of time base generator
5.2 General features of time base signals
5.3 Methods of generating time base waveforms
5.4 Principle and working of Miller sweep and bootstrap sweep time base generating circuit

PRACTICALS

1. Design a RC high pass filter for a given frequency

1.1 Plot its frequency response
1.2 Measures the percentage tilt
1.3 Observe it as a differentiator (for different time constant)

2. Design a RC low pass filter for a given frequency

2.1 Plot its frequency response
2.2 Measure its rise time
2.3 Observe it as an integrator (for the different time constant)

3. Observe the wave forms of various clipping circuit
4. Observe the wave forms of various clamping circuits
5. Study of Bistable multivibrator and measure voltages at different points
6. Observe the voltage wave forms at different points of MMV and measure its pulse width.
7. Observe the voltage waveforms at different points of AMV and measure its free running frequency.
8. Observe the output wave form of a schmitt trigger and measure LTP and UTP.
9. Observe the output waveform of a staircase generator
10. Observe the waveform of a blocking oscillator.
11. Observe the waveform of a transistorized Sweep circuit.

Digital Instruments

1. Introduction :

1.1 Comparison of analog and digital instrument

2. Converters :

2.1 D/A converter

2.1.1 Resistive divider
2.1.2 Ladder type

2.2 A/D converter

2.2.1 Simultaneous A/D
2.2.2 Ramp type
2.2.3 Integrating type
2.2.4 Dual slope type
2.2.5 Successive approximation type

3. Digital Voltmeter (DVM) :

3.1 Types of digital voltmeter

3.1.1 Ramp DVM
3.1.2 Integrating DVM
3.1.3 Successive approximation DVM

3.2 General characteristics of DVM
3.3 Advantage of DVM
3.4 Automation in DVM

3.4.1 Automatic polarity indication
3.4.2 Auto ranging
3.4.3 Auto zeroing

3.5 Organisation of digital parts of DVM

4. Digital Multimeter :

4.1 DC voltage attenuator
4.2 Current to voltage convertor
4.3 AC/DC convertor
4.4 Resistance to voltage convertor
4.5 HF to LF voltage converter
4.6 Accuracy of DMM

4.6.1 Sources of errors in D.C. voltage measurement
4.6.2 Sources of errors in DC/AC currents
4.6.3 Sources of errors in AC/DC conversion

4.7 RMS detector in DMM and DMM specifications

5. Digital Frequency Counter :

5.1 Block diagram and working

5.1.1 Basic circuit
5.1.2 Time base
5.1.3 Start stop gate

5.2 Errors in measurements
5.3 Block diagram of universal counter

5.3.1 Measurements of period, frequency, time interval and ratio

6. General Purpose Digital Instruments :

6.1 Basic block diagram, working and applications of -

6.1.1 Signal generator
6.1.2 Function generator
6.1.3 Digital storage CRO
6.1.4 Digital phase meter
6.1.5 Logic analyser
6.1.6 Signature analyser
6.1.7 Logic probe
6.1.8 Logic pulser

7. Guarding Techniques:

7.1 Safety guard and signal ground.
7.2 Ground loops and ground currents.
7.3 Common mode and series mode voltage.
7.4 Avoiding parasitic voltage.

PRACTICALS

1. Assembling and Testing of 3/4 bit DAC using Resistive network divider
2. Assembling and Testing of 3/4 bit DAC using resistive ladder network
3. Design of 2/3 bit simultaneous type A/D converter
4. Study of Ramp type A/D converter
5. Study of Successive Approximation type ADC
6. Study of different digital multimeters
7. Measurement of current, voltage and resistance by digital multimeters
8. Study of logic probes
9. Study and operation of digital frequency counter
10. Study of digital IC tester and testing of IC
11. Study and operation of logic analyser
12. Study and operation of signature analyser

Instrumentation and Control System

1. Basic Concept of Measurement :

1.1. Introduction.
1.2. Generalized configuration of measuring system.
1.3. Characteristics of measuring devices

1.3.1. Accuracy.
1.3.2. Resolution.
1.3.3. Precision.
1.3.4. Expected Value.
1.3.5. Error (Gross, Systematic and Random error).
1.3.6. Sensitivity.
1.3.7. Linearity.
1.3.8. Hysterisis.
1.3.9. Repeatability.
1.3.10. Threshold

1.4. Calibration of measuring devices.

2. Transducers :

2.1 Concept of Primary and Secondary transducers.
2.2 Difference between active and passive transducer.
2.3 Difference between analog and digital transducer.
2.4 Construction and working of the following transducers and measurement of quantities such as Displacement (Linear and angular), Strain, Stress, Temperature, Pressure, Flow level, pH value.

2.4.1 Potentiometers
2.4.2 Strain gauge (resistance and semiconductor type)
2.4.3 Resistance Temperature detectors (RTD)
2.4.4 Thermo couples, thermistor.
2.4.5 Linear variable differential transformer (LVDT).
2.4.6 Capacitive transducer
2.4.7 Load Cell
2.4.8 Piezo Electric Transducer
2.4.9 Photo Cells
2.4.10 Photo Voltaic Cell
2.4.11 Techogenerator
2.4.12 Ultrasonic method for level measurement
2.4.13 Electro magnetic flow meter.
2.4.14 pH electrodes

3. Signal Conditioning :

3.1 Introduction.
3.2 DC Signal Conditioning.
3.3 AC Signal Conditioning.
3.4 Brief idea of data acquisition system

4. Control System :

4.1 Concept of open loop and close loop system
4.2 Automatic control system
4.3 Transfer function
4.4 Block diagram reduction techniques
4.5 Concept of feedback control and its effects

5. Control System Components :

5.1 Working principle and construction of -

5.1.1 Synchro Transmitter
5.1.2 Synchro receiver
5.1.3 Control transformer
5.1.4 DC and A.C. servo motors

5.2 Characteristics of servo amplifier for A.C. and D.C. error signals

6. Position Control System :

6.1 Introduction.
6.2 Study position control in small/large system with the help of block diagrams of -

6.2.1 Pen recorder
6.2.2 Real drive
6.2.3 Machine tool control
6.2.4 Level Control
6.2.5 Temperature Control

PRACTICALS

1. To measure the linear and angular displacement by

1.1 LVDT.
1.2 Potentiometer.
1.3 Capacitive transducer.

2. Measurement of speed of the shaft by contact and non contact methods.

2.1 Photo electric transducer.
2.2 Magnetic transducer
2.3 Techogenerator

3. Measurement of force by strain gauge bridge
4. Measurement of pH value using pH meter
5. Error detection by synchro pair
6. Measurement of temperature and draw the characteristics of following -

6.1 Thermocouple.
6.2 RTD
6.3 Thermister

7. To draw the torque and speed curve for servo motor.
8. Measurement of level by capacitive transducer.
9. To observe the output wave form of synchro transmitter on CRO and find the electrical zero.

Transmission Line and Wave Propagation

1. Electromagnetic Theory :

1.1. Maxwell's Equations.
1.2. Electromagnetic Wave Equation for free space.
1.3. Propagation of uniform plane wave.
1.4. Reflection Refraction and polarisation of electromagnetic waves. (Simple description - no derivation)

2. EM Wave Propagation :

2.1. Ground Wave propagation and effect of curvature of the earth.
2.2. Space Wave Propagation

2.2.1. Line of sight distance.
2.2.2. Effect of Atmosphere and Obstacles. (no derivation)

2.3. Sky Wave Propagation

2.3.1. Ionospheric and its characteristics
2.3.2. Critical frequency
2.3.3. Effect of the Earth's magnetic field on ionospheric propagation
2.3.4. MUF and Skip distance.
2.3.5. Ionospheric absorption and disturbances.
2.3.6. Atmospheric noise.
2.3.7. Scatter propagation.
2.3.8. Fading of Radio Waves. (no derivation)

3. Transmission Lines :

3.1. Fundamentals of Transmission Line

3.1.1. Transmission Line Equation.
3.1.2. Characteristic Impedance.
3.1.3. Terminated Loss-less Line.
3.1.4. Standing Wave Ratio V.S.W.R. and its measurement
3.1.5. Behaviour of quarter and half wave line

4. Antennas :

4.1. Principle of Radiation.
4.2. Resonant and non resonant antennas.
4.3. Radiation Pattern of l/2, l and 3l/2 dipoles. Effect of ground on l/2 dipole.
4.4. Radiation pattern of grounded l/4, l/2, and l dipole.
4.5. Radiation resistance, total resistance, efficiency, beam width, gain, aperture area of an

antenna. (no derivation)
4.6. Antenna Array -

4.6.1. Principle of Pattern Multiplication
4.6.2. Broad Side array
4.6.3. End Frire array

4.7. Folded dipole and Rhombic antenna.
4.8. Yagi antenna and parasitic elements
4.9. Log Periodic and Loop antenna.
4.10. Parabolic antennas and Horn antenna
4.11. Measurement of antenna impedance and field pattern

Microprocessor

1. Introduction :

1.1 Microprocessor concept
1.2 Historical review of microprocessor development
1.3 Organization of a micro computer

2. The 8085 Architecture :

2.1 Internal block diagram
2.2 8085 signals and their functions
2.3 Demultiplexing of buses
2.4 Pin configuration and logical diagram.

3. 8085 Instructions and Programming :

3.1 Instruction format

3.1.1 Mnemonics
3.1.2 Opcode and operand
3.1.3 Instruction length

3.2 Classification of instruction

3.2.1 Data transfer
3.2.2 Arithmetic
3.2.3 Logical
3.2.4 Branching
3.2.5 Machine control

3.3 Different interrupts of 8085 Microprocessor
3.4 Addressing modes
3.5 Stack operation and related instructions
3.6 Subroutine and related instructions
3.7 Machine and assembly language
3.8 Assembly language programming
3.9 Debugging of programs

4. Memory and I/O System :

4.1 Memory types
4.2 Memory organization
4.3 Basic concept of memory interfacing and I/O interfacing
4.4 Difference between peripheral I/O and memory mapped I/O

5. Instruction Execution and Timings :

5.1 Instruction cycle - machine cycle, T-states
5.2 Fetch cycle
5.3 Memory read and write cycle
5.4 I/O read and write cycle
5.5 Interrupt acknowledge cycle
5.6 Bus idle cycle
5.7 DMA cycle
5.8 Machine cycle with wait states.
5.9 Programs using delays and counters

6. Limitation of 8 bit Microprocessor.

PRACTICALS

1. Study of 8085 microprocessor kit
2. Addition of two 8 bit numbers with and without carry
3. Subtraction of two 8 bit numbers with and without borrow
4. Multiplication of two 8 bit number using successive addition and resistor shifting method
5. Program to find out square of a number.
6. Programs involving data arrays

6.1 Generating odd numbers.
6.2 Data transfer schemes
6.3 Sorting of odd/even numbers.
6.5 Finding largest and smallest numbers.
6.6 Arrange data array in ascending / descending order

7. Programs using stack
8. Programs using subroutine.
9. Debugging of programs using single stepping on kit

6. .

5th Sem.

Audio and Video System

1. Magnetic Tape (Audio System) :

1.1 Introduction of audio system

1.1.1 Monophonic
1.1.2 Stereophonic

1.2 Block diagram of tape recorder
1.3 Material used for tape
1.4 Head

1.4.1 Types
1.4.2 Construction, working
1.4.3 Comparison
1.4.4 Faults

1.5 Working principle of Magnetic tape recorder in Recording Mode
1.6 Working principle of Magnetic tape recorder in Play back Mode
1.7 Biasing technique

1.7.1 Type of biasing
1.7.2 Bias oscillator

1.8 Equalization
1.9 Tape transport mechanism

1.9.1 ATR
1.9.2 ACR
1.9.3 Comparison

1.10 Recording techniques

1.10.1 Direct recording
1.10.2 FM recording
1.10.3 PDM recording
1.10.4 Digital recording
1.10.5 Comparison between recording techniques

2. HI-FI and Stereophony :

2.1 Meaning of Hi-Fi
2.2 Basic components
2.3 Fundamental of sound harmonics
2.4 Loudness
2.5 Pitch
2.6 Timbre
2.7 Sensitivity
2.8 Stereophony recording
2.9 Broadcasting of stereophony and its reproduction
2.10 Active and passive audio circuits

2.10.1 Volume control
2.10.2 Tone control
2.10.3 Bass and treble control
2.10.4 Graphic equaliser

2.11 Basic idea about audio pre amplifier and power amplifiers

3. Magnetic Tape (Video System) :

3.1 Basic principle
3.2 Video tape transport mechanism
3.3 Video head drum assembly
3.4 Different tape threading system and formats

3.4.1 VHS
3.4.2 Betamax
3.4.3 Comparison

3.5 Azimuth recording techniques
3.6 Signal processing

3.6.1 Recording system
3.6.2 Play back system

3.7 Servo mechanism

3.7.1 Need of servo control
3.7.2 Basic principle

3.8 Block diagram and functioning of VCR

4. Basic Concept of New Trends :

4.1 Audio CD player
4.2 Audio conferencing
4.3 Video CD player
4.4 Digital versatile disk (DVD)
4.5 Video Home Entertainment Centre (VHEC)
4.6 Video Test Data Terminal
4.7 Simple audio and video compression techniques

PRACTICALS

1. Study of Audio tape transport system.
2. Study of signal processing of Audio tape recorder
3. Maintenance of Audio tape recorder
4. Study of different audio circuits volume, tone, bass, treble and equaliser
5. Alignment of audio tape recorder head
6. Study of video tape transport mechanism
7. Operating procedure of video tape recorder
8. Study of different sections of VCR
9. Alignment of internal controls of VCR
10. Fault finding of VCR
11. Study of audio CD player
12. Study of Video CD player

Power and Industrial Electronics

1. Introduction :

1.1 Principle, Construction and characteristics of SCR, TRIAC, DIAC, UJT, PUT, Power MOSFET, LASCR.
1.2 Ratings of SCR
1.3 "Turn on" and "Turn off" mechanism of SCR
1.4 Series and parallel connections of SCR
1.5 Snubber circuits
1.6 UJT as a relaxation oscillator

2. Power Control and Rectifiers :

2.1 Phase control circuit of SCR

2.1.1 Simple R-C circuit
2.1.2 Transformer circuit
2.1.3 UJT circuit
2.1.4 Ramp and Pedestal circuit

2.2 Different methods of turning off SCRs
2.3 SCR Half Wave rectifier (single phase)

2.3.1 SCR with resistive load
2.3.2 SCR with inductive load (with and without free wheeling diode)

2.4 TRIAC as a power control circuit
2.5 Three phase HW and FW rectifier using PN junction diode

2.5.1 Calculation of RMS value
2.5.2 Average value
2.5.3 Ripple factor
2.5.4 PIV
2.5.5 TUF

3. Inverters and Converters :

3.1 Basic principle of inverters
3.2 Ringing choke inverter
3.3 Push pull type inverter using transistor
3.4 Series and parallel inverter circuits using SCR (Single phase)
3.5 Basic idea of PWM inverter

4. AC Stabilizer and Power Supply :

4.1 Resonant stabilizer
4.2 Electro mechanical stabilizer (using relay and servo motor)
4.3 Electronic stabilizer
4.4 Block diagram of UPS (OFF line and ON line)
4.5 Switched mode power supply (SMPS)

4.5.1 Block diagram and basic principle
4.5.2 Types of SMPS
4.5.3 Merits and demerits of SMPS

5. Timer Circuit :

5.1 Using transistor
5.2 Using SCR

6. Speed Control of D.C. Motor :

6.1 Concept of motor speed control
6.2 Speed torque relation for motor
6.3 Armature voltage control method (using SCR)
6.4 Speed control method (using techo-generator)

7. Heating, Welding and their Application :

7.1 Principle and application of induction heating
7.2 Principle and application of dielectric heating
7.3 Principle of resistance welding
7.4 Type of resistance welding
7.5 Sequential timing circuit

Computer Architecture and Organization

1. Introduction :

1.1 Block diagram of computer
1.2 Register transfer
1.3 Arithmetic micro - operation
1.4 Logical micro-operation
1.5 Control function

2. Processor Design :

2.1 Introduction

2.1.1 Simple accumulator based CPU
2.1.2 CPU with register organisation

2.2 Instruction sets

2.2.1 Instruction format
2.2.2 Addressing mode
2.2.3 Instruction type

2.3 Fixed Point Arithmetic :

2.3.1 n bit two's complement adder and subtractor
2.3.2 Two's complement multiplier
2.3.3 Combinational array multipliers

2.3.4 Division by sequential n bit binary adder
2.3.5 Division by repeated multiplication

2.4 ALU Design

2.4.1 Structure of a basic fixed point ALU
2.4.2 Basic of floating point ALU

3. Control Design :

3.1 Introduction

3.1.1 Instruction sequencing
3.1.2 Instruction interpretation

3.2 Hard wired control (Basic Concept)
3.3 Micro programmed Control

3.3.1 Microinstruction
3.3.2 Micro programme
3.3.3 Basic concept of micro programmed control unit
3.3.4 Wilkes's design

4. Memory and its Organizations :

4.1 Types of Memory

4.1.1 Magnetic tape, floppy disk, hard disk, and bubble memory
4.1.2 Optical
4.1.3 CCD
4.1.4 Semiconductor
4.1.5 Flash memory

4.2 Memory Mapping

4.2.1 Virtual
4.2.2 Associative and set-associative
4.2.3 Cache mapping

5. IO Devices :

5.1 Keyboard and Mouse
5.2 Floppy drive
5.3 CD ROM drive
5.4 Printer - Dot Matrix, inkjet, Laser
5.5 Monitor and Plotter

6. Parallel Processing :

6.1 Introduction of pipeline structure
6.2 Introduction of RISC processor and CISC processor

COMMUNICATION SYSTEM

1. Telephony :

1.1 Basic idea of automatic exchange
1.2 Various tone used in automatic telephone exchange
1.3 Electronic telephone hand set
1.4 Block diagram of cordless phone system
1.5 Brief idea of EPABX

2. PLCC System :

2.1 Concept of PLCC
2.2 Coupling equipments
2.3 Mode of coupling to power lines
2.4 Power level
2.5 Modulation method
2.6 Frequency assignment
2.7 Advantage and limitations of PLCC

3. Pulse Modulation :

3.1 General description of PAM, PWM, PPM
3.2 Pulse code modulation

3.2.1 Sampling and sampling theorem
3.2.2 Quantization - uniform and non uniform (definition, different between them)
3.2.3 Quantization noise
3.2.4 PCM reconstruction

3.3 Basic principle and block diagram of Delta modulation

4. Digital Communication :

4.1 Block diagram of Digital Communication system
4.2 Multiplexing - FDM, TDM

4.2.1 Basic concept of synchronisation

4.3 Basic idea of digital modulation techniques

4.3.1 ASK
4.3.2 FSK
4.3.3 PSK, QPSK

4.4 Simple idea of MODEM
4.5 Circuit switching and packet switching
4.6 Brief idea of ISDN
4.7 Comparison of analog and digital communication

5. Facsimile System :

5.1 Introduction
5.2 Use of facsimile

5.3 Facsimile transmitter
5.4 Facsimile receiver

5.4.1 Synchronization
5.4.2 Phasing
5.4.3 Photographic recording
5.4.4 Directing recording

6. Phase Locked Loop :

6.1 Block diagram, working and uses of PLL
6.2 Application for frequency multiplication translation and division
6.3 FM demodulation

PRACTICALS

1. Study of various parts of electronic telephone set
2. Study of EPABX
3. Verification of various tones of automatic telephony system
4. Study of cordless phone system
5. Visit of station employing PLCC system
6. Visit of local telephone exchange
7. Study of multiplexing techniques
8. Study of PCM generation and reconstruction
9. Study of FAX machine
10. Study of MODEM.

Linear Integrated Electronic Circuits

1. IC Fabrication :

1.1 Basic monolithic integrated circuit
1.2 General IC processing steps

1.2.1 Epitaxial growth
1.2.2 Masking and etching
1.2.3 diffusion of impurity
1.2.4 Metallization

1.3 Transistor for monolithic circuit
1.4 Monolithic diode
1.5 Integrated resistor
1.6 Integrated capacitor
1.7 Concept of SSI, MSI, LSI and VLSI

2. Operational Amplifier :

2.1 OP AMP, symbol, equivalent circuit and characteristics.
2.2 Differential amplifier and its configurations

2.3 Working of emitter coupled differential amplifier
2.4 Characteristics of ideal and practical OP-AMP
2.5 Block diagram of OP AMP
2.6 Inverting and non-inverting OP AMP
2.7 OP AMP parameters and their measurements
2.8 Off set null techniques
2.9 OP AMP applications as :

2.9.1 Adder, subtractor, differential amplifier and instrumentation amplifier
2.9.2 Differentiator and integrator
2.9.3 Peak detector, precision rectifier
2.9.4 Log and anti log amplifier
2.9.5 Wein bridge and RC phase-shift oscillator
2.9.6 Pulse, square, triangular and sawtooth wave generator
2.9.7 Comparator and Schmitt trigger
2.9.8 Active filters (single order) - LPF and HPF
2.9.9 Sample and hold circuit
2.9.10 Frequency selective amplifiers

3. Timer Chip 555 :

3.1 Functional block diagram and working
3.2 555 Applications as :

3.2.1 Saw tooth generator
3.2.2 BMV, AMV and MMV
3.2.3 PWM and PPM

4. Voltage Regulation :

4.1 Need of voltage stabilisation
4.2 Transistor series voltage regulator - open loop and close loop
4.3 Short circuit and overload protection circuit
4.4 Functional diagram of IC voltage regulator chip (fixed and variable) 723 and 78XX, 79XX
4.5 Voltage regulator using OP-AMP

PRACTICALS

1. Study of IC 741 OP AMP
2. Design and test the null circuit for OP AMP
3. Design and test an adder and subtractor circuits using OP AMP
4. Design and test an integrator and differentiator circuit using OP AMP
5. Wein bridge and RC phase shift oscillator using OP AMP
6. Design and test a Schmitt trigger circuit using OP AMP
7. Assemble and test a square wave generator and pulse generator circuit using OP AMP
8. Assemble and test a triangular wave generator circuit using OP AMP
9. Design and test a BMV and Schmitt trigger circuits using 555
10. Design and test a MMV and precision timing circuit using 555.
11. Design and test a AMV and a square wave generator circuit using 555

12. Assemble and test high and low voltage regulator using 723 IC
13. Assemble and test a fixed positive and negative voltage regulator using 78XX, 79XX ICs.

Microwave Engineering

1. Microwave :

1.1 Introduction
1.2 Microwave region and bands
1.3 Advantage and applications

2. Microwave Vacuum Tube Devices :

2.1 Construction, working principle and application of :

2.1.1 Klystron
2.1.2 Reflex klystron
2.1.3 Magnetron
2.1.4 Travelling wave tube

3. Microwave Solid State Devices :

3.1 Construction, working principles and application of :

3.1.1 PIN Diode
3.1.2 Tunnel Diode
3.1.3 Gunn Diode
3.1.4 IMPATT Diode

4. Microwave Components :

4.1 Rectangular and circular wave guides
4.2 T junction
4.3 Magic TEE
4.4 Couplers
4.5 Duplexer
4.6 Rotating joints
4.7 Wave guide terminations
4.8 Attenuators
4.9 Wave guide bends, Corners and Twist
4.10 Wave guide irises
4.11 Post and tuning screws
4.12 Coupling probes and coupling loops

5. Microwave Measurements :

5.1 Introduction
5.2 Measurement of frequency and wavelength
5.3 Measurement of power

5.3.1 Calorimeter
5.3.2 Bolometer

5.4 Measurement of VSWR
5.5 Q Measurement
5.6 Noise Figure measurement

6. Introduction of Propagation modes in wave-guides.

C Programming

1. Introduction :

1.1 Scope of 'C' Language
1.2 Distinction and similarities with other HLLs
1.3 Special features and Application areas

2. Elements of 'C' :

2.1 Character set
2.2 Key words
2.3 Data types
2.4 Constants and Variables
2.5 Operators: unary, binary, ternary
2.6 Operator precedence

3. Console Input-Output :

3.1 Types of I-O
3.2 Console I-O
3.3 Unformatted console I-O: getchar(),putchar(), gets(), puts(), getch(),getche()
3.4 Formatted I-O: scanf(), printf()

4. Control Flow :

4.1 Statements and blocks
4.2 if
4.3 switch
4.4 Loops: for, while, do-while
4.5 goto and labels
4.6 break, continue, exit
4.7 Nesting control statements

5. Arrays :

5.1 Basic concepts
5.2 Memory representation

5.3 One dimensional array
5.4 Two dimensional array

6. Functions :

6.1 Basic concepts
6.2 Declaration and prototypes
6.3 Calling
6.4 Arguments
6.5 Scope rules
6.6 Recursion
6.7 Storage classes types
6.8 Library of functions: math, string, system

7. Pointers :

7.1 Basic concepts
7.2 &, * operator
7.3 Pointer expression: assignment, arithmetic, comparison
7.4 Dynamic memory allocation
7.5 Pointer v/s Arrays

8. Structure and Enumerated Data Types :

8.1 Basic concepts
8.2 Declaration and memory map
8.3 Elements of structures
8.4 Enumerated data types : typedef, enum
8.5 Union

PRACTICALS

1. Problems based on arithmetic expression, fixed mode arithmetic.
2. Problems based on conditional statements and control structures.
3. Problems based on arrays (1-D, 2-D), functions and pointers.
4. Problems based on Engineering applications.

6th Sem.

Television Engineering

1. Picture Scanning :

1.1 Scanning Process.
1.2 Number of Scanning Lines.
1.3 Flicker
1.4 Inter lace scanning
1.5 Fine Structure
1.6 Contrast Ratio
1.7 Aspect ratio and viewing distance

2. Composite Video Signal for 625 Line System :

2.1. Video signal dimensions.
2.2. Horizontal sync details.
2.3. Vertical Sync details.
2.4. Scanning sequence and Function of sync pulse train.
2.5. TV standards

3. T.V. Signal Transmission :

3.1. Modulation technique for picture and sound with reason of preferences
3.2. Concept of Vestigial Side Band (VSB)
3.3. VSB band width and transmission efficiency
3.4. TV channel B.W.
3.5. Positive and Negative modulation
3.6. Block diagram of TV transmitter
3.7. Interference suffered by carrier
3.8. TV transmitting antenna

4. Monochrome Picture Tube :

4.1. Monochrome Picture Tube construction

4.1.1 Electron gun
4.1.2 Deflection unit
4.1.3 Screen and face plate

4.2. Picture Tube Circuit Controls.

5. T.V. Receiver :

5.1 Principle of TV Receiver.
5.2 VSB reception
5.3 Block diagram of B/W T.V. Receiver and function of each stage
5.4 Circuit of following stages using transistor / I.C.

5..4.1 RF and IF Section.
5.4.2 Video detector

5.4.3 Video Amplifier, B.W. and Contrast Control
5.4.4 AGC and noise Cancellation Circuit.
5.4.5 Sync Separation Circuit.
5.4.6 Sync processing and AFC Circuit
5.4.7 Vertical deflection Circuit
5.4.8 Horizontal deflection Circuit
5.4.9 Sound signal separation
5.4.10 Sound section
5.4.11 Power Supply - EHT.

5.5 Balun and its construction

6. Colour T.V. :

6.1 Colour T.V. Essentials.
6.2 Compatibility.
6.3 Colour perception and three colour theory
6.4 Luminance, hue, saturation, chroma
6.5 Colour difference signal
6.6 Colour picture tube

6.6.1 Delta gun
6.6.2 Precision in line (PIC)
6.6.3 Trinitron

6.7 Colour Signal Transmission (frequency inter leaving technique)
6.8 Band width for Colour Signal Transmission.
6.9 Modulation of Colour Signals
6.10 Weighting factor
6.11 Elementary idea for NTSC, PAL, SECAM systems, their merits and demerits.

7. Concept of Alignment and troubleshooting procedure.

PRACTICALS

1. Installation and study of different TV receiving antennas.
2. Study of controls of monochrome and colour TV.
3. Study of picture tubes for monochrome and colour TV.
4. Study of different sections of monochrome TV.
5. Study of different sections of Colour TV and observe the waveform.
6. Study of setting up and alignment/adjustment of following using pattern generator.

6.1 Sound IF, picture IF
6.2 Vertical height adjustment, vertical linearity adjustment
6.3 Horizontal linearity and size adjustment
6.4 Tuner adjustment

7. I.F. alignment of TV receiver using Wobbuloscope
8. Trouble shooting of monochrome and colour TV receiver
9. Study of UHF to VHF converter.

10. Colour adjustment of Colour TV
11. Visit of TV studio/Telecasting station.
12. Various faults of colour and B/W receivers and their remedies

Advance Microprocessor

1. 8086 Microprocessor :

1.1 Internal architecture - Bus interface unit, execution unit, internal registers and flags.
1.2 Instruction execution sequence
1.3 Addressing modes
1.4 Modes of operation
1.5 Comparison with 8088

2. 8086 Instructions and Programming :

2.1 Data transfer instructions
2.2 Arithmetic instructions
2.3 Logic, shift and rotate instructions
2.4 Processor control instructions
2.5 String operation instructions
2.6 Writing simple assembly language programs
2.7 System bus timing

3. I/O Data Transfer Schemes :

3.1 Classification of IO schemes
3.2 Programmed data transfer - IO mapped and memory mapped IO
3.3 Asynchronous data transfer and synchronous data transfer
3.4 Interrupt driven data transfer

3.4.1 Interrupt process
3.4.2 Multiple interrupts and priorities
3.4.3 Enabling, disabling and masking of interrupts

3.5 DMA data transfer scheme
3.6 Serial data transfer scheme

4. Peripheral Devices and their Interfacing with 8085 :

4.1 Programmable peripheral interfaces - 8255 and its applications.
4.2 DMA controller - 8257
4.3 Programmable interrupt controller - 8259
4.4 Programmable communication interface - 8251
4.5 Programmable TIMER - 8253.
4.6 Programmable keyboard and display interface 8279
4.7 Brief idea of CRT controller, dot-matrix printer controller and floppy disk controller

5. Bus Standards :

5.1 RS 232 C
5.2 IEEE 488

PRACTICALS

1. Study of 8086 trainer kit
2. Assembly language programming in 8086

2.1 Storing an immediate operand in a register/memory
2.2 Copying contents of a register to memory location and vice-versa
2.3 Exchanging controls of two memory locations
2.4 Addition/subtraction of two numbers
2.5 Sorting of odd/even no.
2.6 Arrange data arrays in ascending and descending.
2.7 Programs using stack subroutine.
2.8 Convert ASCII code into packed BCD
2.9 Program for case conversion of letters

Biomedical Instrumentation

1. Introduction to Physiology :

1.1 Physiological systems of the human body
1.2 Nerve physiology
1.3 Mechanism of respiration
1.4 Generation, propagation and distribution of action potentials

2. Medical Electrodes :

2.1 Introduction
2.2 Bio-electrode theory
2.3 Types of electrodes and implantation

2.3.1 Microelectrode
2.3.2 Body surface electrode
2.3.3 Needle electrode

3. Bio Medical Recording System :

3.1 Introduction
3.2 Construction of centre type PMMC Galvanometer
3.3 Recording mechanism
3.4 Writing techniques and recorder problems
3.5 Constructional features of strip chart recorder

3.6 Recorder electronics
3.7 Stylus protection technique
3.8 X-Y recorder

4. Electro Cardiograph (E.C.G.) :

4.1 Electrical activity of heart and its construction
4.2 Block diagram of E.C.G. machine
4.3 ECG electrodes
4.4 Lead configuration
4.5 ECG electronics
4.6 ECG controls
4.7 Heart rate measurement
4.8 Artefacts and troubleshooting
4.9 Principle of recording other bioelectric events like EEG and EMG

5. Pace Makers :

5.1 Need
5.2 Classification
5.3 Block diagram of Demand pacemaker
5.4 Basic circuit of fixed rate and synchronous pacemaker

6. Blood Pressure Monitoring :

6.1 Blood circulation system
6.2 Blood pressure waveform
6.3 Blood pressure measurement techniques

6.3.1 Direct
6.3.2 Indirect

6.4 Circuit diagram of B.P. processor to indicate diastolic - systolic blood pressure

7. Defibrillator :

7.1 Need
7.2 Types of defibrillator

7.2.1 A.C. defibrillator
7.2.2 D.C. defibrillator

7.3 Basic defibrillator circuits and control circuits
7.4 Lawn waveform and its synchronization
7.5 Operating controls and precautions

8. Biomedical Instructions :

8.1 Blood Gas analyser
8.2 Densitometer
8.3 Flame photometer
8.4 Blood flow meter
8.5 Skin and systemic body temperature measurement
8.6 X- Ray machine

8.6.1 Tube construction and housing
8.6.2 High voltage power source
8.6.3 Block diagram of X-Ray machine
8.6.4 Image intensifier

8.7 Concept of Sonography
8.8 Concept of CT Scan
8.9 Concept of Magnetic Resonance Indication (MRI)

9. Bed Patient Monitoring System :

9.1 Introduction
9.2 ICU/ CCU systems

10. Electrical Safety :

10.1 Types of Hazard
10.2 Safety precautions

PRACTICALS

1. Study of different types of electrodes
2. Study of different types of recorders
3. Study of ECG machine
4. Measurement of blood pressure using indirect method.
5. Study of blood pressure amplifier
6. Measurement of skin systemic temperature
7. Study of pacemakers
8. Visit to clinical laboratory or hospital
9. Visit to a hospital for X-ray machine / Sonography / CT scan.
10. Visit to ICU/ CCU of hospital

Advance Communication System

1. Information Theory :

1.1 Amount of information
1.2 Average information
1.3 Entropy
1.4 Information rate
1.5 Channel capacity
1.6 Shannon Hartley theorem (No formula derivation)
1.7 Brief idea of coding

2. Satellite Communication :

2.1 Concept of satellite communication
2.2 Idea of satellite orbits
2.3 Operating frequency consideration
2.4 Basic idea of transponder
2.5 Path loss calculation
2.6 Multiple access techniques - basic idea
2.7 Simple block diagram of earth station
2.8 Advantage and limitations of satellite communication
2.9 Application of satellite communication

3. Optical Fibre Communication :

3.1 Block diagram of optical fibre communication
3.2 Guided light system
3.3 Acceptance angle
3.4 Numerical aperture
3.5 Attenuation in optical fibre
3.6 Dispersion in optical fibre (BW consideration)
3.7 Type of optical fibre

3.7.1 Single mode
3.7.2 Multi mode

3.8 Light source - basic principle and working

3.8.1 LED
3.8.2 Laser diode

3.9 Light detector - basic principle and working

3.9.1 PIN diode
3.9.2 Avalanche photo diode

3.10 Brief idea of coupler and splicer
3.11 Advantage and disadvantage of optical fibre communication system

4. Mobile Communication :

4.1 Limitation of conventional mobile telephone system
4.2 Basic concept of cellular telephone system
4.3 Operating frequency consideration of cellular telephone system
4.4 Basic concept of frequency reuse technique
4.5 General formula for mobile radio propagation (Path characteristics - no derivation)
4.6 Hand off mechanism
4.7 Consideration of the components of cellular system

PRACTICALS

1. Study of satellite receiver.
2. Visit of satellite earth station.
3. Study of various types of optical fibres
4. Plot the characteristics of LED.

5. Study of laser diode.
6. Study of PIN diode.
7. Study of Avalanche photo diode.
8. Study of optical fibre bench.
9. Study of cellular telephone hand set.
10. Visit of Cellular Base station.

6.

Electronic Circuit Design

1. Power Supply Design for Rated Voltage, Current and Regulation :

1.1 Using Zener diode
1.2 Emitter follower
1.3 Transistorised series feed back regulator with short circuit protection

2. Design of Transistor biasing circuits for the various class - A,B, AB,C

3. Design of Transistor Amplifiers

3.1 CE amplifier (with & without emitter bypass capacitor)
3.2 Direct coupled CE Amplifier (two stages)
3.3 R-C coupled CE Amplifier (two stages)
3.4 Emitter follower
3.5 Push Pull Amplifier

4. Design of Time Delay Relay Circuits :

4.1 Using transistor and SCR
4.2 Using IC 555
4.3 Using IC 741
4.4 Design of long duration timer using suitable ICs

5. Design of Wave Generator :

5.1 Wein bridge oscillator using transistor and IC (741)
5.2 Phase shift oscillator using transistor and IC (741)
5.3 Square wave and triangular wave generators using IC (741 and 555)

6. Design of Digital Circuits :

6.1 2 bit simultaneous analog to digital converter
6.2 Multi range DVM using suitable IC
6.3 Design of Digital Clock
6.4 Design of 2-digit low frequency counter
6.5 Design of traffic light controller using ICs

PRACTICALS

Note : Assemble and test all the designed circuit mentioned in theory.

Management

4. Principles of Management
5. Human resources Development
6. Wages and Incentives
7. Material Management
8. Financial Management
9. Marketing Management
10. Tax System and Insurance
11. Labour Legislation and Pollution Control Acts.
12. Entrepreneurship Development

Semester 7th

Computer Programming – II (C++)

1. Concept of OOP and POP.

2. Introduction of C++.

3. Elements of C++

a. Character Set

b. Key Words

c. Data Types

d. Constants and Variables

e. Operators unary, binary, ternary

f. Operator precedence

4. Control Flow :

a. Statements and blocks

b. if

c. Switch

d. Loops : For, While, Do-While

5. Arrays :

a. Basic Concepts

b. Memory Representation

c. One Dimensional Array

d. Two Dimensional Array

e. Three Dimensional Array

6. Functions :

a. Basic concept

b. Declaration and prototype

c. Calling

d. Arguments

7. Pointers :

a. Basic Concepts

b. &,* operator

8. Structure, Union and Enumerated Data Types

Basic Concepts, reference operator, structure with array

9. File Handling :

a. Types of Files

b. File Organization

c. Opening, Reading, Writing, Closing

d. Text and binary file

10. Class : Declaration, Definition, use of scope resolution operator

Analog Electronics II

UNIT-I- FIELDEFFECT TRANSISTORS:-

Introduction of field effect transistor (FETs), Pinch off voltage, junction field effect transistor (JFETs), Voltage-current (V-I) characteristics, Metal oxide semiconductor field effect transistor (MOSFET) structure and V-I characteristics.

UNIT-II- FEEDBACK AMPLIFIERS:-

Characteristics of amplifiers feedback concept, transfer gain with F/b, input resistance, output resistance, voltage series f/b, current series f/b; current-shunt f/b, voltage-shunt f/b

UNIT-III-MULTISTAGE AMPLIFIER:-

Introduction, multistage amplifier gain, n-stage case coded amplifier, R-C coupled transistor amplifier, transformer coupled, impedance coupled, direct coupled.

UNIT-IV-POWER AMPLIFIER:-

Introduction, Difference between voltage and power amplifier, classification of power amplifier, class-A amplifier, class-B amplifier, class-AB power amplifier, transistor at high frequencies.

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Electrical Science II

Introduction; sinusoidal steady state analysis of circuits; three phase circuits; magnetic circuits; transformers; basics of rotating machines; DC machines; synchronous machine; induction machine.

Optimization

Optimization of functions of one and many variables with and without constraints; Kuhn-Tucker conditions; gradient methods; linear programming; simplex based and integer programming methods; duality theory; transportation and assignment problems; dynamic programming; branch and bound methods; models of linear production systems, sequencing and scheduling, PERT, CPM

Electromagnetic Fields & Waves

Unit 1

Electromagnetic Theory: Review of scaler and vector field, Dot and Cross products, coordinates cylindrical, spherical etc. Vector representation of surface, physical interpretation of gradient divergence and curl, different coordinated systems.

Unit II

Electrostatic fields: Electric field due to point-charges, line charges and surface charges, Electrostatic potential, Solution of Laplace and Poission's equation in one dimension, M-method of image applied to plain boundaries. Electric flux density, Boundary conditions, Capacitance, Electrostatic energy.

Ampere's law of force, Magnetic flux density, Ampere's circulate law, Boundary conditions, Faraday's law, Energy stored in magnetic fields.

Unit III

Continuity equations, Displacement current, Maxwell's equation, Boundary conditions, Plane wave equation and its solution in conducting and non conducting media, Phasor notation, Phase velocity, Group velocity, Depth of penetration Conductors and dielectrics, Impedance of conducting medium. Polarization, Reflection and refraction of plane waves at plane boundaries, Poynting vectors, and Poynting Theorem.

Unit IV

Transmission line equations, Characteristics impedance, Distortion-less lines, Input impedance of a loss less line, Open and Short Circuited lines, Standing wave and reflection losses, Impedance matching, Application of smith chart.

Data Structure & Algorithm

Introduction to software design principles, modularity, abstract data types, data structures and algorithms; Analysis of algorithms; Linear data structures – stacks, arrays, lists, queues and linked representations; Pre-fix, in-fix and post-fix expressions; Recursion; Set operations; Hashing and hash functions; Binary and other trees, traversal algorithms, Huffman codes; Search trees, priority queues, heaps and balanced trees; Sorting techniques; Graphs and digraphs; Algorithmic design techniques; Data structures for external storage, multi-way search and B-trees.

Semester 8th

Circuit & Signals

UNIT-1 Introduction to signal and system->

Introduction,signals,classification of signal, general signals,systems,classification of system, linear time invariant system, classification of linear time invariant (LTI) system, properties of LTI system.

UNIT –2 Continuous and Discrete time Fourier series->

Introduction,fourier series representation of a discrete time and continuous time periodic signal,convergence of fourier series, properties of continuous and discrete time fourier series, trigonometric fourier series ,evalution of fourier series coefficients, wave form symmetry,half

wavesymmetry, continuous and discrete time fourier transform,properties of continuous and discrete time fourier transform.

UNIT -3 Laplace and z-transform->

Introduction to laplace transform,definition of laplace transform,Inverse laplace transform,properties of laplace transform,the region of convergence for the laplace transform, Introduction to Z-transform,definition of Z- transform,properties of Z-transform,the region of convergence for the Z- transform of a disrete time signal, Inverse Z-transform.

UNIT-4 Sampling->

Introduction to sampling process ,sampling of continuous time signal, sampling theorem for continuous time signal impulse train sampling of continuous time signals,zero order hold sampling,reconstruction of continuous time signal from its samples using interpolation techniques, alasing phenomenon,discrete time processing of continuous time signals,discrete time decimation.

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Numerical Analysis

Solution of non linear algebraic equations, Interpolation & Approximation, differentiation & integration, system of linear equations, Eigen values & Eigen vectors problems, round off and conditioning.

Computer networks

Evolution of communication and computer networks, protocol layering, network reference models, multiple access protocols, local area networks, packet and circuit switching, switching fabrics, network performance analysis and simulation techniques; addressing, routing, flow and congestion control, IP protocol; Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM) reference models; network interoperability, traffic management and quality of service in integrated network protocol design and implementation strategies

Control System

Unit I

Concept of Control System:

Examples and application of open loop and closed loop system, Differential equations

Determination of transfer function by block diagram reduction technique and signal flow graph methods

Unit II

Time Response Analysis and frequency Domain Method

Study state error & error specification in frequency domain and their Co-relation with time domain.

Unit III

Stability of the System:

Absolute Stability and Relative Stability, Routh, s Stability Criterion, Hurwitz criterion Root locus Method of analysis, Polar plots Nyquist stability criterion,

M and N loci, Nicholas Chart.

Unit IV

Z transform and digital Control System, Concept of State Variable and State Model. Solution of state equation. Concept of Controllability & obserability

Antenna & Wave Propagation

1. Antenna
2. Radio Wave Propagation

Semester 9th

Wireless Communication

UNIT-1

Introduction to cellular mobile systems, A basic cellular system,

Performance criterion, operation of cellular systems, overview of generation of cellular systems.

Elements of cellular radio systems, Design and interference, Concept of frequency reuse channels, co-channel interference, reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting consideration of the components of cellular system.

UNIT-2

Cell coverage for signal and antenna structures, general introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance , cell site, antenna height and signal coverage cells, frequency management & channel assignment, handoff and dropped calls, frequency management, fixed channel assignment, traffic and channel assignment, need of hand off, types of hand off and their characteristics, dropped calls rates and their evaluation.

UNIT-3

Modulation methods and coding, introduction to digital modulation techniques, modulation method in cellular wireless system, multiple access techniques: FDMA , TDMA, CDMA.

UNIT-4

Second generation, digital wireless system, GSM, IS-136(D-amps), IS-95,mobile management, voice signal processing and coding.

Digital Signal Processing

Unit I

Discrete –Time Signal and System

Introduction, Discreat-Time signal Sequences (Basic Sequence, Sequence operation

Discreat-Time systems (Memory less system, linear, system, time invariant system, stability)

Unit II Discreate and fast Fourier transforms

Introduction Discreat convolution, Discret –time Fourier Transform (DTFT)

Fast Fourier transform (FFT), Computing an inversion DFT by Doing a direct DFT, Composite radix FFT, Fast Convolution

Unit III

Finit impulse response (FIR) Filters

Introduction, magnitudes Response and phase Response of Digital; filter, frequency response of linear Phase FIR Filters Design Techniques Filters Basic Struture of FIR Filters.

Unit IV

Infinite impulse Response (IIR)

Introductions, IIR Filter Design by approximation of Derivations IIR Filter Design by Impulse invariant methods, IIR Filter Design by the bilinear transformation, Butterworth filters, inverse chebyshev filters, basic structure of IIR filters

Analog and Digital VLSI Design

Unit I

Evolution of VLSI, MOS Transistor theory,MOS Structure, Enhancement & Depletion transistor, threshold Voltage,MOS Device design equations.CMOS inverter,DC-characteristics,static load MOS inverter,CMOS& NMOS Process technology, explanation of different stages in fabrication.

Unit II

Switching Characteristics & interconnection effect, Rise time, falltime delays, Inverter design with delay Constants, CMOS logic gate design,

Fan in, Fan out, Typical NAND, NOR, delaye Transistor sizing XOR and XNOR gates

Unit III

Closed CMOS logic, pass transistor logic domino, zipper CMOS, Clocking strategies, clocked system, latches & Registers, system timing set up &hold timing, signal phase memory, Two phase memory .

Unit IV

Two phase logic structure, four phase memory logic structure ,Introduction of VLSI- designing methodology ,VLSI –Design flow, Design Hierarchy concept of regularity, modularity&locality,VLSI Design style, design quality, computer aided design technology Design Capture and Verifications tools

Satellite communication

Introductory Concepts: Historical perspective, System Definition, Software Life Cycle, Software Engineering paradigms.

System analysis: Feasibility study requirement analysis, Cost benefit analysis, Planning systems, Analysis tools and techniques.

System Design: design fundamentals, Modular Design, Data and procedural design, object oriented design.

System Development: Code documentation, Program design paradigms, Efficiency Consideration.

Verification, Validation and Testing: testing methods, Formal Program Verification, Testing Strategies.

Software Maintenance: Maintenance Characteristics, Maintainability, Maintenance tasks and side effects.

Telecommunication switching systems network

UNIT –I

Introduction to telecommunication networks, Overview of network structure and services, Evolution of basic switching, Control of switching system.

UNIT-II

Stronger switching system, Rotary Dial phone, signaling tones, step by step switching, cross bar switching, electronic space division switching, time division switching

UNIT-II

Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, incoming traffic and service time characteristics

Radio System : LOS, Microwave communication,lonk behaviour,antenna gain, link budget analysis, fading techniques

UNIT-IV

Overview of FDMA, TDMA and CDMA, overview of ATM, cell str., overview of ISDN, Overview of WLL, Overview of AIN

Semester 10th

Sr.No.	Code	Name of Subject	L	P	U
1	421	Practical Training for 6	**4**	**0**	**4**

		Month 7. Project 8. Seminar			