

Five Year
Integrated Course M.Sc. (Tech.)
In
Applied Electronics
Text Books / Reference Books

Semester 1	Paper I- Electronic Components
	Basic Electronics solid state physics B.L.Theraja, S.Chand and company
	Basic Electronics Grob, Tata McGraw Hill
	Electronic Devices and circuits Allen Mottershed, Prentice hall of India pvt.ltd.
	Electronic components and materials Madhuri Joshi, Schroff pub. And distributors
Semester 1	Paper II - Measuring Instruments
	Principles of Electronics V.K.Mehta, Rohit Mehta
	EDC I, EDC II A.P. Godse, U.P.Bakshi Technical Publishers pune
	Modern electronic Instrumentation and measurement techniques, Cooper, Prentice hall
Semester 1	Paper 3, Mathematics – 1
	Differential Equations with Applications and historical Notes (Second Edition) George F. Simmons , MaGraw Hill International Edition
	Fourier Transform, I N Snddon, MaGraw Hill International Edition (mathematics Series)
	Advanced Engineering Mechanics, Erwin Kreyzig, John Willy and Sons. Inc
	Treaties on Differential Equations, A. R. Forsyth, MaGraw Hill International Edition (mathematics Series)
	Methods of Mathematical Physics (Vol. I & II), B. Courant & D. Hilbert, Willy Inter science,1953
Semester 1	Paper 4, Communication Skill
	Radiance, Orient black Swan

Semester 2	Paper 1: Semiconductor Devices
	Basic Electronics solid state physics B.L.Theraja, S.Chand and company
	ELECTRONIC DEVICES AND CIRCUIT THEORY ROBERT BOYLESTAD, LOUIS NASHESKY
	Basic Electronics Grob, Tata McGraw Hill
	Electronic Devices and circuits Allen Mottershed, Prentice hall of India pvt.ltd.
Semester 2	Paper 2, Fundamentals of Digital Electronics
	An Introduction to Electronics R.G.Kale,U.K.Puranik,V.N.Pendse, A.A.Sakale, Kitab mahal
	Digital principles and applications A.P.Malvino, D.P.Leach McGraw Hill Book Co.
	Modern digital Electronics R.P.Jain, Tata McGraw Hill publishing co.ltd
	Digital Fundamentals Floyd,Jain Pearson
	2000 solved problems in digital Electronics S.P.Bali, Tata McGraw Hill publishing co.ltd
Semester 2	Paper 3, Mathematics – 2
	Mathematics for degree students, Dr. P K Mittal, S.Chand & Co.
	Differential Calculus, Shanti Narayan & Dr. P K Mittal, S.Chand & Co.
	Topics in Algebra, I. N. Herstein Willy Eastern Ltd.
	Matrix and linear algebra, K. B. Dutta, Prentice Hall of India
	Plane Trigonometry, S. L. Loney , S.Chand & Co.
Semester 2	Paper 4, Application of language
	Radiance, Orient black Swan

Semester 3	Paper 1: Advance Semiconductor Devices
	Integrated Electronics, K. R. Botkar, Khanna Publications
	Basic Electronics solid state physics B.L.Theraja, S.Chand and company
	ELECTRONIC DEVICES AND CIRCUIT THEORY ROBERT BOYLESTAD, LOUIS NASHESKY
	Basic Electronics Grob, Tata McGraw Hill
	Electronic Devices and circuits Allen Mottershed, Prentice hall of India pvt.ltd.
Semester 3	Paper 2, Digital Techniques and Applications
	An Introduction to Electronics R.G.Kale,U.K.Puranik,V.N.Pendse, A.A.Sakale, Kitab mahal
	Digital principles and applications A.P.Malvino, D.P.Leach McGraw Hill Book Co.
	Modern digital Electronics R.P.Jain, Tata McGraw Hill publishing co.ltd
	Digital Fundamentals Floyd,Jain Pearson
	2000 solved problems in digital Electronics S.P.Bali, Tata McGraw Hill publishing co.ltd
Semester 3	Paper 3, Amplifiers and Power Supplies
	Principles of electronics, A. P. Malvino Tata McGraw Hill publishing co.ltd
	Electronic Devices and circuits Allen Mottershed, Prentice hall of India pvt.ltd.
	Broad Band Amplifiers , B S Sonde
	Modern Power Devices, Baliga, B. Jayant,, Wiley-Interscience publication.
Semester 3	Paper 4, Operational Amplifiers and Application
	Op-Amp and linear circuits Gaikwad, PHI
	Analog & Digital Techniques R.G.Kale,U.K.Puranik,V.N.Pendse, A.A.Sakale, Kitab mahal

Semester 4	Paper 1, Circuit Maker 2000
	Circuit maker manual
Semester 4	Paper 2, Circuit analysis and Network theorems
	Network analysis Van valkenburg, PHI
	Network analysis Goal & Khetan,
Semester 4	Paper 3, Computer Organization
	Microprocessors and digital systems - Douglas V. Hal
	Computer Architecture & Organization (SIE) (Schaum\'s Outline Series) Raj Kamal, Nicholas Carter, Tata Mcgraw Hill Education Private Limited
Semester 4	Paper 4, Introduction to Microprocessor
	Fundamentals of Microprocessor and Microcomputers B.Ram, Dhanpat Rai publications
	Microprocessor Architecture, programming and applications with 8085/8080 A Ramesh S. Gaonkar, Wiley eastern ltd.
	Introduction to microprocessor A.P. Mathur, Tata McGraw Hill
	Microprocessor and interfacing D.V.Hall , Tata McGraw Hill
	Introduction to Microprocessors Vilas Ghodki and Satish Sharma

Semester 5	Paper 1, Fundamentals of Biomedical instrumentation
	Biomedical Electronics R. S. Khandpur
	Biomedical Signal Analysis, A Case-Study Approach Rangaraj. M. Rangayyan
	Handbook of Biomedical Instrumentation Khandpur, Tata McGraw-Hill Education, 2003
Semester 5	Paper 2, Power Electronics
	POWER ELECTRONICS HANDBOOK Edited by Muhammad Rashid, Elsevier Publication
	Power electronics: converters, applications, and design Ned Mohan, Tore M. Undeland, Willy Student Edition
	Power Electronics: Circuits, Devices & Applications Muhammad Rashid, Pearson Education
	Power Electronics P.C. Sen Tata McGraw Hill
Semester 5	Paper 3 Microcontroller Programming & Interfacing
	Fundamentals of Microprocessor and Microcomputers B.Ram, Dhanpat Rai publications
	Microprocessor Architecture, programming and applications with 8085/8080 A , Ramesh S. Gaonkar, Wiley eastern ltd.
	Introduction to microprocessor A.P. Mathur, Tata McGraw Hill
	Microprocessor and interfacing D.V.Hall , Tata McGraw Hill
	Introduction to Microprocessors Vilas Ghodki and Satish Sharma
Semester 5	Paper 4, Fundamentals of NANO-ELECTRONICS
	Fundamentals of Nanoelectronics By Hanson
	Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications , Vladimir V. Mitin, Viatcheslav A. Kochelap, Michael A. Strosio Cambridge
	Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices , Karl Gosser, Peter Glösekötter, Jan Dienstuhl, Springer

Semester 6	Paper 1, Wave form generators
	Integrated Electronics, K. R. Botkar, Khanna Publications
	PLL Performance Simulation and Design Handbook Texas Online
	Op-Amp and linear circuits Gaikwad, PHI
Semester 6	Paper 2, Fundamentals of Communication Electronics
	Electronic Communication Systems Kennedy ,Tata McGraw-Hill Education,
	Communication electronics principles and application Frenzel, Tata McGraw Hill
Semester 6	Paper 3, Electromagnetic Theory and Antennas
	Microwave Circuits and Antennas D. M. Sazonov, Mir Publishers
	Electronic Communication Systems Kennedy ,Tata McGraw-Hill Education,
	Communication electronics principles and application Frenzel, Tata McGraw Hill
	ELECTROMAGNETIC FIELD THEORY , BoThidé, Ebook- Online
Semester 6	Paper 4, Computer aided PCB designing
	ORCAD Manual
	Complete PCB Design Using OrCad Capture and Layout (Google eBook) Kraig Mitzner

Semester 7	Paper 1, Computer Oranisation and interfacing
	Microprocessors and digital systems - Douglas V. Hall
	Computer Architecture & Organization (SIE) (Schaum\'s Outline Series) Raj Kamal, Nicholas Carter, Tata Mcgraw Hill Education Private Limited
	Fundamentals of Microprocessor and Microcomputers B.Ram, Dhanpat Rai publications
Semester 7	Paper 2, VLSI
	VLSI Design Debaprasad Das, OUP India,
	VLSI Design K. Lal Kishore, V.S.V. Prabhakar, I. K. International Pvt Ltd,
	VLSI Design K. Lal Kishore, V.S.V. Prabhakar, I. K. International Pvt Ltd,
	Algorithms for VLSI Physical Design Automation Naveed A. Sherwani
	VHDL: Programming by Example Douglas L. Perry , McGraw-Hill Education
	The VHDL Cookbook Peter J. Ashenden
	VLSI Design Black Book Dr. K.V.K.K. Prasad , Kattula Shyamala , Dreamtech Press
Semester 7	Paper 3, Programming in C
	Let us C Y.Kanetkar, BPB publications
	Gate to C programming Kishor S B, Vilas Ghodki and Madhavi
	C in depth Shrivastava, BPB publication
	Programming in ANSI C E Balgurusamy, Tata McGraw Hill
	Programming with C Byron Gottfried Schaums outline series Tata McGraw Hill
Semester 7	Paper 4, Embedded system & Application
	Single-board computer applications Joseph J Carr
	Specification And Design Of Embedded Systems Daniel D. Gajski ,Jie Gong ,Sanjiv Narayan ,Frank Vahid, Pearson Education
	The 8051 Microcontroller Kenneth J. Ayala

Semester 8	Paper 1, Biomedical Instrumentation – II
	Handbook of Biomedical Instrumentation –R. S. Khandpur, TMH, New Delhi
	Biomedical Instrumentation – Leslie Cromwell, PHI Publication, New Delhi
	Biomedical Engineering System – Leslie Cromwell, PHI Publication, New Delhi
	Biomedical Phenomenon – Robert Plonsay, John Wiley & Sons
	Computers in medicine – R. D. Lele, TMH, New Delhi
	Introduction to Biomedical Equipment Technology: J. J. Carr and J. M. Brown, Pearson Education Asia Publication, Singapore
Semester 8	Paper 2, Virtual Instrumentation
	Virtual Instrumentation using Lab VIEW : Jovitha Jerome, PHI Learning Pvt. Ltd.,
	Virtual Instrumentation using Lab VIEW : Sanjay Gupta and Joseph John, TMH,
	Lab VIEW for Everyone: Jeffrey Travis and Jim Kring, Pearson Education,
	NI Lab VIEW user manual
Semester 8	Paper 3, Digital signal Processing
	Digital Signal Processing: N. G. Palan (Tech Max Publications, Pune
	DSP Processor Fundamentals: Architectures and Features: Phil Lapsley, Jeff Bier, Amit Shoham & Edward A. Lee
	Discrete Time Signal Processing: Allen V. Oppenheim & Ronal W. Schafer (PHI,)
	Introduction to Digital Signal Processing: Roman Kuc (MGH)
	Digital Signal Processing- Principles, Algorithms and Applications: J. G. Proakis and D. G. Manolakis (PHI, New Delhi)
	Introduction to Digital Signal Processing: Johny R. Johnson ,PHI, Delhi
	Digital Signal Processing: Sanjit K. Mitra (TMH, New Delhi)
	Signal Processing using MATLAB: C. Sidney Burrus, J. K. Mc Clellan, A. V. Oppenheim, R. W. Schafer and H. W. Schuessler
	Digital Filtering: An Introduction – Edward P. Cunningham
Semester 8	Paper 4, Fuzzy Logic and Artificial Neural Networks
	Fuzzy Logic with Engineering Applications: Timothy J. Ross, McGraw Hill, Inc.
	Neural Networks, A comprehensive Foundation: Simon Haykin, Pearson Education, Asia
	Neural networks: Algorithms, applications & Programming Techniques: J.A. Freeman & D. M. Skapura, Pearson Education Asia
	Artificial Neural Networks: K. Mehrotra, C. K. Mohan & Sanjay Ranka, Penram International Publications, New Delhi
	Introduction to Artificial Neural Systems: J. M. Zurada, Jaico Publishing House, New Delhi

Semester 9	Paper 1, Digital Communication
	Digital communications: Bernard Sklar Pearson Education, Asia Publ
	Digital communications: Symon Haykin (John Wiley & Sons)
	Modern Digital communications Systems : Leon W. Couch (PHI, Delhi)
	Analog and Digital Communications: Hwei Hsu (Schaum Outline MGH)
	Modern Digital and Analog Communications Systems: B. P. Lathi Oxford Univ.Press
	Digital communications: J. G. Proakis (MGH)
Semester 9	Paper 2, Microwave and Optical Communication
	Microwave devices and Circuits: Liao
	Microwave Engineering: David Pozar
	Electronics and Radio Engineering: Terman
	Introduction to Microwave Theory and Measurement: A. L .Lance
	Optical Fiber Communication : B. Keiser (MGH)
	Optical Communication Systems: J. Gower (Prentice Hall)
	Optical Fiber Systems: Kao (MGH)
	Fiber Optic Communication: D. C. Agrawal (A. H. Wheeler Co.)
Semester 9	Paper 3, Mobile anti Satellite Communication
	Mobile Cellular Telecommunication: William C. Y. Lee (MGH Inc.
	Mobile communication : Jochen Schiller (2nd edition
	Satellite Communication: T. Pratt
	Satellite Communication: D. C. Agrawal
Semester 9	Paper 4, Communication Network
	Computer Communications and Networks Series Ed.: Sammes, Anthony, Springer Publications
	Communication Networks Alberto Leon-Garcia , Indra Widjaja Tata McGraw Hill Education
	Network Security Technologies and Solutions (CCIE Professional Development Series) Yusuf Bhajji , Pearson Education Singapore Pvt Ltd
	Communication Networks, Sharam Hekmat, PragSoft Corporation

Syllabus for
Five Year
Integrated Course M.Sc. (Tech.)
In
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Semester 1

At a glance

Paper 1: Electronic Components

Paper 2: Measuring Instruments

Paper 3: Mathematics 1

Paper 4: Communication Skills

Practical 1: Based on paper 1

Practical 2: Based on paper 2

Work-shop: Practice based on above 4 papers

Unit 1

RESISTORS- Concept of Resistors, Classification and Materials used for Resistors. Specifications: Max. Voltage Rating, Power Rating, Temperature Rating, Tolerance, Operating Range, Construction, specifications and applications of Carbon Film Resistors, Wire Wound Resistors. Colour Coding with Three, Four, Five Bands.

Equivalent Circuits of Resistor Combinations. Construction and Working of Rheostats. Potentiometers: Construction, Working, Characteristics of Linear and Logarithmic Potentiometers.

Unit 2

INDUCTORS- Construction, working and Uses of Air Core, Iron Core, Ferrite Core Inductor. AF, RF, IF Inductors. Colour Coding using Colour band System. Equivalent Circuits. Transformer: Construction and working and uses of Power, audio, RF, Driver Isolation, IFT, Current transformer. RELAYS- Construction, working and application of General purpose relay. Reed relays.

Unit 3

CAPACTORS- Classification of Capacitors, Materials Used in Capacitors. Specifications: Working Voltage, Power Factor, Insulation Resistor Construction, Working, Specifications, Uses of Fixed Value, Variable Capacitors. Coding of Capacitors: Colour Coding. Numerals, Equivalent Circuits of Capacitor Combinations. RC combination.

SWITCHES — Switch Specifications- voltage rating, contact current rating, contact resistant, Characteristics of switch: operating time, release time, bounce time, electrical life, and mechanical life. Constructional diagram, application of Toggle, Rotary, push to on & push to off, slide switch, thumbwheel switch, rocker switch.

Unit 4

CABLES- General Specifications of Cables: Characteristic Impedance, Current Carrying Capacity, Flexibility. Types of Cables: Construction and applications of Co-axial cable, Twin core cable, Optical Fibre Cable, Twisted pair.

CONNECTORS- General specifications of connectors —contact resistance, breakdown voltage, insulation resistance. Constructional diagram, applications of BNC, D series, Audio, Video, printer, edge, FRC, RJ45 connectors.

Unit 1

Basics of measurement: Classification of instruments- Absolute Instruments, Secondary Instruments. Characterization of instruments static – Accuracy Precision, sensitivity, resolution, static error, reproducibility, drift, dead zone. Dynamic – Speed of response, lag, fidelity, dynamic error.

Types of error – Gross, systematic, random

Units of measurement: Standards and International, primary, secondary, working classification.

Calibration of instruments

Importance of grounding and safety of instruments.

Unit 2

Classification of analog instruments, Definition of average and RMS Value, PMMC – Working principle, construction. Analog DC voltmeter and ammeter. Analog AC voltmeter and ammeter. Analog Ohm meters: series type shunt type. Analog multi-meter: construction and working

Unit 3

Limitations of conventional meters need of viewing signal under measurement,

Oscilloscope: Basic principle, block diagram, detail working of each block of CRO

Multi input CRO, dual channel CRO Block diagram

CRO probes : Active and passive , 10:1,100:1, HV, current, compensation

Uses of CRO.

Unit 4

Limitation of C.R.O., DSO principle, block diagram of DSO, facilities in DSO measurement, Measurement of voltage, frequency, duty cycle, rise time, fall time, pulse width using DSO, PC interface, printer interface.

UNIT 1:

First Order Equations- Homogeneous Equations, Exact Equations, Integrating Factors, Linear Equations, Reduction of Order.

UNIT 2:

Second Order Linear Equations- The general Solution of the Homogeneous Equation, Use of Known Solution to find another, Homogeneous Equation with constant coefficient, Method of Variation of Parameters.

UNIT 3:

Fourier series- Fourier Coefficients, Problem of Convergence, Even and Odd Functions, Cosine and Sine Series, Extension to Arbitrary Intervals.

UNIT 4:

Laplace Transforms- Introduction, Theory of Laplace Transformation, Applications to Differential Equations, Derivatives and Integrals of Laplace Transforms, Convolutions and Abel's mechanical problem

UNIT 1:

General Essay

UNIT 2:

Prose

1. Mother Teresa
2. The Cabuliwallah
3. Uncle Podger Hangs a Picture
4. Education: Indian and American

UNIT 3:

Poetry

1. The Phenomenal Women
2. Psalm of Life
3. Night and Death
4. Money Madness

UNIT 4:

Grammar

1. Tenses
2. Subject-Verb Agreement
3. Voice
4. Transformation

- 1) Characterization of fix Value resistor
 - a. V I characteristics
 - b. Temperature characteristics
 - c. Frequency response
- 2) Characterization of variable Value resistor
 - a. V I characteristics
 - b. V I characteristics of multi-turn potentiometer
- 3) Study of series combination of resistor
 - a. Combination of approximately same value resistor
 - b. Combination of one high value and other low value resistor
 - c. Combination of same value high watt and low watt resistor
- 4) Study of parallel combination of resistor
 - a. Combination of approximately same value resistor
 - b. Combination of one high value and other low value resistor
 - c. Combination of same value high watt and low watt resistor
- 5) Study of series combination of Capacitors
 - a. Combination of approximately same value Capacitors
 - b. Combination of one high value and other low value Capacitors
 - c. Combination of same value high watt and low watt Capacitors
- 6) Study of parallel combination of Capacitors
 - a. Combination of approximately same value Capacitors
 - b. Combination of one high value and other low value Capacitors
 - c. Combination of same value high watt and low watt Capacitors
- 7) Study of RC time constant
 - a. With variation in capacitors for constant resistor
 - b. With variation in resistor for constant capacitors
- 8) Study of inductor frequency response
- 9) Study of frequency response of transformer
 - a. Power step down
 - b. R.F. transformer
 - c. A.F. transformer
 - d. I.F. transformer

- 10) AC- DC Characterization of cable
 - a. Twin core
 - b. Twisted pair
 - c. Co-axial cable
 - d. Power cable

- 11) Study of switching time and contact bouncing in Switches
 - a. Toggle Switches
 - b. Rocker Switches
 - c. Micro (Tact) Switches

- 12) Study of switching time and contact bouncing in Relays
 - a. General purpose relay
 - b. Sugar cube relay
 - c. Reed relay

- 1) Conversion of Galvanometer into multi-range Voltmeter (DC)
- 2) Conversion of Galvanometer into multi-range Ammeter (DC)
- 3) Conversion of Galvanometer into multi-range Voltmeter (AC)
- 4) Conversion of Galvanometer into multi-range Ammeter (AC)
- 5) Conversion of Galvanometer into Series type Ohm meter
- 6) Conversion of Galvanometer into Shunt type Ohm meter
- 7) Study of range – resolution , sensitivity in standard Voltmeters
- 8) Study of range – resolution , sensitivity in standard Ammeters
- 9) Study of Loading effect
 - a. Voltmeter
 - b. Ammeter

- 10) Use of CRO in X-Y Mode for measurement of frequency and Phase
- 11) Use of CRO for measurement of frequency and amplitude, including on board calibration
- 12) Use of DSO in X-Y Mode for measurement of frequency and Phase
- 13) Use of DSO for measurement of frequency and amplitude, including on board calibration
- 14) Measurement of power factor for capacitive and inductive load.
- 15) Use of power meter and its calibration

- 1) Identification of components in terms of value, wattage, tolerance and packaging
 - a. Resistor, Resistor Bank
 - b. Capacitors, Trimmers
 - c. Inductors
 - d. Transformers
 - e. Relays
 - f. Switches
 - g. Cables

- 2) Soldering Practices
 - a. Exposure to various soldering materials, tools, technique, soldering station
 - b. Hands on soldering and de-soldering practice

- 3) Identification and Use of Tools
 - i) Saw ii) Cutters iii) Pliers iv) Drilling Machine v) crimping tools

- 4) Study of Function Generator

- 5) Study of Phase Lead and Phase Lag circuit
 - a. Using RC combination
 - b. Using RL combination

Semester 2

At a glance:

Paper 1: Semiconductor Devices

Paper 2: Fundamentals of Digital Electronics

Paper 3: Mathematics 2

Paper 4: Application of the Language

Practical 1: Based on paper 1

Practical 2: Based on paper 2

Seminar / Presentation: Based on above 4 paper

Unit 1

Introduction to semiconductors: Concept of energy band diagram (Conductor, Semiconductor, Insulator) , Intrinsic and extrinsic semiconductor (P type, N type), diffusion junction, depletion layer, Barrier potential, PN Junction diode, forward and reversed bias characteristics of diode, Diode equivalent circuits, transition capacitance, diffusion capacitance, Avalanche effect and avalanche diode, Zener effect and Zener diode, reference diode, Varactor diode, Schottky diode

Unit 2

Uses of diode – Clipper and its type, clamper and its type, voltage multiplier, Half wave rectifier, full wave rectifier, Bridge rectifier, peak detector

Unit 3

The bipolar junction transistor, construction of BJT , modes of BJT (CE,CC,CB), transistor equation, junction biasing, Input, output and transfer characteristics of BJT in CE,CB & CC mode

Transistor Biasing, load line, Q point transistor parameters, Study of BC 147, SL 100 & TIP220 transistor, introduction to transistor as amplifier and as switch.

Unit 4

Limitations of bipolar transistor- leakage current, stray capacitance. Junction field effect transistor, Basic structure of N channel , P channel FET, Characteristics of JFET in CS mode, FET parameters, Use of JFET as VVR , MOSFET : , Basic structure of N channel , P channel MOSFET, Types of MOSFET- enhancement mode & depletion mode Characteristics of MOSFET in CS mode, MOSFET parameters, Use of MOSFET as high voltage high frequency device

Unit 1

Number Systems- Binary, Octal, Decimal and Hexadecimal Number Systems.

Conversion of number Systems. 1's Complement, 2's Complement. Binary Arithmetic.

Codes-BCD, 8421, Excess 3, Gray, ASCII Codes and their uses. Basic Laws in Boolean Algebra: Cumulative, Associative, Distributive, Complement Laws. De Morgan's and Duality Theorems

Logic Gates: AND, OR, NOT, ex-OR, ex-NOR gates (Symbols, Truth Tables, Logic Equations and Applications) . Universal Logic gates: NOR, NAND gates (Symbols, Truth Tables, Applications).

Unit 2

Combinational Logic Circuits- Half Adder, Full Adder. Multiplexer- Necessity of multiplexer, Types of multiplexer 2:1, 4:1, 8:1, 16:1 with realization, Multiplexer Tree, Study of MUX ICs 74150, 74151, 74152, 74153, 74157, Applications of Multiplexer.

Demultiplexer- Necessity and Principle, Types: 1:2, 1:4, 1:8, 1:16 De Mux. Use of DeMux. Study of ICs 74138, 74139, 74154, 74155.

Unit 3

Concepts of Edge and Level Triggering, Propagation Delay, Power Dissipation.

Sequential Logic Circuits- R-S Flip Flop, Clocked R-S Flip Flop, Limitations of R-S FF, D FF, Use as Memory Cell. JK FF, Limitations of JK FF. Race Round Condition, JKMS FF. Truth Tables. Study of ICs 7474, 7475, 7476

Unit 4

Applications of Flip Flops: Counters Asynchronous, up/down, Decade, Synchronous, modules of counter Ring Counter, Johnson counters. Study of IC 7490, 7493, 74193, CD 4060

Registers: Buffer , left shift, right shift, SISO, SIPO, PISO, PIPO Registers Study of IC 74194, 74195, 74198

UNIT 1:

Algebra: Some Special types of Matrices and Elementary Operations, Ad joint and Inverse of a square Matrix, Rank of a Matrix, System of Linear Equations, Eigen Values and Eigen Vectors, Cayley Hamilton Theorem.

UNIT 2:

Trigonometry: De- Moivre's Theorem, Applications of De- Moivre's Theorem, Functions of Complex Variable, Summation of a Series.

UNIT 3:

Differential Calculus: Successive Differentiation, Higher order Derivatives, Calculation of nth Derivative, Determination of nth Derivative of Rational Functions, nth Derivatives of the Products of the powers of Sines and Cosines, Leibnitz's Theorem for the nth derivative of the product of two functions.

UNIT 4:

Indeterminate Forms: $0/0$, ∞/∞ , $0 \cdot \infty$, $\infty - \infty$, 0^0 , 1^∞ , ∞^0

UNIT 1:

1. Paragraph Writing
2. Letter Writing

UNIT 2:

1. Report Writing
2. Writing Notices, Agendas and Minutes

UNIT 3:

1. Comprehension
2. Curriculum Vitae

UNIT 4:

1. Electronic Correspondence
2. One word substitute
3. Synonyms
4. Antonyms

- 1) Characterization of diode (Forward bias and reverse bias)
 - a. PN junction (1N 4007)
 - b. L.E.D. (Red & White)
 - c. Zener & avalanche
 - d. Temperature characteristics of PN junction diode

- 2) Study of Half wave, Full wave and bridge rectifier

- 3) Characteristics of BJT
 - a. DC input characteristics of BJT in CE mode
 - b. DC output characteristics of BJT in CE mode
 - c. DC transfer characteristics of BJT in CE mode
 - d. Calculation of parameters

- 4) Characteristics of JFET
 - a. DC input characteristics of JFET in CS mode
 - b. DC output characteristics of JFET in CS mode
 - c. DC transfer characteristics of JFET in CS mode
 - d. Calculation of parameters

- 5) Characteristics of MOSFET
 - a. DC input characteristics of MOSFET in CS mode
 - b. DC output characteristics of MOSFET in CS mode
 - c. DC transfer characteristics of MOSFET in CS mode
 - d. Calculation of parameters

- 6) Switching characteristics of BJT
 - a. general purpose BC 147
 - b. Power transistor 2N2055
 - c. Darlington pair transistor TIP220

- 7) Switching characteristics of JFET

- 8) Study of Diode as positive & negative clipper

- 9) Study of Diode as positive & negative clamper

- 1) Study of basic logic gates (OR, AND, NOT, Ex-OR)
- 2) Study of NOR gate as universal building block
- 3) Study of NAND gate as universal building block
- 4) Switching characteristics of NAND & NOR gates
- 5) Measurement of propagation delay time, t_{PLH} , t_{PHL} in NAND gate
- 6) Study of multiplexer
- 7) Study of de-multiplexer
- 8) Construction and study of half adder, full adder using basic logic gates
- 9) Construction and study of RS FF clocked RS FF Using NAND gate
- 10) Construction and study of D FF and T FF
- 11) Construction and study of JKMS (7476)
- 12) Construction and study of various counters using 7490
- 13) Construction and study of various counters using 7493
- 14) Construction and study of various counters using 74193
- 15) Construction and study of various counters using CD 4060
- 16) Construction and study of Ring counter using 7476
- 17) Construction and study of shift register using 7476
- 18) Study of ICs 74194, 74195, 74198 as shift register

Students' presentation based on data sheet of components specified in paper 1 & 2, each

Work shop

- 1) Identification of components in terms of value, wattage, tolerance and packaging
 - a. Resistor , Resistor Bank
 - b. Capacitors, Trimmers
 - c. Inductors
 - d. Transformers
 - e. Relays
 - f. Switches
 - g. Cables

- 2) Soldering Practices
 - a. Exposure to various soldering materials, tools, technique, soldering station
 - b. Hands on soldering and de-soldering practice

- 3) Identification and Use of Tools
 - i)Saw ii) Cutters iii) Files iv)Drilling Machine

- 4) Study of Function Generator

- 5) Study of Phase Lead and Phase Lag circuit
 - a. Using RC combination
 - b. Using RL combination

Semester 3

At a glance

Paper 1: Advance Semiconductor Devices

Paper 2: Digital Techniques and Applications

Paper 3: Amplifiers and Power Supplies

Paper 4: Operational Amplifiers and Application

Practical 1:

Section A: Based on paper 1

Section B: Based on paper 2

Practical 2:

Section A: Based on paper 3

Section B: Based on paper 4

Work shop: Based on Theory

Unit 1

Properties of semiconductors: Carrier transport, Excess carrier, Junction behavior, high level injection effect, abrupt junction with example, linearly graded junction, temperature dependence, break down mechanism

Unit 2

Majority Carrier Diode: Tunnel diode, Schottky barrier diode, Ohmic contact hetero junction

Microwave diode: PIN diode, IMPATT diode, TRAPATT, BARITT

Unit 3

Optoelectronics: L.E.D. – materials, construction, working and application. LED as lighting source, power LED Construction, working and application. Driver for LED & power LED, LED application as backlighting in displays

LASER - materials, construction, working and application

Unit 4

Photo detector- photo voltaic, photo conductive LDR – materials, construction, working and application. IR detectors – materials, construction, working and application.

Photocell – materials (GaAs, CdTe, CIS, CIGS, Dye sensitized Solar Cell, Organic Solar Cell,), types, construction, working and application. parameters of solar cell, Multi junction solar cell, Principle of solar energy harvesting

Unit 1

Transistor as switch, logic families – TTL, CMOS, open collector, TTL sub families. Concept & comparison on Fan in, Fan Out, Propagation delay, noise, input / output voltage margin, max. Operational frequency, power dissipation, working temperature range. Data sheet reading of digital devices

Unit 2

Simplification of logic circuits, tools for simplification, SOP, POS, reduction using K-map, representation of truth table, SOP, POS. problem solving using K-map, minimization of logical function in SOP, POS form, Circuit design application, Arithmetic circuits, BCD-to 7 Segment decoder

Unit 3

Information in digital form, bit, nibble, byte, word concepts, problems in communication of digital data, codes – Straight binary code, Natural BCD code, Excess-3, gray, alphanumeric code, Error detection and correction code
Encoders - construction, working and application. Decoders - construction, working and application. Study of encoder & decoder IC

Unit 4

Need and advantages of Digital system, Need of analog to digital, digital to analog converters, Parameters for converter, DAC-weighted Resistor and its limitations, R-2R ladder, specification of D/A converter. Calibration of DAC circuit. Study of DAC IC
ADC- principle of conversion, sampling theorem, quantization and encoding, parallel comparator A/D, Successive-approximation A/D, Counting A/D, Dual slope, Specifications of A/D converter, calibration, Study of A/D ICs,

Unit 1

Introduction to amplifier, amplifier parameters, role of active device in amplifiers, BJT based amplifiers, DC and AC biasing, transistor equivalent circuits and models- T-model, Pi- model h-parameters, and formulae. Classification of amplifiers, Class-A, Class-B, class AB, class C amplifiers and their analysis.

Unit 2

Multi stage amplifiers : coupling – direct, RC, transformer and their comparisons, design of 2 stage amplifier, Concept of power amplifier, complementary symmetric amplifier, R.F. amplifier- single tuned amplifiers, Broad band amplifier

Distortions in amplifiers, Noise, Classification of internal noise, thermal, shot, flicker, noise figure

Unit 3

Feed back system : principle, types, advantages of positive and negative feed back system, voltage feed back , current feed back, feed back factor, various criterion of feed back and stability, feed back and band width, feed back and noise, design of two stage negative feed back amplifier.

Unit 4

Definition of power supply, need, types of power supply- Unregulated, regulated (linear, switching), power supply parameters – ripple factor, efficiency, voltage drop, line regulation, load regulation, max. Current delivery. Study of unregulated power supply with various filters, Regulated power supply design using series pass transistor, concept and block diagram of ERPS, short circuit protection. Design dual power supply, Study of IC 78xx and 79xx families, 317 as variable regulator, Limitations of linear regulator, Switching regulator- principle, types, working, advantages, application. Study of SMPS used for PC and mobile

Unit 1

Operational Amplifier: Differential amplifier: gain expression using H parameters, transfer-characteristics, constant current source, level shifting, block diagram of op-amp, frequency response, frequency compensation methods, study of IC741, measurement of parameters of op-amp, off set nulling and their importance.

Unit 2

Linear Applications of Op-amp : Inverting and non-inverting amplifiers, voltage followers (AC-DC), Adder, integrator, differentiator, Differential amplifier, Subtractor bridge amplifier, Instrumentation amplifiers, precision rectifier, RMS to DC converter, voltage to current converter, constant voltage sources, active filters: low frequency, mid frequency and High frequency filters of first order

Unit 3

Non-Linear Applications of Op-Amp and Filter Circuits, Clipping and clamping circuits, comparator, level comparator, astable, monostable and bistable multivibrator, Schmitt Trigger, voltage sweep generator,

Unit 4

Study of various industrial op-amps, single pkg, multi pkg, compensated, single supply, High impedance op-amp, front end design and signal conditioning using op-amp, Case study: Design of typical pH meter.

- 1) Characterization of diode (Forward bias and reverse bias)
 - a. PIN
 - b. L.E.D. (Red & White)
 - c. Tunnel
 - d. PCD

- 2) Study of radiation pattern of LED, High intensity LED

- 3) Measurement of Band Gap of semiconductor material of different concentration
 - a. Zener diode (about 2.2 V)
 - b. Avalanche (about 18 V)
 - c. L.E.D. (Blue)
 - d. Germanium

- 4) Characteristics of LDR
 - a. by varying intensity
 - b. by varying wavelength
 - c. measurement of Dark resistance.

- 5) Characteristics of different types of Photo Cell (Min.2)
 - a. by varying intensity
 - b. by varying wavelength
 - c. measurement of threshold intensity

- 6) Study of charging pattern of solar panel
 - a. measurement of generated voltage across standard load with time

- 7) Study of charging capacity of solar panel of different sizes

Practical for

Section B: Paper 2, Digital techniques and Application

305

- 16) Comparative study of TTL and CMOS NAND gate
(Fan-in, Fan-Out, Voltage windows, power dissipation)
- 17) Comparative study of TTL and CMOS NAND gate
(Delay time, rise time, fall time, max. frequency)
- 18) Study of Encoder IC
- 19) Study of Decoder IC
- 20) Study of BCD to 7 Segment decoder
- 21) Construction and study parity generator and checker using gates
- 22) Construction and study of op-amp based weighted D/A Converter
- 23) Construction and study of op-amp based R-2R ladder D/A Converter
- 24) Study of flash type A/D converter
- 25) Construction and study of single slop A/D converter
- 26) Study of IC ADC 0808
- 27) Study of sampling speed in different types of A/D converter

Practical for

Section A: Paper 3, Amplifiers and Power Supplies

306

- 1) Study of frequency response of various types of coupling
 - a. RC with standard load
 - b. Transformer with standard load
 - c. direct with standard resistive load
 - d. direct with standard capacitive load
 - e. direct with standard inductive load
- 2) Characterization of single stage CE amplifier
(Finding input resistance, output resistance, A_v , BW)
- 3) Characterization of single stage CB amplifier
(Finding input resistance, output resistance, A_v , BW)
- 4) Characterization of single stage CC amplifier
(Finding input resistance, output resistance, A_v , BW)
- 5) Characterization of A.F. Power amplifier
(Finding input resistance, output resistance, A_p , BW)
- 6) Study of positive feed back system with variation of feed back factor
- 7) Study of negative feed back system with variation of feed back factor
- 8) Study of series pass regulator
- 9) Study of IC 78xx and 79xx
- 10) Study of 317 variable voltage regulator
- 11) Study of SMPS

Practical for
Section B: Paper 4, Operational Amplifiers and Applications

306

- 1) Study and measurement of op-amp parameters
- 2) Construction and study of inverting amplifier using op-amp
- 3) Construction and study of non-inverting amplifier using op-amp
- 4) Construction and study buffer amplifier using op-amp
- 5) Construction and study of adder circuit using op-amp
- 6) Construction and study of subtractor circuit using op-amp
- 7) Construction and study of integrator circuit using op-amp
- 8) Construction and study of differentiator circuit using op-amp
- 9) Construction and study of voltage comparator circuit using op-amp
 - a. positive comparator
 - b. negative comparator
 - c. zero crossing
 - d. Schmitt Trigger
- 10) Construction and study of astable and monostable circuit using op-amp
- 11) Construction and study of Low pass filter using op-amp
- 12) Construction and study of High pass filter using op-amp

Seminar / presentation:

307

Students' presentation based on data sheet of components specified in paper 1 to 4, each

Semester 4

At a glance

Paper 1: Circuit Maker (software)

Paper 2: Circuit analysis and network theorems

Paper 3: Computer organization 1

Paper 4: Introduction to Microprocessor

Practical 1:

Based on paper 1 & 2

Practical 2:

Based on paper 3 & 4

Work shop: Based on Theory

Unit 1

Basics, Accessing Tools and Features, file management, Drawing a schematic, simulating digital circuit, analog analysis, drawing and editing tools

Unit 2

Digital logic simulation, Analog and mixed signal simulation, Exporting file, Fault simulation , file, edit and macro menu, Option, View& Window, simulation menu,

Unit 3

Introduction to SPICE, Creating New devices,

Unit 4

Digital SimCode

Paper 2, Circuit analysis and Network theorems

402

Unit 1

Nodal and mesh-basis equilibrium equation, matrix approach for complicated network containing voltage current sources and reactance, source transformations, duality, Mesh basis equation for coupled circuits. Network Theorems: Superposition, Reciprocity, Thevenin's Norton's Maximum Power transfer, Compensation, Tellegen's theorem as applied to AC circuits.

Unit 2

Trigonometric and exponential Fourier series, Discrete spectra and symmetry of waveforms, steady state response of a network to non-sinusoidal periodic inputs. Power factor, Fourier transforms and continuous spectra, three phase unbalances circuit and power calculations. Laplace transforms and properties, partial fractions, singularity functions, waveform synthesis, analysis of RC, RL1 and RIG networks with and without initial conditions with Laplace transforms, Evaluation of initial conditions.

Unit 3

Transient behavior, concept of complex frequency, Driving points and transfer functions, poles and zeros of Immitance function, their properties, sinusoidal response from pole-zero locations, convolution Theorem and integral solutions.

Unit 4

Two port Network Parameters and inter-connections, Behavior of series and parallel resonant circuits, Introduction to band pass, low Pass, High Pass and band reject filters.

Unit 1

Register level design general characteristics, description language. Combinational and sequential components, design methods.

Processor level design components, design techniques.

Processor design processor organization, information representation. Number formats instruction sets instruction formats! instruction types, multiplication and division ALU design, floating point arithmetic, IEEE 754 floating point formats.

Unit 2

Control design instruction sequencing, interpretation, Hardwired control - design methods, multiplier and CPU control unit. Microprogrammed control- basic concepts, minimising micro instruction size, multiplier control unit.

Microprogrammed computers- CPU, control unit, conventional and unconventional computers.

Unit 3

Introduction to Memory, basic memory cell circuit, organization, device characteristics, RAM, serial access memories, virtual memory, concept of cache and associative memories. PROM, EPROM,EEPROM,CAM

Unit 4

System organization:

Local and long distance communication, input/output systems, interrupt, DMA, introduction to parallel processing. Concept of parallel processing, pipelining, vector processors, introduction to RISC architectures, data flow architecture.

Unit 1

Approach to integrated system Design using microprocessors. Bus concept. Address Data & control. Organization of a computer with MPU. Bits/Bytes /Words /Long - words their range- accuracy & precision. Memory organization, Introduction to Intel's 8085. A Architecture-description, instruction set, Addressing Modes timing diagrams, Assemblers

Unit 2

Flag structure, concept of PSW stacks & subroutines- simple & Nested, PUSH, POP instruction & CALL/RETURN instructions, Stack manipulation, simple programs. Interrupts - Concept and structure in 8085. Interrupt service routines. Advanced instructions & Programming of 8085.

Unit 3

Introduction to 16-bit microprocessors, 8086/8088 CPU architecture, memory segmentation, physical address generation, addressing modes, Instruction set: data transfer, arithmetic, logical, string manipulation, control transfer, unconditional branch, conditional branch, flag, processor control, 8087 coprocessor, data formats

Unit 4

Assembler organization, assembler directives and operators, Assembly language programs, MASM and DEBUG utility, stack structure, PUSH and POP instructions, subroutine, procedure and macros, timing and delays

- 1) Simulation and study of RC, RLC circuits using circuit maker (CM)
- 2) Simulation and study of single stage BJT amplifier using circuit maker (CM)
- 3) Simulation and study of single stage FET amplifier using circuit maker (CM)
- 4) Simulation and study of up/down counter using circuit maker (CM)
- 5) Simulation and study of ring / Johnson counter using circuit maker (CM)
- 6) Simulation and study of shift register using circuit maker (CM)
- 7) Simulation and study of Thevenins & Nortons Theorem using circuit maker (CM)
- 8) Simulation and study of superposition & max. power transfer theorem using circuit maker (CM)
- 9) Simulation and study of High pass & low pass filter circuits (1st & 2nd Order) using circuit maker (CM)
- 10) Verification of Max. Power transfer theorem using discrete components

Paper 3 & 4 **Practical for** **406**

- 28) 25 programs covering instruction set based on 8085
- 29) 25 programs covering instruction set based on 8086

Seminar / presentation / work shop :

407

Hand made PCB design of standard circuit, assembling & testing
Hands on training simulation software of 8085
Faculty seminar / Guest lecture on algorithm, flow chart & Programming
Students' presentation based on paper 1 to 4, each

Semester 5

At a glance

Paper 1: Fundamentals of Biomedical instrumentation

Paper 2: Power Electronics

Paper 3: Microcontroller Programming & Interfacing

Paper 4: Nano electronics

Practical 1:

Based on paper 1 & 2

Practical 2:

Based on paper 3 & 4

Work shop: Based on Theory

Unit 1

Biometrics, Basic design specifications & biomedical instrumentation systems, man instrument system, classification of biomedical equipments- diagnostic, therapeutic and clinical equipment Origin of bioelectric events, polarization & depolarization of the cell, bio-potentials, signals generated by muscles of the heart, muscle activity and neuronal activity of the brain (ECG, EMG & EEG)

Unit 2

Bioelectrodes, electrode-tissue interface, contact impedance, effects of high contact impedance, types of biopotential electrodes- microelectrodes, skin surface electrodes & needle electrodes, electrodes for ECG, EEG & EMG. Transducers & transduction principle, Active & passive transducers, factors governing selection of transducers

Unit 3

Transducers for Biomedical Application

Resistive transducers -	Muscle force and Stress (Strain gauge), Spirometry (Potention), humidity, (Gamstrers), Respiration Thermistor
Inductive Transducers -	Flow measurements, muscle movement (LVDT)
Capacitive Transducers -	Heart sound measurement, Pulse pick up
Photoelectric Transducers -	Pulse transducers, Blood pressure, oxygen Analyses
Piezoelectric Transducers -	Pulse pickup, ultrasonic blood flow meter
Chemical Transducer -	Electrodes, PH electrode

Unit 4

General consideration of electronic recording: preamplifier, main amplifier and driver amplifier; consideration of noise; Medical display systems: oscilloscopes for biomedical measurements - long persistence, memory facility, multi-channel displays, flat panel displays, touch screens

Paper 2, Power Electronics

502

Unit 1

Power devices : Types (DIAC, SCR, TRIAC), Construction, Principle of Operation, I-V Characteristics, Specifications and ratings, Selection criteria and applications, Turn ON methods : Voltage triggering, Gate triggering, dv/dt triggering, High temperature triggering, Light triggering Communications, Series and parallel configuration of thyristors.

Unit 2

Thyristor family :Phase controlled Thyristor, fast switching Thyristor, Gate turn off Thyristor (GTO), Reverse Controlled thyristor, Static Induction Thyristor, Light activated silicon controlled rectifier (LASCR), FET controlled Thyristor (FET-CHT), MOS controlled Thyristor, Programmable Unijunction Transistor (PUT), Silicon Unilateral switch (SUS), Silicon bilateral switch (SBS), Silicon controlled switch, Schokley diode. Power integrated circuits.

Unit 3

Controlled Rectifiers : Performance indices of rectifiers, Single phase half wave, full wave and bridge rectifiers with Resistive and R-L as loads, and Three phases fully controlled bridge converter comparison with single phase, single phase, three phase semi converter, dual converters.

Unit 4

Choppers : Principles, control techniques, classifications: Class A, B, C, D, F : Communication methods.

Paper 3 Microcontroller Programming & Interfacing

503

Unit 1

Microcontrollers : Introduction to embedded systems, classifications, processor in the system, microcontroller, introduction: 8051 architecture, features of 8051, basic assembly language programming concepts, instruction set, data transfer, logical operations, arithmetic operations, jump/call instructions, interrupt handler, addressing modes, an 8051 microcontroller design & testing

Unit 2

Interfacing : Interfacing of Keyboard, Character displays, ADC/DAC, stepper motor, dc motor; serial communication with PC using RS232, Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I2C), serial communication with other microcontrollers/devices using I2C, SPI, RS232 and USB

Unit 3

Touch screen interface (capacitive & resistive), graphical display interface, isolated power control module & its interface, small 24 character printer (thermal & dot matrix) interface, RTC interface

Unit 4

Other Microcontrollers: Introduction to 16-bit micro-controllers, ATMEGA, PIC processors: General architecture and their limitations, clocking unit, Real Time Clock and Timers, Reset Circuitry and Watchdog Timer; development tools: ATMEGA assembler and simulator, ATMEGA AVR studio; robotic control applications

Paper 4, Fundamentals of NANO-ELECTRONICS

504

Unit 1

Introduction to Nano-Electronics : Top-down, Bottom-up approaches, Potential of Nano electronics, Classical Particles, Classical Waves and Quantum particles, comparison of classical and quantum systems, Quantum electronics of an electron, Confined electrons- Dots, wires and wells, Band theory of solids, Carbon nano tubes and graphene.

Unit 2

Single electron and few-electron phenomena : Tunnel junctions and their applications- Metal-Insulator, Metal-Semiconductor and Metal- Insulator-Metal junctions, Field emission, Gate-Oxide tunneling and Hot Electron Effects in MOSFETs, STM, Double barrier tunneling and resonant tunneling diodes, Coloumb blockade in nano devices, Single electron transistor, Carbon Nanotube SETs and FETs Semiconductor nanowire SETs and FETS, Molecular SETs.

Unit 3

Many Electron Phenomena: Particle statistics and density of states, Semiconductor hetero structures and quantum wells, Models of dots, wires and wells and their applications, Fabrication techniques of dots, wires and wells.

Unit 4

Nano wires, Ballistic Transport and Spin Transport : Classical and semi classical transport theories, Ballistic transport, Carbon Nano tubes and Nano wires, Transport of spin and spintronics

Practical for

Section A: Paper 1, Fundamentals of Biomedical instrumentation

505

- 1 Study of High input impedance amplifier.
- 2 Study of instrumentation amplifier
- 3 Study of Strain Gauge
- 4 Study of NTC type thermister characteristics for wide range (0° C to 100° C)
- 5 Study of thermister as respiration sensor
- 6 Study of passive sensor biasing using capacitive sensor
- 7 Study of Skin impedance measurement using surface electrode

Section B: Paper 2, Fundamentals of Biomedical instrumentation

- 1 Study of SCR Characteristics
- 2 Study of Triac Characteristics
- 3 Study of TRIAC based AC controller
- 4 Study of Full Wave, Bridge Rectifier
- 5 Study of controlled Rectifier
- 6 Study of switching circuits for High Power SCR/ TRIAC
- 7 Study of Resistive, Capacitive and Inductive load characteristics & power factor calculation.

Practical for

Section A: Paper 3 Microcontroller Programming & Interfacing 506

- 1 Study of interfacing 3X4 Keyboard with microcontroller
- 2 Study of interfacing 16X2 LCD with microcontroller
- 3 Study of interfacing two microcontroller using RS232 ,I2C mode
- 4 Study of interfacing 12 bit ADC with microcontroller
- 5 Study of interfacing 12 bit DAC with microcontroller
- 6 Study of interfacing RTC with microcontroller
- 7 Study of interfacing 24 character thermal printer
- 8 Study of light dimmer using microcontroller – TRIAC interface.

Section B: Paper 4 Fundamentals of NANO-ELECTRONICS

- 1 5 Practicals based on simulation

Seminar / presentation / work shop :

507

Study of Invertors

Visit to Hospital to elaborate role of biomedical instruments

Faculty seminar / Guest lecture on 3 phase power system

Students' presentation based on paper 1 to 4

Semester 6

At a glance:

Paper 1: Wave form generators

Paper 2: Fundamentals of Communication Electronics

Paper 3: Electromagnetic Theory and Antennas

Paper 4: Computer aided PCB designing

Practical 1:

Based on paper 1 & 2

Practical 2:

Based on paper 3 & 4

Work shop: Based on Theory

Paper 1, Wave form generators

601

Unit 1

Introduction: Sinusoidal & Non-Sinusoidal wave form generators, types of Sinusoidal & Non-Sinusoidal wave form generators, Pulse Generator, Random signal generators.

Positive feed back based oscillators- Barkhausen Criteria, Oscillator parameters, LC Oscillators – Colpitts Oscillator, RC oscillator- Phase shift (3 stage & 4 stage) , Crystal oscillator

Unit 2

Multivibrators: square & rectangular wave generators, Study of IC 555 as Astable Multivibrator, square & rectangular wave generators using NOT gate & crystal, square & rectangular wave generators using CMOS gate- study of IC CD4060, Concept of Duty cycle, Pulse width, Conversion of square & rectangular wave in triangular, sawtooth, sine wave

Unit 3

Pulse Generator : Monostable Multivibrator, Positive and negative pulse, trigger signal, level & edge trigger, concept of PRF, triggerable & Non- triggerable , Study of IC 74121,74123, High voltage pulse generation – transistor based circuit design, SCR based circuit design

Unit 4

VCO: Concept of VCO, voltage to Frequency converter, Basic action, parameters of VCO, Range, Input sensitivity, type of input(AC-DC, V-I), Applications of VCO, Study of VCO IC

PLL: Concept & Need of PLL, working block diagram, role of each block, Various techniques for modules, Study of monolithic PLL, standard applications of PLL

Unit 1

Introduction to electronic communication

Importance , Block diagram of communication system, Modulation, Need for modulation

Types of Electronics communications, Simplex, Duplex — Full & Half

Digital, Analog, Applications of communication, The electromagnetic spectrum

(different bands & their frequencies) Concept of Transmission bandwidth

Unit 2

Amplitude modulation & Frequency modulation, Modulation index — definition, its effect on modulated signal, simple numerical. Mathematical representation of amplitude modulated wave & its meaning (concept off side bands)

Bandwidth requirement Representation of AM signal in time & frequency domain

Power relation in AM wave, Frequency modulation (definition)

Definition — Deviation ratio, max Deviation ratio, Mathematical representation of frequency modulation and its meaning. Representation of frequency modulated signal in time domain frequency domain. Bandwidth requirement — simple numerical

FM signal generation using reactance modulator circuit, concept of pre emphasis and de-emphasis. Block diagram of FM transmitter explanation with waveform frequency modulation system

Unit 3

Radio receivers (AM & FM) : Principle of heterodyne, Block diagram of super heterodyne receiver and its working with waveforms. Characteristics of AM radio

receiver- Sensitivity, Selectivity, and Fidelity. Demodulation of AM signal. Need of

AGC and its type — simple, delayed (with graph) Block diagram of FM receiver

explanation with waveform. FM Detector — slope detection, transformer action at above & below resonance ratio detector (diode circuit)

Unit 4

Wave Propagation: Fundamental of electromagnetic wave. Transverse electromagnetic wave, polarization. Ground wave Ionosphere Sky wave propagation, Concept of actual height and virtual height. Definition — critical frequency, max. Useable frequency, skip distance, fading, Space wave propagation. Duct propagation, Troposphere scatter propagation

Unit 1

Electromagnetic waves : The equation of continuity for time varying fields, Maxwell's equations, EM waves in a homogeneous medium, wave equations for a conducting medium, conductors and dielectrics, Poynting's theorem, interpretation of $E \times H$, complex Poynting vector

Unit 2

Antenna Basics : Basic radiation equation, radiation resistance, antenna patterns, half-power bandwidth, radiation intensity, directivity and gain, resolution, apertures, effective heights, Friis's transmission formula, field zones, linear, elliptical and circular polarization

Unit 3

Antenna types : The antenna family, short dipole antenna, antenna arrays, broad-side and end-fire arrays, linear arrays, folded dipole, Yagi-Uda array, helical beam antenna, horn antenna, rhombic antenna, parabolic reflectors

Unit 4

Antennas for mobile communications and antenna measurements

Antennas for terrestrial mobile communications, base station antennas, switched beam and beam forming antennas, antennas on cellular handsets, micro-strip lines and antenna

Antenna measurements: The reciprocity theorem, antenna ranges, compact antenna test ranges (CATR), instrumentation for measurement of radiation properties of antenna under test (AUT)

Unit 1

Introduction to PCB Design and CAD, Introduction to ORCAD, PCB- fabrication, cores, layer stack-up, fabrication process, photolithography and chemical etching, milling, layer registration, implementation using ORCAD, files in ORCAD,

Unit 2

PCB design Flow by example, PCB designing with PCB editor, PCB editor tool set, Introduction and details of industrial standards, Introduction to design for manufacturing, PCB design for signal integrity

Unit 3

Circuit design issues not related to PCB design, issues related to PCB layout, ground planes and ground bounce, PCB electrical characteristics, Routing topics, PSpice to simulate Transmission Lines, Making and editing capture parts, making and editing foot prints

Unit 4

PCB design example; analog dual power supply, mix analog / digital design, Multi page, multi power & multi ground mix ADC PCB design, High speed digital design, Artwork Development and board fabrication

- 1 Design and study of single frequency collpitts oscillator (2-10 Mhz)
- 2 Design and study of single frequency phase shift oscillator (AF Range)
- 3 Design and study of variable frequency Astable Multivibrator using 555
- 4 Study of stability factor in crystal oscillators designed with gates
- 5 Design & study of pulse generator using IC (Duty Cycle less than 1 mS)
- 6 Design & study of High voltage narrow pulse generator using Transistor
(Duty Cycle less than 500nS, Output Voltage about 50 V)
- 7 Design & study of High voltage narrow pulse generator using SCR
(Duty Cycle less than 500nS, Output Voltage about 100 V)
- 8 Design & study of VCO using IC
- 9 Design & study of PLL using IC

Paper 2: Fundamentals of Communication Electronics

- 1 Design and study of Amplitude Modulator
- 2 Design and study of Frequency Modulator
- 3 Design and study of Amplitude de-modulator
- 4 Design and study of Frequency de-modulator using PLL
- 5 Design and study of LC tank circuit and its Q factor
- 6 Characteristics study of different HF cables

Practical for

Paper 3: Electromagnetic Theory and Antennas

606

- 1 Characteristics study of Yagi antenna
- 2 Characteristics study of Horn antenna
- 3 Characteristics study of Transmission Line
- 4 Characteristics study of dish antenna
- 5 Characteristics study of Telescopic antenna as receiver
- 6 Characteristics study of Telescopic antenna as Transmitter

Paper 4: Computer aided PCB designing

- 1 Designing, fabrication and testing of DC power supply PCB
(without transformer)
- 2 Designing, fabrication and testing of timer circuit PCB
- 3 Designing, fabrication and testing of crystal oscillator with frequency divider
- 4 Designing, fabrication and testing of 7 segment display with BCD driver
- 5 Designing, fabrication and testing of RF oscillator above 10 Mhz.

Seminar / presentation / work shop:

607

Field Strength Measurement

Study of significance of ionosphere studies

Faculty seminar / Guest lecture on communications in animal kingdom / biological communication

Students' presentation based on paper 1 to 4, each

Semester 7

At a glance:

Paper 1: Computer Organization and interfacing

Paper 2: VLSI

Paper 3: C

Paper 4: Embedded system & Application

Practical 1:

Based on paper 1 & 2

Practical 2:

Based on paper 3 & 4

Work shop: Based on Theory

Unit 1

Computer Organization : A functional view of the computer, Pentium and power PC evolution, computer function and interconnection, PCI bus, cache/main memory structures, DMA module, the external interface: fire wire and infiniband

Unit 2

Reduced Instruction Set Computers : Pipelining concepts, RISC architecture, comparison of complex instruction set computers (CISC) and RISC, RISC pipelining, organisation of pipelining, overview of super-scalar and superpipelined organizations, Introduction to PC based instrumentation – Internal & external, limitations and advantages, case study of internal & external instruments

Unit 3

Data Acquisition Systems (DAQ) : Basic components of the DAQ system, functional block diagram of PC bus based DAQ system, data acquisition configurations, parallel port data acquisition; GPIB (IEEE-488), UART, USB interface; networked data acquisition.

Unit 4

Expansion buses and I/O ports: ISA, EISA, PCI, USB port; Peripherals: Monitors, printers of different types; BIOS services; 8-bit ISA bus signals and their functions, timing diagrams of ISA bus cycles, interfacing to 8-bit ISA bus, interrupt handling, using DMA channels, limitation of 8-bit ISA bus; features of PCI bus, PCI system, standard parallel port (SPP), centronics, interfacing to parallel port and serial ports

Unit 1

Very Large Scale Integration (VLSI) Technology : Classification of IC Technology- SSI, MSI, LSI, VLSI, ULSI. MOSFET's current equation in Linear & Saturation Mode
Threshold voltage- Definition, Derivation of Threshold voltage(Numericals) Body effect & effect of body effect on Threshold voltage Short channel effect
a) Channel length modulation b) Hot electron effect c) Mobility variation effect
VLSI Concepts : Resistance & capacitance estimation of MOSFET
C-V (capacitance-voltage) characteristics of MOS capacitor Principle of MOS scaling, types of scaling, functional limitation of scaling, Wafer Processing with C-Z method
Definition & Application of Mask generation, Oxidation, Diffusion, Ion Implantation, Metallization, Photolithography in MOSFET Basic process steps of n-MOS
Basic process steps of CMOS (n Well, p Well & Twin Tube) Latch up in CMOS and its prevention

Unit 2

MOS Inverters: Aspect ratio and Inverter ratio, n-MOS inverter with resistive load
n-MOS inverter with EMD load, n-MOS inverter with DMD load, CMOS inverter.
Logic Gates using n-MOS & CMOS.(Only circuit diagram & operation)
Realization of any Boolean equation using n-MOS & CMOS
Finite state machines (FSM) : Moore and Mealey machines: Implementation of circuits using Moore and Mealey machines.

Unit 3

Architecture of ASIC and PLD
CPLD -Xilinx and Atmel series architecture, Details of internal block diagram
FPGA - Introduction to FPGA like Xilinx (FPGA), SPARTAN 3 series and Atmel
Hardware Description Language (HDL): Features of Verilog-Entity, Architecture, Configuration, Package, Bus, Driver, Attributes Process, Behavioral Modeling, Sequential Processing, Data Types, Configurations.

Unit 4

Simulation, Testing and Synthesis using VHDL : 6.1 Simulation Issues, Testing Issues
Synthesis Issues
Hardware Modeling examples (operation & block Testing) : Different styles of modeling
Modeling simple elements, Modeling conditional operators, Modeling combinational logic, Modeling regular structure, Modeling synchronous logic

Unit 1**Data types**

Basics of programming — algorithms, flow charts, pseudo codes; Structure of a C program, compilers, assembler, interpreters; C character set, constants, variables and keywords, types of constants and variables; type declaration and arithmetic instructions, Integer and float conversions; operators in C, hierarchy of operators, Input-Output statements in C (Formatted and Unformatted), tools for programming in C — data types, data storage, data access, operators, associativity of operators, operator precedence

Unit 2

Control structure : Decision control structures- if-else, nested if, nested if-else, else-if ladder, switch-case; loop control structures —while, do-while, for loop, break statement, continue statement

Unit 3**Arrays, functions, Structures and Unions**

Arrays and strings; One- dimensional, Two dimensional and multidimensional array, various string operations; Function definition and prototyping, types of functions, type of arguments, recursion, passing arrays to functions, passing structures to functions, storage class in C;

Structure and union: structure variable, accessing structure member, arrays of structure, union, bit fields

Unit 4**Pointers and file handling**

Pointers: declaration of pointers, chain of pointers, pointer expression, pointer arrays, pointer to array, pointer to function; file handling- file opening modes, text and binary files, high level and low level operations on files; pointers, file handling in C; hardware access using C program- serial and parallel port; limitations of C programming

Paper 4, Embedded system & Application

704

Unit 1

Introduction & need of embedded System, types, selection parameters, general purpose, specific embedded system, Single board computers - Introduction & need , comparative study of market & trend, Block diagram of SBC, features of SBC, operating system and environment needed for SBC, compilers, cross compilers.

Unit 2

Application in consumer electronics : detail case study of Washing machine, Dish washer, Digital TV, Home automation, Security- Biometric recorder

Unit 3

Application in research & industrial electronics: detail case study of data loggers including various types, wire less data logger, industrial automation- PID based temperature controllers, visual inspection and analysis, condition & vibration analysis, High speed data acquisition, Enforcement of laws & condition using embedded technology. Industrial noise and shielding of advance electronic assemblies

Unit 4

Application in Automotive & power

Practical for

Paper 1: Computer Organization and interfacing **705**

- 1 Design and study of PC interface using printer port
- 2 Design and study of PC interface using RS232 port
- 3 Study of PC interface using PCI bus
- 5 Study of DAQ
- 6 Study of Mother Board
- 7 Study of S.M.P.S

Paper 2: VLSI

- 1 Design, simulation and testing of suitable 5 designs on CPLD
- 2 Design, simulation and testing of suitable 5 designs on FPGA
- 3 Design, simulation and testing of various devices in VHDL

Practical for

Paper 3: Programming in C **706**

- 1 20 Practical based on Skill development in C
- 2 5 practical involving interfacing, external data handling and device control

Paper 4: Embedded system & Application

- 1 10 Practical based on SBC prototype Board
- 2 PT100 external sensor interface with SBC
- 3 High speed data interface with SBC
- 4 Power circuit control using SBC
- 5 3phase AC motor control using SBC
- 6 Stepper motor control & interface with SBC
- 7 Character display interface with SBC

Seminar / presentation / work shop: **707**

Faculty seminar / Guest lecture on “industrial PC”, “Noise removal techniques” or topics related to practical applications in industries.

Comparative Study of market with reference to SBC/ CPLD /FPGA/ sensors

Students’ presentation based on paper 1 to 4, each

Semester 8

At a glance:

Paper 1: Biomedical Instrumentation – II

Paper 2: Virtual Instrumentation

Paper 3: Digital signal Processing

Paper 4: Fuzzy Logic and Artificial Neural Networks

Practical 1:

Based on paper 1 & 2

Practical 2:

Based on paper 3 & 4

Work shop: Based on Theory

Unit 1

Biotelemetry: Introduction, physiological parameters adaptable to biotelemetry, the components of biotelemetry systems, application of telemetry to patient care
Patient monitoring systems: System concepts, Measurement of heart rate, blood pressure, temperature and respiration rate, apnoea detectors, Computerized patient monitoring system

Unit 2

Biomedical Instruments & Therapeutic Equipments : Electrocardiograph (ECG), Phonocardiograph, Electromyograph (EMG), Electroencephalograph (EEG) , fetus monitoring Instruments, External & Implantable cardiac pacemakers, Programmable pacemakers, power sources of implantable pacemakers, Defibrillators, Ventilators

Unit 3

Modern Imaging Systems : Need for imaging human body, X-Ray machines and computed Tomography, Magnetic Resonance Imaging system, Ultrasonic Imaging systems, endoscope, flexible bronchoscope and gastro scope, Medical thermography

Unit 4

Physiological effects of Electric currents, Microshocks, Macroshocks, Electronic shock hazards in biomedical instrumentation, Leakage current, grounding techniques, Test instruments for checking safety parameters of biomedical equipments, Methods of Accident prevention Biomedical Computer Application: Data acquisition, storage and retrieval, data reduction & transformation, Mathematical operation, pattern recognition, limit detections

Unit 1

Virtual Instrument (VI): Definition of VI, architecture of VI, development of Lab VIEW, graphical programming, advantages of Lab VIEW, palettes, sub VI, express VI, data flow program, modular programming

Unit 2

VI Programming Techniques : For and WHILE loops, feedback nodes, local and global variables. arrays, array functions, polymorphism, cluster operations, conversion between arrays and clusters, case and sequence structures, formula nodes, strings and file I/o, charts and graphs

Unit 3

Instrument I/o Assistant, VISA, instrument drivers, serial port communications with GPIB, RS232, USB, firewire, ethernet and IEEE-1394 controllers,

Unit 4

Processing and Analysis tool kits, Control design and simulation tools, PID control, digital filter design and modulation tool kits, simulation of ECG signal, motion control systems, prototyping with Motion Assistant

Unit 1

Discrete time Signals and Systems : Discrete time signals, basic sequences and sequence operations, DT systems, moving average, time-invariance, linearity, causality, stability criterion, properties of linear time-invariant systems; Linear convolution, linear constant-coefficient difference equations

Unit 2

The z-transform : Definition, region of convergence (RoC), pole zero plot and region of convergence, properties of region of convergence, the inverse z-transform, power series expansion, z-transform properties

Unit 3

Digital Filter Design : Design of D-T IIR filters from continuous time filters, frequency transformations of low pass IIR filters; Design of FIR filters by windowing technique, the Kaiser window filter design method, design procedure using frequency sampling method

Unit 4

DSP Chips and Applications : Introduction to DSP processors, types of DSP processors and architecture, general purpose DSP processors; Digital filter design using DSP chips, implementation of noise removal techniques, echo effect introduced in music

Unit 1

Fuzzy sets and Membership functions : Fuzzy set operations, properties of fuzzy sets, fuzzy relations, features of the membership function, Lambda — cuts, De-Fuzzification methods

Unit 2

Extension principle, Approximate reasoning, Representing set of rules, fuzzy rule-based systems. Graphical techniques of inference; Fuzzy classification, Fuzzy c-means clustering (FCM)

Unit 3

Fundamental concepts of ANN

Model of an artificial neural network (ANN), Network architectures, feed forward networks, Learning processes, Delta learning rules for multi-perception layer, back propagation algorithm

Unit 4

Associative memories and self organizing networks: Basic concepts and performance analysis of recurrent associative memory, bidirectional associative memory (BAM); the counter-propagation network (CPN), self-organising feature maps, Adaptive Resonance Theory (ART-I)

Practical for

Paper 1

805

1. Design and study of op-amp based EEG signal amplifier.(input through simulation)
2. Design and study of electronic stethoscope
3. Design and study of body temperature measuring system
4. Design and study of respiratory rate measuring system
5. Design and study of arm pressure measuring system
6. Design of digital heart rate measuring system

Paper 2

1. Data acquisition using virtual instrumentation from temperature transducer
2. Data acquisition using virtual instrumentation from pressure transducer
3. Stepper motor control using virtual instrument
4. Creation of Oscilloscope using virtual instrument
5. Design of digital multi-meter using virtual instrument
6. Design of variable function generator using virtual instrument
7. Creation of digital temperature controller using virtual instrument
8. Machine vision concepts using virtual instrument

Practical for

Paper 3

806

1. Study of some discrete- time signals
2. Design and study of some FIR filters
3. Study of triangular and Blackman windows
4. Design of FIR filters using windowing technique
5. Design of filters based on pole-zero placements
6. Study of linear convolution
7. Design and study of FFT using programming
8. Design and study of digital filters (HF and LF) using programming
9. Study of experiments based on DSP chips

Paper 4

1. At least 5 Typical Fuzzy Logic and Artificial Neural Networks problem solving using PC
2. At least 5 Real life Fuzzy Logic and Artificial Neural Networks problem solving using Embedded technology

Seminar / presentation / work shop:

807

Faculty seminar / Guest lecture on DSP & virtual instrumentation
Students' presentation based on paper 1 to 4 each
Workshop on Entrepreneurship Development

Semester 9

At a glance:

Paper 1: Digital Communication

Paper 2: Microwave and Optical Communication

Paper 3: Mobile anti Satellite Communication

Paper 4: Communication Network

Practical 1:

Based on paper 1 & 2

Practical 2:

Based on paper 3 & 4

Work shop: Based on Theory

Unit 1

Signals and spectra : Classification of signals, energy and power signals, energy spectral density, power spectral density, unit impulse function, sifting property of the Dirac delta function, Fourier series, Parseval's theorem, Fourier transforms, properties of Fourier transforms, convolution properties, graphical convolution

Unit 2

Digital Communication system : Elements of digital communication system, the sampling theorem, aliasing error, PAM, PPM & PWM signals generation and detection Pulse code modulation, uniform and non-uniform quantization, SNR, companding characteristics, Inter- symbol interference, Nyquist criteria of zero ISI, eye pattern

Unit 3

Digital Modulation Techniques : Coherent binary modulation techniques, PSK, FSK, QPSK, MSK differential pulse code modulation, predictor, delta modulation, adaptive delta modulation, slope overload and granular noise, M-ary signaling

Unit 4

Information Coding : Measure of information, entropy, mutual information, Shannon's coding theorem, channel capacity, capacity of Gaussian channel, source coding, Huffman code, channel coding, block codes, syndrome decoding, convolutional coding, code tree, spread spectrum communication: PN sequences, direct sequence and frequency hopping spread spectrum systems

Unit 1

Microwave Generators and wave guides : Failure of vacuum tubes at high frequency, Two cavity klystron, reflex klystron oscillator, magnetron oscillator, TWT amplifier, backward wave oscillator, GaAs oscillator; Propagation of EM waves through wave guide, TE, TM and TEM waves

Unit 2

Microwave components and Measurements : Microwave components: scattering matrix, attenuators, Tees, directional couplers, circulators, isolators, phase shifters, cavity resonators Microwave measurements: Measurement of VSWR, phase shift, frequency, power, attenuation, dielectric constants of liquids and solids, Q of cavity

Unit 3

Fiber optics

Principles of optical communication, single mode and multi mode fibers, step index, graded index, ray model, multi path dispersion, material dispersion, optical fiber as wave guide, fiber sources and detectors,

Unit 4

Manufacture and Measurements of fibers : Optical fiber cable, fiber joints, splices, couplers and connectors, measurement in optical fibers, attenuation measurement, dispersion measurement, refractive index profile measurement, transmission links, optical transmitters and receivers

Unit 1

Cellular Concepts and Equalization : Cellular telephone system, frequency reuse, channel assignment and land off strategies, elements of cellular radio system design, switching and traffic, data links and microwaves, system evaluation, interference and system capacity, Improving coverage capacity; Fundamentals of equalization, space polarization

Unit 2

Diversity, channel coding and GSM system for Mobile Frequency and time diversity techniques, channel coding; service and features, GSM system architecture, GSM channel types, GSM frame structure, intelligent cell concept and applications; Features of handset, SMS, security; Interfacing of mobile with computer, application of mobile handset as modem, data storage device, multimedia device; Measurement of signal strength; Introduction to CDMA digital cellular standard

Unit 3

Satellite Communication : Satellite orbits, frequencies, stabilization, orbital parameters, coverage area, work angle, Attitude and orbit control system, telemetry tracking and command power system; Satellite Link design: system noise temperature and G/T ratio, down link design, domestic satellite system; eclipse on satellite

Unit 4

Multiple Access Techniques: FDMA and TDMA, TDMA synchronization and timing, code division multiple access. Applicability of CDMA to commercial system, Earth's path propagation effects; satellite services for communication — Weather forecasting, remote sensing, direct to home (DTH) TV

Unit 1

Network & Services: Communication Network, Approaches to network Design, types of Network, Two Stage, Three stage Network, Time Division Switching, Time Multiplexed Switching. Time Multiplexed Time Switching.

Unit 2

LAN Network & Medium Access layer: LAN structure, random access, multiple access protocols, IEEE standard 802 for LAN & MAN. High speed LANS, FDDI, Fast Ethernet

Unit 3

Application & Layered Architecture: OSI reference Model, TCP/IP Architecture, TCP/IP protocol, IP packets, IP 55, subnet addressing, address resolution & reverse resolution, TCP/IP utilities.

Physical Layer & Data Link Layer : Transmission media, wireless Transmission, X.25 network, Narrow band & Broadband ISDN, ATM. Data link Layer design, Error detection & correction Elementary data link protocols, sliding window protocols.

Unit 4

Network Layer & Transport Layer : Network layer design, Routing, congestion, Internet working Transport layer design issues, Transport services primitives, Internet transport protocol, wireless TCP and UDP.

Application Layer : Network security cryptography, secret key, public-key digital signature, Domain Name system, Electronic Mail system, Multimedia, Real Time Transport protocol.

Practical for

Paper 1

905

1. Study of PCM circuit and quantization
2. Study of PAM, PWM and PPM circuits and detection of these signals
3. Study of a Delta modulator
4. Study of a DBPSK communication system
5. Study of an adaptive Delta modulator
6. Study of a convolutional encoder
7. study of a PN sequence generator
8. Study of a spread spectrum direct sequence communication system

Paper 2

1. Characteristics of reflex Klystron
2. Attenuation Measurement
3. Coupling and directivity of a directional coupler
4. Standing wave plotting and measurement of guide wavelength
5. Measurement of low VSWR and high VSWR
6. Measurement of unknown impedance using Smith chart
7. Transmission characteristics of optical fiber link
8. Attenuation measurement
9. Dispersion measurement
10. Refractive index profile measurements

Practical for

Paper 3

906

1. Measurement of field strength – mobile towers
2. Any suitable practicals on the above topics

Paper 4

Any suitable practicals on the above topics

Seminar / presentation / work shop :

907

Students' presentation based on paper 1 to 4, each
Students' presentation based on proposed project ideas,
Workshop on Finance & Accounting

Semester -10

1. Project to be completed preferably in the industry.
2. Seminar/workshop based on the project work done by the students.