

**SAURASHTRAUNIVERSITY  
DEPARTMENT OF ELECTRONICS  
M.Sc. (ELECTRONICS) SYLLABUS  
SEMESTER I TO IV**

**SEMESTER I**

- PAPER 1 ADVANCE LINEAR ELECTRONICS : CONCEPTS, DEVICES AND CIRCUIT
- PAPER 2 ADVANCE DIGITAL CONCEPTS : MICROPROCESSOR
- PAPER 3 COMPUTER FUNDAMENTALS AND BASIC ENVIRONMENT

**SEMESTER II**

- PAPER 4 ELEMENTS OF ELECTROMAGNETICS
- PAPER 5 COMMUNICATION ELECTRONICS
- PAPER 6 ADVANCE MICROPROCESSORS

**SEMESTER III**

- PAPER 7 ADVANCE COMMUNICATION
- PAPER 8 COMPUTER HARDWARE
- PAPER 9 THE 'C' LANGUAGE

**SEMESTER IV**

- PAPER 10 FIBER OPTICS
- PAPER 11 ELECTRONICS TECHNIQUES
- PAPER 12 OPTIMAL PAPERS
  - (1) ROBOTICS
  - (2) BIO-MEDICAL INSTRUMENTATION
  - (3) MICROWAVE ELECTRONICS

Paper I Advance Linear Electronics: concepts, devices and circuits

**Unit : 1 Introduction to data acquisition :**

- Glossary of Data Conversion terms.
- Principles of data acquisition and conversion

Introduction, basic data distribution system, Quantizing theory, sampling theory, coding for data converters, Amplifiers and filters, settling time, digital to analog converters, voltage reference circuits, analog to digital converters, integrating type A/D converters, Analog Multiplexers, Sample - Hold circuits, specification of converters.

REFERENCE: INTERSIL application hard book  
GE solid State, 1988.

**Unit : 2 ANALOG SWITCHERS :**

- Definition of terms used for analog switch.  
 $R_{ON}$ ,  $I_S$ ,  $I_D$ ,  $C_S$ ,  $C_D$ ,  $I_D-I_S$ ,  $t_{RAN-tON}$ ,  $t_{OFF}$
- Monolithic analog current switch AH5009/AH5010/AH5011/AH5012.  
Packing information, Schematic and Connection diagram, Test Circuit and timing waveforms, application.
- Quad bilateral switch CD 4066.

**Unit : 3 a/d converters chips :**

- ADC 0800 8 BIT A/D CONVERTER:  
Block diagram, function description, pin description, Application hints, typical application.
- ADC 0808 / 0809 pp compatible A/D converts with 8- Channel Multinlexer.  
Block diagram, functional description, connection diagram, timing diagram, Application information, typical application.

**Unit : 4 digital to analog converters**

- DAC 0808 / DAC 0807/ DAC 0806 8-bit digital to analog converters. Block diagram, connection diagram, Application hints, test circuit, equivalent circuit, typical application.
- DAC 1000/ DAC 1001/ DAC 1002 / DAC 1006/ DAC 1007/ DAC 1008 up compatible double buffered D to A converter.  
Block diagram, connection diagram, definition of package Pinouts, double buffering, application hints, Analog application, digital control description, microprocessor, interface.

REFERENCE : Data Acquisition Liner Devices Data Book. National Semiconductor, 1989.

**UNIT : 5 : POWER DEVICES :**

- BJT Power transistors:
- Power MOSFETS
- SITs, IGBTs, series and parallel operators.
- di/dt and dv/dt limitation, Isolation of Base drivers.
- Typical IGBT component: HGTIS6N4OE1 / HGDT6N4OEIS/ HGDT6NSLE1/ HGDT6NSOELS.
- 6A 400V and SOOv N-Channel IGBT.
- General description Package type, terminal diagram, test circuit.

REFERENCE:

1. Power electronics: Circuits, devices and application.  
By : Muhammed H. Rashid, PHI, Second Edition.
2. MCT/IGBTs/DEVICES/ (Data Manual)  
Harris Semiconductor, 1995.

**Unit : 6: advance circuits :**

- Inverters, choppers, dual Converters, cycloconverter.

**UNIT:7: Thyristor control circuits:**

Temperature Control, illumination Control, Application of TRIAC AS A three - Position static switch, Light activated turn off circuit using DIAC-TRIAC and LDR, OFF at dark circuit Automatic Street lighting circuit using LDR and SCR, emergency Light using SCR, Automatic Water level indicator using SCR, automatic battery chargers using SCR, Light operated SCR alarm, burglar alarm circuit using SCR, Direct current circuit breaker using SCR, battery operated inverter circuit using power transistor, SCR-UJT operated time circuit.

REFERENCE:

1. Industrial electronics and control.  
By : Bhattacharya, Chatterjee, TMH, New Delhi.

**Unit:8: SURFACE MOUNT DEVICES:**

Advantages of SMDs, components, SMD production techniques, PC Board Layout, soldering techniques, Automatic components placement unit.

REFERENCE:

Semiconductors : Technical information and characteristic data for students.  
Semen's Aktiengesellschaft Publication.

## **PAPER -2 ; ADVANCE DIGITAL CONCEPTS : MICROPROCESSOR**

> UINIT - 01 Review of Basic Digital Electronics:

FFs and their truth tables, Boolean algebra, rules (Statement Only), Simplification of few functions using Boolean algebra and Karnough Map Counters, shift registers. Block diagram of 8085 and functional description in brief, Overview of instruction set.

> UNIT - 2 Keyboard and display controller - 8279

Keyboard basics - matrix organization and scanning Block diagram of 8279- Detailed functional description of 8279-Programming 8279- Interfacing of 8279-with a typical Hex Keyboard, and seven segment display.

> UNIT 03 Peripheral Programmable Interface - 8255

Block diagram and functional description, Programming 8255 (For All Modes) - Interfacing examples.

> UNIT - 04 Universal Synchronous and Asynchronous: Transmitter and Receiver - 8251

Block diagram of 8251- Detailed functional description - programming 8251 interfacing examples - Rs 232 Standard.

> UNIT - 05 DMA Controllers - 8257

Block diagram - Detailed functional description, programming - interfacing examples

> UNIT – 06 Programmable Interrupt Controller - 8259

Bloc diagram-Detailed functional description - Programming - Interfacing examples

> UNIT - 07 General interfacing module Stepper motor - Hardware – Software, Elevator - Simulated hardware – software, Traffic light simulation - hardware - software 18 -

Column printers - hardware - software

> UNIT - 08: FLOPPY DISK CONTROLLER : 8272

Block Diagram. Functional Description. and Programming concepts.

> UNIT - 09 : CRT CONTROLLER : 8275

Block Diagram, Functional, Description, and Programming Concepts.

> TEXT BOOK (S):

(01) Digital logic and computer design

By~ M.M. Mano / PHI

(02) 0000 to 8055 : Introduction to Microprocessor for engineers and scientists.

By~ P.K. Ghosh and P.R. Sridhar , PHI.

(03) Microprocessor Book, John Wiley & Sons New York.

Reference Book

01 Microprocessor, Architecture, programming and applications with the 8085/8085A

By : R.S, Gaonkar.

## **PAYER:3 : COMNUTER FUNDAMENTALS & BASIC ENVIRONMENT**

### **UNIT - 01 LINDERSTANDING THE COMPUTER**

- Importance of Computer
- History of Computer
- Types of Computers
- Computing Concepts
- Classification of Computers
- Input Devices
- Processing Unit
- Output Devices
- External Storage devices
- Driving the Computer: The Software
- Programming Language
- Common High Level languages
- Program Execution Modes

### **UNIT - 02 FUNDAMEN'TALS OF OPERATING SYSTEM**

- Introduction to Operating System
- Process Management
- Memory Management File Management

### **UNIT - 03 DOS FUNDAMENTALS**

- Introduction
- The Computer as worker
- Introducing DOS
- The Computer at work
- Setting up DOS
- Fundamentals of DOS commands Understanding Disk
- DOS Editing
  - Edlin Editor
  - MSDOS Editor
- Customizing DOS
  - Config.sys - autoexe.bat

### **UNIT - 04 GUI-OPERATING SYSTEM**

- Introduction
- Windows 3.1 Environment
- Windows 95 Environment
- Windows 98 Environment
- Working with win-98
- Configuring Win-98

## UNIT - 05 WORKING ENVIRONMENT - MS-OFFICE

- Introduction
- Word Processor: MS Word
- Spreadsheet: Excel
- Presentation: Powerpoint

## BOOKS

- 01 Peter Norton DOS guide By Peter Norton
- 02 Programming in Basic By E Balaguruswamy Tata McGraw Hill
- 03 Operating system - concept and Design By Madnick & Donovan McGraw Hill
- 04 CS-02, Block-02, IGNOU Study Material for MCA.

## LIST OF EXPERIMENTS OF SEMESTER I

1. Study of analog switches.
2. Study of ADC 0800/0808.
3. Study of DAC 0808/DAC. 1008.
4. Study of IGBTs.
5. Demonstrate working of cycloconverters and inverters.
6. Light activated turn off circuit using DIAC-TRIAC AND LDR.
7. Emergency light using SCR
8. Burglar alarm using SCR.
9. Soldering-desoldering PCB of using SMT technology.
10. Serial data transmission and reception on the same microprocessor kit using 8251.
11. Data transfer between two microprocessor kits using 8251.
12. Interface keyboard and display using 8279.
13. Study of 8255 in simple mode 0.
14. Study of 8255 in mode 1.
15. Study of 8255 in mode 2.
16. Study of interrupts of 8085.
17. Study of interfacing module stepper motor.
18. Study of elevator module in microprocessor kit.
19. Study of traffic light module in microprocessor kit.
20. Use of Epson 460 printer in microprocessor kit.
21. Understanding DOS commands and windows environment.
22. MS-Word practice.
23. MS-Excel Practice.
24. Power Point practice.

## PAPER IV ELEMENTS OF ELECTROMAGNETICS

### Unit I VECTOR ANALYSIS

#### Vector Algebra

Scalars and vectors-unit vector-vector addition and subtraction -position and distance

vectors-vector multiplication-components of a vector

Coordinate system and Transformation

Introduction-cartesian coordinates-cylindrical and spherical coordinates

### Unit 2 VECTOR CALCULUS

Differential length, area and volume-line, surface and volume integrals-del operator-

gradient of scalar-divergence of vector and divergence theorem-curl of vector and stoke's theorem- Laplacian of a scalar.

### Unit 3 ELECTROSTATICS

#### Electrostatic Fields

Coulomb's law and field intensity-electric field due to continuous charge distributions

electric flux density-gauss's law-electric potential-relationship between E and V-

Maxwell's equation-an electric dipole-energy density in electrostatics

Electric Field and material space

Properties of materials-convection and conduction current-polarization in dielectrics-

dielectric constant and strength-continuity equation-boundary conditions

#### Electrostatic Boundary

Introduction-poisson's and laplace's equations-uniqueness theorem-general procedure for solving poisson's or laplace's equations

### Unit 4 MAGNETOSTATIC

#### Magneto-static Fields

Introduction-Biot Savart's law-Ampere's circuital law-magnetic flux density-Maxwell's

equations for static fields-magnetic scalar and vector potential-derivation of Biot

Savart's law and Ampere's law

#### Magnetic Forces and Materials

Force due to magnetic fields-magnetic torque and moment-a magnetic dipole~

magnetization in materials-magnetic boundary conditions-magnetic energy

### Unit 5 ELECTROMAGNETICS WAVE & APPLICATIONS

#### Maxwell's Equations

Faraday's law-transformer and motional emf's-displacement current-Maxwell's equations in final forms-time varying potentials

### Unit 6 ELECTROMAGNETIC WAVE PROPAGATIONS

Plane wave in free space-good conductors-power and the Poynting vector-reflection of a plane wave at normal incidence-reflection of a plane wave at oblique incidence

### TEXT BOOK

Elements Of Electromagnetics by Matthew N. O. Sadiku

Saunders College Publication, 2<sup>nd</sup> edition

### REFERENCE BOOKS

- 1 . Electromagnetics theory and its applications by U.Sinha;
2. Introduction to electrodynamics by David J. Griffiths , PHI
3. Elements of engineering electromagnetics by Narayana Rao, PHI

## **PAPER V Communication Electronics**

### **UNIT 1 Transmission Lines**

Transmission line parameters-transmission line equations-input impedance, SWR and power-the smith chart-some application of transmission lines.

### **UNIT 2 Waveguides**

Rectangular wave guide-transverse magnetic (TM) modes-transverse electric(TE) modes-wave propagation in the guide-power transmission and attenuation-waveguide current and mode excitation-waveguide resonators.

### **Unit 3 Antennas**

Hertzian dipole half wave dipole-antenna arrays-quarter wave monopole antenna-small loop antenna characteristics-antenna arrays-effective area and Friis equation- the RADAR equation.

### **Unit 4 Basic Communication Concepts**

Signal analysis-mixing-noise analysis-phase locked loops-frequency synthesizers-principle of amplitude modulation (AM)- AM circuits-AM receivers-TRF, superheterodyne-AM receivers circuit, RF amplifying-low noise amplifier-mixer/converter-IF amplifier-AM detector, AGC-Single side band systems: AM single side band full carrier-AM independent side band-AM vestigial side-comparison of single side band to double sideband AM- advantage and disadvantage of SSB transmission-single side band generation balanced ring modulator- FET push pull modulator-balanced bridge modulator.

### **Unit 5 Angle modulation**

Angle modulation and mathematical analysis-FM and PM waveforms-phase deviation modulation index and frequency deviation-percent modulation-phase and frequency modulators and demodulators-phaser representation and average of an angle modulator wave-frequency modulator transmission-direct FM-indirect FM-phase locked-loop FM transmitter.

### **Unit 6 Angle Modulator receivers**

FM receiver FM demodulator-slope detector-balanced slope detector-faster-seely discriminator-ratio detector-PLL FM demodulator-amplitude limiters and FM thresholding-limiter circuit--linear integrated circuits FM receivers-mobile telephone service cellular radio-frequency allocation-basic cellular radio concept-electronics switch in center-cellular telephone block diagram-digital cellular radio-TDMA digital cellular standard-code division multiple access(CDMA).

### **TEXT BOOK: -**

- 1) Element of Electromagnetics by Matthew N.O. Sadiku  
Saunders college publishing (Unit 1,2 and 3)
- 2) Electronics Communication Systems: Fundamental through advanced By Wayne Tomasi, Pearson Education Asia

### **REFERENCE BOOK: -**

- 1) Elements of engineering electromagnetic by Narayana Rao, PHI

## Paper VI Advance Microprocessors

### Unit 1 8086

Block diagram, functional descriptions and pins details-addressing nodes, complete instruction set and assembler directives-interrupt processing

### Unit 2 8086 software aspects

- **Introduction to Programming 8086**

Tackling a large programming assignment-writing a software driver-data gathering searching data tables-string operations-sorting-computational routines-control applications-number conversion-data structure-troubleshooting technique

- **Programming with DOS and BIOS function calls**

Introduction-using the keyboard-controlling the video display-controlling the speaker controlling the printer-using the command line interface-additional applications troubleshooting technique

### Unit 3 Advance Programming

Using the EXTRN and PUBLIC directives-using macros-instruction execution times working with interrupt vector-multitasking-memory management-using the mouse-writing a memory resident program-protected mode detection-interfacing C with assembly language-troubleshooting technique

### Unit 4 Using DISK and FILES

Organization of floppy and hard disks-reading and writing disk headers-directory function reading text filer-creating a text file-accessing an existing file-miscellaneous file and disk function-troubleshooting technique.

### Unit 5 80386 Microprocessor

Block diagram-register description-instruction set-addressing modes-data types-memory organization-I/O space-interrupts-reset and initialization-testability-debugging support

### Unit 6 80386 details

#### **Real mode architecture**

Introduction-memory addressing-reserved locations-interrupts-shutdown and halt

#### **Protected mode architecture**

Introduction-addressing mechanism-segmentation protection-paging

#### **Functional data**

Introduction-signal description-bus transfer mechanism-bus functional description (with timing diagram)-other functional description (with timing diagram)-self test

### TEXT BOOKS

1. An introduction to the Intel family of microprocessors  
By James L. Antonakos, Pearson Education Asia Publishers
2. Microprocessor and peripheral Vol. I Microprocessor, Intel Corporation

### REFERENCE BOOKS

1. The Intel microprocessors 8086/8085, 80186, 80286, 80386 and 80486 Architecture, programming and interfacing by Barry B. Brey , PHI
2. Programming the 80286, 80386, 80486 and Pentium based personal computers by Barry B. Brey, PHI

## LIST OF EXPERIMENTS FOR SEM II

1. Study of standing waves (V & I).
2. Measurement of VSWR.
3. Study of characteristic impedance  $Z_0$ .
4. To find out unknown impedance.
5. Stuf matching
6.  $T_L$  Losses.
7. Study of 8086 microprocessor kit :: lay out, command.
8. To hand assemble the code of small ALP for 8086.
9. Write and Execute the ALP.
10. Excercise the DOS function calls through ALP of 8086.
11. Study of instruction set of 8086.
12. Study of AM modulation and modulation circuits.
13. Study of RF amplifier
14. FET push-pull modulator for SSB generation.
15. Study of frequency modulation.
16. Study of PLL.
17. Foster-Seely discriminator Ratio detector
18. Limiters.
19. Linear integrator FM receiver.
20. Study of mobile phone.

### NOTES:

1. Minimum 10 practical from above list are to be performed.
2. Any three will be asked in the practical examination. each practical will carry 50 marks.
3. Following compulsory project will carry 50 marks.  
"contruction, testing, working and fault finding of trasistorized radio receiver"
4. Total 200 marks are to be allocated for practical examination for semester II.  
i.e. 150 marks for practical and 50 marks for project.

## PAPER VII ADVANCE COMMUNICATION

### UNIT 1: INTRODUCTION TO TELECOMMUNICATION

Digital communication system functional architecture, communication channel, coded and uncoded digital communication system architecture, ISO- OSI network architecture, telecommunication network and service (DNS, TDRSS, GPS, ISDN) iridium.

[ page : 22, chapter 1, digital communication technique by Simon etal, PiiI]

### UNIT 2: DIGITAL TRANSMISSION

Advantage of digital transmission, pulse modulation, PCM, folded binary code, liner vs. non-liner PCM codes, companding, delta modulation PCM, differential pulse code modulation, pulse transmission

[page : 621- 652 = 31 pages chapter 15 electronics communication system by w. tomasi, Pearson edu.]

### UNIT 3: MULTIPLEXING

. Time division multiplexing, tl digital carrier system, d- type channel banks, super frame format, ccitt tdm carrier system, combo chips, north American digital hierarchy, t carriers, Frequency division multiplexing AT & T's FDM hierarchy, composite base band signal formation of different groups, hybrid data

[pages 657 - 700 = 57 pages, chapter 16 electronics communication system by w. tomasi, Pearson edu.]

### UNIT 4: SIGNAL PROCESSING

Fourier series, exponential form of Fourier series, examples of Fourier series, the sampling function, Fourier transform, correlation between waveform power and cross correlation, auto correlation.

### UNIT 5: INFORMATION THEORY AND CODING

Discrete message, concept of amount of information, average information entropy, information rate, shanon's theory, channel capacity of a gaussian channel, bandwidth - s/n trade off.

[Principles of communication systems, by taub and schilling, tmh]

### UNIT 6: SATELLITE COMMUNICATION

History, orbital satellite, geostationary satellites, orbital pattern, look angles, classification and frequency allocation, radiation pattern, link models, system parameters, link equations, link budget.

[chapter 18 pages : 30 electronics communication system by w. tomasi Pearson edu]

Text book:

(1) Electronics communication system

By Wayne Tomasi, Pearson Education Asia (2) Principles of communication systems

By Taub and Shilling Mc-Graw Hill

## PAPER VIII COMPUTER HARDWARE

### UNIT 1 PC COMPONENT, MICROPROCESSOR TYPES, MOTHERBOARD AND BASICS

- System components
- Processor features, processor sockets, processor types
- Motherboard form factors - motherboard components- type of i/o buses

### UNIT II MEMORY

Memory basics- types of memory, memory speeds- future DRAM memory technology - cache memory - physical memory- the system logical memory layout

### UNIT III MAGNETIC STORAGE

- PRINCIPLES OF MAGNETIC STORAGE

Data encoding schemes- encoder schemes comparison- dram- capacity measurements

- HARD DISK DRIVE

Definition- operation - HDD components, HDD feature

- HARD DISK INSTALLATION PROCEDURES

Drive configuration - host adapter configuration - physical installation system configuration - formatting - troubleshooting and repairing

- FLOPPY DISK DRIVE

Drive components, physical specification and operation- analyzing FDD construction- drive installation procedure - repairing FDD

### UNIT IV OPTICAL STORAGE

What is CD-ROM, What types of drives are available - CDROM disc and drive formats, write-able CDROM drive- DVD

### UNIT V PRINTERS

- How printer works: Laser, inkjet, dot matrix
- Printer technology · Colors printer
- Preventing maintenances
- Common printing problem

### TEXT BOOKS

1. UPGRADING AND REPAIRING PCs  
BY SCOTT MUELLER  
PHI, EEE, TENTH EDITION

## PAPER IX : THE 'C' LANGUAGE

### UNIT 1: BASIC CONTROL STRUCTURE OF C:

- FUNDAMENTALS:

What is c, getting started with c, c instruction- the first c program control instructions in c.

- DECISION CONTROL STRUCTURE

THE 'if' statement- the 'if-else' statement - use of logical operator hierarchy of logical operator - a word of caution - the conditional operator

- THE LOOP CONTROL STRUCTURE

Loops - the "while" loop - the "for" loop - the odd loop - the "break" statement - the "continue" statement - the "do-while" loop

- THE CASE CONTROL STRUCTURE Decision using "switch"- the "go to" statement

### UNIT 2: FUNCTIONS AND DATA TYPES

- FUNCTIONS

What is a function- passing values between function- scope rule of function advance features of functions

- DATA TYPES

Integers long and short - integer signed and unsigned - chars signed and unsigned- floats and doubles - storage classes in c

### UNIT 3: ARRAYS, STRINGS AND STRUCTURES

- ARRAYS

What is arrays- more on arrays- pointer and arrays- more than one dimensions- array of pointers

- STRINGS

What are strings- more about strings- standard library string function - two dimensional array of characters - array of pointers to strings- limitation of array of pointers to strings

- STRUCTURES

Why use structures - arrays of structures - additional features of structures use of structures

### UNIT 4: I/O IN C AND HARDWARE THROUGH C

- I/O

Types of I/O- console INPUT/ OUTPUT function - disk I/O functions - I/O redirection in DOS

- HARDWARE

Of approaches- the CPU registers- interrupts and IVT - inverting ROM BIOS function- unions- the int86 ( ) function - interrupts to access ROM BIOS services - Dos function requests.

### UNIT 5: BITS GRAPHICS AND MORE PROGRAMMING

Bit wise operators - all lines are not same - stylish lines - drawing and 'filling imager - pattern with a difference - why use a bar ( )? Filling regular and non-regular shapes of palette and colours- drawing with mouse - building mouse cursors-freehand drawing using mouse - menus using mouse

### TEXT BOOKS

#### 1. LET US C

BY YASHAVANT KANETKAR

BPB PUBLICATION, 3RD EDITION

## List of Experiments

### GROUP- A

1. Study of assembling a typical PC
2. Study of HDD and FDD
3. Study of CD-ROM
4. Study of printer

### GROUP- B

5. `C' programming practice
6. `C' programming practice
7. `C' programming practice
8. `C' programming practice
9. `C' programming practice
10. `C' programming practice

### GROUP-C

11. Study of QPSK modulation/demodulation system
12. Phase shift keying
13. Amplitude shift keying
14. Frequency shift keying

## PROJECT

Any project given by the in charge teacher

## NOTE :

Any 10 practical from 14 with not less than three practical from each group are to be given to students. The project is a compulsory component. Any three practical will be asked in examination. Each practical carries 50 marks. Also project carries 50 marks. Thus practical exam will be of 200 marks for 3rd semester.

## PAPER X FIBER OPTICS

### UNIT 1:-Overview

Overview of optical Fiber communication- elementary idea about optical fiber transmission link - optical fiber systems

#### Optical fibers

The nature of light and laws of optical reflection- fiber modes and configuration ray optical representation - wave representation - mode theory - waveguide equation - step index fiber - modal equation - modes in step index fiber - graded index fiber - numerical aperture - modes in graded index fibers

### UNIT 2:-Fiber fabrication

Attenuation and absorption - scattering and radiation losses - material) dispersion - waveguide dispersion - pulse broadening in graded index waveguide - mode coupling Fiber to Fiber joints

Mechanical misalignment - fiber related losses - fiber end face - preparation splicing - fiber connectors.

### UNIT 3:-Optical source

LED - modulation capability - transient response- semiconductor losses - diode structure and threshold conditions - modulation - temperature effects - source linearity and reliability

#### Photo detectors

PIN photo detector - avalanche photodiode - noise consideration - response time - depletion layer photocurrent - avalanche multiplication noise - materials

### UNIT 4:-Attenuation measurements

Cutback- optical time domain - reflectometer - fiber fault location - dispersion time domain dispersion measurements - frequency domain measurements

### UNIT 5:-Refractive index profile measurements

End reflection technique - transmitted near field scanning method - refracted near field technique - interferometer of optical source characteristics - response time – distortions

### TEXT BOOKS:

1. OPTICAL FIBER COMMUNICATION BY CERD KEISER.
2. AN INTRODUCTION TO OPTICAL. FIBER BY ALLEN H. CHERIN.

## PAPER XI ELECTRONIC TECHNIQUES

### UNIT 1: USING PCB DESIGNING SOFTWARE

Run the software - initial settings - preparation of schematics - using library facility and creating library symbols - preparing layouts - auto routing - printing the designed document

### UNIT 2: ~SPICE FUNDAMENTALS

- INTRODUCTION:

Description of SPICE: - Type of SPICE – type of analysis-limitation of Pspice

- CIRCUIT DESCRIPTION:

Introduction - element values - nodes - circuit elements - sources types of analysis - output variables - Pspice O/P files - example of Spice simulation - graphical I/P file

### UNIT 3: APPLICATION OF SPICE

- AC CIRCUIT ANALYSIS:

Introduction - ac O/P variable - independent ac source - ac analysis magnetic element

- DIGITAL LOGIC CIRCUIT:

Introduction - digital devices and nodes - digital primitives - digital gates and timing models - FFs and latches - pull up pull down - stimulus devices - digital I/P - digital O/P - examples of digital circuits.

### UNIT 4: HARDWARE DEBUGGING TOOLS

- LOGIC STATE ANALYSER
- IN CIRCUIT EMULATOR (WORKING AND USE OF ABOVE TOOLS)

### UNIT 5: TRANSFORMER BASICS

- PRINCIPLE OF POWER TRANSFORMER DESIGN:-

Transformer on no load - hysteresis loss - remanent flux density - induced EMF and eddy currents - turns ratio - Volt Sec product -- stacking factor - transformer on load - leakage flux - equivalent circuit.

- POWER HANDLING CAPACITY OF A TRANSFORMER:-

Voltage equation - power handling capacity - empirical formula for choice of core of a power transformer - window utilization factor - transformer polarities and dot convention - testing for polarity

### UNIT 6: DESIGN AND MANUFACTURING

- DESIGN WITH EXAMPLE: -

Introduction - basic equation - window utilization factor - factors affecting efficiency - winding - winding resistance - calculations for iron loss - temperature rise and thermal design - shielding of transformer - one design example

- MANUFACTURING PROCESS

Winding - bifilar winding - core assembly - termination -- electrical tests - impregnation

## TEXT AND REFERENCE BOOKS

### TEXT BOOKS:

1) PCB DESIGNING SOFTWARE MANUAL

2) SPICE FOR CIRCUITS AND ELECTRONICS USING PSPICE

BY M.H. RASHID

PHI SECOND EDITION

- 3) DESIGN AND TECHNOLOGY OF LOW VOLTAGE TRANSFORMER AND  
INDUCTOR  
BY DR. N. RADHEKRISHANAN AND DR. S.R. BHAT CEDT - I.I.Sc BANGALOR
- 4) MANUAL FOR LOGAN AND PCICE OF ESA, BANGALORE

REFERENCE BOOKS:

- 1) PRINTED CIRCUIT BOARD BY DR. H. N. PANDYA  
UNIVERSITY GRANTH NIRMAN BOARD GUJARAT STATE

**PAPER XII (OPTIONAL PAPER)  
ROBOTICS**

**UNIT 1. INTRODUCTION:**

Robotics and programmable automation, historical background, laws of robotics, robot definition, robot anatomy and systems, human systems and robotics. specification of robotics

**UNIT 2. ROBOT KINEMATICS**

Introduction, forward and reverse kinematics of three degree of freedom robot arm, forward and reverse transformation of a four degrees of freedom manipulator in 3-D, homogeneous transformations kinematic equation using homogeneous transformations.

**UNIT 3. ROBOT DRIVES, ACTUATORS AND CONTROL**

Function of drive systems, general types of fluids, pump classification, pneumatic system, electrical drives, DC: motors, stepper motor and drives mechanisms

**UNIT 4 ROBOT END-EFFECTORS**

Classification of end-effectors, drive system for grippers, mechanical, magnetic, vacuum and adhesive grippers, hooks, scoops and others devices, active and passive. grippers

**UNIT 5 SENSORS AND INTELLIGENT ROBOTS**

Artificial intelligence and automated manufacturing, AI and robotics, need for sensing systems, sensory devices, types of sensors, robot vision systems

**UNIT 6 ROBOT LANGUAGES AND PROGRAMMING**

Different languages, classification of robot languages, computer control and robot software, VAL systems and languages

**TEXT BOOKS:**

1. ROBOTICS TECHNOLOGY AND FLEXIBLE AUTOMATION BY S.R. DEB FROM TATA Mc GRAW HILL

**REFERENCE BOOKS:**

1. ROBOTICS PRINCIPLES AND PRACTICE

BY DR. K.C. JAIN AND DR. L.N. AGGARWAL FROM KHANNA PUBLISHERS 2.

INTRODUCTION TO ROBOTICS, MECHANICS AND CONTROL

BY JOHN J. CRAIG FROM ADDISON WESLEY ;

**PAPER XII (OPTIONAL PAPER)  
BIOMEDICAL INSTRUMENTATION**

**UNIT I: HUMAN BODY**

The cell - body fluids - musculoskeletal system - respiratory system - Gastrointestinal system - nerves system -- endocrine system - the circulatory system - the body as a control system

**ELECTRODES, SENSER AND TRANSDUCERS**

Electrodes for biophysical sensing - medical surface electrodes - micro electrodes

**BIOELECTRIC AMPLIFIERS**

Bioelectric amplifiers - basic amplifiers configuration -- multiple input circuits- differential amplifiers-isolation amplifiers

**UNIT 2: ELECTROCARDIOGRAPHY**

The heart as potential source - the ECG waveform - the standard lead system - other ECG signals - the ECG preamplifier - ECG readout devices ECG machine maintenance and troubleshooting

**PRESSURE MEASUREMENTS**

Blood pressure measurements - blood flow measurement phonocardiography – defibrillator circuit - pacemaker

**UNIT 3: BRAIN FUNCTION MEASUREMENT**

Brain scan - electro encephalograph - ECG block diagram - preamplifier and ECG system specifications

**UNIT 4: MEDICAL LABORATORY INSTRUMENTS**

Blood - blood tests - colorimeter - flame photometer- blood cell counter pH/ blood gas analyzer - chromatography - hemodialysis and machine

**UNIT 5: MEDICAL ULTRASONOGRAPHY**

What is ultra sound -- physics of sound and waves - reflection - refraction, diffraction and scattering - specular reflection - diffuse reflection and scattering - ultra sound transducers -absorption and attenuation of ultrasound energy - scan modes and scanning systems - electronically scan phase array transducers.

**TEXT BOOKS**

1. INTRODUCTION TO BIOMEDICAL EQUIPMENT TECHNOLOGY BY JOSPH J. CARR AND JOHN M. BROWN  
PEARSON EDUCATION ASIA PUBLICATION 4th EDITION

**REFERENCE BOOK:**

1. BIOMEDICAL INSTRUMENTATION BY KHANDPUR TMH PUBLICATION

PAPEPR XII (OPTIONAL PAPER)  
MICROWAVE ELECTRONICS

UNIT 1:

Introduction, definition of microwave, characteristic features, application of microwave

UNIT 2:

Generation of microwave by vacuum tube - limitation of conventional tubes klystron amplifier-reflex klystron oscillator, magnetrons-traveling wave tubes

UNIT 3:

Generation of microwave by solid state devices, bipolar transistor field effect transistors, gunn oscillator, avalanche diode, oscillator, IMPATT & TRPATT mode of operation parametric amplifiers.

UNIT 4:

Microwave integrated circuit design, introduction, hybrid microwave integrated circuits (HMIC), monolithic microwave integrated circuit (MMIC), MIC materials, substrate material, conductor material, dielectric materials, resistive films, types of mics, microwave monolithic integrated circuits (MMIC'S).

UNIT 5:

Waveguide and waveguide component, concept of waveguide, advantage of hollow wave guide, reflection from a metal surface, field pattern obtained by oblique reflection, higher order modes, waveguide dimensions, impedance matching elements, waveguide short circuit, tees and magic tee, phase shiftless, attenuators, matched terminators, waveguide slotted section, PIN diodes, PIN diode switches

UNIT 6:

Microwave measurement techniques, standing wave measurements, impedance measurement, cavity resonator, cavity a. frequency measurements and calibration techniques, dielectric measurements.

TEXT BOOKS:

1. MICROWAVE DEVICES AND CIRCUITS - S. Y. LIAO, PHI
2. INTRODUCTION TO MICROWAVE THEORY AND MEASUREMENTS L.A. LANCE TMH
3. RADIO FREQUENCY AND MICROWAVE ELECTRONICS - M.M. RADMANESH PEARSON

## LIST OF EXPERIMENTS

1. Study of a typical PCB designing software.
2. To design a PCB pattern (solder side) for single sided PCB for a given circuit.
3. To fabricate the finished IC13 from a +ve and -ve artwork
4. To design double sided PCB pattern (track layout)
5. Study of fiber optics kit (if available)
6. Study of fiber optics kit (if available)
7. Study of fiber optics kit (if available)
8. Using Pspice simulate a given circuit
9. Study of Pspice commands
10. Using Pspice simulate a digital circuit
11. Study of logic state analyzer
12. Study of low- power transformer as per given specifications
13. To fabricate a transformers as per design sheet.

The students are supposed to do 10 practical from the above list. Three practical will be asked in examination each consisting of 50 marks. In addition to this each student will have to do a project given by concerned teacher. The marks of the project will be 50 in practical examination. The project is part of practical.