STUDY AND EVALUATION SCHEME

FOR

1. **ELECTRONICS & COMMUNICATION ENGINEERING**
2. **ELECTRONICS ENGINEERING (DIGITAL ELECTRONICS)**
3. **ELECTRONICS ENGINEERING (MEDICAL ELECTRONICS)**

SEMESTER - III

Code No.	Subject	Study Scheme Period/Week			Evaluation Scheme						Total Marks
		L	T	P	Internal Assessment		External Assessment Exam				
					Theory	Practical	Written Paper		Practical		
					Max Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
1	Principles of Communication Engineering	4	-	3	50	25	100	3	50	3	225
2	Digital Electronics	4	-	3	50	25	100	3	50	3	225
3	Networks, Filters and Transmission Lines	4	-	3	50	25	100	3	50	3	225
4	Electronic Devices and Circuits – II	4	-	3	50	25	100	3	50	3	225
*5	Computer Programming and Applications	3	-	3	50	25	100	3	50	3	225
6	Electronic Fabrication & Product Design	1	-	3	-	75	-	-	100	3	175
**	Student Centered activities	-	-	2	-	-	-	-	-	-	-
	TOTAL	20	-	20	250	200	500		350		1300

** Student centered activities will include: extension lectures, field visits, Soft Skills, seminars, debates, hobby clubs, library studies, awareness regarding ecology and environment, conservation of energy (Petroleum products, electricity etc), social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made

* Subjects common with Mechanical, Production, Automobile Engineering

STUDY AND EVALUATION SCHEME

FOR

1. ELECTRONICS & COMMUNICATION ENGINEERING
2. ELECTRONICS ENGINEERING (DIGITAL ELECTRONICS)
3. ELECTRONICS ENGINEERING (MEDICAL ELECTRONICS)

SEMESTER - IV

Code No.	Subject	Study Scheme Period/Week			Evaluation Scheme						Total Marks
		L	T	P	Internal Assessment		External Assessment Exam				
					Theory	Practical	Written Paper		Practical		
					Max Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
1	Electronic Devices and Circuits - III	4	-	3	50	25	100	3	50	3	225
2	Introduction to Microprocessors	4	-	3	50	25	100	3	50	3	225
3	Electronic Instruments and Measurements	4	-	3	50	25	100	3	50	3	225
4	Personal Computer Organisation	4	-	3	50	25	100	3	50	3	225
5	Electronic Design and Drawing	-	-	4	-	50	-	3	100	3	150
6	Minor Project	-	-	6	-	50	-	-	100	3	150
**	Student Centered activities	-	-	2							
	TOTAL	16	-	24	200	200	400		400		1200

** Student centered activities will include: extension lectures, field visits, Soft Skills, seminars, debates, hobby clubs, library studies, awareness regarding ecology and environment, conservation of energy (Petroleum products, electricity etc), social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made.

PRINCIPLES OF COMMUNICATION ENGINEERING

L	T	P
4	-	3

RATIONALE:

The study of principles of communication systems leads to further specialized study of audio and video systems, line communication and microwave communication systems. Thus the diploma holder in electronics and communication engineering shall find employment in areas of R & D, Production, Servicing and Maintenance of various communication systems. The students should understand the advantages and limitations of various analog and digital modulation systems on a comparative scale and relate to them while studying practical communication systems.

DETAILED CONTENTS

1. **Introduction** **(2%)**
   (a) Need for modulation and demodulation in communication systems.
   (b) Basic scheme of modern communication system.
2. **Amplitude Modulation** **(8%)**
   (a) Derivation of mathematical expression for an amplitude modulated wave showing Carrier and side band components. Significance of Modulation index, spectrum and bandwidth of AM wave, relative power distribution in carrier and sidebands.
   (b) Elementary idea of DSB-FC, DSB-SC, SSB-SC, ISB and VSB modulations, their comparison and areas of applications.
3. **Frequency Modulation** **(10%)**
   (a) Derivation of expression for frequency modulated wave and its frequency spectrum (without proof and analysis of Bessel function), modulation index, maximum frequency deviation and deviation ratio, BW of FM signals, Carlson's rule
   (b) Effect of noise on FM carrier, noise triangle, need for pre-emphasis and de-emphasis, capture effect.
   (c) Comparison of FM and AM communication system.
4. **Phase Modulation** **(5%)**
   Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.
5. **Principle of AM Modulators** **(15%)**
   orking principles and typical applications of
   (a) Collector Modulator
   (b) Base Modulator
   (c) Balanced Modulator.
6. **Principles of FM Modulators** **(15%)**
   (a) Working principles and applications of reactance modulator, variactor diode modulator, VCO and Armstrong phase modulator, stabilization of carrier using AFC.
   (b) Block diagram and working principles of reactance transistor and Armstrong FM transmitters.
7. **Demodulation of AM waves** **(10%)**

(a) Principles of demodulation of AM wave using diode detector circuit, concept of diagonal clipping and formula for minimum distortion (No derivation).
(b) Principle of demodulation of AM wave using synchronous detection

8. **Demodulation of FM waves** **(15%)**
   (a) Basic principles of FM detection using slope detector.
   (b) Principles & working of the following FM demodulators.
      - Foster-Seeley Discriminator
      - Ratio Detector
      - Quadrature Detector
      - Phase Locked Loop (PLL) FM Detector

9. **Pulse Modulation** **(20%)**
   (a) Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation.
   (b) Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM).
   (c) Basic ideas about PAM,PPM,PWM and their typical applications.
   (d) **Pulse code modulation (PCM):** basic scheme of PCM system, Quantization, quantization error, block diagram of TDM-PCM communication system and function of each block, Advantages of PCM systems, concept of differential PCM (DPCM).
   (e) **Delta Modulation**: Basic principle of delta modulation system, advantages of delta modulation over PCM system, limitation of delta modulation, concept of adaptive delta modulation system (ADM).
   (f) **Concept of Modem, ASK, PSK, FSK & QPSK (Basic idea).**

List of Practicals

1. (a) To conserve an AM wave on CRO produced by a standard signal generator using internal and external modulation.
   (b) To measure the modulation index of the wave obtained in above practical.
2. (a) To obtain an AM wave from a collector modulator circuit and observe the AM pattern on CRO.
   (b) To measure index of modulation of the AM signal for different levels of modulating signal.
3. To obtain a FM wave from reactance tube modulator/voltage controlled oscillator circuit and measure the frequency deviation for different modulating signals.
4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion.
5. To obtain modulating signal from a FM detector (Fosterseely/Ratio detector/quradrature/IC) circuit and plot the discriminator characteristics.
6. To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.
7. To verify the sampling theorem.
8. To time division multiplex the two given signals.
9. To observe and note the pulse modulated signals (PAM, PPM, PWM) and compare them with the corresponding analog input signal.
10. To measure the quantization noise in a 3 bit/4 bit coded PCM signal.
11. To feed an analog signal to a PCM modulator and compare demodulated signal with the analog input. Also note the effect of low pass filter at the demodulated output.

12. To study the process of delta modulation/demodulation.

DIGITAL ELECTRONICS

L	T	P
4	-	3

RATIONALE:

This syllabus has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to give a background in the broad field of digital systems design & microprocessors.

DETAILED CONTENTS

1. Introduction (2%)

(a) Basic difference between analog and digital signal.
(b) Applications and advantages of digital signals.

2. Number Systems (10%)

(a) Binary, Octal and hexadecimal number system, conversion from one form to another.
(b) Concept of code, weighted and non weighted codes, BCD (8421 code only), excess -3 and grey code.
(c) Concept of parity, single and double parity and error detection.
(d) Alphanumeric codes (ASCII).
(e) Binary arithmetic (addition, subtraction, multiplication and division including binary points). BCD addition, 1's and 2's complement method of addition /subtraction.

3. Logic Gates (10%)

(a) Concept of negative and positive logic.
(b) Definition, symbols and truth table of NOT, AND, OR, NAND, NOR, XNOR, gates, working of AND and OR gates using simple diode circuits, NAND and NOR as universal gates.

4. Logic Simplification (10%)

(a) Postulates of Boolean algebra, De-Morgan's theorems, Various identities, formulation of truth table and Boolean equation for simple problems, implementation of Boolean (Logic) equations with logic gates.
(b) Karnaugh map (up to 4 variables) and simple application in developing combinational logic circuits.

5. Logic Families (10%)

(a) Logic family classification;
  (i) Definition of SSI, MSI, LSI, VLSI
  (ii) Comparison of TTL and MOS family characteristics with respect to delay, speed, noise margin, logic levels, power dissipation, fan-in, fan- out, power supply requirement.
(b) Logic Circuits: Open collector, wired-OR, totem pole output circuit operation (qualitative) for TTL NAND gate.
(c) Tri-state switch / Buffer.

6. Arithmetic Circuits (10%)

(a) Half Adder and Full adder circuits, design and implementation.
(b) Half and full adder circuits, design and implementation.
(c) 4 bit adder/subtractor

7. Display Devices (5%)

LED, LCD, seven segment displays, basic operation of common anode and common cathode types of displays.

8. Multiplexers, De-multiplexers and Decoders (10%)

Basic functions and block diagram of MUX, DEMUX, Encoders and Decoders. Detailed functioning of 3X8 decoder/demux.

9. Latches and Flip-flops (10%)

(a) Concept and types of latch with their working and supplications.
(b) Operation using waveforms and truth tables of RS, JK, D, Master/Slave JK and T flip-flops.
(c) Use of D fil-flop as latch
(d) Flip-flop as basic memory cell

10. Counters (10%)

(a) A synchronous counters:
  (i) Binary counters
  (ii) Modulus of a counter, modified count of a counter, Mod-8 and Mod-10 counter (including design),difference between decade and mod-10 counter.
  (iii) Presentable and programmable counters
  (iv) Down counter, up/down counter.
(b) Synchronous counters (only introduction)
(c) Difference between asynchronous and synchronous counters
(d) Ring counter and Johnson counter with timing diagram.

11. Shift Register (10%)

(a) Introduction and basic concepts including shift left and shift right.
(b) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
(c) Universal shift register.
(d) Buffer register, Tri-state buffer Register.

12. Applications (3%)

Digital Clock and Calculator

List of Practicals

1. Study of pin configuration of different ICs (e.g. DIP ICs etc.)

2. Verification and interpretation of truth tables for AND, OR, NOT, NAND, NOR, Ex-OR and Ex-Nor gates.

3. Logic functions using universal gates
(a) Realization of logic functions with the help of NAND or NOR gates.
(b) Construction of a NOR gate latch and verification of its operations.

4. Half-adder and full adder circuits
(a) Construction of half adder using Ex-OR and NAND gates and verification of its operations.
(b) Construction of a full adder using Ex-OR and NAND gates and verification of its operations.

5. 4 bit adder / subtractor circuit.
(a) Construction of a 4 bit adder 2's complement subtractor circuit using a 4 bit adder IC and an Ex-OR and verify the operation of the circuit.

6. IC Flip-flop
(a) Verification of truth table for some positive edge triggered, negative edge triggered, level triggered IC flip-flops (at least one IC each of D latch, D flip-flop, edge triggered JK and Master –Slave JK flip-flops)

7. Display Devices and their decoder / drivers

(a) Familiarization and use of different type of single LEDs, common node and common cathode seven segment LED displays. Use of 7447, 7448 or equivalent decoder /driver ICs for seven segment displays.

8. Tri-state gate ICs

(a) Verification of truth tables and study the operation of tri-state buffer IC 74126 or equivalent

(b) Construction of a 4 / 8 bit bidirectional bus using an appropriate IC.

9. Decoder, Encoder, Multiplexer and De-multiplexer

(a) Verification of truth table for any one each of encoder and decoder ICs.

(b) Verification of truth tables for one/two each of multiplexer/de-multiplexer ICs.

(c) Shift Register

(d) Construction of a 4 bit serial in serial out / serial in parallel out right shift register using JK flip-flops and verification of its operation.

(e) Construction and testing of its operation of a 4 bit ring counter using Jk flip-flop.

10. Universal shift register IC

(a) Verification of truth table for any one universal shift register IC.

11. Asynchronous Counter ICs

(a) Use of 7490 equivalent TTl

(i) Divide by 2

(ii) Divide by 5

(iii) Divide by 10 counters

OR

(a) Use of 7493 equivalent TTl

(i) Divide by 2

(ii) Divide by 8

(iii) Divide by 16 counters

NETWORKS, FILTERS & TRANSMISSION LINES

L	T	P
4	-	3

RATIONALE

The study of networks, filters and transmission lines leads to understanding of line communication, audio and video communication and microwave communication. Particularly the study of networks takes off from principles of A C theory and introduces the student to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.

DETAILED CONTENTS

1. Introduction to networks (20%)

(a) Two port (4 terminals) networks, network elements, classification i.e, symmetrical and asymmetrical networks, balanced and unbalanced ,T-network, II network, ladder network, lattice network, L-network, bridge-network.

(b) Symmetrical network parameters concepts and significance i.e., characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.

(c) Asymmetrical network parameters concepts and significance i.e., iterative impedance, image impedance image transfer constant and insertion loss.

(d) Network analysis: analysis of symmetrical T and II networks, derivation of Zo, a, b, c, d parameter, open circuit and short circuit analysis, simple design problems.

(e) The half section of symmetrical T and II section, derivation of iterative impedance, image impedance, open circuit and short circuit impedance of half section. Use of half section.

2. Attenuators (15%)

(a) Unit of attenuation (decibel and nepers), general characteristics of attenuators.

(b) Analysis and design of simple attenuators of the following types (i) Symmetrical T (ii) Symmetrical II (iii) L Type.

3. Filters (30%)

(a) Brief idea of the use of filters in different communication systems. Concept of LPF, HPF, BPF, BSF (Band Stop Filter), basic concept about response curve of Butterworth, Chebyshev and Caur type filters.

(b) Theorem connecting attenuation constant and characteristic impedance (Zo), determination of cut-off frequency of constant K-filter.

(c) Prototype of LPF & HPF using T, ⊳ configuration. Following curves & simple design problems.

(d) Reactance

(e) ✔ Vs frequency

(f) ✔ Vs frequency

(g) M-derived filter section: limitation of prototype filter, advantages of m-derived filter, expression for m in terms of fc and fa for LPF and HPF, plots of attenuation (✔), Zo with frequency, simple design problems.

(h) Concept of composite filter and matching of it's various components.

(i) Crystal filter: Crystal and its equivalent circuits, special properties of crystal filter and their use.

(j) Active Filter: Basic concept of active filter, comparison with passive filters, simple design problems on LPF, HPF, first and second order Butterworth filters, concept of all pass filter, active BPF and BSF.

4. Transmission Lines (35%)

(a) Transmission lines and their applications, shapes of different types of transmission lines including optical cables and submarine cables wave guide & stripline. Operating frequency range bandwidth of different type of transmission line.

(b) Primary constants of a transmission lines, equivalent circuit of an infinite line, T and II type representation of a section of transmission line.

(c) Definition, significance of characteristic impedance of a line, concept of short line terminated in Zo, current and voltage along an infinite line, propagation constant, attenuation and phase shift constant of the line.

(d) Relationship of Zo, ■□□ ✔ &□ ✔ in terms of primary constants of the line.

(e) Condition for minimum distortion and minimum attenuation of signal on the line, necessity and different methods of loading the communication lines (no derivation).

(f) Concept of reflection and standing waves on a transmission line, definition of SWR, relation between VSWR and voltage reflection coefficient, maximum impedance on a line in terms of Zo and VSWR.

(g) Transmission line equation, expression for voltage, current & impedance at a point on the line with and without losses. Expression for input impedance of the line (no derivation).

(h) Input impedance of an open and short circuited line and its graphical representation.

(i) Transmission line at high frequency, effect of high frequency on the losses of a transmission line, application of transmission lines as a reactive component and impedance transformer (quarter wave transformer)

(j) Principle of impedance matching using single stub, comparison of open and short circuited stubs. Concept of broad band matching.

LIST OF PRACTICALS

1. To measure the characteristic impedance of a symmetrical T and Pi network

2. To measure the image impedance of a given asymmetrical T/Pi network

3. For a prototype low pass filter:
- (a) Determine the characteristic impedance experimentally
- (b) Plot the attenuation characteristics

4. To design and measure the attenuation of a symmetrical T/Pi type attenuator

5. For a prototype high pass filter :
- (a) Determine the characteristic impedance experimentally
- (b) To plot the attenuation characteristic
- (c) To plot the impedance characteristic of a prototype band-pass filter
- (d) To plot the attenuation characteristic of a prototype band pass filter
- (e) To plot the impedance characteristic of a m-derived low pass filter
- (f) To plot the attenuation characteristics of a m-derived high pass filter

6. To assemble and test the following Butterworth active filters
- (a) First order low pass and high pass
- (b) Second order low pass and high pass

7. To observe the formation of standing waves on a transmission line and measurement of SWR and characteristic impedance of the line.
- (a) To measure following parameters of a Transmission line.
  - (i) Attenuation
  - (ii) Input Impedance
  - (iii) Phase displacement between the Current & Voltage.
  - (iv) Frequency characteristics.

8. Draw the attenuation characteristics of a crystal filter.

ELECTRONIC DEVICES AND CIRCUITS – II

L	T	P
4	-	3

RATIONALE

The course provides the students with basic understanding of the principles of common electronic devices and circuits of importance, the knowledge regarding the application of various circuits and devices, practical experience in the design, fabrication and testing of circuits

DETAILED CONTENTS

1. Multistage Transistor Amplifier (15%)

Need of multistage amplifier, different coupling schemes and their working; brief mention of application of each of the types of coupling, working of R-C coupled and transformer coupled multistage amplifier, approximate calculation of voltage gain of two stage R-C coupled amplifier. Frequency response for R-C coupled and transformer coupled amplifiers and physical significance of the terms bandwidth, upper and lower cross over frequencies. Direct coupled amplifier and its limitation; difference amplifier typical diagram and working.

2. Audio Power Amplifiers (15%)

Difference between voltage and power amplifiers; importance of impedance match in power amplifier, collector efficiency of power amplifier. Typical single ended power amplifier and its working, graphical method of calculation of output power; heat dissipation curve and importance of heat sinks; class A, class B and Class C Amplifier; collector efficiency and distortion in class A,B and C amplifier (without derivations) working principles of push pull amplifier circuits, its advantages over single ended power amplifier, cross over distortion in Class B operation and its reduction. Different driver stages for push pull amplifier circuit. Working principles of complementary symmetry push pull circuit and its advantages. Transformer less audio power amplifiers and their typical applications.

3. Feedback in Amplifier (15%)

Basic principles and types of feedback Derivation of expression for the gain of an amplifier employing feedback Effect of negative feedback on gain, stability, distortion and bandwidth (only physical explanation), Typical feedback circuits RC coupled amplifiers with emitter by pass, capacitor removed Emitter follower and its application, simple mathematical analysis for voltage gain and input & output impedance of above circuits.

4. Operational Amplifier (15%)

Characteristics of ideal operational amplifier and its block diagram, definition of inverting and non-inverting inputs, differential voltage gain, input and output voltages, input offset current, input bias current, common mode rejection (CMRR), Power Supply Rejection Ratio (PSRR) and slew rate. Method of offset, Null Adjustment, use of Opamp as an invertor, scale changer, Adder, Subtractor, Differentiator, Integrator. Schmitt trigger circuit, time base generator circuit, S/H switch circuit.

5. Sinusoidal Oscillators (15%)

Application of oscillators. Use of positive feedback, negative feedback & negative resistance for generation of oscillation, Barkhousen criterion for oscillations. Different oscillator circuits tuned collector Hartley, colpitts, phase shifts, wiens bridge

and crystal oscillators and their working principles (no mathematical derivation), Operational amplifier as Wein Bridge Oscillator and phase shift oscillator

6. Tuned Voltage Amplifiers (15%)

Classification of amplifiers on the basis of frequency. Series and parallel resonant circuits, expression for resonant frequency, expression for impedance at resonance; relationship between resonant frequency, Q and Band width (no derivation) Hybrid equivalent circuits of transistor and its parameters, h parameters model of single and double tuned amplifiers; their working principles and frequency response (no mathematical derivation) Concepts of neutralization. Staggered tuned amplifier and typical applications in brief.

7. Optical Electronics Devices and Their Applications (10%)

Working principles and characteristics of photo resistors, photo diodes, photo transistors, photo voltaic cells, LEDS, LCDs and optical couplers. Simple application of optical electronic devices (one example of each may be mentioned)

LIST OF PRACTICALS

1. Two stage R.C. Coupled Amplifier to measure the over all gain of two stages at 1 KHZ and compare it with the gain of 1st stage. Also to observe the loading effect of second stage on the first stage.

2. To plot the frequency response curve of two stage amplifier and compare it with that of the single stage amplifier

3. For a single ended power amplifier measurement of optimum load, maximum undistorted power (by giving maximum allowable signal), collector efficiency and percentage distortion factor.

4. For a push-pull amplifier measurement of optimum load, maximum undistorted power (by giving maximum allowable signal), collector efficiency and percentage distortion factor.

5. For a complementary symmetry amplifier measurement of optimum load, maximum undistorted power (by giving maximum allowable signal), collector efficiency and percentage distortion factor.

6. Feedback in Amplifier: Single stage amplifier with and without by pass capacitor measurement of voltage gain and plotting of frequency response in both cases (i.e. with and without by pass capacitor).

7. Feedback in Amplifier: Emitter follower circuit measurement of voltage gain and plotting of frequency response curve.

8. Sinusoidal oscillator (LC): Hartley/Colpittis oscillator circuit measurement of frequency and amplitude oscillations by plotting the wave shape from CRO

9. Sinusoidal oscillator (RC): Wein bridge oscillator circuit – measurement of resonant frequency and amplitude of oscillations by plotting the wave-shape from CRO

10. Tuned Voltage Amplifier Series and parallel resonant circuit – measurement of resonant frequency. Plotting of the resonance curve (i.e. graph between input frequency and impedance) and calculation of Q of the resonant circuit from this plot.

11. Plotting of the frequency response of single tuned voltage amplifier and calculate the Q of the tuned circuit load.

12. Use of op-amp (IC741) as inverting and non-inverting amplifier, adder, integrator, buffer, scale changer

13. To measure the output off ser voltage of an op-amp (741) and zero adjustment using nulling techniques.

CM-601 COMPUTER PROGRAMMING AND APPLICATIONS

L	T	P
3	-	3

RATIONALE

Information technology and computers have great influence on all aspects of our life. All over work places and environment around are being computerized. In order to prepare technicians to work in these environments, it has become essential that students are exposed to computers and their applications along with associated peripherals related to their area of work. Hence the subject.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Programming in C / C++. (45%)

- 1.1 Basic structure of C program
- 1.2 Executing a C program
- 1.3 Identifiers & keywords, data types, constants, variables
- 1.4 Operators, expressions & statements.
- 1.5 Library functions
- 1.6 Managing input-output operations, like reading a character, writing a character, formatted input, formatted output through print , scanf, getch, putch statements etc.
- 1.7 Decision making and branching using if --- else, switch, go to statements.
- 1.8 Decision making and looping using white, do & for statements.
- 1.9 Arrays – one dimensional and multi- dimensional
- 1.10 Functions
- 1.11 Recursion
- 1.12 Structures & unions
- 1.13 OOPS concepts

2. Information Storage and Retrieval (15%)

- 2.1 Need for information storage and retrieval
- 2.2 Creating data base file
- 2.3 Querying database file on single and multiple keys
- 2.4 Ordering the data on a selected key
- 2.5 Programming a very simple application
- 2.6 Indexing and storing, concept of storage

3. Computation and Graphic Tools (15%)

3.1 Use of Computation tools for

- (i) Evaluation of function
- (ii) Tabulation of function
- (iii) Integration of functions
- (iv) Matrix calculation
- (v) Statistical calculation

3.2 Use of Graphic tools

- i) Plotting graphics
- ii) Making measurement on the graphs
- iii) Solving equations using graphs

4. Computer Aided Drafting (3-D Design) (15%)

a) Designing simple 3-D objects using Parametric and non-Parametric modeling.
b) Retrieving different views & 2-D details of models.
c) Importing and exporting data for preparing a design.
d) Assembly modeling - Check for fits & tolerances.

5. Applications of computer (10%)

5.1 Web technologies

(i) Introduction to world wide web, search engines
(ii) E-mail, news
(iii) Basics of audio & Video conferencing
(iv) Languages used for web technologies

HTML – Practical examples
DHTML – Practical examples

Practicals

1. Creating / Querying the database.
2. Programming in SQL / PLSQL
3. Programming exercise on defining variables and assigning values to variables.
4. Programming exercise on arithmetic and relational operators.
5. Programming exercise writing input / output statement.
6. Programming exercise on simple for , if , IF ------- else statement.
7. Programming exercise on switch statement.
8. Programming exercise on while, do.. while statement.
9. Programming exercise on one dimensional arrays.
10. Programming exercise on two dimensional arrays.
11. Programming exercise on creating objects in C++.
12. Programming exercise on link lists.
13. Programming exercise sorting data.
14. Designing a simple object using CAD software
15. Retrieving 2D drawing from the designed 3D object.

ELECTRONIC FABRICATION & PRODUCT DESIGN

L	T	P
1	-	3

RATIONALE

DETAILED CONTENTS

1. Introduction to PCB
- (a) Need of PCBs
- (b) Types of PCBs
- (c) Types of materials used for PCB, their characteristics and limitations
- (d) Brief summary of all the processes involved in fabrication of PCB from schematic diagram to final stage.

2. 2. Manual Design of PCB
- (a) Layout generation
- (b) Minimization of layout
- (c) Layout transfer
- (d) Etching of PCB
- (e) Drilling

3. Introduction to PCB design software
- (a) Familiarization and use of PCB software like ORCAD (minimum 9.1), Eagle, Pro E, PCB Express, Lab View (Any two)
- (b) Practice in PCB designing of circuits of the following categories;
  - (i) Communication circuits
  - (ii) Digital circuits (counters, shift registers, multiplexers, de-multiplexer etc.)
  - (iii) Audio & Video
  - (iv) Microprocessor based circuits

4. Fabrication and testing
- (a) Fabrication of small analog and digital (minimum one each) circuits
- (b) Final assembly, troubleshooting of the developed product and product
- (c) demonstration.
- (d) Criterion for selection and mounting of heat sinks.

5. Fabrication Techniques
- (a) Soldering methods, manual and demo on machine soldering
- (b) Comparison of soldering methods
- (c) Component forming and placement on the PCB
- (d) Tools and precautions to be observed during manual soldering.

ELECTRONIC DEVICES & CIRCUITS – III

L	T	P
4	-	3

1

RATIONALE

DETAILED CONTENTS

1. **Wave shaping Circuits** **(15%)**
   General idea about different wave shapes. Review of transient phenomena in R-C and R-L Circuits. R-C and R-L differentiating and integrating Circuits. The applications (physical explanation for square/ rectangular input wave shapes only). Diode clippers, series and shunt biased type. Double clipper circuits. Zener diode clipper circuits. Use of transistors for clipping. Diode clamping circuit for clamping to negative peak, positive or any other level for different input waveforms (e.g. sine, square, triangular), ideal transistor switch, explanation using C.E. output characteristics.
2. **Timer I.C.** **(10%)**
   Block diagram of I.C. timer (such as 555) and its working. Use of 555 timer as mono-stable and astable multivibrators.
3. **Multivibrator Circuits** **(15%)**
   Concept of multivibrator : astable, monostable, bistable. 555 timer as mono and astable multivibrator. Op-amp as monostable, astable multivibrator and schmitt trigger circuit.
4. **Time Base Circuits** **(15%)**
   Need of time base (sweep) wave forms, special features of time base signals. Simple method of generation of saw tooth wave using charging and discharging of a capacitor. Constant current generation of linear sweep voltage circuit using op-amp.
5. **Integrated Electronics** **(5%)**
   Fabrication of transistor by planner process, a typical fabrication process for ICS (brief explanation).
6. **Regulated Power Supply** **(15%)**
   Concept of regulation. Principles of series and shunt regulators. Three terminal voltage regulator ICs (positive, negative and variable applications). Block diagram of a regulated power supply. Concepts of cv,cc and foldback limiting, short circuit and overload protection. Major specifications of a regulated power supply and their significance (line and load regulation, output ripple and transients). Basic working principles of a switched mode power supply (SMPS). Concept of floating andngrounded power supplies and their interconnections to obtain multiple output supplies. Brief idea of CVT,UPS and dual tracking power supply.
7. **VCO (IC565) and PLL(IC566) and their applications** **(10%)**
8. **Thysistors and UJT** **(15%)**
   Name,symbol,characteristics and working principles of SCR, Triac, diac, SCS, SUS,SBS and LASCR. Mention of their applications. Basic structure, principle of operation and VI characteristics of UJT. Explanation of working of UJT as relaxation oscilliator and its use in thyristor.

PRACTICAL WORK

1. Observe and Plot the output Waveshapes of R-C differentiating circuits

2. Observe and Plot the output Waveshapes R-C integrating circuits for squarewave input (observe the effect of the R-C time constant of the circuit on the output waveshape for both the circuits)

3. Construct biased and unbiased series and shunt clipping circuits for positive and negative peak clipping of a sine wave using switching diodes and d.c. sources.

4. Construct a double clipper circuit using diodes and sources and observe wave shapes.

5. Construct zener diode and transistor clipper circuits for positive peak, negative peak and double clipping of sine (other wave shapes).

6. To clamp sine and square wave to their positive and negative peaks and to a specified level.

7. To plot input vs. output characteristics of schmitt trigger circuit and plot the input output waveshapes with a ine wave input.

8. To test mono and astable multivibrator and to plot waveform.

9. To make and test the operations of monostable and astable multivibrator circuits using 555 timer.

10. To determine and plot firing characteristics of SCR by varying anode to cathode voltage and varying gate current.

11. To note the waveshapes and voltages at various points of a UJT relaxation oscillator circuit.

12. To plot the firing characteristics of a triac in different modes, namely, mode I+, mode I-, mode III+ and mode III

INTRODUCTION TO MICROPROCESSORS

L	T	P
4	-	3

RATIONALE:

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings them face with mainframe systems. Thus the study of microprocessors is relevant in finding employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers. Microprocessors find application in process control industry. They are also a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessors are an area of specialization. Students of electronics engineering often use microprocessors to introduce programmable control in their projects, in industrial training.

DETAILED CONTENTS

1. Introduction (5%)

(a) Typical organization of a microcomputer system and functions of its various blocks.

(b) Microprocessors, its evolution, function and impact on modern society.

2. Architecture of microprocessor (with reference to 8085 microprocessor) (10%)

(a) Concept of bus, bus organization of 8085.

(b) Functional block diagram of 8085 and function of each block.

(c) Pin details of 8085 and related signals.

(d) Demultiplexing of address/data bus (AD0-AD7), generation of read, writes control signals.

3. Instruction timing and Cycles (10%)

(a) Instruction cycle, machine cycle and T states.

(b) How a stored programme is executed-Fetch and Execute cycles.

4. Programming (with respect to 8085 microprocessor) (15%)

(a) Brief idea of machine and assembly languages, machine and mnemonic codes

(b) Instruction format and addressing mode, identification of instructions as to which addressing mode they belong.

(c) Concept of instruction set, explanation of the instructions of the following groups of instruction set of 8085. Data transfer group, Arithmetic group, Logic group, Stack, I/O and machine Control Group.

(d) Programming exercises in assembly language (Examples can be taken from the list of experiments)

5. Memories and I/O interfacing (10%)

(a) Memory organization, memory map, partitioning of total memory space, address decoding, concept of mapped I/O and memory mapped I/O. Interfacing of memory and I/O devices

(b) Concept of memory mapping, concept of stack and its function.

6. Interrupts (10%)

(a) Concept of interrupt, maskable and non-maskable, edge triggered interrupts, software interrupts, restart instruction and its use.

(b) Various hardware interrupts of 8085, servicing interrupts, extending interrupt system.

7. Data Transfer Techniques (10%)

(c) Concept of programmed I/O operations, sync data transfer, async data transfers (handshaking), Interrupt driven data transfer, DMA, serial output data, serial input data.

8. Brief idea and programming of interfacing chip 8255. (10%)

9. Microcontrollers (10%)

(a) Introduction, architecture of 8051 only applications of microcontrollers.

10. Comparison (10%)

(a) 8085, Z80, 6800 (8 bit microprocessors)

LIST OF PRACTICALS

1. Addition of two 8 bit numbers

2. (a) To obtain 2's complement of 8 bit number

(b) To subtract a 8 bit number from another 8 bit number using 2's Complement

3. Extract fifth bit of a number in A and store it in another register.

4. Count the number of bits in high state in accumulator

5. Check even parity and odd parity of a binary number

6. Addition of two sixteen bit numbers

7. Subtraction of a sixteen bit number from another sixteen bit number

8. Multiplication of two 8 bit numbers by repetitive subtraction

9. Divide two 8-bit numbers by repetitive subtraction

10. (a) Smallest number of three numbers.

(b) Largest number of three numbers

11. To sort an array of unsigned binary numbers in decreasing/increasing order

12. Generate timing delay through software

ELECTRONIC INSTRUMENTS & MEASUREMENTS

L	T	P
4	-	3

RATIONALE

The study of this subject will help a student to gain the knowledge of the working principles and operation of different electronic instruments (Analog as well as digital). The practical work done in this subject will help to acquire skill in operation and testing of the instruments as per their specifications will also be imparted.

DETAILED CONTENTS

1. Basics of Measurement (5%)

(i) Review of performance, specifications of instruments, accuracy, precision, sensitivity, resolution range etc. Errors in measurement and loading effects.

2. Multi-meter: (10%)

(i) Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance in a multi-meter

(ii) Specifications of a multi-meter and their significance

(iii) Limitations with regards to frequency and input impedance

3. Electronic Voltmeter (10%)

(i) Advantages over conventional multi-meter for voltage measurement with respect to input impedance and sensitivity.

(ii) Principles of voltage, current and resistance measurements (block diagrams only)

(iii) Specifications of an electronic Voltmeter/Multi-meter and their significance.

4. AC Milli-voltmeter (10%)

(i) Types of AC millivoltmeters : Amplifier-rectifier and rectifier-Amplifier, Block diagram and explanation of the above types of ac millivoltmeters

(ii) Typical specifications and their significance

5. Cathode Ray Oscilloscope (20%)

(i) Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only – no mathematical treatment) Deflection sensitivity, brief mention of screen phosphor for CRT in relation to their visual persistence and chemical composition

(ii) Explanation of time base operation and need for blanking during fly back ; synchronization

(iii) Block diagram explanation of a basic CRO and a triggered sweep oscilloscope, front panel controls

(iv) Specifications of a CRO and their significance

(v) Use of CRO for the measurement of voltage (dc and ac) frequency, time period and phase angles

(vi) Special features of dual treace, delayed sweep and storage CROs (brief mention only); introduction to digital CROs

(vii) CRO probes, including current probes.

(viii) Digital storage Oscilloscope: Block diagram and principle of working.

6. Signal Generators and Analysis Instruments (15%)

(i) Block diagram, explanation and specifications of

(ii) laboratory type low frequency and RF signal generators

(iii) pulse generator and function generator

(iv) Brief idea for testing, specification for the above instruments

(v) Distortion factor meter, wave analysis and spectrum analysis

7. Impedance Bridges and Q-Meters (15%)

(i) Block diagram explanation of working principles of a laboratory type (balancing type) RLC bridge. Specifications of a RLC bridge.

(ii) Block diagram and working principles of a Q-meter

8. Digital Instruments: **(15%)**

(i) Comparison of analog and digital instruments, characteristics of a digital meter

(ii) digital voltmeter

(iii) Block diagram and working of a digital multi-meter

(iv) Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time-base stability, accuracy and resolution.

(v) Principles of working and specifications of logic probes, signature analyzer and logic analyzer.

(vi) Digital, LCR bridges

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance

2. To observe the limitations of a multimeter for measuring high frequency voltages and currents

3. To measure Q of a coil and observe its dependence on frequency, using a Q-meter

4. Measurement of voltage, frequency, time period, and phase angle using CRO

5. Measurement of time period, frequency, average period using universal counter/frequency counter

6. Measurement of rise, fall and delay times using a CRO

7. Measurement of distortion of a LF signal generator using distortion factor meter

8. Measurement of R,L and C using a LCR bridge/universal bridge

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PERSONAL COMPUTER ORGANIZATION

L	T	P
4	-	3

RATIONALE

DETAILED CONTENTS

1. **Hardware Organisation of PC:** **(15%)**
   Microcomputer Organisation, 8086/8088 microprocessor, its architecture, brief view of instruction set, memory address and addressing techniques and I/O addressing, the Motherboard of PC: memory organisation, system timers/counters, interrupts, vectoring, interrupt controller, DMA controller and its channels, PC-bus slots, various types of digital buses, serial I/O ports e.g., COM1 & COM2, parallel port.
2. **The Video Display of the PC:** **(15%)**
   The basic principles of the working of video monitors, video display adapters (monochrome and colour graphic). Video modes, detailed study of colour video monitors, introduction to TFT monitors, difference between monochrome, colour and TFT video monitors.
3. **The Keyboard of the PC:** **(10%)**
   The basic principles of the working of a PC keyboard scan codes, introduction to multimedia keyboard.
4. **Disk Drives:** **(15%)**
   Constructional features of Hard disk, Floppy disk and their drives and HDD, DVD drive and CD ROM drive, Pen drive working principle of HDD drive, CD ROM drive, DVD drive, introduction to special type of disk drives like Zip drive, MO drive, Logical structure of a disk and its organization, Boot record. File Allocation Table (FAT), NTFS Disk Directory.
5. **Peripheral Devices:** **(15%)**
   Basic features of various other peripheral devices e.g. mouse, scanner, plotter, digitizer, modem, light pen and joystick, working principle of DMP, Inkjet and Laser printers, Basic operation digital camera, FAX.
6. **Power Supply:** **(10%)**
   SMPS used in PC and its various voltages, basic idea of constant voltage transformer (CVT) and Uninterrupted Power Supply (UPS) – offline and line interactive types.
7. **The BIOS and DOS Services:** **(10%)**
   The basic ideas of BIOS and DOS services for Diskette, Serial Port, Key board, Printer and Misc. services.
8. **Advances Microprocessors:** **(10%)**
   Introduction to PISC and CISC system and comparison between the two introduction to superscalar architecture, detailed study of Pentium IV processor, mother board of PC, memory organization, Catch memory, keyboard interfacing, serial and parallel ports, introduction to pipelining.

PRACTICALS

1. To identify various components, devices and sections of a PC.
2. To interconnect the system unit with the video monitor, mouse and key board, and test the operation of the PC.
3. To connect various add-on cards and I/O devices to a PC motherboard, and test their working.
4. To note the voltages and waveforms at various terminals in the I/O channel (Bus Slots).
5. To study the SMPS circuit of a PC, measure various supply voltages, and connect it to the motherboard and other appropriate I/O devices.
6. To study the operation of a CVT used to supply power to a PC.
7. To study the operation of an uninterrupted power supply (UPS).

Reference Books

1. IBM PC and Clones, Hardware, troubleshooting, and maintenance by B.Govindarajulu-TMH publication.
2. Microprocessor and Interfacing by Raffiquzman.
3. Hall, Douglas, "Microprocessors & Interfacing". McGraw Hill.
4. Bose, SK, "Hardware & Software of personal computers".
5. Small computer theory and Application by Denton G.Dailey-TMH Publications
6. Uffenbeck.

ELECTRONIC DESIGN & DRAWING

L	T	P
-	-	4

RATIONALE

The purpose of this subject is to give practice to the student in drawing of symbols as per ISI standard. Elementary design and drawing of semi-conductor devices, various components, circuits of a small power transformer, design of square wave generator and circuitry for using a dc micro-ammeter.

DETAILED CONTENTS

1. Draw the standard symbols of the following (30%)

(a) (Different parts of ISI Standard IS.2032 may be referred to) for electronics with specification in Digital EC and Microprocessor System Design.

(b) Components : Resistors – Fixed, tapped and variable(presets and potentio-meters LDR, VDR and Thermistor, Capacitors – Fixed, tapped and variable types RF and Af chokes and inductors air cored, solid cored and laminated cored. transformer – step up, step down, Af and Rf types, Auto transformer, IF transformer, three phase transformer, Antenna, chasis, Earth, loudspeaker, Microphone, ear-phone, fuse, indicating lamp, co-axial cables, switches – double pole-on/off double pole, double throw an drotary types, terminal and connections of conductors.

(c) Devices: Semiconductor – rectifier diode, zener diode, variactor diode, tunnel diode, photo diode, light emitting diode (LED), Bipolar transistor,

(d) Working principles of ramp, dual slope and integrating type of field effect transistor (FET), MOSFET Photo transistor. Unjunction transistor (UJT) silicon control Rectifier (SCR), Diac and Triac case outlines (with their type numbers) of different types of semiconductor diodes, transistors, SCR, diacs, triacs and ICS (Along with indicators for identifying pins etc.)

2. Draw the Following (30%)

Circuit diagram of typical multimeter, Circuit diagram of a typical electronic multimeter – Circuit diagram of a typical transistor radio receiver. Complete lock diagram of a typical monochrome TV transmitter and receiver system. Front panel details of typical CRO.

3. Design and Draw for the given Specifications the following : (40%)

(a) A small power transformer. A simple power supply using a full wave rectifier and different types of filters. A simple zener regulated power supply. A small-signal (single-stage low-frequency amplifier) given specifications being the input impedance, load impedance, voltage gain and input signal level and the frequency range.

(b) Square-wave generator using 555 timer. sinusoidal oscillator-Wein's Bridge type using an op-amp. Voltage-controlled oscillator using IC565. Circuitory for using a DC micro-ammeter as

(i) a voltmeter

(ii) a current meter

(iii) for specified ranges

MINOR PROJECT

L	T	P
-	-	6

Minor project work aims at exposing the students to the various industries dealing with electronics components, devices, circuitry and micro processors. They are expected to learn about the construction, working principles of different electronic and Micro processors based instruments. It is expected from them to get acquainted with industrial environment at the shop floor and acquire desired attitudes. For this purpose student during middle of course are required to be sent for a designated period in different industries where production/servicing/installation of microprocessor based systems is going on. Depending on the interest of students they are sent to :

1 Communication stations.
2 Various micro processor oriented industries.
3 Telephone/Telegraph stations.
4 Micro processor based control system industries.
5 Medical electronics industries.
6 Repair and maintenance work shops.

As a minor project activity each student is supposed to study the operations at sight and prepare a detail project report of the observations/processes/activities by him/her. These students should be guided by students.

The teachers along with field supervisors/engineers will conduct performance assessment of students.

Criteria for assessment will be as follows:

	CRITERIA	**WEIGHTAGE**
a)	Attendance and Punctuality	15%
b)	Initiative in performing tasks/clearing new things.	15%
c)	Relation with people	15%
d)	Report writing & seminar	55%
