STUDY-CUM -EVALUATION SCHEME
OF
INSTRUMENTATION AND CONTROL
ON
SEMESTER SYSTEM
FOR
DELHI STATE

BOARD OF THECHICAL EDUCATION, DELHI
Study and Evaluating Scheme System
INSTRUMENTATION & CONTROL
Semester I Revised : From July. 1996 Session

Sr. No.	Subject	L	T	P	C	Evaluation Scheme Total Marks						
						Internal Assessment			External Assessment			
						Theory		Practicals	Written Paper		Practicals	
						Max.		Max.	Max.	Hrs.	Max.	Hrs.
1. CM101	Communication Techniques	3	-	-	3	50		-	100	3	-	150
2. BS 110	Applied Math-I	3	2	-	4	50		-	100	3	-	150
3. BS 111	Applied Physics	3	-	2	4	50		25	100	3	50	3 225
4. ES 122	Basic Electricity	3	-	2	4	50		25	100	3	50	3 225
5. ES 123	Electronics Devices and Circuit s-I	3	1	3	5	50		25	100	3	50	- 225
6. ES 121	W/shop Practice-I	-	-	6	3	-		50	-	3	100	3 150
	Student Centred Activities			4								
		15	3	12	23	25		125	500		250	1125
Semester II												
7. BS 210	App. Math-II	3	2	-	4	50		-	100	3	-	30
8. ES 222	Elect. Engg	3	-	2	4	50/		25	100	3	50	3 225
9. ES 223	Introduction to computers	1	-	6	-	-		50	-	-	100	3 150
10. EX 220	Electronic components & materials	4	-	-	4	50		-	100	3	-	- 150
11. ES 224	Engg. Drawing	-	-	6	3	-		50	100	-	-	- 150
12. EX 221	W/S Prac-II	-	-	8	4	-		50	-	-	100	3 150

1 2 26 23 150 175 400 250 175

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						Theory	Practicals	Written Paper		Practicals	
						Max. mark	Max. marks	Max. marks	Hrs.	Max. marks	Hrs.
13.	10 330 Industrial Instrumentation	3	-	4	5	50	25	100	3	50	3	225
14.	EX 331 Digital Electronics	3	1	3	5	50	25	100	3	50	3	225
15.	10 332 Network Physics	4	-	-	4	50	25	100	3	50	3	225
16.	EX 333 Electronic Devices & Circuits-11	3	1	3	5	50	25	100	3	50	3	225
17.	EX 334 Electronics Fabrication Techniques	1	-	6	4	-	50	-	-	100	-3	150
	Student Centred Activities			4								
		14	2	20	23	200	150	400		300		1050
Semester IV												
18.	EX 431 Applied. Mach Engineering	3	2	-	4	50	-	100	3	-		150
19.	EX 432 Introduction <W> Microprocessors	3	2	2	4	50	25	100	3	50	3	225
20.	EX 422 Electronic Instruments & measurements	3	-	2	4	4	50	25	100	3	50	150
21.	<W> 430 Principal Instruments & Transducers	3	-	4	5	50	25	100	3	50	3	150
22.	ES <W> Projects	-	-	6	3	-	50	100	-	-	-	150
Student Centres Activities				4								
		12	2	20	20	200	150	400		300		1050

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Semester
(ii) A three day Awareness <W> on Entrepreneurship <W> fifth semester.

DETAILED CONTENTS

CM 101 COMMUNICATION TECHNIQUES

L T P

<L>

RATIONALE

Diploma headers are supposed to communicate verbally and in written forms. Further technical report writing forms essentia1 requirement of these people. Keeping in view <W> requirements, this subject has been added to develop necessary competencies in written and oral communication. Efforts <W> be made to give practice of communication to the students.

DETAILED CONTENTS

1. One way and two way communication (1 Hr)
2. Essentials of good communication (1 Hr)
3. Methods of Communication, Oral, written and non-verbal (1 Hr)
4. Barriers to communication (1 Hr)
5. Techniques, of overcoming barriers (1 Hr)
6. Concept of effective communication (1 Hr)
7. All forms of written communication including <W> reports, notices, agenda notes, business correspondence preparation of summaries and press, telegrams <W> representations, press release and advertisements. (3 Hr)
8. Telephonic communications (1 Hr)
9. Essentials of technical report writing, Defect reporting. Analysis and hour to make suggestions (2 Hr)
10. Writing personnel resume and application for a job (2 Hr)
11. Techniques of conducting group discussions (1 Hr)
12. International Phonetics of alphabets and numericals (1 Hr)

LIST OF PRACTICALS

1. Practice Sessions of Oral Communication by <w> Seminars on current topic debates and contests, <w> sessions (6 Hr)

2. Practice of writing officia1 business and personal letters on each of the items given in Section 7 (8 Hr)

3. Practice of handling telephonic communication (3 Hr)

4. Practice of Technical Report writing (5 Hr)

5. Practice of writing personnel biodata and writing application for a job (4 Hr)

6. Practice Session on group discussion (6 Hr)

2. BS 110 APPLIED MATHEMATICS -1

	L	T	P
Hrs/week	3	2	1

RATIONALE

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry, differential ca1culus and integra1 calcu1us have been included in the curricu1um as foundation course and to provide continuing education base to the students.

DETAILED CONTENTS

1. Co-ordinate Geometry (9 Hr)
   - Point : Cartesian coordinates, polar coordinate and their conversion to cartesian coordinates and vice versa (In two dimensions only).
   - Distance between two points. Internal and External division formulae
   - Area of a triangle when its vertices are given conditions of collirearity of points. To find the coordinates of centred, in centre of a triang1e given the vertices using the formula. Simple problems on locus.
   - Straight line : Equation of straight line .in various standard forms. Inter section of two straight 1ines, ang1e between two 1ines.
   - Perpendicu1ar distance formu1a
   - Circle : Genera1 equation of a circ1e and its characteristics. To find the equation of a circle given (i) Center and radius (ii) Three points on it (iii) Co-ordinates of end points of a diameter .
   - Concics : Definitie of conic section standard equation of parabola. Equation of parabola given its focus, and directrix. Given the equation of a parabola, determination of its focus, vertex, axis, directrix and latus rectum.
   - Ellipse and hyperbola (standard equations without roof), writing equations given the directrix. Focus and, eccentricity; given the equation determination of focus, directix, latus rectum, axes, eccentricity and Vertex.
2. Vector Algebra
   - Concept of a vector, vector in polar and cartesian systems. Expressing a polar vector in terms of cartesian unit vectors' and vice versa. Representation of a point by a vector.

- Arithmetic operations on vectors addition, subtraction, Multiplication of a vector by a scalar, scalar product of two vectors and vector product of two vectors. Application of a point by a vector, Application in Mechanics and Electro-magnetism.

3. Matrix and Determinant (6 Hr)

Determinant and its evaluation, minor co-factor, matrix and its simplification, matrix Multiplication, inverse matrix, Solution of simultaneous equations containing upto 3 unknown only.

4. Differential Calculus (8 hr)

Function and Limits :

- Concepts of a function, its value and limit
- Evaluation of limits in case of four standard limits

$$\lim_{x\to 0}\frac{\sin(X)}{x} \qquad \lim_{x\to 0}(1+x)^{1/x} \qquad \lim_{x\to 0}\frac{x^n-a^n}{x-a}$$

$$\lim_{x\to 0}\frac{a^x-1}{x}$$

Differentiation :

- Definition, its physical meaning as rate measure and its geometrical meaning as slope
- Differentiation from first principales of x^n-a^x, log x, sin x, Cos x, tan x
- Differentiation of sum product and quotient of functions
- Differentiation of function of a function
- Differentiation of sec x, cosec x, cot x and of inverse t-ratios
- Differentiation of implicit functions and parametric equations
- Logarithmic differentiations
- Applications of Differentiation Errors. maximum and minimum tangent and normal

5. Integral Calculus (8 Hr)

(a) Indefinite Integrals :

Integration as inverse process of differentation. Simple integration by substitution, by parts and by partial fraction.

Definite Integrals :

Evaluation of definite integrals evaluation of (simple problems)

$$\int_0^{\frac{\pi}{2}} \sin^n x\,dx, \quad \int_0^{\frac{\pi}{2}} \cos^N x\,dx \text{ and } \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\,dx$$

(m, n being positive "integer only)

Application : area bounded by a curve and axes- Volume of solid farmed by revolution of an area about axis.'

(b) Differential Equation :

Solution of differential equation of first order and first degree

(i) Homogeneous differential equation.
(ii) Linear differential equation.

L	T	P
3	-	2

RATIONALE

Applied physics is. a foundation course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. The course cover basics like instrument, waves, sound, light and ‘atomic structure.

DETAILED CONTENTS-

1. Measurement (6 Hr)

a) Units and Dimensions

Fundamental and derived units, SI. units, dimensions of physical quantities, dimensional formula and dimensional equation, principles of homoqeneity of dimensions and applications of homogeneity principle in:

- Checking the Correctness of phyica1 equation.
- Deriving relation among variou physica1quantities.
- Conversion of numerica1 va1ues of physica1 quantities from one system of units into other system

b) Errors in measurement accuracy, estimation of percentage error in the result of measurement.

2) WAVES (6 Hr)

Generation of waves by vibrating partic1es, progressive wave, equation of waves, energy transfer by particles and waves, superposition of waves and its applications to interference, beats and stationary waves (graphical); sound and light as waves - range of frequencies, wavelengths, velocities and their nature, electromagnetic spectrum Doppler effect.

3) Applications of Sound waves (5 Hr)

a) Acoustic

Reflection., refraction and absorption of sound waves by materials; definition of pitch, loudness ,quality and intensity of sound waves, units of intensity (bel and decibel); Echo and reverberation time control of reverberation time Acoustic insulation ; (qualitative treatment <w> of reverberation.

b) Ultrasonic (5 Hr)

Production of ultrasonic waves by magnetostriction and piezoelectric effects, 'detection and propertise of <w> application <w> <w> <w> <w>cleaning, flaw detection and exploration (sonar).

4. Light (9 Hr)

Review of laws of reflection and reflection magnifying power of lens, characteristics of various types of lenses; principles of optical projectors, optical principles of OHP and slide film projectors.

Interference and diffraction of light waves; Interference of light waves; basic ideas about diffraction and polarization of light waves.

5. Laser and its Applications (5 Hr)

Laser principle, types of Lasers; study of the He-Ne and Ruby laser and their application.

6. Atomic Structure and Energy Level (6 Hr)

Bohr model of atomic structure, ionisation potentials; Energy levels, Energy band levels of conductors, insulators and semiconductors. Atomic and crystal structure of silicon and germanium, cava lent bonds, Effect of temperature on conductivity of germanium and silicon.

LIST OF PRACTICALS

1. Use of vernier calipers and micrometer for determination of diameter of a wire.

2. Study of interference of sound waves using Quincke's tube .

3. Study of resonance in air- column and determination of velocity of sound in air.
4. To make a, telescope by combination of suitable lenses and determine, its magnifying power.
5. Measurement of small thickness by interference method (by Fresnel's Biprism method)
6. To make a compound Microscope by suitable combination of 1enses and determine its magnifying power.

7. To determine the wavelength of sodium 1ight by Newton's ring method

8. Setting an OHP lenses and mirrors for its best performance

9. Determination of wavelength of various spectral lines of mercury lamp.

10. Measurement of illumination level of a white surface under: Natural daylight, incandescent light and fluorescent light.

11. To compare the intensity of illumination by Bunsen's photometer.

12. Study of: diffraction of. He-Me laser beam by markings on a vernire-scale and determination of its wavelength.

13. To measure the first ionisation potential of Ha using diode.

SUGGESTIONS

While teaching the subject, teacher should make maximum use of demonstration to make the subject interesting to the students.

4. ES 122 BASIC ELECTRICITY

L T P
3 – 2

RATIONALE

The course provides the student : (i) Understanding the "basic concepts and principles of DC and AC power; DC and AC circuits.(ii) Familiarisation with basic electrical circuits and devices (iii) Understanding the principles of working of various testing and measuring instruments and their effective use.

DETAILED CONTENTS

ELECTROSTATICS

1. Review of following : (5 Hr)

   a) Coulomb's law, Electric field, Electric intensity, Electric lines of force in simple charge configuration

   b) Gauss's theorem (No proof) ; Field around a charged conductor, plane sheet and a sphere, concept of electric displacement current and displacement density.

   c) Concept of potential difference, Potential due to a point charge; Equipotentia1 surfaces; potential difference.

2. Capacitor (4 Hr)

   a) Concepts of capacitance and capacitance capacitor, Units capacitance capacitor ratings.

   b) Parallel plate, spherical and cylindrical capacitor and their capacities.

   c) Energy stored in a capacitor.

   d) Concept of dielectric and its effect on dielectric constant, dielectric constant, dielectric break-down.

   e) Series and parallel combination of capacitors. Simple problems of capacitors.

3. DC Circuits (8 Hr)

   a) Concept and units of electric curent.

   b) Ohm's 1aw, concepts of resistance, <w> resistivity and conductivity. Their hits and dependence on temperature in conductor .

c) Power and energy, heating effect of electric current and ‘conversion of meachancial to electrical units and vice- versa .

d) Kirchoff’s voltage and current laws and their applications in simple DC circuits.

e) Series and parallel .combination of resistors, wattage consideration, Simple problems.

4. Basic Magnetism. (3 H r)

Magnetic: intensity, and Magnetic flux and their units. Intensity of magnetisation; retentivity <w> hystersis loop.

5. Electro Magnetism

(8 Hr)

a) Concept of magnetic field production by flow <w> current Oversted’s experiment, concept of <w> motive force (MMF), permeability Analogy between electric and magnetic circuits.

b) Force on a moving charge and current in a magnetic field, force between two current carrying parallel conductors.

c) Magnetic field around a current carrying conductor, circular loop and solenoids.

d) Faraday’s laws, Lenz’-s law and rules of electromagnetic induction principles, of self and mutual induction, self and -mutually induced, e.m. f; simple numerical problems.

e) Energy “stored in a magnetic, field, concept of current growth, decay and time constant in an inductive(RL) circuit .

f) Energy stored in an inductor, series and parallel combinations of inductors.

6. A.C. Theory (6 Hr)

Concept of alternating voltage and current, difference between AC and DC.

Concept of cycle, frequency, period, amplitude, instantaneous value, average value, rms value and peak value. Form factor (definition on1y)

Equation of sinusodial waveform, representation alternating quantities, concept of phase difference.

Cells and Batteries (3 Hr)

a) Types of cells and their uses; Basic constructional features of Nicket cadmium, Alkali and lead-acid; cell; main properties, difference between dry and wet cells, definition of standard cell and its application, Ratings and maintenance of cells.

b) Battery and battery ratings, charging and maintenance of batteries

Voltage and Current Source (4 Hr)

a) Concept of constant voltage source, symbol and graphical representation,
characteristics of ideal and practical voltage sources

b) Concept of constant current source, symbol, characteristics and graphical presentation of ideal and practical current sources.

c) Equivalence of current and voltage source's

d) Concept of floating and .grounded d.c. power supplies

9. DC Circuit Theorems (8 Hr)

Thevenin's theorem, Norton's theorem, superposition theorem, Maximum power transfer theorem, application of network theorems in solving DC circuit problems.

LIST OF PRACTICALS

1. Verification of Ohm's Law

2.a Verification of Req = R_1 + R_2 + R_3 +…….in circuit, where are R_1 R_2, R_3…….. are in series.

b Verification of 1/Req = 1/R_1 + 1/R_2 +…….in circuit where R_1….R_2 are in parallel.

3. Verification of Kirchaff's first and second laws

4. To measure the (very low) resistance of ammeter and (very high) resistance of voltmeter

5. To measure resistance of galvanometer by half deflector method

6. Conversion of galvometer into (i) <w>.<w>.<w>.

7. To verify .in dc circuits:. (i) Thevenin's theorem theorem (ii) Norton's theorem (iii) Superposition theorem (iv) Maximum power transfer theorem

8. To varify In dc circuits (i) superposition theruem (ii) <w> transfer therum.

9. To measure inductance of ferrite core coil by first removing the core and then by inserting the core gradually to the full extent and observe the effect of flux concentration on value of inductance

10a. To verify Leq = L_1 +L_2 +...where inductances L_1 ,L_2 ....are connected in series

b. To verify l/leq = l/L_1 +1/L_2 +where inductances L_1, L_2 ...are connected in parallel

11. To measure capacıtance of tuning capacitor by gradually turning the plates inside one another and to observe effect of different overlaps

12a. To verify Ceq = C_1+C_2 . . .where capacitances C_1,C_2 .... are connected in parallel.

b. To verify 1/Ceq = 1 /C_1+1C_2 +…… where capacitances C_1, C_2 <W> are connected in series.

13. Plot current and voltage growth and decay in R.L and <W> circuits for different time constants

5. ES 123 Electronic Devices and Circuits – I

L	T	P
3	1	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.Practica1 experience in the design, fabrication and testing of circuits.

DETAILED CONTENTS

1. Introduction (3 Hr)

Introduction to active and passive components, passive components, fixed and variable resisters their various types and specializations including thermistors, LDR and VDR fixed and variable capacitors, their various types and important specifications and colours codes.

2. Semiconductor Physics (5 Hr)

Intrinsic semicronductors - Conductivity, atomic and crystal structure of germanium and silicon, covalent bonds, genertion and recombination, effect of temperature on conductivity of intrinsic semiconductors; energy level diagrams of conductor, insulator and intrinsic semiconductors. Extrinsic semicondutors materials - <w> of impurity, P and N type semiconductors and the conductivity. Minority and majority carriers; Draft <W> Diffusion currents.

3. Semiconductor Diode : (5 Hr)

P-N junction diode, mechanism of current flow in P-N junction, drift and diffusion current.<w> layer, potentia1 barrier, behaviour of P-N junction characteristics, zener and avalanche breakdown, concept; junction capacitance in foward and reverse bias condition <W>.

Semiconductor diode characteristics, static and dynamic resistance and their calculation from diode characteristics. Dynamics resistance of diode in terms of diode current.

$$r_D = 25/I_D$$

Diode (P-N junction) as rectifier, half wave rectifier. full wave rectifier including bridge rectifier, relationship between D.C. output voltage and A.C. input voltage rectification efficiency and ripple factor for.<w> circuits, fi1ter circuits : Shunt capacitor.<w>inductor, capacitor input, filter, bleeder resistance,

physical explanations of the working of the <w> typical applications of each <W> Different type diodes; brief idea and typical applications of power <W> zener diodes; varactor diodes and point. Contact. Important specification of rectifier dioce and zener <w>.

4. Introduction to Biploar Transistor- (8 Hr)

Concept of bipolar transistor as two junction three ter <W> kinds of current carries; PNP and transistors, their, symbols a mechanisms of current <W> explanation of fundamental current relations,

$$I_e = I_b + I_c$$

and

$$I_e = a I_e + I_{cbo}$$

Concept of leakage, current ICBO, effect of temperature leakage current CB, CE and CC configuration, Common configuration (CD) : Input and output characterist determination of transistor parameter input <W> dynamic resistance, current amp1ificatien factor. <W> emitter configuration : collector current relations in configuration, collector current in terms of base <W> and leakage current. (ICBO) relationship between the <W> current in CB and CE configuration input and <W> characteristics, determination of dynamic in and output resistances and current amplification factor from the characteristics. Common collector configuration expression of emitter current in terms, of the base <W> and leakage current in CC configuration Comparison of and CE configuration with regard to <W> input and <W> resistance, current gain and leakage current, performance CE configuration over CB configuration Transistor as amplifier in CE configuration. DC load line, its <W> and drawing it on collector characteristics. Determination of small signal voltage and currents gain of a <W> transistor amplifier using CE gain as product of the voltage <W> and current gain.

5. TRANSISTOR BIASING AND STABL1SATION OF OPERATING POINT

(6 Hr)

Different transistor biasing circuit for fixing operating point, temperature and <w> ‘Bdc’ operating point need for stabilization of operating point operating point in cut off and sat on <w> region performance of the amplifier.

Calculation of operation point for different circuits. Simple design problems on potential divider biasing circuit.

SINGLE STAGE TRANSISTOR AMPLIFIER. (6 Hr)

Single stage CE amplifier circuit with proper biasing components, AC load, line and its use in :

- Calculation of current and voltage gain of a Sinq1e amp1ifier circuit.
- Explanation of phase reversal of the output voltage with respect to input voltage .

- Explanation of phase reversal of the output voltage with respect to input voltage.
- Transistor hybrid low frequency model in CE configuration, 'h' parameters and their physical significance, typical values of the parameters.

- Expressions for voltage gain, current gain, input and output impedance for a single stage CE amplifier circuit in 'h' parameters, appropriate approximation.

7. FIELD EFFECT TRANSISTOR (FET) (6 Hr)

Construction, operation, characteristics and equivalent circuit; of JFET and its circuit app1ication.

Construction, operation, characteristics and equivalent circuit of MOSFET in depletion, enhancment modes and its circuit app1ications.

CMOS, advantage and application..

Comparison of JFET, MOSFET, BJT

Simple FET amplifier circuit and its working <w> (without analysis).

LIST OF PRACTICALS

Practice in the use of following e1ectronic instrument

Nultimeter-ordinary as well as electronic (analog/digital type)

Regulated power supply.

LF signal generator, CRO

1. Experiments to be Performed

i) Measurement of voltage at var1ous setting (low and high voltages) of reulgated power supply by using <w> and digital multimeter.

ii) Measurement of voltage and current by loading the regulated power supply.

iii) To obtain various voltages like +15V + 5V and measure them with the
help of analog and digital multimeter.

iv) Practice in the use of signal generator and CRO : measurement of d.c. and a.c. voltages, time period/frequency of sine/square wave using triggered sweep CRO

2. Identification and famifarisation of passive components.

Experiments to be performed.

i) Measurement of resistors by and ordinary multimeter and an electronic nultimeter and their vertification on the basis of colour code & specification.

ii) Measurement of transformer turn ratio of a transformer and to note its specification.

iii) Note the variations in resistance by variation of:

(a) light on LDR (b) temperature on a thermistor.

3. Semiconductor diode characteristics :

i) Identification of types of packages, terminals and ting different ratings using data books for various types of semiconductor diodes. (germanium point contact, silicon low power and high power and switching diodes.

ii) Plotting of forward V.I characteristics for a <W> P.N. Diode (silicon and germanium diodes).

4. Rectifier circuits using semiconductor diode measurement of input and output voltage and plotting of input and waveshape

i) half wave rectifier. (ii) fullwave rectifier, (iii) bridge rectifier diode circuits.

5. Plot forward and reverse V-I characteristics for a zener Diode.

6. Plot the waveshapes of a full wave rectifier with <W> Capacitor, series inductor, and pie filter circuit.

7. Ploting input and output characteristics and calculation of Parameters of a transistor in common base configuration.

8. Ploting input and output characteristics and calculation of Parameters of a transistor in common emitter configuration.

9. Transistor biasing circuit. Measurement of operating point (IC and VCE) for a:

   i) fixed bias circuit (ii) potential divider biasing circuit.

   (Measurement can be made by changing the transistor in the circuits by another of same type number).

10. Single stage common emitter amplifier circuit.

   i) Measurement of voltage gain at 1 KHz for different load resistances.

   ii) Measurement of input and output impedance of the amplifier circuit.

11.a) Plot the FET characteristics and determine the FET parameters from its characteristics.

   b) Measure voltage gain and plot the frequency response of JFET or MOSPET amplifier circuit.

ES 126 WORKSHOP PRACTICE I

	L	T	P
Hrs/week	-	-	6

RATIONALE

This subject is gateway to the technological/industrial Processes. The mental and manual abilities will be developed to handle engineering materials with hand tools with quality and Safety consciousness. The elementary abilities developed in carpentry, fitting, sheetmetal and jointing shops will find applications in the practice of this profession. The emphasis seven on practical work will provide the students the primary Experience of working in team.

DETAILED CONTENTS

The following trades are considered basic.

1. Carpentry
2. Fitting
3. Sheet Metal & Jointing.

1. CARPENTRY SHOP (40 Hr)

Keeping in view the essential elements of knowledge and skill, the following exercises are planned:

1. Introduction to raw materials, various hand tools and safety measures to be observed.
2. Exercise on Marking and Sawing.
3. Planning Practice.
4. Chiselling practice.
5. Introduction of joints, their relative advantages and uses.
6. Preparing of half lap joint.
7. Preparing of mortise and tennon joint.
8. Preparation of dovetail joint.
9. Preparation of mitre joint.
10. Demonstration job showing use of rip saw, bow saw and Trammel.
11. Demonstration of job on band saw, circular saw.

2. FITTING SHOP (40 Hr)

1. Common materials used in fitting shop and description of work bench, holding devices and files.

2. Filing practice (production of flat surfaces). Checking by straight edge.

3. Filing a dimensioned rectangular or square piece to an accuracy of ± 0.25 mm.

4. Description of chisels, hammers etc. and chipping practice

5. Simple operation of hacksawing, description of various types of blades, their uses and how to fit the blade and Hacksawing practice.

6. Description of drills, selection of drills for tapping, types of taps, tapping and dieing operations.

7. Drilling practice on soft metals (Al, Brass and lead).

8. Handling of measuring instruments, checking of zero error, finding of least count etc.

9. Practice of filing on non ferrous metal.

3. SHEET METAL & JOINTING SHOP (40 Hr)

1. Introduction to sheet metal shop, use of hand tools and accessories, e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowances required during job fabrication. Selection of material.

2. Demonstration of the use of hand shears, sheet metal machines, creasing and grooving tools.

3. Preparation of a sheet metal job involving rolling shearing, creasing, binding, corner making and round cutting

4. Preparation of a sheet metal jobs involving shearing, grooving, greasing, circle cutting folding beading, etc.

5. Different types of rivets and their applications. Use of puncher and pullers.

6. Practice of riveting in different fashion e.g. lap, butt, chain, zig-zag etc.

7. Preparation of utility jobs.

8. Introduction to soldering and brazing and; Demonstration on brazing by the Instructor.

7. BS 210 APPLIED MATHEMATICS-II

	L	T	P
Hrs/week	3	2	4

RATIONALE

Applied Mathematics forms the backbone of Engineering Students. In : continuation of topics covered in applied mathematics I, elements of differential equations, fourier Series, laplace transform, complex numbers and partial differentiation has been including in the curriculum as a foundation course to comprehend advanced analysis and theory of the fields of electronics.

DETAILED CONTENTS

1. Differential Equation of Second Order : (8 Hr)

- Solution of differential equations of second order having ax, ax, e , e , sin ax, cos ax and x^n in the right hand side. Solution of R-L-C circuits.

2. Fourier Series : (8.Hr)

Periodic function, equation of waves, determination of fourier co-efficients, expansion of a periodic function by fourier series. Functions defined in two or more subranges.

3. Laplace Transform (8.Hr)

Definition, transforms of elementary functions, Properties of laplace transforms. Inverse transforms, transforms of first and second derivatives. Solutions of differential equations using laplace transforms. Transforms of integrals Solution of RL, RC and R-L-C circuits.

4. Complex Number : (8.Hr)

Complex number in exponential form. Euler's exponential forms. Hyperbolic functions, Relation between hyperbolic and circular function.

Phasor, addition of sinusoidal term, phasor diagrams of R-L, R-C, R-L-C circuits. Impedance and admittance as complex numbers. Solution of simple R-L-C circuits including bridge circuits.

5. Partial Differentation : (8.Hr)

Partial derivative of first and higher orders. Homogeneous function, Euler's theorem on homogeneous function. Total differentiation.

ES 222 **ELECTRICAL ENGINEERING**

L	T	P
3	-	2

RATIONALE

The nature of jobs an electronic technician has to perform varies widely. Any electronic system (i.e. tape recorder, VCR, TV receiver) is a combination of electronic circuits and electrical components (e.g. small electrical motor, different types of switches etc.) In order to carry out his job function effectively, apart from the knowledge and skills of electronics, he must possess sound knowledge about basic principles off working of electrical machines and equipment. The practical work done in this subject will help in developing skills of operating, repairing and testing of electrical machines and components (e.g. small electrical motor, transformer etc)

DETAILED CONTENTS

1. Measuring Instruments (2 Hr)

a) Working principles and construction of Ammeters and voltmeters (moving coil and moving iron type)

b) Difference between ammeter and voltmeter, extension of their range and simple numerical problems.

c) Principle and working of :

- wattmeter (dynamo-meter type)
- Energy meter (induction type)

2. Generalised Treatment of Electrical Machines (4 Hr)

a) Introduction.

b) Definition of motor and generator.

c) Basic principle of a generator and a motor

d) Torque due to alignment of two magnetic. Fields and the concept of Torque angle.

e) Basic Electromagnetic laws.

f) E.M.F. induced in a coil rotation in a magnetic field

g) Elementary concept of an Electrical Machine.

h) Common features of rotating electrical machines.

3. Three Phase Supply (3 Hr)

a) Advantage of three phase system over single phase system

b) Star Delta connections

c) Relation between phase and line voltage single phase system and three phase system

d) Power and power factor in three phase system and their measurements

4. DC Machines (8 Hr)

a) Main constructional features, principle of working.

b) Function of the commutator for motoring and generating action

c) Armature winding

d) Factors determining induced e.m.f.

e) Factors determining Electromagnetic torque

f) principle s of generating and matoring

g) Action and relationship between termina1 voltage and induced e.m.f

h) Factors determining the speed of a DC motor

i) Different types of a excitation

j) Performance and characteristics of different types of DC machines

k) Starting of DC machines, motors and starters

l) Application of DC machines

5. Transformers (8 Hr)

a) Principles of operation and constructional details of sing1e phase and three phase transformer. core type and shell type ransformers, difference between single phase and three phase transformers and advantages and disadvange

b) Voltage Regulation of a transformer

c) Losses in a transformer

d) Efficiency, condition for maximum efficiency and all day efficiency

e) Auto transformers and instrument transformer

6. A.C. Motors (8 Hr)

a) Brief introduction about three phase induction motors, its principle of operation

b) Types of induction motors and constructional features of squirrel cage and Slip-ring motors

c) Starting and speed control: Star Delta and DOL (Direct on-line) starters

d) Reversal of direction of rotation of 3 motors

e) Applications of induction motors

f) Introduction to synchronous motors and their applications

7. Single Phase and Fractional Kilowatt Motors (6 Hr)

a) introduction
- Principle of operation of single phase motors
- Types of single phase induction motors and their constructional details(i.e.) split phase, capacitor start, capacitor start and run, shaded pole and reluctance start)

b) Single phase synchronous motor-reluctance motor (hyrteresis motor)

c) Commutator type single phase motors Repulsion Induction motor shaded pole motors, AC series motor and universa1 motors

d) Introduction to servo-motors and stepper motors.

LIST OF PRACT ICALS

1. Conversion of Galvanometer into Ammeter and Voltmeter

2. To measure power and power factors in a 3 phase system with

a) balanced load
b) unbalanced load by the two wattmeter method and any one other method

3. To find the value of capacitance and power factor of a capacitor by approximate method.

4. To draw the equivalent circuit of a transformer and to determine efficiency and regulation by performing:
   a) Open circuit test
   b) Short circuit test

5. To measure the induced e.m.f. of a separately excited d.c generator as a function of field current.

6. To measure the terminal voltage of a separately excited dc generator as a function of load current

7. To measure the terminal voltage of a.d.c. shunt generator as a function of load current

8. To measure the speed of a separately excited dc. motors a function of load torque at rated armature voltage

9. To measure the speed of a separately excited dc motor as a function of load torque at rated armature voltage

10. To measure the speed of a dc series motor .as a function of load torque at rated armature voltage

11. To determine the efficiency of a dc shunt motor by the measurement of losses (Sunburn's method)

12. To observe the difference in the effect of switching on a single phase capacitor start induction motor with

    a) the capacitor disconnected and
    b) the capacitor connected

    Also to determine how to reverse the direction of rotation

9. ES 223 INTRODUCTION TO COMPUTERS

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RATIONALE

Information technology and computers have great influence on all aspects of our' life. All our workplaces and the living environment are being computerized. In order to prepare the diploma holders to work in these environments and contribute to them, it is essential that they are exposed to this area of work or study. This exposure will enab1e the students to enter the world with confidence, live in these environments in a harmonious way and contribute to the productivity.

DETAILED CONTENTS

1. Introduction to Computers : (15 Hr)

(i) Block diagram of a computer& overview of its working.

(ii) Interconnections. of various pheripherals with computers.

(iii) Input/output & secondry storages devices.

(iv) Classification of programming 1anguages.

(v) Classification of computers.

2. FAMILIARIZATION WITH OPERATING SYSTEM (15 Hr)

(i) Introduction to computer operating system (DOS, windows 95).

(ii) Introduction to DOS structure, system fi1es <W> files & configuration files.

(iii) Booting the system from floppy hard disk.

(iv) Brief introduction to DOS internal & external commands.

(v) Fami1arisation with windows structures, its use & app1ication.

3. PREPARATION OF DOCUMENTS THROUGH WORD PROCESSING (30 Hr)

3.0 Idea of text editors like microsoft word. <w> etc.

3.1 Opening a document

3.2 Preparing documents inserting diagrams & table

3.3 Editing document
- 3.3.1 Character word and Line Editing
- 3.3.2 Margin Setting Paragraph alignment
- 3.3.3 Block operations
- 3.3.4 Spell checker
- 3.3.5 Saving a document

3.4 Printing a document

INFORMATION PRESENTATION FOR DECISION MAKING USING SPREAD SHEET (Excel/Lotus 1-2-3)

(20 Hr)

4.1 Applications of spread Sheed
4.2 Structure of spread sheet
4.3 Preparing spread sheet for simple data and numeric operations
4.4 Using formulae in spread sheet operations
4.5 Making tables sorting and querying
4.6 Creation of graphs Pie charts bar charts
4.7 printing reports

COMPUTER AIDED DRAFTING

5.1 Making simple drawings using features of CAD & Conforming the drafting specifications
5.2 Saving and retrieving drawings
5.3 Dimensioning
5.4 Lettering
5.5 Plotting drawings

10. EX 220 ELECTRONIC COMPONENTS AND MATERIALS

L T P
4 - -

RATIONALE

The Study of electronic Components and Materials is important form the point of view of manufacturing testing and maintenance of electronic devices and systems. Students Should understand the construction identification characteristics specifications merits limitations and applications of electronic components and materials

DETAILED CONTENTS

1. Materials

Classification of materials into conducting semiconducting and insulating materials through a brief reference to atomic structure.

Conducting Materials :

- Resistivity and factors affecting resistivity such as temperature alloying and mechanical stressing

- Classification of conducting materials into low resistivity and high resistivity materials . Some examples of each and their typical applications.

Insulating Materials :

- Electrical properties – volume resistivity surface resistance, dielectric loss dielectric strength (breakdown voltage) and dielectric constant

- Thermal properties – Heat resistance classification according to temperature endurance thermal conductivity

- Plastics – classification into thermo plastic and thermo-setting categories : examples of each and their typical applications

- Important relevant (electrical mechanical and thermal) characteristics and applications of the following materials

Mica	Paper (dry and impregnated)
Asbestos	Rubber
Ceramic	Silicon rubber
Class	PVC
Cotton	Polythene
Jute	Polyester
Tefion	

Acrylics	
Silicon grease	
Bakelite	Phosphor – Bronze alloy
Epoxy Glass	Beryllium – copper alloy
Varnish	Soldering Lead alloy
Lacquer	Copper
Enamel	Silver Gold

Magnetic Materials :

- Different magnetic materials : (Dia, para, ferro) their properties
- Ferromagnetism Ferrimagnetism domains permeability, Hysteresis loop (indluding coercive force and residual magnetism and magnetic saturation)
- Soft and hard magnetic materials, their examples and typical applications

2. Components

- Capacitor Polyster, Metallised Polyster ceramic paper, mica and electrolytic types, construetiona1 details and testing, specifications, temperature and frequency stability and other limitations. Mutual comparison.
- Resistors-carbon film, metal film, carbon composition wire wound and variable types (presents and potentiometers) Constructional details and testing, specifications, temperature and frequency dependence and noise considerations. Mutual comparison
- Transformers Inductors and RF Coils: method or manufacture of inductors, RF coils and small transformers (up to 1 KVA) and their testing. Properties of cores. Need and types of shielding
- Surface Mounted Devices (SMDs)
- Connectors, Relays and Switches:

a) Various types of switches, e.g. slide, rotary, push, toggle, micro-switches etc. Their symbols, specifications and applications

b) Concept of ‘make’ and ‘break’ contacts in relays. Operating current, Holding crept. Various of relays Their symbols, specifications and applications

c) Various types of connectors. Their symbols, specifications and app1icat1ions

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RATIONALE

Engineering Drawing known as the language of engineers is a widely used means' of communication among the designers, engineers, technicians, draftsmen and craftmen in the industry. The translation of ideas into practice' without the use of this graphic language is rea11y beyond imagination. The diploma holder is required to read and interpret the design , and drawings, provided to him for actual execution of the job. This course aims at buid1ing foundation for comprehension of this language of engineering profession.

DETAILED CONTENTS

Introduction to instruments & materials used in drawing.
Plate No.1:Free.'hand sketching
Plate No.2:Coventiona1 representation of lines,
materials, breaks, electric and electronics symbols.
Plate No. 3: Free hand lettering & numerals in 3,5,8, &12

mm series Vertical & inclined lettering at 75 Instrumental single stroke lettering in 12 mm.
Plate No.4 : Dimensioning techniques.
Plate No. 5 : Three views of an objects in 1st angle projection.
Plate No.6 : Six views of an object in 1st angle projection.
Plate No.7 : Six views of an object in third angle projection.
Plate No.8 : Six views of an object in third angle projection
Plate No. 9 : Identification of surfaces from different objects including inclined & curved surfaces.
Plate No. 10 : Sections-conventional representation of materials, general conventions of revolved & removed sections.
Plate No. . 11 : Representation of pictorial/isometric view of a simple object.
Plate No. 12 : Isometric views of simple objects including slant curved surfaces.
Plate No. 13 : Isometric of a circle, semicircle, arcs &angles.
Plate No. 14 : Missing views & lines.
Plate No. .15 : scales, diagonal scale, scale of chords.

12. EX 221 workshop practice-II

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RATIONALE

This subject is gateway to the technology/industrial processes. The mental ‘and manual abilities will be developed handle engineering materials with hand tools with quality a safety consciouness. The elementary abilities developed carpentary, fitting, sheetmetal and jointing shops earlier and in electric & electronics shops during this study will find applications in other subjects. The emphasis given on practical work will provide the students the primary experience of work) in team.

DETAILED CONTENTS

ELECTRICAL SHOP (52 Hr)

1. Electrical Safety Rules. During the first session all students must learn important safety rules, precautions and measures against fire hazards due to Electrical fault and treatment against electric shock

2. Identification of commonly used electrical engineering materials. During these turns students must learn about different types of insulators, conductors (types of wires, cables etc.) and magnetic materials. They should be shown these materials in Electrical workshop and also told the typical applications

3. Familiarisation with Domestic Wiring: Some simple exercises should be done by students in the electrical workshop. Three such exercises are given below:

   a) Wiring of a mains outlet panel consisting of specified combination of 15 amp, 15 amp sockets, mains switch, indicator lamps and fuse links.

   b) Wire a fluorescent lamp to AC main alongwith the switch, starter and the choke

   c) Wire, a door bell.

ELECTRONIC SHOP (60 Hr)

1. Identification and fami1iariasan with the follow electronic instrument :

   a) Multimeter digital(three and half digit,

   b) Single team simple CRO function of every knob on the

front panel

c) Audio-oscillator sine and square wave output

d) Power supply fixed voltage and variable voltage, single output as well as dual output.

2. Practice in the use of above mentioned equipment a small experiment may be done by them so that they can just use of them

3. Identification and fami1iarisation with commonly used tools; statement of their uses. Identification and familiarisation with active and passive components; colour code and types of resistor and potentiometers (including VDR, LDR and thermistor); some small practical exercises on measurement of these components; identification of diode and transistor terminals. Identification of other components including LED, LCD, UJT, FET , Coils, relays, switches (SPDT, DP DT, etc) connectors, microswitches, read relays, transformers (mains, audio and RF, etc) Linear and Digital IC s, Thyristors, etc.

   NOTE: Demonstration Boards for the above components should be made

4. Cut,. strip, join and insulate two length of wires/cables (repeat with different types of cables/wires)

5. Cut, strip,connect/so1der/crimp different kinds of wires/ cables (including shielded cable) to different types of power'/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminals strips, connectors. The tasks should include making complete recording/p1ayfcack/Antenna/Speaker leads for common consumer electronic products such as Radio, TV, VCR, Cassette Recorder, Hi-Fi equipment, Head set, microphone

6. Cut, bend, tin component, leds, inserts and solder components (resistor, capacitor, diodes, transistors, IFT type coils, DIL, ICs etc) on a PCB

7. Wiring of. a small circuit on a PCB/tag strip tag strips involving" lacking, sleeving arid use of identifier tags

8. Desolder, remove and clean all the 'components, wires, from a given equipment, APCB or a tap strip

9. Soldering Iron

10. Temperature Control Soldering Iron

11. Desoldering pump

12. Desoldering strip

13. Exposure modern soldering and desoldering processes
14. Field visits

15. Demonstrate (or explain) the joining (or connecting) methods or/and mounting and dismantling method as well as .uses of the items mentioned below:

    a) Various types, of single, multi cored insulated screened pour Audio video, general; purpose wires/cables

    b) Various types of plugs, sockets, connectors suitable for,-, general purpose audio video use. Some of such connectors area: 2 and 3 pin mains plug, and sockets,

       Banana plugs, and-sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

    c) Various types of switches' such ass normal/miniature toggle, slide, push button piano key, rotary, SPST, SPPT, DPST, DP DT, band selector, multiway Master Mains Switch.

    d) Various types of protective devices such as: Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal' fuse, single/multipole miniature circuit breakers, over and under current relays.

16. Demonstrate the skill to make faultless solder joints

17. Demonstrate the skill to remove components/wires by unsoldering

18. Demonstrate the skill to assemble, components on boards, chassis tape strips

19. Explain (or demonstrate), various method' making and laying of cable forms, wiring techniques

<u>Suggest ions for Achievement of Objectives</u>

For making students fami1iar with electronic components as .well as passive), tools, accessories, equipment (active as well passive; tools, accessories, equipment (listed as above) tutorial lessons should be used. The students must be taken to electronics laboratory and taught rating limitations, symbol, connection procedures, practice period should be used for gaining physical examination, testing, wiring, mounting, connecting .jointing exercises. General purpose equipment listed above should be operated and used by them. Such parameters an amp1itude, frequency phase, time period, rise and fa11 time of pulse waveforms , transistor parameters , circuit resistance should be measured by students in the laboratory.

The situation requiring the use of low power and high power soldering irons and tips should be discussed and should be a part of training.

The use of de-soldering wick, desoldering tool, solder sucker, desoldering of ICS and multipin components need Variety of soldering exercises involving different and cables should be included as practical work.

13. IC 330 INDUSTRIAL INSTRUMENTATION

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RATIONALE

Syllabus has been designed to give thorough insight in the measurement of different parameters in the field of instrumentation engineering. Different methods of measurement and their appropriate selection with limitation have also been taken up to bring the students to a level where they will be able to solve practical problems faced n the field. the relation between the final and primary process control components and functioning of various components have also been dealt with coverage is also given to various types of control valves and their applications., Application in industry have also been dealt with.

DETAILED CONTENTS

1. Temperature

Importance of temperature measurement in an industry, seeback effect, Peltier's effect, Temperature scales and conversions.

Principles of working, materials of constructions, advantages and limitations of the following :

- Vapour filled thermometer, gas filled thermometer, liquid filled thermometer, mercury in glass thermometer
- Bimetallic thermometer
- Pressure spring thermometers
- Thermocouples
- Resistance thermometers
- Thermisters
- Radiation pyrometers
- Opticals pyrometers
- Location of sensor for measurement speed of response of sensor
- Lead wire compensation
- Installation of thermometers

Level :

Importance of level measurement; principle of working material of construction advantages and limitations of the following :

- Visual Level indicators
- Ordinary float type using strings and pulley
- Purge method
- Bouyancy method
- Prsistance probes for level measurements
- Capacitance probe for level measurements
- Ultrasonic level measurements
- Gamma ray level measurements
- Level limit switches
- Level measurement in pressure vessels
- Solid level measurement techniques

Mechanical Flow

Mechanical flowmeter – Principle of working and constructional features, reciprocating piston, nutating discs, oscillating dises, helix oval gears.

Differential pressure meters – types, construction features, working and applications of orifice plate, venture tube, dall tube, flow nizzle pitot tube, differential pressure transmitter, shunt flow meter for liquid and gases, variable area flowmeter, rotometer, electro magnetic and ultrasonic flow meters mass flow meters target flow meters and turbine flow meters

Pressure

Principle of measurement of absolute and gauge pressure, units of pressure and conversion – different type of manometer, principle of working of bellows, bourdon capsule and diaphragm pressure switches vaccum gauges.

OF PRACTICALS

To determine time constant and reading time of thermocouple and
RTD (resistance temperature detector)

To fine the temperature coefficient of a RTD and thermister

3. To calibrate an instrument using a thermocouple
4. To determine the time constant of thermal process like an oven
5. To study and use radiation pyrometer for measuring high temperatures.
6. To study and use an optimal pyrometer for measuring high temperatures.
7. To study and verify the operation of a level limit switch
8. To measure level in tank using a purge method
9. To use a capacitance probe along with the measurement circuitry to transducer liquid level into a voltage
10. To disassemble and assemble a bourdon pressure guage
11. To calibrate a Rutameter
12. To verify the working of different types of pressure gauge
13. To calibrate on instrument using RTD
14. To calibrate on instrument using thermister

14 EX 331 DIGITAL ELECTRONICS

L T P
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RATIONAL

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 a background in the broad field of digital systems design microprocessors

DETAILED CONTENTS

1. Introduction (1 Hr)

   a) basic difference between analog and digital signal.

   b) Application and advantages of digital signals.

2. Number System: (4 Hr)

   a) Binary and hexadecimal number system; conversion from decimal and hexadecimal to binary and vice- versa. BCD representation.

   b) Binary addition, subtraction, multiplication and division including binary points. BCD addition.
   1's and 2's complement method of addition/subtraction

3. Logic Gates (4 Hr)

   a) Concept of negative and positive logic

   b) Definition, symbo1s and truth tab1e of NOT, AND, OR NAND NOR EXOR Gates. NAND and NOR as universal gates.

4. Logic Simplification (4 Hr)

   a) Postulates of boolean algebra, DE Morgan's Theorems, Various identities. Formulation of truth table and boolean equation for simple problem. Implementation of Boolean (logic) equations with gates

   b) Karnaugh map (up to 4 variables) and simple application a in developing combinational logic circuits

5. Logic Fami1ies (5 Hr)

   a) Logic fami1y c1assification :

      - Definition of SSI, MSI, LSI, VLSI
      - TTL and MOS f ami1ies & their subc1assification.

- Characteristics of TTL an d MOS digital gates delay, speed noise margin, logic level, power dissipation, fan-in, fan-out, power supply requirement and comparison between TTL and MOS families.
- Interfacing TTL and MOS ICs.

b) Logic Circuits: (3 Hr)

Open collector, wired OR and totem pole output circuit operation (qualitative) for a TTL NAND gate

- MOS circuit operation for a standard gate (NOR)

c) Tristate Switch / Buffer

6. Codes and Parity (4 Hr)

a) Concept of code, weighted and non-weighted codes examples of 8421, BCD, excess-3 and Grey code.

b) Concept of parity, single and double parity and error detection

c) Alphanumeric cades: ASCII & EBCDIC

7. Arithmetic Circuits (2 Hr)

a) Half adder & Full adder circuit, design and imp1ementation.

b) Half & Full subtractor circuit, design and imp1ementation.

c) 4 bit adder/subtractor.

8. Decoders,Disp1ay Devices and Associated Circuits (3 Hr)

a) LED, LCD, seven segment display, basic operation of various commonly used types

b) Four bit decoder circuits for 7 segment display and decoder/driver ICs.

9. Multiplexers and De-mu11ip1exers (3 H r)

Basic functions and block diagram of MUX & DEMUX. Different types

10. Latehes and Flip F1ops (4 Hr)

a) Concept and types of latch with their working and applications
b) Operation using waveforms and truth tables of RS, T, D, JK, Master/Slave JK flip flops.
c) Difference between a latch and a flip flop

11. Counters (6 Hr)

a) Binary counters
b) Divide by N ripple counters (inc1uding design), Decade counter
c) Presettable and programmable counters
d) Down counter, up/down counter
e) Synchronous counters (only introduction)
f) Difference between Asychronous and Synchronous counters
g) Ring counter with timing diagram

12. Shift Register (4 Hr)

a) Introduction and basic concepts including shift left and shift right.
b) Serial in parallel out, seria1 in .serial out, parallet in serial out, parallel in parallel out.
c) Universal shift register
d) Buffer register, Tristate Buffer register

13. MEMORIES (3 Hr)

Basic RAM cell, N x M bit RAM. Expansion of wordlength and capacity, static and dynamic RAM, basic idea of , ROM. PROM, EPROM and EEROM.

14. A/D. and D/A CONVERTERS (3 Hr)

General principle of A/D and D/A conversion and brief idea of their appl1ications. Binary resister network and resister ladder network methods of D/A conversion. Dual slope and successive approximation types of ADCs.

LIST OF PRACT ICALS

1. AND, OR, NOT, NAND, NOR and EX-QR ICs

Verification and interpretation of truth tables for AND, OR, MOT NAND, NOR and Exclusive OR (EX-QR) gates

2. Logic functions using Universal gates:

- Rea1isation of logic functions with the help of NAND or NOR gates

- Construction of a NOR gate latch and verification of its operation

3. Half adder and Full adder Circuits:

- Construction of half adder using EX-OR and MAND gates and (verification of it s operation
- Construction of a full adder circuit using EX-0R and NAND gates and verify its operation

4 4 bit adder/subtractor circuit

Construct ion of a 4 bit adder 2's –complement subtractor circuit using an 4 bit adder IC and an EX-OR IC and verify the operation of the circuit

5. IC Flip-flop

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)

6. Display devices and their decoder/drivers:

Familiarisation and use of different types of single LEDs, common anode and common cathode seven segment LCD displays

Use of '47',' '48' (or equiva1ent) decoder/driver ICs for 7 segment dis1ays

7. Tristate gate ICS:

Verification of truth table and study the operation at tristate buffer IC '126 or equivalent

Construct ion of a 4/8 bit bidirectional bus by using an appropr1ate IC

8. Decoder, encoder, mu1tip 1exerand demultiplexer

- Verification of truth table for one/two each of encoder and decoder ICs
- Verification of truth table for one/two each of multiplexer and demultiplexer ICs

9. Shift register

- 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.

- Construction and testing for its operation of a 4 bit ring counter using JK flip flop

10. Universal shift Registers IC

Verification of truth table for any one universal shift register IC

11. Asynchronous Counter ICs

- Use of 7490 equivalent TTL (a), divide by 2 (b) divide by 5 (c) divide by 10 counter

or

- Use of 7493 equivalent or TTL (a) divide by 2 (b) , by 8 (c) divide by 16 counter

12. To construct and test 4/8 bit D/A converter using IC.

13. To construct and test 4/8 bit A/D converter using IC.

Note: The students should be exposed to different digital IC's, related to the experiments and the data book**.**

15. IC 331 NETWORK ANALYSIS

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RATIONALE

The study of networks and filters taker off form principles of A.C theory and introduces the students to parameters and characterstics of various networks including filter and helps in understanding their basic use for various control system design circuitry.

DETAILED CONTENTS

1. Signal waveform and specification : Exponential step ramp and impulse functions. periodic waveforms, the sinusoidal average peak and effective values.
2. Network elements and their characterization : Terminal properties of R.C and L elements, V-I relationships for mathematically coupled coll, voltage and current, dependant and independent sources, sourse transformation.
3. Fundamentals of network analysis : Kirchoff's laws, analysis of series, parallel and series – parallel network, Tropological considerations (Elementary ideas only) loop and nodal analysis dual consideration.
4. Transient response of simple circuits : RL, LC and RLC series, parallel and series – parallel <w>.. time constant; initial conditions.
5. Steady state response of AC ckts. : Phasor representation of sinusoidual impedance concept, Active and reactive power, power factor, Q of inductor and capacitor, series and parallel response, Bandwidth and selectivity.
6. Network theorems and Transformations : Star mesh convension, reciprocity, Theyenin's Norton's maximum power transfer and tellegen's theorems, their statements and application to the solution of network with DC and AC excitation.
7. Coupled circuits : Inductive coupling, coeff, of coupline. frequency response of single and double tuned okts.
8. Fourier series : Evaluation of Fourier coeff. of periodic non-sinusoidal waveforms.
9. Laplace transforms : The laplace transform and its properties, partial fractional expansions. The initial and final value theorem. Application of Laplace Transform to networks with step and pulse excitation of initial conditions. Convolution integral.

10. Networks :

(a) One short network : Series and parallel tuned circuits, expression for their impedence in terms of Q and component value (LCR) frequency and Q.

(b) Two part (Four part Terminals) Network, : Basic concepts of the following terms.

- symmetrical and asymmetrical networks :

Balance and unbalanced networks; Pi network, ladder network : lattice network :

- Representation of a two part black box in terms of z,y and h parameters and mentioned of applications to transistor as a two part network.

(c) Symetrical network : concept and significance of the terms chateristic impedence, propagation constant, attenuation constant, phase shift constans.

- Expression for characteristics imbedence, progagation constant, attenuation constant and phase shift constant in terms of zo, zoc for the following

  - T network
  - Pi network

11. Reliability of one port : Properties of driving point impedance functions of passive lumped networks, Brunes positive. Hurwitz polynominal, Necessary and sufficient conditions for positive realness, concept of stability and conditions for stability.

12. Filters & Attenuators : Brief idea of the use of filter networks in different communication system, Concept of low pass, high pass, based pass and band stop filters. Basic response of butter worth chebychey and caner type filters. Units of attenuation and then characterstics. Design of simple attenuations of phie and tee type.

16. EX 333 ELECTRONIC DEVICES AND CIRCUITS - II

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RAT IONALE

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 (6 Hr)

Need of mu1tistaq e amp1ifier , different coupling schemes and their working; brief mention of application of each of the types of coupling, working or R-C coupled and transformer coupled multistage ap1ifier, approximate calculation of voltage gain of two stage R-C coupled amplifier 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 circuit diagram and its working.

2. Transistor Audio Power Amplifiers (6 Hr)

Difference between voltage and power amplifiers; importance of impedance matching in power amplifier, collector efficiency of power amplifier. Typical single ended power of output power; heat dissipation curve and importance of heat sinks; class A, class B and class Camplifiers; collector efficiency and distortion in class A, B and C amplifier (without derivations) working principles of push pull amplifier circuits, its advantages over single <W> 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 advantage. Transformerless audio power amplifiers and their typical applications.

3. Feedback in Amplifier (6Hr)

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)

Typica1 feedback circuits;

RC coupled amplifiers with emitter by pass, capacitor removed

Emitter follower and its application, simple mathematical analysis for voltage gain and input impedance of above circuits.

4. Sinusoidal Oscillators
(5 Hr)

App1ication of oscillators.

Use of positive feedback and negative feedback resistance for generation of oscillation. barkhausen criterion for oscillations.

Different oscillator circuits turned collector Hartley, colpitts', phase shifts, wiens bridge and crystal oscillators and their working principles (no mathematical derivation)

5. Tuned Voltage Amp1ifiers (5 Hr)

Classification of amplifiers on the basis of frequency, Series and parallel resonant circuits, expression for resonant frequency, expression for impedance as, resonance: relationship between resonant frequency, Q and Band width (no derivation) Hybrid equivalent circuits of translator and its parameters, in h parameters, single and doub1e amplifiers; their working principles and frequency (no mathematical derivation) Concepts of neutralization. Staggered tuned amp1ifier and typical app1lcatons in brief

6. Opto Electronics Devices and Their Applications (5 Hr)

Working principles and characteristics of photo resistors, photo diodes, photo transistors, photo voltaic cells, LEDs LCDs and opto couplers. Simple application of electronic devices (one examp1e of each may be mentioned.

7. Operational Amp1ifier (5 Hr)

Characteristics of ideal operational amplifier and it, block diagram, definition of inverting and non-inverting input, differentia1 voltage gain, input and output volt ages, offset current, input bias current, common mode rejection (CMRR.), Power Supply Rejection Ratio (PSRR) and rate. Method of offset, Null Adjustment, use of Opamp as an Invertor, Scale changer, Adder, Subtracter, Different integrator.

Schmitt trigger circuit, time base generator circuit time S/H switch circuit.

LIST OF PRACTICALS

1. Two stage R.C. Coupled Amplifier

   i) To measure the over all gain of two stages at 1 KHZ and compare it with the gain of Ist stage. Also to observe the loading effect of second stage on the first stage.

   ii) To plot the frequency response curve of two stage amplifier and compare it with that of the single stage amp1ifier.

2. Transistor audio power amplifier

   i) Transistorized single ended power amplofier measurement of optimum load, maximum undistorted power (by giving maximum allowable signal) efficiency and percentage distortion factor.

   ii) Same measurement as above for the transistorized push-pull amplifier

   iii) Same measurement as in (i) for a comp1ementary symmetry amplifier

3. Feedback in Amplifier

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

   ii) Emitter follower circuit measurement of vo1tage <W> and plotting of frequency response curve.

4. Sinusoidal Oscillator

   i) Hartley/Colpittis oscillator circuit measurement of frequency and amplitude, oscillation by plotting the waveshape from CRO

   ii) Wein bridge oscillator circuit - measurement of resonant frequency and amplitude of oscillations by plotting the wave-shape from CRO

5. Tuned Vo1tage Amplifier

   i) Series and parallel resonant circuit – measurement of resonant frequency. P1otting of the resonance curve (i.e. graph between input, frequency and impedance) and calcu1ation of Q of the resonant circuit from this plot.

   ii) To measure the frequency response, of single tuned voltage amplifier and calculate the Q of the tuned, circuit 1oad.

6. Use of op-amp (IC 741) is inverting. and non-inverting amplifier, adder, integrator, buffer, scale changer

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

8. Identification of package types and terminals and familiarization with characteristic and ratings using data book for various optoelectronic devices like photo transistor, photo diode, LED, LDS and Photo Voltaic Cells (any three)

17. EX 334 ELECTRONICS FABRICATION TECHNIQUES

L T P
1 - 6

RATIONALS

The study of electronic manufacturing practices is a detailed study of design and fabrication of PCBs with a view to, assemble desired instruments. The topic of production, testing and documentation have been included to give an overall picture of the process of manufacture of electronic devices and systems. Particularly, the, students should be oriented to practise and draw on the skills acquired in various workshops attended by them earlier.

DETAILED CONTENTS

1. PCB board materials, their characteristics and limitations (1 Hr)

2. Surface treatment, painting, anodising, p1ating corrosion and its prevention (2 Hr)

3. Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multi-layer PCBs. (4 Hr)

4. Standards of board sizes. Modular assemblies edge connectors, multi board racks, flexible boards. (1 Hr)

5. Assembly of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering. Solderability, composition of solder. Edge connector. Elements of, <W> shaping.

<W>

6. Production: (<W>)

Storage and supply of components for assembly, <W> incoming inspection of components, assembly line reduction, tools and jigs per lead bending. Manual and <W> insertion techniques. Closed loop assembly of modules and/or complete instruments. Specific examples of small scale and large scale production be given to illustrate above mentioned methods

7. Testing: (5 Hr)

Jigs and fixtures for operational testing of modu1es/sub-assemblies. Sequence testing for failure analysis. Environmental testing at elevated temperature and humidity, Vibration and mechanical endurance testing. Packing for transportation

8. Documentation: (5 Hr)

   Statement of brief specifications, detailed specifications and limitations. Block diagram, detailed diagrams. Testing and checking points. Warning relative to high voltage for hand1ing during repair. Fault 1ocation guide. Simple solutions for fault removal

9. Computer aided manufacturing Practices (3 Hr)

10. Production Planning (2 Hr)

11. CNC drilling, photo p1ating (1 Hr)

PRACTICAL WORK

1. Preparation of PCBs (Handmade and screen printed) from schematic diagrams (4-6 examp1es such as single transistor voltage stabilizer, regulated supply, timer etc.)

2. Fabrication of small equipment inc1uding chasing, front pane1 etc (4-6 jobs of increasing job of increasing proportionality) involving different techniques of making chassis/cabinets, panel engraving.

<w> APPLIED MECHANICAL ENGINEERING

L T P
3 – 2

<w>
Technology is integration of different branches <w> are put together to achieve required functional <w> are therefore required to know the basics <w> engineering branches so as to have a clear <w> the process equipment and controls. The <w> Engineering has been prepared with a view <w> with the basics of mechanical engineering.

DETAILED CONTENTS

<W> stress and strain

<w> Young's modulus, rigidity modulus, bulk modulus <w> ratio. Properties of materials. stress – strain <w> a ductile metal, working stress, ultimate stress <w> safety resilience – strain energy. temperature <w> stress in composite bars

<w> and application of : Helical springs deflection <w> deflection under compression and torque of <w> springs, spiral springs, taut bands, helical <w> springs and leaf springs.

<w> Compound

<w> working and application of diaphragm, capsule <w> elements,, bellows

<w>

<w> of a link, kinematic pair, kinematic chain <w> inversions machines, simple mechanisms with lower <w> bar chain slider crank chain, double slider <w> higher pairs.

<w> of Fluids :

<w> of fluid (viscosity, specific weight, specific <w> specific gravity)

<w> law concept of static pressure. intensity of <w> and total pressure head, total pressure on a plain <w> centre of pressure (without proof).

6. Flow of Liquids :
   Types of flow (laminar and turbulent). Reynold number, rate of discharge, law of continuity potential pressure and kinetic energy. Bernoulli's Throem (without proof)

   Concept of atmospheric pressure, gauge pressure, absolute pressure vacuum and differential pressure.

   Concept of water turbines and pumps

7. Principles of fluidics

8. Gas Laws :

   Boyle's law, charle's law, Joule's law, characteristic equation, gas constant universal gas constant

9. Laws of thermodynamics :

   Zeroth law, first law of thermodynamics, equation of first law. Second law of thermodynamics concept of entropy

10. Processes :

    Constant volume constant pressure isothermal adiabatic and polytropic processes, Throttling and free expansion Work done under these processes

11. Principle of working of a steam power plant and a gas power plant.

LIST OF PRACTICALS

1. To prove the relationship, p=wh for various fluids

2. To measure the pressure head of water in a pipe line by
   a) Piezometer tube
   b) U-tube or double column manometer
   c) Inverted U-tube
   and compare it with the measurement made by means of a pressure gauge.

3. To verify the Bernoulli's theorem

Visit : To visit a hydro-electric power plant and note the position of its each equipment/component and instrument. Draw a scheme diagram and give function of its each part/component briefly.

4. To study functional features of a steam power plant through visit and through models

5. To study the constructional and functional features of a steam turbine.

19 EX 432 INTRODUCTION TO MICROPROCESSORS

L T P
3 - 2

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 bring them face-to-face with mainframe systems. Thus the study of microprocessors relevant in finding of hardware of microprocessors and computer.

Microprocessors find application in process industry. They are also a part of the electronic. They are also a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessors is an area of application. Students of electronics engineering often use microprocessors to introduce programmable control in then projects, in industrial training.

DETAILED CONTENTS

1. Introduction

   a) Typical organization of a microprocessor system function of its various blocks.

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

2. Architecture of a Microprocessor
   (with reference to 8085 microprocessor)

   a) Concept of Bus, Bus organisation 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 (AD-AD). Generation of read write control signals.

3. Memory organization, and I/O interfacing

   a) Memory organisation, memory map. Partitioning of total space. Address decoding, concept of IO mapped I/O and memory mapped IO. Interfacing of memory and I/O devices.
   b) Concept of memory mapping.
   c) Concept of stack and its function

4. Programming (with respect tof 8085 microprocessors (10 Hr)

   a) Brief idea of machine and assembly languages. Machine to Mnemonic codes.

b) Instruction format and Addressing mode. Identification of instructions as to which addressing mode to belong.

c) Concept of Instruction set. Explanation of the Instruction of the following groups of instruction set (of 8085):

Data transfer groups, Arithmatic Group, Logic Group Stack. I/O and Machine Control Group

d) Programming exercises in assembly languages. (Example can be taken from the last of experiments)

5. Instruction Timing and Cycles (4 Hr)

a) Instruction cycle, machine cycle and I states
b) How a stored programme is executes. Fetch and execute cycle.

6. Interrupts (3 Hr)

Concept of interrupt, maskable and non-maskable. edge triggered and level triggered interrupts. Software interrupts. Restart instruction and its use.
Various hardware interrupt of 8085. Servicing interrupts, extending interrupt system.

7. Data transfer techniques (5 Hr)

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

8. Brief idea of interfacing chips : 8255, 8253, 8279 and 8259. (4 Hr)

9. Comparative study of 8 bit microprocessors i.e. 8085, Z80, 6809 (1 Hr)

LIST OF PRACTICALS

1. Addition of two 8 bit numbers

2. a) To obtain 2's complement of 3 bit number
   b) To subtract a 8 bit number from another 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 an other register.

4. Count the number of kit 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 an other sixteen bit number

8. Multiplication of two 8-bit numbers by repetitive addition

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

20. EX 433 ELECTRONIC INSTRUMENTS AND MEASUREMENTS

L T P
3 - 2

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 then specifications. Skills in fault diagnosis and repair of instruments will also be imparted.

DETAILED CONTENTS

1. Basic of Measurement (2 Hr)

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

2. Multimeter: (3 Hr)

   a) Principles of measurement of dc voltage and dc current, as voltage, ac current and resistance in a multimeter.

   b) Specifications of a multimeter and their significance.

   c) Limitations with rewards to frequency and input impedance.

3. Electronic Voltmeter (3 Hr)

   a) Advantages over conventional multimeter for voltage measurement with respect to input impedance and sensitivity.

   b) Principles of voltages, current and resistance measurements (block diagrams only).

   c) Specifications of an electronic. Voltmeters/Multimeters and their significance.

4. AC Millivoltmeter (3 Hr)

   a) Types of AC millivoltmeters: Amplifier-rectifier and rectifier-amplifier. Block diagram and explanation of the above types of ac voltmeter

   b) Typical specification and their significance

5. Cathode Ray Oscilloscope (8 Hr)

a) Construction of CRT, Electron gun electrostatic focusing and acce1eration (Explanation mathematical treatment) deflection sensitivity, brief mention of screen phosphor for CRT in relation to their visual persistence and chemical composition

b) Explanation of time base operation and need for blanking during flyback; synchronization

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

d) Specifications of a CRO and their significance

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

d Special feature of dual treace, delayed sweep and storage CROs (brief mention only); introduction in digital CROs

e) CRO probes, including current probes.

f) Digital Storage Oscilloscope: Block diagram and principle of working.

6. Signal Generators and Analysis Instruments (4 Hr)

a) Block diagram, explanation and specifications of

- laboratory type low frequency and RF signal generators

- pulse generator, and function generator

b) Brief idea for testing, specification for the above instruments

c) Distortion factor meter, wave analysis and spectrum analysis

7. Impedance Bridges and Q-Meters (3Hr)

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

b) Block diagram and working principles of a Q-meter

8. Digital Instruments: (10 Hr)

a) Comparison of analog and digital instruments characteristics of a digital meter.

b) Working principles of ramp, dual slope and integrating type of digital voltmeter

c) Block diagram and working of a digital multimeter

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

e) Principles of working and specifications of logic probes, signature analyser and logic analyser.

b) Digital LCR bridges.

LIST OF PRACTICALS

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

   d) To observe the limitations of a voltmeter for measuring high frequency voltages and currents.

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

3. Measurement of time period, frequency, average period, and phase single using CRO

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

5. Measurement of rise, fall and delay time using a CRO

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

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

21 IC 431 PRINCIPLES OF INSTRUMENTATION & TRANSDUCERS

L T P
3 - 2

RATIONALE

This syllabus has been designed to make a base for Understanding of instrumentation technology. The basic principles involved in instrumentation, displays etc, are included in the syllabus. The students will be able to identify different types of instruments, sensors and transducers used in the field of instrumentation. The students will also be able to select appropriate transducers relating to process that will <W> know about the conditioning of a signal from a <W> the purpose of indication/control. Faculty is advised to <w> them and make them familiar will tranducers while covering the topic.

DETAILED CONTENTS

1. Basic Building blocks of any instrumentation <w>

   - Scope and necessity of instrumentation.
   - Neames of important process variables, their units.
   - Building blocks of instrumentation system.
   - Various testing signal.
   - Controlling system and controllers
   - Display system : Analog and digital
   - Typical specification to be given regarding an instrument.

2. Performance Characteristics of Instruments

   - Concept of time constant, response time, nature Frequency, damping coefficient.
   - Order of instruments
   - Step response of different of orders of instrument systems

3. Display Means

   - Various indicating, integration and recording methods and their combination
   - Merites and demerits of circular chart and strip chart recorders

- Basic of printing devices.

- Scanning and data logging

4. Basics Definition

   Classification – definition of terms used – accuracy, Precision, sensitivity, linearity, hysterisis etc, selection Criteria of tranducers.

5. Variable Resistance Tranducers

   - Basic principles; potentiometrs strain <w> Cells – temperature compensation – applies <w>

   - Hot wire anemometers: photo resistors <w> <w> <w>

   - Resistive temperature transducers,

   - Thermistors and their circuit; carbon microphones

6. Variable Inductance Transducers

   Basics principles, EI pick ups induction potentiometers LVD (linear variable differential transformer) variable reluctance accelerometers

7. Variable Inductance Transducers:

   Basic principles, capacitance pickups. considense microphones, differential capacitance pick <w> conditioning circuits. Measurement of pressure liquid leve moisture etc.

8. Piezo Electric Transducers

   Piezoelectric crystals and their properties, general general <w> of piezoelectric transducers, accelerometers, jerk <w>, <w>

9. Magnetostrictive transducers

   Magnetoelastic property of nickel and permalloy Measurement of force, acdeleration, torque.

10. Other transducers

    - Based on Hall effect, eddy current ionisation

    - Optical transducers

    - Digital transducers, single shaft encoders

    - Thermocouple sensor photo voltaic cell

- Tachogenerator

- Synchros (Selsyns)

- Selection of sensors for measurement of following Parameters : Temperature, pressure, flow and level vibration, displacement speed.

11. Principles of operation, construction details and transfer functions of : Electrical components like limit switches, polentiometer, synchros, auto transformer, servomotors (DC & AC), stepper motor, magnetic amplifiers, operation amplifiers, application to typical servo system.

12. Pneumatic components; flapper nozal system, bellows & relays Lock up relays,

    Hydraulic components: principle of operation of hycraulic amplifier, electropnuematic relays; construction are application, control valves and actuators – concept are type of control valves and their characteristics, principles of operation and constructional details of solenoid valve motor operated valve diapharagm operated valves, power cylinders, piston operated valve. Handwheel <w> control valves and its application selection of valves CV Cb factors.

LIST OF PRACTICALS

1. Study of strain gauge and measurement of strain in given sample.

2. Study of synchro transmitter and receiver

3. Study of piezoelectric pressure transducer

4. Study and calibration of L.V.D.T.

5. Study of variable capacitive transducer

6. Study of variable inductive transducer

7. Study of servomoter

8. Study of pneumatic control valve

9. Study of solenoid valve and motor operated valve.

10. Study of optical transducer.

22 IC 433 MINOR PROJECT WORK

L T P
- - 6

Minor project work aims at exposing the student to the various industries. They are expected to 1earn about the construction, working principles of different electronic and Micro processors based instruments. It is expected from them get accqunitated 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 an interest of students they are sent to :

1. Chemical Industry
2. Power Plant
3. Sugar Factory
4. Paper Industry
5. Fertilizer Factory
6. Hospital
7. Automobile Industry
8. Petro Chemical Industry
9. Air Lines

As a minor project activity each student as supposes 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 respective subject teachers Each teacher may guide a group of 4 to 5 students.

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

	Criteria	Weightage
a)	Attendence and Punctua1ity.	15%
b)	Initiative in performing tasks/clearing new things	15%
c)	Relation with people	15%
d)	Report writing & seminar	55%

23. CM.403 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P
4	-	-

RATIONAL

The knowledge of this subject is required for all engineering technicians, but it becomes more important for those who intend to choose industry for their career. This course designed to develop an understanding of various function of managements, role of worker, foreman and engineer industrial safety, marketing, entrepreneurship, inventory industrial legislation.

DETAILED CONTENTS

1. Introduction

Pattern of economics i.e. socialistic economy capitalistic economic and mixed economy. Industrial Growth in India.

2. Business Organisations

Salient features of sale proprietary. partnership private and public limited companies. cooperative societies and public sector.

Role of public and private sectors in growth of economy and their social obligations towards society : monopoly and price restriction.

3. Entrepreneurship

Entrepreneurial qualities selection of product, estimation of capital expenditure resources of capital financial agencies, procedural formalities for registrations of firm Exposure to sales tax registration import export procedures and project report preparation..

4. Financial Management

Brief idea of money banking, international trade foreign exchange, various taxes such as property, wealth company income, excise duty, sales tax, finance forecasting. Types of accounts and account books, trial balance final accounts and statements.

5. Personnel Management

Duties and responsibility of personal department manpower planning, sources of employment. recruitment selection, various methods of testing. training and development of workers and supervisors promotions Promotion retrenchment. Industrial relations discipline.

Industrial fatigue, leadership, attitudes and human Behaviour, morale maintenance, motivation systems, payment of Wages, personnel records.

6. Technician

Role of engineer and technical of the industry and in society duties and responsibilities of a technician (foreman) towards management, workers and work.

7. Industrial Safety and House Keeping

Magnitude and cost of accidents, causes of accident, job safety analysis, safety planning and its implementation safety education instruction and visual aids, obligatory provisions, first aid, investigation of accident, fire Fighting, BIS standards, security watch and ward.

8. Marketing

Importance of marketing, theory of demand and supply forecasting demand and supply, product pricing, branding and packing, sales promotions, advertising and publicity, warranty, after sales service, product improvement and development, salesmanship, tenders and contracts installation and commissioning, feedback invoicing and trade documents.

9. Industrial Legislation

Important provisions of the following acts: Factory Acts ESI, GPJ, Bonus, Trade Union, Industrial Dispute, Shop Minimum Wages, Compensation, Apprenticeship, Payment of Wages Acts and Commercial Establishment Act.

24 IC 532 INDUSTRIAL AUTOMATION

L T P
3 – 2

RATIONALE

Industry is adopting modern manufacturing system involving automation by way of computer and software. Diploma holders will the employed in section of new technology of factory of tomorrow. The are expected to understand advanced manufacturing system and make adaption of these methods to their requirement.

DETAILED CONTENTS

1. Flexible manufacturing system :

   Concept, subsystems of FMS, scope, comparison with other methods of manufacturing, types of FPS, FMS lavour.

2. CAD/Cam Integration :
   Introduction data base management, design engineering change control, management information system communication network, automated process planning and group technology, manufacturing and data preparation case study of CAD and CAM for mould making, 3-D modeling

3. Computer Integrated Manufacturing Data base and Manufacturing System :

   Data base management of CIM, features of database : DBMS architecture, query language, SQL as a knowledge base query language.

4. Shop Floor Data Calculation System :

   Shop Floor control, data collection types of data.

   Data input techniques : automatic data collection system.

   Barcode technology, voice recognition optical character recognition, smart cards, data acquisition system, types of simulation & trends.

   Application case study using simulator package.

5. Manufacturing Systems Integration Using CAD/CAM & CIM.

   Step to implementation of CIM.

LIST OF PRACTICALS

1. <w>
2. <w>
3. Use of any RDBMS package (Dbase prolac)
4. Exercise on computer added process.
5. Exercise on M.R.P. (manufacturing resources and planning)
6. Exercise on C.M.M. (coordinate measuring machine)
7. Exercise on C.A.T. (computer aided testing)
8. Exercise on flexible inspection system.
9. Use of powerful computer like Pentium to handle dimensional data.
10. Use of A.I. (artificial intelligence) and expert system for robot central and process planning.
11. Exercise on networking (LAN & WAN)
12. Demonstration of MAP & TOP (manufacturing automation protocol & technical office protocal)
13. Knowledge of structure query language (SQL).
14. Use of ethernet

25 EX 538 INDUSTRIAL ELECTRONICS

L	T	P
3	-	2

RATIONALE

Electronic adapted to industrials plant, in terms of timings, action switching and action or parameter control, its called 'Industrial Electronic'; other common areas of application where electronics is increasing its interface with other branching of engineering include temperature control, welding control, speed regulation of motor and soldering. The student should study this subject with the view to understand the use of electronics to bring about faster and more accurate response in industrial plants.

DETAILED CONTENTS

1. Name Symbol characterisctics and working principles of SCR. Triac, Diac, SCS, SUS, SBS and LASCR. Mention of their applications

2. Thyristor ratings arid gate ratings. Turn on methods - DC gate , AC Gate, and Pluse Gate Triggering and R-C trigger circuits, Turn off method – Natural and Forced turn off method.

3. International power dissipation and need for Heat Sinks in thyp<W>. istors. Definition of following terms and their relations with the power dissipation of the device (no deviation).

   a) Heat Sink efficiency

   b) Heat Sink transfer co-efficient.

   c) Heat dissipating area of a Heat Sink, Concept of thermal resistance of Heat Sinks. Various Types of Heat sinks and techniques of mounting device on Heat sinks.

4. Basic structure, principle of operation and V-I characteristics of UJT. Explanation of working of UJT as relaxation oscillator and its use in thyristor triggering
5. Principle of operation and working of the following switching circuits, using SCRs and Triacs.

   a) Automatic Battery Charger.
   b) Voltage regulator.
   c) Emergency light.
   d) Alarm circuit.

e) Time delay relay Circuits
f) Circuits for over voltage and over current.

6. a) Explanation of the working of a 3 phase half wave and full wave bridge rectifier with the help of waveforms.

b) Explanation of working of following <w> rectifier using SCRS and resistive and inductive loads with the help of wave forms and appropriate mathematical expression (no deviation).
- Single phase; half wave, full wave and bridge rectifier.
- Three phase; Half wave, full wave and bridge rectifier.

7. Principle of working of AC phase control circuit using triac

8. Application of phase controlled rectifications and AC phase control circuits in:

a) Illumination control
b) Fan speed control
c) Temperature control
d) Speed control of DC and small AC motors

9. Principle of operation of Basic inverter circuits. Basic series and parallel commutated inverters.

10. Principle of induction and dielectric heating and then typical application.

11. Introduction

Basic Measurement System function its elements namely the transducer, signal conditioner, display or read-out and power supply.

12. - Digital system architecture
- Factory communication – LAN/WAN/INTERNET
- Network to network interconnection.

13. Signal Conditioners

Characteristics of instrumentation amplifiers in respect of input impedance, output impedance, drift, dc offset, noise, gain, common mode rejection ratio, frequency response, etc, relating to suitability of these characteristics for amplifying signals from various transducers. Need and working of a typical isolation amplifier

14. Operational Amplifier
15. Linear Integrated circuit

LIST OF PRACTICALS

1. Identification of various types of packages and terminals of various low and high power thyistors (SCR and Triac)

2. To determine and plot firing characteristics of SCR
   a) By varying the anode to cathode voltage
   b) By varying the gate current

3. Observation of waveshape and measurement voltage of a UJT relaxation oscillator circuit

4. Observation of. waveshapes and measurement of voltages at relevant points of an SCR. based single phase half wave controlled rectifier circuit using resistive (in phase gate triggering circuit)

5. Observation of waveshapes and measurement of voltages at relevant, points of an SCRs based single phase half wave controlled rectifier circuit using R-C phase shift gate triggering circuit

6. Observation of waveshapes and measurement of voltages at relevant points of an SCR based single phase half wave controlled rectifier circuit using UJT phase shift gate triggering

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

8. Observation of waveshapes and measurement of voltage relevant points of an SCR based single phase full wave controlled rectifier circuit

9. Observation of waveshapes and measurement of voltages at relevant points of an SCR based single phase controlled bridge rectifier circuit

10. Observation of waveshapes and measurement of voltage at relevant points in a triac based AC phase control circuit used for lamp intensity and/or AC fan speed control

11. Observe the waveforms and measure voltages at various points of a circuit for over voltage protection using SCR

12. Observe the waveshapes and measure voltage at various point levels.

26. IC 534 PRINCIPLE OF AUTOMATIC CONTROL

L	T	P
3	-	2

RATIONALE

The students are required to know about the process system which is an important factor of a plant controls. In this subject introduction to theory in control systems has been given which will enable the students to understand the process control concepts to be covered in the subsequent semesters. Faculty is advised to teach the subject by citing the practical examples.

DETAILED CONTENTS

1. Introduction to Automatic Control :

Basic elements of control systems. Definition <W> terminology used in control systems. Open loop and <w> loop system concepts of feedback. Functional block diagram of a control system. Time lag, dead time, hysterisis, linearity. Self regulating and non self regulating system. Practical examples of the above

2. Block diagram and transfer Function

Review of Laplace transforms. Transfer function of simple control components like mass spring daper, thermometer single and multi-capacity processes. Single feedback configuration.

3. Time Response of Systems :

Order of systems. Test inputs, step response of Ist order and II order system - overshoot and under shoot, rise time, damping ratio. Simple example of 1 order and II order systems. Steady state response and error

4. Introduction to stability Analysis:

Characteristic equation. ‘Rouths’ table Nyouist <w> phase margin and gain margin. Relative stability.

5. Routh – Hurwitz criterion

Root locus technique :

Bode Plot

Polar Plot

Gain margin and Phase margin

LIST OF PRACT1CALS

1. To find time lag, overshoot and other parameters or both the above circuits

2. To design and fabricate a first order system for temperature or flow or pressure of level from simulated input.

3. To find transfer function of RC circuit by Bode plot.

4. To study LVDT

5. To study torque speed characteristic or AC servo motor <w> help of magnetic/mechanical loading.

6. To study synchro

7. To study stepper motor.

8. To study the frequency domain technique using MATLAD of <w>

Bode plot, Polar plot, Root locus. Time lag, Routh Huritz.

27 EX 431 ELECTRONICS DEVICES AND CIRCUITS III

L	T	P
3	-	2

1. Waveshaping Circuits

(8 Hr)

General idea about different waveshapes. 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 waveshapes 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 peak or any other level for different input waveforms (e.g. sine, square, tri angular), Ideal transistor switch, exp1anation using C.E. output characteristics.

2. Timer I.C

(2 Hr)

Block diagram of I.C timer (such as 555) and its working. Use of 555 timer as monostable and astable multivibrators.

3. Mu1tivibrator Circuits

(5 Hr)

Concept of multivibrator: astable, monostable, bistable. 555 timer as mono and astab1e mu1tivibrator. Op-amp as monostable, astable multiivibrator and schmitt trigger .

4. Time Base Circuits

(3 Hr)

Need of time base (Sweep) wave forms, special features of time base signals. Simple method of genration 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

(3 Hr)

Fabrication of transistor by planner process, a typical fabrication process for ICS (brief explanation)

6. Regulated Power Supply

(6 Hr)

Concept of regulation. Principles of series and shunt regulators. Three terminal voltage regulator ICs (positive negative and variable appllications)

Block diagram of a regu1ated 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 nipple and transients)

Basic working principles of a switched mode power supply.
Concept or floating and grounded power supplies and their interconnection to obtain multip1e output supplies Brief idea of CVT, UPS and dual tracking power supply.

7 VCO (IC565) and PLL (IC566) and their applications (3 Hr)

8 THYRISTORS AND UJT (6 Hr)

Name, symbol, characteristics and working principles of SCR, Triac, diac, SCS, SUS, SBS and LASCR. Mention of applications.
Basic structure, principle of operation and VI characteristics of UJT. Explanation of working of UJT as <W> oscillator and its use in thyristor triggering.

LIST OF EXPERIMENTS

1. Observe and P1ot the Output Waveshape of

   i) R-C differentiating circuits
   ii) R-C integtrating circuits f or squarewave input (observe the effect of the R-C time constant of the circuit <W> the output wave shape for both the circuits

2. i) Construct biased and unbiased series and shunt clipping circuits for positive and negative peak clipping of a sine wave using switch diodes and d.c. sources.

   ii) Construct a double Clipper circuit using diode-and dc. sources and observe waveshapes

   iii) Construct a zener diode and transistor clipper <W> for positive peak, negative peak and double clipping of sine (other wave shapes)

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

3. i) To measure IC and VCE for a translator when to varied from zero to a minimum value and measure the value of 1b(sat), VCE(Sat). <W> for saturation at a given supply voltage and load.

   ii) To calculate the value and assemble and test <W> transistor switching circuits to switch on an:

   a) LED
   b) Relay
   c) 200/500 MA Lamp of 6 or 12 volts

4. To plot input vs output characteristics of Schmitt <W> circuit and plot the input output waveshapes with a sine wave input

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

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

7. To determine and plot firing characteristics of SCR by varying anode to cathod voltage, and varying gate current.

8. To note the waveshapes and voltages at various points of a UJT re1axation osci11ator circuit.

9. To plot the firing characteristics of a triac in different nodes, namely, mode I+, mode I–, mode III+, and mode III-

28 IC 543 INSTRUMENTATION WORKSHOP

L	P	T
-	-	6

RAT IONALL

The purpose of this practical subject is to give thorough practice and skill training in the fabrication of thrormocouple handling, pressure gauges. I various types of valves and flow meters. Also the student is *a a*cquainted with various types of proximate switches, sensors, timers and counters.

DETAILED CONTENTS

1. Making different type of: thermocoupies and their testing.

2. Study of different industrial thermometers, dial thermometers

3. Study of bourden pressure gauges, liquid or oil filled pressure gauges. diaphragm gauges, capsul gauges, Bellow gauges, transmitting pressure gauges, differential pressure gauges, electrical pressure gauges and master pressure gauges

4. Study of immersion probes, prick probes. bow probe. Gas probes and leaf probes

5. Dismenta1ling and assembling ail the transducers as many as possible

6. Study of different type of bronze/gun metal control valves/stainless steel control valves, boiler mounting steam control valves/cast iron/cast steel control valves

7. Study of different type of flowmeter such as rotometer, manometer etc

8. Study of different type of solenoid valves

9. Study of proximity switches, sensors, counters, timers. programmable logic controller programmable timer, programmable counters, multirange timers, rate indicators, mini temperature controller

10. Making different types of liquid level controller for filling and draining the sumps

11. Making a pH meter

12. Troubleshooting, repair and fabrication of process control instruments

IC 643 PROCESS CONTROL AND INSTRUMENTATION

L	T	P
3	-	2

RATIONALE

The Subject enables the students to study in detail different types of control systems used in instrumentation. The contents of the syllabus lead the students to appreciate the appearance and limitations of different types of process <W> Knowledge of tuning of process controls loop is <W> in lepth. The subject <W> with operation and <W> of Various controllers and their use in process <W>

DETAILED CONTENTS

1. Basic Central Loops and Characteristics :

   Simple processes 1ike : —

   - single capacity pressure system
   - single capacity temperature system
   - single capacity Level system
   - single flow loop system
   - dead time process lag – first order approx of process system.

2. Basic Controller Modes:

   Concept of on - off and throtting <w>

   - On – off ,proportional
   - Single speed floating, action
   - Integral and derivative action and their combination add their response to step ramp and sinusoidal test inputs

   Examples of on – off control systems

Example of simple systems using. Single speed floating P, P+I, P+I+D mode of control. Relative merit of P+I and P+I+ modes of control. Relative merit of the above modes of control suitability of various control actions for different application.

3. Multiloop Control:

   Introduction to feed forward, cascade and ratio control.

4. Controller Adjustment:

   Alignment and tuning, Ziegler – nichol’s method.

7. Introduction to ROBOTICS, COMPUTER CONTROL OF <w>

8. Computer control system.

PRACTICALS

1. To demonstrate on a simple system the principle of the working of synchros.

2. To rig up a driver circuit for a stepper motor and verify its working.

3. To rig up an electronic PID controller circuit and <w> step and ramp input for a proportional bend of 50%

4. To obtain the output of a pneumatic PID controller

5. To study and obtain input/output relation of a <w> relay.

6. To study and set a pneumatic PID controller.

7. To obtain input/output of an elctropneumatic converter.

8. To study the control loop for a tank level control.

9. To determine the differential gap, amplitude, frequency of oscillation of an on – off thermal system.

10. To determine the output response of thermal PID control System for a stop input when P+I action is provided.

IC 631 ADVANCED CONTROL SYSTEMS

L	P	T
4	-	2

DETAILED CONTENTS

<W> Analysis non Linear central System :
<W> Introduction to non linear Control system describing function and functionality in analysis of non linear control system

<W> Characterisation
<W> of state, matrix representation of stage equation, state transition matrix, relation between state equation and transfer function.

LIA Punew stability Analysis :
Introduction to stability <W> stability and instability, second methods <W> LIA PUNEW stability analysis of linear time Instrument system <W> method.

<W> Optimal and Adaptive Control system:
<W> operability, time optimal control system, definition of adaptive control system model reference control system.

<W> Compensation. Techniques:
Compensation. of system compensation, series and feed back compensation lag compensation, lag-lead compensation, lead lag compensation.

<W> Descrete Time system and Z Transformation:
Introduction to descrete time system Z transformation, growing differential equation by the Z transformation <W> diagram of sampled data and its analysis <W> Z.O.H. (zero order hold).

b) Sampled Data System with Digital <W>
<L>

<W> Stepper Motor :
<W> Study of stepper motor <W> reluctance, stepper motor <W> megnet stepper motor, important parameters of stepper motor apparitional features of stepper motor.
Interfacing of stepping motors to micro processors.

<W> OF PRATICALS

1. Test the stability of a given system using software by LIA PUNOV stability rule.
2. Test for controllability of given system/observability of a given system using software on a computer.
3. Interfacing of a stepper motor with a computer
4. study various types of stepper motors.

<W>. IC 636 MAJOR PROJECT (INDUSTRY BASED)

Major project work is meant for solving live problems faced in Instrumentation and control work in plants by applying the knowledge and skills gined through the diploma course Instrumentation and control. The institute offering the course will identify live problems pertaining to Electronics industries. The activity of problem identification should begin well in advance (say in the beginning of fifth semester). Students should be allotted a problem of invest to him/her as a major project work. For solving one problem there should not be more than two students in a group. The students will execute the project work under the guidance of teacher. Each teacher would not have more than 6 students for guiding major project work.

The students will be given major project assignment for a period of 6 to 8 week at a stretch in the final semester. During this project period, concerned teacher will monitor the progress of students by paying regular visits to the industry. The students will submit a comprehensive project report (in a presentable manner, preferably tayped and bound) for evaluation by the teacher guide, an expert from industry and an external examiner.

Some of the suggested projects are its follows :

1. Tachogenerator
2. Study of chemical process control, power plant instrumentation – thermal & gas.
3. Study of robots in a factory like maruti.
4. Furnance instrumentation.
5. Computer aided instruction for instrumentation.
6. Study of frequency domain techniques of control system using MATLAB.
7. PLC (Programmable logic control).
8. Instrumentation amplifier.
9. Constant voltage transformer
10. CT & PT
11. Micro processor based control system.
12. Study of control system using software.

- Any other related problems of interested of host industry.

Assessment criteria will be as under:

-	Attendance and punctuality	15% weightage
-	Initiative is problem solving	30%
-	Relationship with people	10%
-	Report-Writing	45%

ELECTIVE EX 635 COMPUTER PROGRAMMING AND APPLICATION

L T P
2 - 4

DETAILED CONTENTS

1. Information Storage and Retrieval

   1.1 Need for information storage and retrieval

   1.2 Creating data base file.

   1.3 Querying database file on single and multiple keys

   1.4 Ordering the data on a selected key

   1.5 Programming a very simple application

2. Programming in C :

   2.1 Basic structure of C programs

   2.2 Executing a C program

   2.3 Constants, variable, and data types

   2.4 Operator and expressions

   2.5 Managing Input-Output operation like reading a character, writing a character, formatted input, formatted output through printf, scanf, getch, putch statements etc.

   2.6 Decision making and branching using IF …… else, switch goto statements.

   2.7 Decision making and looping using while, do, and for statements

   2.8 Arrays – one dimensional and two dimensional

3. Computers Application Overview

   3.1 Commercial and business data processing application

   3.2 Engineering computation

   3.3 CAD, CAM, CAE, CAI

4. Use of computer for measurement and control. Overview of a computer based data acquisition & control system. Practice in the use of the systems.

5. LIST OF PRACTICALS

6. Creating database.
7. Quering the database.
8. Report generation.
9. Programming in dbase.
10. Use of spread sheets/Matlan/Mathematica/Eureka (or any other Package) for engineering computers.
11. Use of design packages (appropriate design packages may be selected depending upon the branch)
12. Use of CAI packages.
13. Programming for DAS & control.
14. Exercises on data acquisition.
15. Exercises on control – on/off switch, and proportional control.
16. Programming exercise on executing a C program
17. Programming exercise on editing a C program
18. Programming exercise on defining variables and assigning values to variables.
19. Programming exercise on arithmetic and relational operators.
20. Programming exercise on arithmetic expressions and their evaluation.
21. Programming exercise on reading a character.
22. Programming exercise on writing a character.
23. Programming exercise on formatting input using printf.
24. Programming exercise on formatting output using scanf.
25. Programming exercise on simple if statement.
26. Programming exercise on IF …….. else statement.
27. Programming exercise on switch statement.
28. Programming exercise on goto statement.
29. Programming exercise on while statement.
30. Programming exercise on do statement.
31. Programming exercise on for statement.
32. Programming exercise on one dimensional arrays.
33. Programming exercise on two dimensional arrays

IC 632 OPTICAL & ANALYTICAL INSTRUMENTATION

L T P
3 - 2

<w>
Syllabus has been designed to given an opening to a take up a topic of his choice for specialization. And analytical instruments branch is used in the (w) for checking and testing in-coming or final product (w) techniques such as leaser. Radioactive isotopes etc. <w>Included

DETAILED CONTENTS

introduction to optical glass, optical flat, mirrors, lens and prism, principle of microscopy equipment. Use of (w) projector.

Introductions to fibre optics:

(W): Ultraviolet, visible, infra-red, atomic (W) .Emission spectroscopy. Mass spectrometer and MMR (W).

principle of colorimetric, photometry and flame photometry and use of various types of color imeters. Photometers and lame photometers

Basic principles of radio activeisotopic techniques to technical to (W) measurement, nature and sources of radio (W), measurement of radioactivity, application to (W) and thickness measurements safet considerations, (W) counters and liquid scientillation counters.

(W) and redoxpotential, use of PH meters.

Chromatography, gas-liquid chrmatorgraphy, gas analysis and (W) Ionexchange,

(W) and moisture indicating, recording and controlling services.

(W) analysers.

Electrical conductivity analyzers.

Paramagenetic analysers.

Laser based instruments.

<w> LIST

To generator monochromatic light and to check the range.

To use laser for testing and checking different parameters
Used in (W) control, packings etc. e.g. size checking and sampling homogeneity of flowing liquid checking of proper quantity in mixing or two or more liquids etc.

ph measurement using ph measuring equipment.

To find the impurty, contents in the gases such as
(I)SO2 (ii) SO3 (iii) CO2
by making use of gas analysers.

To find out the, conductivity of a liquid by electrical conductivity analyzer,

To find the humidity content in the room and RH by hygrometers.

ELECTIVE EX 634 MICROPROCESSOR SYSTEM DESIGN

L T P
3 – 2

DETAILED CONTENT

1. Block diagram of Microprocessor based system. Bus structure .Selection criteria of Microprocessor for different applications.

2. Review of Microprocessors: 8085 and 8086/8088, their architecture, programming models, addressing modes and instruction set.

3. Memory Interfacing: Characteristics, Timing consideration & Address decoding. Interfacing of static and dynamic RAMs. Interfacing of ROMs.

4. I/O Interfacing: Interfacing of keyboards, displays, ADC and DAC

5. Perpheral Interfacing Chips: Block diagram operation, programming and interfacing considerations of the following chips: 8255, 8253, 8251, 8259A, 8229 and 8237

6. System Design Consideration: steps for design of Microprocessor based system. System specifications and design constraints, various design alternatives, Noise filtering & signal conditioning, Cost effectiveness, system flow diagram & block diagram. Protioning of hardware & software and their trade offs.

   Working out the major devices & components and software routines. Construction and testing of prototype hardware. Debugging of the software integration of hardware and software. Analysis of system performance in real time systems.

7. Development Tools: Software Tools and Method, Emulator, Simulator, Assembler, Debugger , MDS.

8. Interfacing Standards: RS232, IEEE488, Current loop, S100.

9. Microprocessor Troubleshooting: Typical faults, instruments for fault finding: Logic Pulser, Logic probe, Logic analyzer, Signature analyzer.

10. Design example and Case Students for example, multichannel DOS, temperature monitoring and control system. CNC machine control

LIST OF PRACTICALS

1. Practice on use of software tools: assembler and debugger.
2. Practice on working of hardware development tools: Emulation, MDS.
3. Interfacing of a multichannel A to D converter.
4. Interfacing of Stepper motor.
5. Design & implementation of a 16 channel DAS system.

ELECTIVE IC ROBOTICS

L	T	P
3	-	2

DETAILED CONTENTS

Definition of Robot element of roboties. System and need for robot. Degree for freedom of robots. Specification of robots. Programming method of robots. Geometric requirement of CAD/ROBOT linkage integration of industrial robot (W) system product design for automatic manufacture by robots.

Dynamics motion of robots, study of arm lynamics, planning of manipulator study of vision system, robot intelligence and task planning.

Robot application : robot applications. robot cell design types of robot applications. Material handling applications processing operation assembly and inspection.

LIST OF PRACTICALS

1. Microprocessor control of robot manipulater arm.
2. Study basic mode of operation to control the movement of robots (i) pick and place (ii) point to point (iii) continuous path (iv)control path.
3. Study of vision system and setting up the vision system.

Elective IC 636 BIO-MEDICAL INSTRUMENTATION

RATIONALE

The knowledge of the subject is required as a basic input for specification in biomedical equipment and instuments. The students will be made aware of the various types of basic loops and equipment such as electrodes, transducers, waveform display devices, circulatory, respiratory and therapeutic equipments.

DETAILED CONTENTS

1. Overview of Medical Electronic Equipments:

   Classification application and specification of diagnostic therapeutic and clinical laboratory equipments.

2. Electrodes:

   Elementary idea of cell structure Bioelectric signal Bio electrodes Electrodes – tissue interface Contact impedence. Effect of high contact imbedence types electrodes. Electrodes for ECG.CMG and EEG.

3. Circulatory System and Cardiac Equipments :

   The Heart, Electroconduction system of the heart, EGG wave form. The standard lead system, EGG machine block diagram working principles, Defibrillator <w> circuit and testing of defibrillator. pacemaker – operation and classification Heart lung machine.

4. Respiratory System and Related Equipment:

   The human respiratory system internal and external respiration organs of respiratory system Machines of breathing. parameters of respiration and their measurement impedance pneumograph spirometers.

5. Therapeutic equipments

   Intermittent positive pressure breathing (TPPB) respirator functional block diagram. Artificial ventilators Humidifiers nebulizer.

6. <w>y System and. Related Equipments :

The Neuton structure and function of the central <w> system. Cerebrat angiography. Elect <w> <w> electrode system BFG c<w> <w> <w> system – block <w> <w> <w> <l> Contral.

7. Musculatory System and Related Equipments :

Muscle action EMG machine – different units and working principle. physiotheraphy – short wave <w> <w> diathermy. mi crowave diathermy <w><w><w> functions and applications.

8. Blood Cell Counters :

Basic block diagram. Working principle and maintenance.

9. Operation Room Equipments :

Electrosurgery Machine Electrosurgery <w> <w> machine.

10. Neonatal Instruments :

Inbalation therapy and the Neuborn. Must the any <w> therapy. Neonatal inclubators. Photolight therapy

LIST OF PRACTICALS

1. Measurement of skin contact impedance and techniques to reduce it

2. Determine the contact impedance of following electrodes ; ECB, EEG, and EMG machines. <w> <w> transducers.

3. Study of physiological transducers <w> <w> transducers. temperature transdaver <w>

4. Study of ECG machine frequency response input <w> and CMRR measurement.

5. To study and ECG machine <w> <w> <w>.

6. Learning to use oscillioscipe and <w> <w> without memory.

7. To measure of leakage currents of <w> <w>

8. Testing of <w> <w> <w>