

**THIRUVALLUVAR UNIVERSITY****BACHELOR OF SCIENCE****B.Sc. PHYSICS****DEGREE COURSE****CBCS PATTERN****(With effect from 2012 - 2013)****The Course of Study and the Scheme of Examinations**

S.NO.	Part	Study Components		Ins. hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title							
SEMESTER I							CIA	Uni. Exam	Total
1	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2	II	English	Paper-1	6	4	English	25	75	100
3	III	Core Theory	Paper-1	6	6	Properties of Matter and Acoustics	25	75	100
	III	Core Practical	Practical-1	3	0		0	0	0
4	III	Allied-1	Paper-1	4	4	Chemistry I or Biochemistry I	15	60	75
	IV	Allied Practical	Practical-1	3	0		0	0	0
5	IV	Environmental Studies		2	2	Environmental Studies	10	40	50
				30	20		100	325	425
SEMESTER II							CIA	Uni. Exam	Total
8	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9	II	English	Paper-2	4	4	English	25	75	100
10	III	Core Theory	Paper-2	6	5	Thermal Physics and Statistical Methods	25	75	100
11	III	Core Practical	Practical-1	3	3	Any 16 Experiments given in syllabus	40	60	100
12	III	Allied-1	Paper-2	4	4	Chemistry II or Biochemistry II	15	60	75
13	IV	Allied Practical	Practical-1	3	2		10	40	50
14	IV	Value Education		2	2	Value Education	10	40	50
15	IV	Soft Skill		2	1	Soft Skills	10	40	50
				30	25		160	465	625

S.NO.	Part	Study Components		Ins. hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title							
SEMESTER III							CIA	Uni. Exam	Total
16	I	Language	Paper-3	6	4	Tamil / Other Languages	25	75	100
17	II	English	Paper-3	6	4	English	25	75	100
18	III	Core Theory	Paper-3	3	3	Electricity	25	75	100
19	III	Core Practical	Practical-2	3	0		0	0	0
20	III	Allied-2	Paper-3	7	4	Mathematics I	25	75	100
22	IV	Skill Based Subject	Paper-1	3	3	Electrical Appliances	15	60	75
23		Non-Major Elective	Paper-1	2	2	Renewable Energy Sources	10	40	50
				30	20		125	400	525
SEMESTER IV							CIA	Uni. Exam	Total
24	I	Language	Paper-4	6	4	Tamil/Other Languages	25	75	100
25	II	English	Paper-4	6	4	English	25	75	100
26	III	Core Theory	Paper-4	3	3	Mechanics	25	75	100
27	III	Core Practical	Practical-2	3	3	Any 16 Experiments given in syllabus	40	60	100
28	III	Allied-2	Paper-4	7	6	Mathematics II	25	75	100
30	IV	Skill Based Subject	Paper-2	3	3	Electronics Appliances	15	60	75
31		Non-Major Elective	Paper-2	2	2	Basic Physics	10	40	50
				30	25		165	460	625
SEMESTER V							CIA	Uni. Exam	Total
32	III	Core Theory	Paper-5	6	6	Optics	25	75	100
33	III	Core Theory	Paper-6	6	5	Atomic Physics and Spectroscopy	25	75	100
34	III	Core Theory	Paper-7	6	5	Basic Electronics	25	75	100
35	III	Core Practical	Practical-3	3	0	General	0	0	0
36	III	Core Practical	Practical-4	3	0	Electronics	0	0	0
38		Elective I	Paper-1	3	3	Group (A) or (B) or (C)	25	75	100
39		Skill Based Subject III	Paper - 3	3	3	Astro Physics	15	60	75
				30	22		115	360	475
SEMESTER VI							CIA	Uni. Exam	Total
34	III	Core Theory	Paper-8	5	4	Nuclear Physics and Radiation Physics	25	75	100

## B.Sc. Physics: Syllabus (CBCS)

S.NO.	Part	Study Components		Ins. hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title							
	III	Core Theory	Paper-9	5	4	Relativity, Quantum Mechanics and Mathematical Physics	25	75	100
35		Core Theory	Paper-10	5	4	SolidState Physics	25	75	100
36	III	Core Practical	Practical-3	6	3	Any 20 Experiments given in syllabus	40	60	100
37	III	Core Practical	Practical-4		3	Electronics	40	60	100
40	III	Elective	Paper-2	3	3	Group (A) or (B) or (C)	25	75	100
		Elective	Paper-3	3	3	Group (A) or (B) or (C)	25	75	100
	IV	Skill based Subject	Paper-4	3	3	Instrumentation Techniques	15	60	75
	V	Extension Activities		-	1			50	50
		TOTAL		30	28		220	605	825

Part	Subject	Papers	Credit	Total credits	Marks	Total Marks
Part I	Languages	4	4	16	100	400
Part II	English	4	4	16	100	400
Part III	Allied (Odd Semester)	2	4	8		175
	Allied (Even Semester)	2	4	10		175
	Allied Practical	1	2	2	50	50
	Electives	3	3	9	100	300
	Core Theory	10	(3-7)	45	100	1000
	Core Practical	4	3	12	100	400
Part IV	Environmental Science	1	2	2	50	50
	Soft skill	1	1	1	50	50
	Value Education	1	2	2	50	50
	Lang. & Others/NME	2	2	4	50	100
	Skill Based	4	3	12	75	300
Part V	Extension	1	1	1	50	50
	<b>Total</b>	<b>40</b>		<b>140</b>		<b>3500</b>

**ELECTIVE SUBJECTS**

Students can choose any one of the groups (Elective I, II & III)

**GROUP A**

Elective 1: Digital Electronics

Elective 2: Applied Electronics

Elective 3: Microprocessor and its Applications – 8085

**GROUP B**

Elective 1: Materials Science

Elective 2: Applied Electronics

Elective 3: Laser and Fibre Optic Communication

**GROUP B**

Elective 1: Fundamentals of Nano Materials and its Characterization

Elective 2: Applied Electronics

Elective 3: Medical Physics

**THIRUVALLUVAR UNIVERSITY**

**BACHELOR OF SCIENCE**

**B.SC. PHYSICS**

**SYLLABUS**

**UNDER CBCS**

**(with effect from 2012 - 2013)**

**SEMESTER I**

**PAPER – 1**

**PROPERTIES OF MATTER AND ACOUSTICS**

**UNIT – I : ELASTICITY**

Hooke's law – Stress-strain diagram – Elastic moduli – Relation between elastic constants – Poisson's Ratio – Expression for Poisson's ratio in terms of elastic constants – Work done in stretching and work done in twisting a wire – Twisting couple on a cylinder – Determination of Rigidity modulus by static torsion – Torsional pendulum – Determination of Rigidity modulus and moment of inertia and  $q$ ,  $n$ ,  $\sigma$  by Searles method.

**UNIT – II : BENDING OF BEAMS**

Bending of beams – Expression for bending moment – Cantilever – Expression for depression at the loaded end – oscillations of a Cantilever – Expression for time period – Determination of Young's modulus by cantilever oscillations Non-uniform bending – Determination of young's modulus by Koenig's method – Uniform bending – Expression for elevation – Experiment to determine young's modulus using pin and microscope method.

**UNIT – III : FLUIDS**

Surface Tension: Synclastic and anticlastic surface – Excess of pressure – Application to spherical and cylindrical drops and bubbles – variation of surface tension with temperature – Jaegar's method.

Viscosity : Viscosity – Rate flow of liquid in a capillary tube – Poiseuille's formula – Determination of coefficient of viscosity of a liquid – Variations of a liquid with temperature lubrication.

Physics of low pressure – production and measurement of low pressure – Rotary pump – Diffusion pump – Molecular pump – Knudsen absolute gauge – penning and pirani gauge – Detection of leakage.

## **SOUND**

### **UNIT – IV : WAVES AND OSCILLATIONS**

Simple harmonic motion – free, damped, forced vibrations and resonance – Fourier's Theorem – Application to saw tooth wave and square wave – Intensity and loudness of sound – Decibels – Intensity levels – musical notes – musical scale.

Acoustics of buildings : Reverberation and time of reverberation – Absorption coefficient – Sabine's Formula – measurement of reverberation time – Acoustic aspects of halls and auditoria.

### **UNIT – V : ULTRASONICS**

Ultrasonic waves – Production – Piezo electric crystal method – Magnetostriction Method – Properties – Deductions – Attenuation – Diffraction – Acoustic Grating – Velocity of ultrasonics in liquids – application of ultrasonics – Medical, Industrial and Scientific – Non destructive testing (NDT) – Classification of ultrasonic testing – Pulse echo method – Sources of ultrasound – clinical applications of different scans.

#### **Books for study:**

Properties of matter by Murugesan R, S Chand & Co. Pvt. Ltd., New Delhi.

Properties of matter by Brij Lal & Subramaniam, N Eurasia Publishing Co., New Delhi, 1989.

Text book of sound by Brij Lal & Subramaniam, N Vikas Publishing House, New Delhi, 1982.

Text book of sound by M N Srinivasan – Himalaya Publications (1991).

Science and Technology of Ultrasonics by Baldevraj, Narosa [2004].

**Books for reference:**

Elements of Properties of Matter by Mathur D S, Shymal Charitable Trust, New Delhi, 1993.

Fundamentals of General Properties of Matter by Gulati H R, R Chand & Co. New Delhi, 1982.

Waves & Oscillations by Subrahmanyam N & Brij Lal, Vikas Publishing House Pvt. Ltd., New Delhi, 1994.

A Textbook of Sound by Khanna D R & Bedi R S, Atma Ram & Sons, Jew Delhi 1985.

Fundamentals of Physics, 6<sup>th</sup> Edition by D Halliday, R Resnick and J Walker, Wiley NY 2001.

Physics, 4<sup>th</sup> Edition vols, I, II & II Extended by D Halliday, R Resnick and K S Krane, Wiley NY 1994.

CRC Handbook of Physics & Chemistry, 80<sup>th</sup> ED., CR5 Press, NY, 1999.

The Feynman Lectures on Physics, Vols. I, II and III, by R P Feynman, RB Leighton and M Sands, Narosa, New Delhi, 1998.

**ALLIED - 1**

**PAPER – 1**

**CHEMISTRY – I**

**UNIT - I**

1.1 Extraction of Metals Minerals and Ore difference - Minerals of Iron, Aluminum and Copper - Ore Dressing or concentration of Ore - Types of Ore Dressing Froth Floatation and Magnetic separation.

1.2 Refining of Metals - Types of Refining - Electrolytic, Van Arkel and Zone Refining.

1.3 Extraction of Uranium and Thorium.

**UNIT - II**

2.1 Cyclo-alkanes preparation properties of Cyclo-hexane -- Bayers strain theory.

2.2 Polarization - Inductive effect, mesomeric effect and steric effect - (Acid and Base strength.)

2.3 Stereo isomerism - Types, Causes of optical activity of (lactic acid) and tartaric acid - Racemisation - Resolution - Geometrical isomerism - maleic and fumaric acid.

**UNIT - III**

3.1 Chemical Kinetics - Distinction between Order and Molecularity - derivation of First order rate equation - half life period of first order reaction - determination of rate constant of hydrolysis of ester

Catalysis - catalyst - auto catalyst - enzyme catalyst - promoters - catalytic poisoning - Active center - Distinction between homogeneous and heterogeneous catalysts - Industrial application of catalysts.

3.3 Photochemistry - Grothus Drapers law, Stark Einsteins law - quantum yield - photosynthesis, phosphorescence - fluorescence - chemiluminescence's - photosensitization.



**UNIT - IV**

4.1 VSEPR Theory - Shapes of Simple Molecules  $\text{BF}_3$ ,  $\text{PCl}_5$ ,  $\text{SF}_6$  and  $\text{XeF}_6$

4.2 Fuels - Calorific value of fuels - Non-conventional fuels - need of Solar energy - Applications - Bio-fuels.

4.3 Osmosis - Osmotic pressure - reverse osmosis - desalination of sea water.

**UNIT - V**

5.1 Nuclear Chemistry - Definition of Half life period - Group displacement law - Radioactive series. Nuclear Fission and Fusion - Application of nuclear chemistry in Medicine, agriculture, industries -  $\text{C}^{14}$  dating.

5.2 Crude Oil - Petroleum - Petroleum Refining - Cracking - Applications of Cracking. Naphthalene - Preparations, Properties and uses of Naphthalene - Structure of Naphthalene.

5.3 Elements of symmetry - unit cell - crystal lattice - types of cubic lattice - one example for each.

**ALLIED – 1**

**PAPER – 1**

**BIOCHEMISTRY – I**

**UNIT - I**

Chemistry of Carbohydrates Definition and Classification of carbohydrates, linear and ring forms (Haworth formula) for monosaccharides for glucose and fructose. Disaccharides-sucrose and lactose. Physical properties-mutarotation and kiliani cynohydrin synthesis. Chemical properties-Oxidation, reduction, osazone formation. Disaccharide-sucrose and lactose-occurrence, structure; Physical and chemical properties. Polysaccharides: starch and cellulose-occurrence, structure, physical and chemical properties.

**UNIT - II**

Chemistry of aminoacids: Definition and classification of aminoacids, common properties of aminoacids, amphoteric nature, isoelectric point, iselectric pH and Zwitter ion. Reaction with ninhydrin, 1-fluoro-2, 4-dinitronitrobenzene (FDNB) and Sieg Fried—s carbamino reac<sup>o</sup>on.

**UNIT - III**

Chemistry of Proteins : Classifications-shape and size, solubility and physical properties and functional properties. Physical properties: salting in and salting out, denaturation, peptide bond. Structure of protein: primary, secondary, tertiary and quaternary. N-terminal determination-Edman—s and Dansyl chloride method. C-terminal determination-Van-Slyke reaction, Phosgene reaction.

**UNIT - IV**

Chemistry of Lipids : Definition, classification and functions. Occurrence, chemistry and biological functions- simple lipids: tertiary compound lipids (e.g. phospholipids), derived lipids: steroids (e.g. cholesterol). Saturated fatty acids: arachidic acid. Unsaturated fatty acids: linolenic acid. Physical property - emulsification. Chemical properties-saponification, rancidity, definition of acid number, saponification number, iodine number and Reichert-Meissl number. Bile acid and bile salt functions.

**UNIT - V**

Chemistry of Nucleic acids : Definition, nucleoside, nucleotide and polynucleotide. Double helical model of DNA and its biological functions. Structure of RNA: tRNA, mRNA and rRNA-occurrence, chemistry and its biological functions. Differences between DNA and RNA properties: cot curve and cot value,  $T_m$ , hypo and hyper chromicity.

**References :**

1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper—s Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
5. Biochemistry-Dr. Ambika Shanmugam, Published by Author.
6. Biomolecules-C. Kannan , MJP Publishers,Chennai-5.

## **SEMESTER II**

### **PAPER – 2**

## **THERMAL PHYSICS AND STATISTICAL METHODS**

### **UNIT – I : TRANSMISSION OF HEAT**

Conduction in solids : Thermal conduction – thermal conductivity of a good conductor – theory and determination – Forbe’s method – thermal conductivity of a poor conductor – theory and determination – Lee’s disc method – relation between thermal and electrical conductivities – Wiedmann – Franz law – practical applications of conduction of heat.

Black body radiation : Stefan – Boltzmann law – determination of Stefan’s constant – laboratory method – distribution of energy in the spectrum of a black body – results – Planck’s quantum theory of radiation – solar constant – temperature of the Sun – Solar Spectrum.

### **UNIT – II : LOW TEMPERATURE PHYSICS**

Joule – Kelvin effect – liquefaction of hydrogen – liquefaction of helium – Kammerling – Onne’s method – Helium I and II – Lambda point – production of low temperatures – adiabatic demagnetization – practical applications of low temperature – refrigerators and air-conditioning machines – super fluidity – application of super fluidity – elementary ideas and applications – Superconductivity – Type I and II superconductors – Meissner effect – applications of superconductors – superconducting magnets.

### **UNIT – III : THERMODYNAMICS I**

Thermodynamics Potentials – Zeroth law, First and Second law of thermodynamics – Carnot’s theorem – thermodynamic scale of temperature – Perfect gas scale of temperature – internal combustion engines – Otto engine and Diesel engine – working and efficiency.

### **UNIT - IV : THERMODYNAMICS II**

First latent heat equation (Clausius-Clapeyron equation) – effect of pressure on melting point and boiling point – second latent heat equation – Third law of thermodynamics – concepts of entropy – temperature entropy diagram – entropy of perfect gas – Maxwell’s thermo dynamical relations – derivation – applications – i) Clausius – Clapeyron equation, ii) Specific heat Relation.

**UNIT – V : STATISTICAL METHODS**

Phase space, Micro and Macro – canonical – Ensembles – Different types of ensembles – Definition of Probability – Relation between entropy & probability – Degrees of Freedom – Statement of theorem of equipartition of energy – Classical Statistics – Group Velocity and Phase velocity – MB Statistics.

Maxwell – Boltzmann law – distribution of velocity – Quantum Statistics – Phase Space – Fermi – Dirac Distribution Law – Bose–Einstein distribution law – comparison of three statistics.

**Books for study:**

Heat and thermodynamics – Brijlal and Subramaniam, S Chand & Co.

Heat and thermodynamics – J B Rajam, S Chand & Co., New Delhi.

Thermal Physics – R Murugesan and Kiruthiga Sivaprasad, S Chand & Co., New Delhi.

**Books for Reference:**

Heat and thermodynamics – D S Mathur, S Chand & Co., New Delhi

Elements of Statistical Mechanics – Gupta and Kumar, Pragati Prakashan, Meerut.

Statistical Mechanics – Sathya Prakash and J P Agarwal, Kedar Nath & Ram Nath & Co., Meerut.

Introduction to Solid State Physics – C Kittel, Prentice Hall of India.

**CORE PRACTICAL**

**PAPER 1 & 2**

**(Any 16 Experiments)**

1. Young's modulus – non uniform bending – pin and microscope.
2. Young's modulus – non uniform bending – optic lever.
3. Young's modulus cantilever – depression – dynamic method – Mirror Scale and Telescope.
4. Rigidity modulus – torsional pendulum – without masses.
5. Rigidity modulus and moment of inertia – torsional pendulum – with identical masses.
6. Surface tension and interfacial surface tension – drop weight method.
7. Coefficient of viscosity of liquid – graduated burette – Radius of capillary tube by mercury pellet method.
8. Comparison of viscosities – ( $\eta_1/\eta_2$ ).
9.  $q$ ,  $n$ ,  $\sigma$  by Searle's method.
10. Rigidity modulus – Static torsion – Mirror scale and telescope.
11. Compound Pendulum – Determination of 'g' and 'k'
12. Thermal conductivity of a bad conductor – Lee's disc method.
13. Specific heat of liquid – Newton's law of cooling.
14. Sonometer – frequency of tuning fork.
15. Sonometer – RD of a solid and liquid.
16. Focal length – R and  $\mu$  of a long focus convex lens.
17. Auto collimation method
18. Auxiliary Lens Method
19. Focal length – R and  $\mu$  of a long focus concave lens.
20. Combination Method
21. Auxiliary Lens Method
22. Spectrometer – Hollow prism –  $\mu$  of a liquid.
23. Potentiometer – Calibration of low range voltmeter.
24. Potentiometer – Internal resistance.
25. Post office box – temperature coefficient of resistance.

**ALLIED – 1**

**PAPER – 2**

**CHEMISTRY – II**

**UNIT - I**

**1.1 Co-ordination Chemistry:**

Nomenclature of co-ordination compounds - Werner Theory of Co-ordination Compound - Chelation - Functions and structure of Haemoglobin and Chlorophyll.

**1.2 Industrial Chemistry:**

Fertilizers and manures - Bio-fertilizers- Organic Manures and their importance - Role of NPK in plants - preparation and uses of Urea, Ammonium nitrate, potassium nitrate and super phosphate of lime.

1.3 Contents in Match sticks and match box - Industrial making of safety matches. Preparation and uses of chloroform, DDT, gamhexane and Freon.

**UNIT - II**

**2.1 Carbohydrates:**

Classification - structure of glucose - Properties and uses of starch - uses of Cellulose Nitrate - Cellulose acetate.

**2.2 Amino Acid and Protein:**

Classification of Amino Acids - preparation and properties of Glycine - Classification of Protein based on Physical properties and biological functions

2.3 Primary and Secondary structures of protein (Elementary Treatment only) composition of RNA and DNA and their biological role. Tanning of leather - alum (aluminum tri chloride tanning - vegetable tanning)

**UNIT - III**

**3.1 Electro Chemistry:**

Specific and equivalent conductivity - their determination - effect of dilution of conductance.

3.2 Kohlrawsh Law - Determination of dissociation constant of weak Electrolyte using Conductance measurement - Conductometric Titrations

3.3 PH and determination by indicator method - Buffer solutions - Buffer action - Importance of buffer in the living system - Derivation of Henderson equation.

#### **UNIT - IV**

4.1 Paints - Pigments - Components of Paint - Requisites of a good paint. Colour and Dyes - Classification based on constitution and application.

4.2 Vitamins:

Biological activities and deficiency diseases of Vitamin A, B, C, D, E and K - Hormones - Functions of insulin and adrenaline.

4.3 Chromatography - Principles and application of column, paper and thin layer chromatography

#### **UNIT - V**

5.1 Drugs- Sulpha Drugs - Uses and Mode of action of Sulpha Drugs -- Antibiotics - Uses of Penicillin, Chloramphenicol, streptomycin. Drug abuse and their implication alcohol - LSD

5.2 Anaesthetics - General and Local Anaesthetics - Antiseptics - Example and their application. Definition and one example each for analgesics antipyretics, tranquilizers, sedatives, causes for diabetes, cancer and AIDS.

5.3 Electrochemical corrosion and its prevention - fuel cells.



**ALLIED – 1**

**PAPER – 2**

**BIOCHEMISTRY – II**

**UNIT - I**

Metabolism Glycolysis, TCA cycle, HMP shunt and its energy yield. Deamination, transamination reaction, SGOT and SGPT. Urea cycle, Biosynthesis of fatty acids, beta oxidation.

**UNIT - II**

Metabolic Disorders Jaundice, hypoxia, glycogen storage diseases, pentosuria, ketosis, lipidosis, edema, gout. Dehydration: definition, causes, symptom and prevention.

**UNIT - III**

Enzymes Definition, classification of enzymes with one example. Mechanism of enzyme action. Lock and key mechanism, induced fit theory. Property: specificity. Isoenzyme: Definition with one example. Factors affecting enzyme activity: pH, temperature and substrate concentration. Michaelis-Menten equation. Enzyme inhibition: competitive, uncompetitive and non competitive. Biological functions of enzymes

**UNIT - IV**

Molecular Biology Replication: Definition, types, mode of action of replication, mechanism of replication. General mechanism of transcription and translation. Genetic code. DNA and RNA act as genetic material.

**UNIT - V**

Vitamins and Minerals A brief outline of occurrence and biological function of Vitamins and minerals (Na, K, Cl, Ca, P, I, Fe, Mg & S)

**References :**

1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper—s Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
5. Biochemistry-Dr. Ambika Shanmugam, Published by Author.
6. Biomolecules-C. Kannan , MJP Publishers,Chennai-5.

**ALLIED PRACTICAL**

**CHEMISTRY – I & II**

**VOLUMETRIC ANALYSIS**

- 1) Estimation of hydrochloric acid using std. sulphuric acid
- 2) Estimation of Borax using std sodium carbonate
- 3) Estimation of sodium hydroxide using std sodium carbonate.
- 4) Estimation of  $\text{FeSO}_4$  using std. Mohr salt Solution.
- 5) Estimation of Oxalic acid using std  $\text{FeSO}_4$
- 6) Estimation of FAS using Std oxalic acid
- 7) Estimation of  $\text{Fe}^{2+}$  using diphenylamine / N phenyl anthranilic acid as indicator.

**ORGANIC ANALYSIS:**

Reactions of aldehyde (aromatic), carbohydrate, carboxylic acid (mono and dicarboxylic), phenol, aromatic primary amine, amide and diamide. Systematic analysis of organic compounds containing one functional group and characterizationss by confirmatory tests.

**ALLIED PRACTICAL**  
**BIOCHEMISTRY I & II**

**PRACTICAL I**

**Volumetric Estimation**

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as link and NaOH as primary standard.
2. Estimation of Iron in Ferrous Ammonium Sulphate using potassium permanganate as link solution and oxalic acid as primary standard.
3. Estimation of Glucose by Benedict's method.
4. Estimation of Glycine by formal titration.
5. Estimation of Ascorbic acid.

**PRACTICAL II**

**Qualitative analysis**

1. Carbohydrates: Glucose, fructose, galactose, mannose, maltose, lactose and arabinose and xylulose.
2. Amino acids: Arginine, cysteine, tryptophan and tyrosine.

**Colorimetric analysis (only for demonstration)**

1. Estimation of protein by Biuret method.
2. Estimation of DNA using diphenyl amine.
3. Estimation of glucose by O -Toluidine.

**Books Recommended:**

1. Practical Clinical Biochemistry - Harold Varley, CBS, New Delhi.
2. Medical Laboratory Technology-Kanai L. Mukherjee, Tata McGraw Hill., Vol. I, II, III.
3. Clinical Chemistry - Ranjana Chawla.
4. Laboratory manual in Biochemistry - Jayaraman.
5. Biochemical methods - S.Sadasivan and Manickam.
6. Introduction to Practical Biochemistry - David T. Plummer.

## **SEMESTER III**

### **PAPER – 3**

## **ELECTRICITY**

### **UNIT – I : ELECTROSTATICS**

Gauss' Law – Electric Field due to uniformly charged sphere – Electric Intensity - Electrostatic potential – electric potential as line integral of electric field – relation between electric potential and electric field in vector form – Poisson's and Laplace's equations – capacitance – capacitance of a spherical and cylindrical capacitor – energy of a charged capacitor – loss of energy due to sharing of charges. The quadrant electrometer – heterostatic and idiostatic uses.

### **UNIT – II : CURRENT ELECTRICITY**

Carey Foster bridge – theory – determination of temperature coefficient of resistance – calibration of ammeter and voltmeter using a potentiometer.

### **UNIT – III : THERMO ELECTRICITY**

Seebeck, Peltier and Thomson effects – laws of thermoelectric circuits – Peltier coefficient – Thomson coefficient – application of thermodynamics to a thermocouple and expressions for Peltier and Thomson coefficients

### **UNIT – IV : ELECTRO MAGNETIC INDUCTION**

Faraday's laws of electromagnetic induction in vector form – determination of self-inductance by Anderson's bridge method and absolute mutual inductance by BG-Ruhmkorff's induction coil – induction coil and its uses – Eddy Currents.

### **UNIT – V : TRANSIENT CURRENT**

Growth and decay of current in a circuit containing resistance and inductance. Growth and decay of charge in circuit containing resistance and capacitor – measurement of high resistance by leakage – growth and decay of charge in a LCR circuit – condition for the discharge to be oscillatory – frequency of oscillation.

**Books for study:**

R Murugesan – Electricity and magnetism, 8<sup>th</sup> Edn, 2006, S Chand & Co., New Delhi.

M Narayanamurthy & N Nagarathnam, Electricity & Magnetism 4<sup>th</sup> Edn, National Publishing Co., Meerut.

Duggal and Chhabra, Electricity and Magnetism.

Brijlal, N Subramanyan and Jivan Seshan, Mechanics and Electrodynamics [2005], Eurasia Publishing House [Pvt.] Ltd., New Delhi.

**Books for reference:**

Sehgal D L, Chopra K L, Sehgal N K – Electricity and Magnetism, Sultan Chand & Sons, New Delhi.

Brijlal and Subramanian, Electricity and Magnetism, 6<sup>th</sup> Edn., Ratan & Prakash, Agra.

David J Griffiths, Introduction to Electrodynamics, 2<sup>nd</sup> Edn. 1997, Prentice Hall of India pvt. Ltd., New Delhi.

Electricity & Magnetism by K K Tewari, S Chand & Co., 3<sup>rd</sup> Edition, 2001.

**ALLIED – 2**

**PAPER – 3**

**MATHEMATICS – I**

**Objectives of the Course:**

**To Explore the Fundamental Concepts of Mathematics**

**UNIT-I ALGEBRA**

Partial Fractions - Binomial, Exponential and logarithmic Series (without Proof) -Summation - Simple problems

**UNIT-II : THEORY OF EQUATIONS**

Polynomial Equations with real Coefficients - Irrational roots - Complex roots- Transformation of equation by increasing or decreasing roots by a constant - Reciprocal equations - Newton's method to find a root approximately - Simple problems.

**UNIT-III : MATRICES**

Symmetric - Skew-Symmetric - Orthogonal and Unitary matrices - Rank of a matrix -Consistency of equations - Eigen roots and eigen vectors - Cayley-Hamilton theorem (without proof)-Verification and computation of inverse matrix

**UNIT-IV: TRIGONOMETRY**

Expansions of  $\sin^n \theta$ ,  $\cos^n \theta$ ,  $\sin n\theta$ ,  $\cos n\theta$ ,  $\tan n\theta$  - Expansions of  $\sin \theta$ ,  $\cos \theta$ ,  $\tan \theta$  in terms of  $\theta$  - Hyperbolic and inverse hyperbolic functions - Logarithms of complex numbers.

**UNIT-V: DIFFERENTIAL CALCULUS**

n-th derivatives - Leibnitz theorem (without proof) and applications – Jacobians -Concepts of polar co-ordinates-Curvature and radius of curvature in Cartesian co-ordinates.

**Recommended Text**

P.Duraipandian and S.Udayabaskaran,(1997) *Allied Mathematics*, Vol. I & II. Muhil Publishers, Chennai.

**Reference Books**

1. P.Balasubramanian and K.G.Subramanian,(1997) *Ancillary Mathematics*. Vol. I & II. Tata McGraw Hill, New Delhi.
2. S.P.Rajagopalan and R.Sattanathan,(2005) *Allied Mathematics* .Vol. I & II. Vikas Publications, New Delhi.
3. P.R.Vittal (2003) *Allied Mathematics* . Marghan Publications, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) *Allied Mathematics Vol-I, II* S.Chand & company Ltd., New Delhi-55.
5. Isaac, *Allied Mathematics*. New Gamma Publishing House, Palayamkottai.



**SKILLED BASED SUBJECT**

**PAPER – 1**

**ELECTRICAL APPLIANCES**

**UNIT – I**

Resistance and its types – capacitance and its types – Colour codes-inductance and its units – Transformers – Electrical Charge – Current – Electrical Potential

**UNIT - II**

Ohm's law – Galvanometer, Ammeter, Voltmeter and Multimeter Analog and Digital - Electrical Energy – Power – Watt – kWh – Consumption and electrical power.

**UNIT – III**

AC and DC – Single phase and three phase connections – RMS and peak values, House wiring – Star and delta connection – overloading – earthing – short circuiting – Fuses – Colour code for insulation wires

**UNIT - IV**

Inverter – UPS – generator and motor – types – different types of windings – circuit breaker- Electrical switches and its types.

**UNIT – V**

Electrical bulbs – Fluorescent lamps – Street Lighting – Flood lighting – Electrical Fans – Wet Grinder – Mixer – Water Heater – Storage and Instant types, electric iron box, microwave oven – Stabilizer, fridge.

**Books for study:**

A text book in Electrical Technology – B L Theraja – S chand & Co.

A text book in Electrical Technology – A K Theraja.

Performance and design of AC machines – M G Say EIBS Edn.

**NON – MAJOR ELECTIVE**

**PAPER – 1**

**RENEWABLE ENERGY SOURCES**

**Unit - I: Conventional Energy Sources**

The fossil fuels - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits – fuel cells.

**Unit - II: Solar Energy**

Renewable energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits

**Unit - III: Biomass energy fundamentals**

Biomass energy – classification – photosynthesis – Biomass conversion process

**Unit - IV: Biomass Utilization**

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

**Unit - V: Other forms of energy sources**

Geothermal energy – wind energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas)

**Books for Study:**

“Renewable energy sources and emerging Technologies”, by D.P. Kothari, K.C. Singal & Rakesh Ranjan, Prentice Hall of India pvt. Ltd., New Delhi (2008)

**Books for Reference:**

“Renewable Energy sources and their environmental impact” – S.A. Abbasi and Nasema Abbasi PHI Learning Pvt. Ltd., New Delhi (2008).

## **SEMESTER IV**

### **PAPER – 4**

### **MECHANICS**

#### **UNIT – I : DYNAMICS**

Rigid body – moment of inertia – radius of gyration – moment of inertia of a solid cylinder, cylindrical shell, solid sphere, spherical shell - Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of suspension and oscillation

#### **UNIT – II : STATICS AND HYDROSTATICS**

Centre of pressure – centre of pressure of a vertical rectangular lamina – vertical triangular lamina - Laws of floatation – meta centre – meta centric height of a ship – atmospheric pressure and its variation with altitude – reasons for such variations – Bernoullies theorem – Applications – Pitot tube - Venturi meter .

#### **UNIT – III : ROCKETS AND SATELLITES**

Rockets and Satellites – Basic Principles of rocket motion – Rocket Equation, thrust and acceleration – Escape velocity multistage rockets – liquid, solid and cryogenic – propellant rockets – space shuttle - Orbital velocity – launching of a satellite, types of satellite orbits.

#### **UNIT – IV : CLASSICAL MECHANICS I**

Lagrangian formulation of classical mechanics – Mechanics for a system of particles – Generalised co-ordinates – transformation equations – configuration space – Principles of virtual work – D'Alembert's principle – Lagrange's equation – Applications of Lagrange's equation – Simple pendulum.

#### **UNIT – V : CLASSICAL MECHANICS II**

Hamiltonian formulation of classical mechanics – phase space – Hamiltonian function – Hamilton's canonical equations of motion – Applications of Hamilton's equations of motion – Simple pendulum.

**Books for study:**

Mechanics and mathematical methods by R Murugeshn, S Chand.

Elements of mechanics by Gupta.

Dynamics by Naranamurthi, National Publishing Company, Chennai.

Classical Mechanics by Gupta Kumar and Sharma.

Classical Mechanics by B D Gupta and Sathya Prakash, Kedar Nath Ram Nath & Co.,

**Books for Reference:**

Mechanics by D S Mathur.

Classical Mechanics by Goldstein, Narosa.

Mechanics and Properties of Matter, C.L. Arora, S. Chand & Co.

**CORE PRACTICAL**

**PAPER – 3 & 4**

**(Any 16 Experiments)**

1. Youngs modulus uniform bending Pin and microscope.
2. Youngs modulus uniform bending Scale and Telescope.
3. Sonometer – AC frequency – steel and brass wires.
4. Melde's String – Frequency of the vibrator – Both modes.
5. Spectrometer –  $\mu$  of a prism – id curve.
6. Spectrometer – grating – N and  $\lambda$  normal incidence method.
7. Spectrometer – grating – N and  $\lambda$  minimum deviation method.
8. Air wedge – thickness of a thin wire.
9. Carey fosters bridge – Temperature coefficient of resistance.
10. Potentiometer – Calibration of high range ammeter.
11. Potentiometer – resistance and specific resistance of a wire.
12. Figure of merit of a galvanometer – Table Galvanometer.
13. m and  $B_H$  – Tan C – deflection magnetometer and vibration magnetometer.
14. BG – Figure of merit – Charge sensitiveness.
15. BG Comparison – ( $C_1/C_2$ ) of capacitance.
16. BG Comparison – ( $E_1/E_2$ ) emf's of two cell.
17. Low range power pack – using two diodes.
18. Transistor Characteristics – CE / CB modes.
19. Zener diode & Voltage regulator.
20. IC Voltage regulator using 7805.

**ALLIED – 2**

**PAPER – 4**

**MATHEMATICS – II**

**Objectives of the Course**

**To Explore the Fundamental Concepts of Mathematics**

**UNIT-I : Integral Calculus**

Bernoulli's formula for integration by parts - Reduction formulae

for:  $\int x^m e^{ax} dx$ ,  $\int \sin^n x dx$ ,  $\int \cos^n x dx$  ( with proof & problems),

$\pi/2$

$\int \sin^m x \cos^n x dx$  (no proof , problems only), properties of definite

0

integrals and simple problems.

**UNIT-II: Application of Integration**

Evaluation of double, triple integrals - Simple applications to area, volume -Fourier series for functions in  $(0, 2\pi)$  and  $(-\pi, \pi)$ .

**UNIT-III: Partial Differential Equations**

Formation, complete integrals and general integrals - Four standard types , Lagrange's equations.

**UNIT-IV : Laplace Transforms**

Laplace Transformations of standard functions and simple properties - Inverse Laplace transforms - Applications to solutions of linear differential equations of order 1 and 2-simple problems

**UNIT-V: Vector Analysis**

Scalar point functions - Vector point functions - Gradient ,divergence, curl - Directional derivatives - Unit to normal to a surface - Line and surface integrals - Gauss, Stoke's and Green's theorems(without proofs) - Simple problem based on these Theorems.

**Recommended Text**

P.Duraipandian and S.Udayabaskaran,(1997) *Allied Mathematics*, Vol. I & II. Muhil Publishers, Chennai

**Reference Books**

P.Balasubramanian and K.G.Subramanian,(1997)*Ancillary Mathematics*. Vol. I & II. Tata McGraw Hill, New Delhi.

S.P.Rajagopalan and R.Sattanathan,(2005) *Allied Mathematics* .Vol. I & II. Vikas Publications, New Delhi.

P.R.Vittal(2003). *Allied Mathematics* . Marghan Publications, Chennai.

P.Kandasamy, K.Thilagavathy (2003) *Allied Mathematics* Vol-I, II S.Chand & company Ltd., New Delhi-55.

Isaac, *Allied Mathematics*. New Gamma Publishing House, Palayamkottai

**SKILL BASED SUBJECT**

**PAPER – 2**

**ELECTRONICS APPLIANCES**

**UNIT – I**

Passive devices – Resistors – types – characteristics – colour coding – capacitors – type – characteristics – colour coding star and delta connection of a resistors and capacitors.

**UNIT - II**

chokes – Transformers – testing of diodes, transistors and ICs – CRO – Waveforms and Lissajoue's figures – A/F and R/F oscillators – usage of bread board.

**UNIT – III**

Semiconductor diode – Zener diode – Transistor – Transistor configurations – diode rectifier – half wave and full wave – Bridge rectifier – Diode voltage doublers and multiplier.

**UNIT – IV**

Regulated power supply, Zener diode voltage regulator (Series and Shunt type) IC Voltage regulators: fixed positive – fixed negative – adjustable.

**UNIT – V**

Basic concepts of radio transmitter and receiver – Basic concepts of TV Transmitter and receiver – TV antennas: Resonance antennas and their characteristics – Dipole Antenna – Folded dipole – Yagi antenna – Yagi antenna design – Dish Antenna – DTH system – Mobile communication system - MODEM.

**Books for study:**

Principles of Electronics by V K Metha, S Chnd & Co., 5<sup>th</sup> edition 2001.

Functional Electronics by Ramanan.

Elements of Electronics by Bagde and Singh.

Monochrome and Colour TV by Gulati.

Basic Electronics, 6<sup>th</sup> Edition by B Grob, McGraw Hill NY 1989.



**NON MAJOR ELECTIVE**

**PAPER – 2**

**BASIC PHYSICS**

**UNIT – I : MECHANICS**

Force – Weight – Work – Energy – Power – Horsepower – Centrifuge – Washing Machine.

**UNIT – II : HEAT**

Variation of boiling point with pressure – Pressure cooker – Refrigerator – Air Conditioner – Principle and their capacities – Bernoulli Principle – Aero plane.

**UNIT – III : SOUND AND OPTICS**

Sound waves – Doppler effect – Power of lens – Long sight and short sight – Microscope – Telescope – Binocular - Camera.

**UNIT – IV : GEO PHYSICS AND MEDICAL PHYSICS**

Earthquake – Richter scale – thunder and lightning – Lightning arrestors – Cosmic showers – X-rays – Ultrasound scan – CT scan – MRI scan.

**UNIT – V : SPACE SCIENCE AND COMMUNICATION**

Newton's law of gravitation – Weather forecasting and communication satellites – Indian Satellites – Electromagnetic spectrum – Radio Waves – AM and FM transmission and reception.

**Books for study:**

The Learner's Series – Everyday Science – Published by INFINITY BOOKS, New Delhi.

The Hindu speaks on Science, Vol I & II, Kasturi & Sons, Chennai.

**Books for study:**

Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker, 6<sup>th</sup> Edition, Wiley, NY (2001).

Physics, Vols I, II, III by D. Halliday, R. Resnick and K.S. Krane, 4<sup>th</sup> Edition, Wiley, New York (1994).

The Feynmann Lectures on Physics Vols, I, II, III by R.P. Feynmann, R.B. Leighton & M. Sands, Narosa, New Delhi (1998).

## **SEMESTER V**

### **PAPER – 5**

### **OPTICS**

#### **UNIT – I : GEOMETRICAL OPTICS**

Spherical aberration in lenses – Methods of minimizing spherical aberration – Condition for minimum spherical aberration in the case of two lenses separated by a distance – Chromatic aberration in lenses – Condition for achromatism of two thin lenses (in contact and out of contact) – coma – astigmatism – Ramsden's and Huygen's eyepieces – Constant deviation spectrometer – Calculation of characteristic wave number of spectral lines.

#### **UNIT – II : INTERFERENCE**

Theory of thin films – Air wedge – Determination of diameter of a thin wire by air wedge – Michelson's Interferometer – Theory – Applications – wave length, thickness of thin transparent material and resolution of spectral lines – Brewster's fringes – Refractive index of gases – Jamin's & Rayleigh's Interferometers.

#### **UNIT – III : DIFFRACTION**

Fresnel's diffraction – Diffraction at circular aperture, straight edge and single slit – Plane diffraction grating – theory and experiment to determine wavelength – normal incidence – oblique incidence – Fraunhofer's diffraction – Missing orders – Overlapping spectra Rayleigh's criteria – Resolving power of telescope, prism, microscope and grating.

#### **UNIT – IV : POLARIZATION**

Introduction to polarisation – Double refraction – Huygen's explanation of double refraction in uniaxial crystal – Dichroism – Polaroids and their uses Plane, elliptically and circularly polarized light – Production and detection – Optical Activity – Fresnel's explanation of optical activity – Specific Rotatory Power – Determination using Laurent's Half Shade Polarimeter – Kerr effect and Faraday effect.

**UNIT – V : FIBRE OPTICS**

Introduction – Structure of optical fibre - Types of Optical Fibres – Classification based on Refractive index – Transmission characteristic of optical fibres – optical fibre communication system Application of optical fibres as wave guide and sensors – Mach – Zehnder interferometer.

**Books for study:**

Optics by Subramaniam N & Brij Lal, S Chand & Co. Pvt. Ltd., New Delhi, 1990.

Optics by Khanna D R & Gulati H R, S Chand & Co. Pvt. Ltd., New Delhi, 1979.

Optics and Spectroscopy by Murugesan, S Chand & Co. Pvt. Ltd., New Delhi.

**Books for Reference:**

Fundamentals of Optics by Jenkins Francis and White E Harvey, McGraw Hill Inc., New Delhi, 1976.

Optical Physics by Lipson. S G, Lipson H and Tannhauser D S, Cambridge University Press (1995).

Fundamental of Optics by Raj M G, Anmol Publications Pvt. Ltd., (1996), New Delhi.

Fundamentals of Physics, 6<sup>th</sup> Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.

Physics, 4<sup>th</sup> Edition Vols I, II & II Extended by D Halliday, R Resnick and K S Krane, Wiley, Ny, 1994.

CRC Handbook of Physics & Chemistry, 80<sup>th</sup> Ed., CRS Press, Ny, 1999.

The Feynman Lectures on Physics, Vols. I, II and III by R P Feynman, R B Leighton and M Sands, Narosa, New Delhi 1998.

Fibre Optic Communication System, Govind P. Agarwal, John –Wiley & Sons.

## **PAPER – 6**

### **ATOMIC PHYSICS AND SPECTROSCOPY**

#### **UNIT – I : DISCHARGE PHENOMENON THROUGH GASES**

Moving of a charge in transverse electric and magnetic fields – specific charge of an electron – Dunnington's method – Magnetron method – Positive rays – Thomson parabola method – Aston and Dempster's mass spectrograph.

#### **UNIT – II : ATOMIC STRUCTURE**

Vector atom model – Pauli's exclusion principle – explanation of periodic table – various quantum numbers – angular momentum and magnetic moment – coupling schemes – LS and JJ coupling – spatial quantisation – Bohr magneton – Stern and Gerlach experiment.

Spectral terms and notations – selection rules – intensity rule and interval rule – fine structure of sodium D lines – alkali spectra – fine structure of alkali spectra – spectrum of Helium.

#### **UNIT – III : IONISATION POTENTIAL AND SPLITTING OF ENERGY LEVELS**

Excitation and ionization potential – Davis and Goucher's method – Zeeman effect – Larmor's theorem – Debye's explanation of normal Zeeman effect – Anomalous Zeeman effect – theoretical explanation. Lande's 'g' factor and explanation of splitting of  $D_1$  and  $D_2$  lines of sodium – Paschen back effect-theory – Stark effect (qualitative treatment only).

#### **UNIT-IV: INFRARED AND RAMAN SPECTROSCOPY**

The energy of a Diatomic molecule - The simple harmonic oscillator - The Diatomic vibrating rotator - The vibration - rotation spectrum of carbon monoxide - Techniques and Instrumentation (outline).

Quantum theory of Raman effect - Molecular Polarizability - Pure rotational Raman spectra of linear molecules - Vibrational Raman spectra - Structured determination from Raman and Infrared spectroscopy - Techniques and Instrumentation (outline).

**UNIT V : ELECTRONIC SPECTROSCOPY OF MOLECULES AND LASER PHYSICS**

Electronic spectra of Diatomic molecules - Intensity of vibrational - Electronic spectra: The Franck Condon Principle - Disassociation energy and disassociation products - Techniques and Instrumentation (outline).

Lasers: Population inversion, Laser pumping, Resonators - Vibrational modes of resonators, number of modes/unit volume - Open resonators, Control resonators, Q Factor, Losses in the cavity, Threshold condition, Quantum yield. Ruby Laser – 3 level system, Pumping power, Spiking  $U^{3+}$  in  $CaF_2$  laser, four level laser, Neodymium laser - Nd:YAG, Applications of Lasers in Industry, Medicine & Communication.

**Books for study:**

Modern physics by R Murugesan, S Chand & Co., New Delhi - 2004.

Atomic and Nuclear physics by N Subramanian and Brij Lal, S Chand & Co. - 2000.

Atomic physics by J B Rajam.

Spectroscopy by Gupta & Kumar

Spectroscopy by Banewell

**Books for Reference:**

Atomic physics by A B Gupta and Dipak Ghosh – Books and Allied Publishers.

Modern physics by J H Hamilton and Yang, McGraw Hill Publication 1996.

Concepts of Modern physics by A Beiser, Tata McGraw Hill, New Delhi 1997.

Fundamentals of physics, 6<sup>th</sup> edition, by D Halliday, R Resnick and J Walker, Wiley NY 2001.

## **PAPER – 7**

### **BASIC ELECTRONICS**

#### **UNIT – I : SEMICONDUCTOR THEORY DEVICES AND CHARACTERISTICS**

Classification of solids in terms of forbidden energy gap Fermi level – Fermi – dirac function – Carrier concentration intrinsic and extrinsic semi conductors – effect of temperature on Fermi level – PN junction diode – Zener diode – Tunnel diode – photo diode – PIN – APD – Photo transistor – LED, LCD – Solar cell – Transistor construction – different modes of operation – transistor – biasing – characteristics in CB & CE modes –  $\alpha$  and  $\beta$  of a transistor.

#### **UNIT – II : RECTIFIERS AND AMPLIFIERS**

Half-wave, Full-wave and bridge rectifier – Two port representation of a transistor –  $h$ -parameters – AC equivalent circuit using  $h$ -parameters – analysis of an amplifier using  $h$ -parameters – Expressions for current gain, voltage gain input impedance, output impedance and power gain for common emitter only. RC coupled amplifier – frequency response curve – classification of amplifiers – class A power amplifier – Push-pull, class B power amplifier – Emitter follower.

#### **UNIT – III : FEEDBACK OSCILLATORS**

Voltage gain of a feedback amplifier – Barkhausen criterion – Hartley, Colpitt's, phase shift and Weinbridge oscillators – expressions for frequency of oscillations and condition for sustained oscillations in each case – crystal oscillator – frequency stability.

#### **UNIT – IV : WAVE SHAPING CIRCUITS AND MULTI VIBRATORS**

Clipping and clamping circuits – biased clipper – integrating and differentiating circuits. Multivibrators – Astable – Mono stable and bi-stable multivibrators-Schmitt trigger.

#### **UNIT – V : RADIO COMMUNICATION AND TELEVISION**

Principles of transmission and reception – Modulation – types of modulation – amplitude modulation – frequency modulation and phase modulation – theory and mathematical analysis for AM, FM and PM – detector – AM Detector – FM Discriminator – AM and FM transmitter and receiver – Block diagram of TV transmission and reception – principles of colour TV.

**Books for study:**

Principles of electronics by V K Mehta, S Chand & Co., 5<sup>th</sup> edition 2001.

Elements of electronics by Bagde and S P Singh.

Functional electronics by Ramanan.

Monochrome and Colour TV by Gulati.

Basic and applied electronics by M Arul Thalpathi, Comptek, Publishers, Chennai 2005.

**Books for reference:**

Electronic principles by Malvino.

Electronic devices and circuits by Allen Mottershed.

Monochrome and colour TV Gulati.

Basic Television and videosystems by B Grob.

Solid State Electronics by Manna, Tata McGraw Hill.

Basic electronics, 6<sup>th</sup> Edition by B Grob, McGraw Hill, NY 1989.

**SKILL BASED SUBJECT**

**PAPER – 3**

**ASTRO PHYSICS**

**UNIT – I : EARLIEST ASTRONOMY AND SPACE**

Origin – Earliest Astronomy (2500 – 100 BC) – Pythagorean Spherical Earth – Aristotle's Earth as Centre – Copernicus Theory – Kepler's Law – Galileo's observations – Newton's Synthesis.

**UNIT – II : SPACE**

Introduction – Hubble's Law – Big bang theory – Shape of Universe – Expanding universe in space – Galaxies – Types of Galaxies – Spiral, Elliptical and Irregular Galaxies – Clusters of Galaxies – Milky Way – Quasars.

**UNIT – III : STARS**

Birth of Stars – Colour and Age – Life of Stars – Red giant stars – White dwarf star – Neutron Star – Black hole – Supernovae – Constellations - Zodiac.

**UNIT – IV : SOLAR SYSTEM**

Introduction – Sun – Structure of Sun – Nuclear reactions in sun – Sun spot and solar flares – Earth – Structure of earth – Atmosphere – Moon and its structure – Inner planets – Outer planets – Asteroids – Meteors – Meteorites - Comets.

**UNIT – V : SPACE DISTANCE, UNITS AND CO-ORDINATES**

Cislunar space – Translunar space – Inter planetary distance – Interstellar space – Inter galactic space – Light Year – Astronomical Unit – Astronomical Map. Astronomical Systems – Astronomical co-ordinates – Celestial Sphere – Celestial Equators – Celestial Poles - Celestial.



**Books for study:**

Hewish. A / Physics of the universe / CSIR publication, New Delhi, 1992.

Biman Basu / Inside Stars / CSIR Publication, New Delhi, 1992.

Biman Basu / Cosmic Vistas / National Book Trust of India, 2002.

Krishnasamy K.S. / Astro Physics a modern perspective / New Age International / New Delhi.

Murugesan. R / Modern Physics / S. Chand & Co. / New Delhi, 2003.

**Books for reference:**

Mohan Sundara Rajan / Space today / National Book Trust of Indi, 2000.

William K. Hartmann / The Cosmic Voyage through time and space / Wads worth Publishing company, Californi, 1990.

## **SEMESTER VI**

### **PAPER – 8**

## **NUCLEAR PHYSICS AND RADIATION PHYSICS**

### **UNIT – I : NUCLEAR STRUCTURE**

Nuclear spin – determination of magnetic dipole moment, electric quadrupole moment, parity of nuclei, isospin, theories of nuclear composition, proton and neutron hypothesis, proton – neutron hypothesis, nuclear forces – meson theory of nuclear forces.

Liquid drop model – Bethe – Weizacker's mass formula – application to alpha decay – Bohr – Wheeler theory – Shell model – evidences – theory of energy level diagram – spin orbit interaction – magic numbers – nuclear stability.

### **UNIT – II : NUCLEAR DECAY**

Radioactive disintegration – law of successive disintegration – transient and secular equilibrium – radioactive series – Geiger – Nuttall law – Age of earth – alpha particle disintegration energy – alpha particle spectra – theory of alpha decay (qualitative treatment). Beta ray spectra – origin – neutrino theory of beta decay – electron capture – gamma rays – determination of wavelength by Dumond – crystal spectrometer – nuclear isomerism.

### **UNIT – III : PARTICLE ACCELERATORS AND DETECTORS**

Cyclotron – synchrocyclotron – Betatron – electron synchrotron – proton synchrotron (Bevatron) GM counter – ionization chamber – bubble chamber – scintillation counter – photographic emulsion techniques.

### **UNIT – IV : RADIATION PHYSICS**

Nuclear fission – Chain reaction – four-factor formula – reactor theory – critical size of a reactor – general aspect of reactor design – reactor shielding – reactor control – classification of reactors – pressurized heavy water reactor – fast breeder reactor – Radiation hazards – biological effects of radiation – radiation sickness – radiation units and operational limits – radiation survey meters – pocket dosimeter – control of radiation hazards – radiation therapy – radioisotopes used for therapy – nuclear medicine – industrial applications – food preservatives.

**UNIT – V : ELEMENTARY PARTICLES**

Classification – types of interaction – symmetry and conservation laws – hadrons – leptons – baryons – mesons – strangeness – hyperons – antiparticles – antimatter – basic ideas about quarks – types of quarks.

**Books for study:**

Modern physics by R Murugesan S Chand & Co.

Introduction to Modern Physics by Rich Meyer, Kennard, Coop Tata McGraw Hill Publishing Co.

Atomic and nuclear physics by Littlefeld & Thorley.

Modern physics by R Murugesan & Kiruthiga, Sivaprasath S Chand & Co. (2006).

**Books for reference:**

Nuclear Physics S N Ghoshal – S Chand & Co. Edition 2003.

Nuclear Physics D G Tayal – Himalayan Publishing House.

Elements of Nuclear Physics – M L Pandya & R P S Yadav Kedar Nath Ram Nath (2000).

Nuclear Physics – Irving Keplan.

Nuclear Physics – J B Rajam, S Chand Publishing Co.

**PAPER – 9**

**RELATIVITY, QUANTUM MECHANICS & MATHEMATICAL PHYSICS**

**UNIT – I : RELATIVITY**

Frames of reference – Michelson – Morley experiment – Significance of negative result – postulates of special theory of relativity – Lorentz transformation equations – Length contraction – Time dilation – Relativity of simultaneity – Law of addition of velocities – variation of mass with velocity – relativistic kinetic energy equations – postulates of general theory of relativity – gravitational red shift.

**UNIT – II : WAVE MECHANICS**

Matter waves – de Broglie wavelength – wave velocity and group velocity – Heisenberg's Uncertainty principle – proof of Uncertainty principle for one dimensional wave packet – Postulates of wave mechanics – properties of wave functions – operator formalism – eigen functions – eigen values – expectation values.

**UNIT – III : SCHRÖDINGER EQUATIONS AND ITS APPLICATIONS**

Schrodinger equation – time dependent and time independent – application of Schrodinger equations – linear harmonic oscillator – zero point energy – particle in a one dimensional box – barrier penetration and tunnelling effect – rigid rotator – hydrogen atom.

**UNIT – IV : MATHEMATICAL PHYSICS**

Gauss divergence theorem – Stokes theorem – Greens theorem – applications of vectors to hydrodynamics.

Orthogonal curvilinear coordinates – spherical polar coordinates – differential operators in terms of orthogonal curvilinear coordinates – expressions for gradient, div, curl and  $\nabla^2$  in Cartesian, spherical and cylindrical coordinates.

**UNIT – V : SPECIAL FUNCTIONS**

Beta and gamma functions – problems – relation between beta and gamma functions – Bessel's differential equations – Legendre's differential equations – Hermite's differential equations – Laguerre's differential equations – series solutions – Dirac delta functions - properties.

**Books for study:**

Quantum Mechanics by V. Devanathan, Narosa, Chennai, 2005.

Modern Physics by R Murugesan, Kiruthiga, Sivaprasath S Chand & Co. (2007).

Quantum Mechanics by V K Thangappan, Wiley Eastern.

A Text Book of Quantum Mechanics by P M Mathews and Venkatesan, McGraw Hill.

Mathematical Physical by Sathya Prakash.

Mechanics and Mathematical Methods by Murugesan, S Chand Publishing & Co.

**Books for reference:**

Mathematical Physics by B D Gupta.

Quantum Mechanics by Ghatak and Loganathan, McMillan.

Basic Quantum Mechanics by A Ghatak, McMillan India (2002).

**PAPER – 10**

**SOLIDSTATE PHYSICS**

**Unit - I**

Crystallography: Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Primitive and Unit cell – Number of lattice points per unit cell - Seven Classes of Crystals - Bravais lattices – Miller indices – Elements of Symmetry – Structure of KCl and NaCl crystal - Diamond Structure – Atomic Packing – Atomic radius – Lattice constant and density- Crystal structure (sc; hcp; fcc; bcc.)

**Unit - II**

Types of Bonding in Crystals - Ionic, Valence, Metallic, vanderwaal's and Hydrogen Bonding – Optical properties of solids – Specific heat capacity of solids – Dulong and Pettit's law – Einstein's and Debye's theory – Explanation for the Occurrence of Super Conductivity - General Properties of Superconductors - Types of Superconductors – Meissner effect - Application of Superconductors.

**Unit - III**

Diffraction of x-Rays by Crystals - Bragg's Law In one Dimension - Experimental Method in x- Ray Diffraction - Laue Method, Rotating Crystal Method - Powder Photograph Method - von Laue's equations. Point Defects, Line Defects - Surface Defects - Volume Defects - effects of Crystal Imperfections.

**Unit - IV**

Different Type of Magnetic materials - Classical Theory of Diamagnetism (Langevin's Theory) - Langevin's Theory of Paramagnetism - Weiss Theory of Paramagnetism - Qualitative Explanation of Heisenberg's Internal Field and Quantum Theory of Ferromagnetism.

**Unit - V**

Fundamental Definitions in Dielectrics - Different types of Electric polarization - Frequency and Temperature Effects on Polarization - Dielectric Loss - Local Field on Internal Field Clausius-Mosotti Relation - Determination of Dielectric Constant Dielectric Breakdown - Properties of Different Types of Insulating Materials.

**Books for Study:**

1. Solid State Physics Gupta and Kumar
2. Modern Physics R Murugesan
3. Material Science by M. Arumguarn, Anuradha Publishers.
4. Material Science and Engineering by V.Raghavan, PHI
5. Introduction to Solids by Azaroff, TMH.
6. Concepts of Modern Physics by Beiser, Tata Mc.Graw Hill, 5<sup>th</sup> Edition, 1997.

**Books for Reference:**

1. Introduction to Solid State Physics by Kittel, Wiley and Sons, 7<sup>th</sup> Edition.
2. Solid State Physics A J Dekker

**CORE PRACTICAL – III**

**PAPER – 5 & 6**

**(Any 20 Experiments)**

1. Bifilar Pendulum – Parallel Threads – Verification of Two Theorems.
2. Young's modulus – Koenig's method - non uniform bending.
3. Young's modulus – Koenig's method - uniform bending.
4. Newton's rings –  $R_1$ ,  $R_2$  and –  $\mu$  of material a convex lines.
5. Searle's viscometer – ' $\eta$ ' for High Viscous Liquid.
6. Spectrometer i – I' Curve.
7. Spectrometer – narrow angled prism – angle of deviation – normal incidence and normal emergence – refractive index.
8. Dispersive power of a prism.
9. Dispersive power of a grating.
10. Spectrometer – Cauchy's constants.
11. Laser beam – diffraction at a straight wire – determination of thickness of the wire.
12. Field along the axis of circular coil – deflection magnetometer – M and  $B_H$  – Null Method.
13. Field along the axis of circular coil – Vibrating magnetic needle -  $B_H$ .
14. EMF of a thermocouple – Mirror galvanometer – Direct deflection method.
15. Potentiometer – emf of a thermocouple.
16. Potentiometer – calibration of high range voltmeter.
17. Potentiometer – Conversion of galvanometer into voltmeter.
18. Potentiometer – Conversion of galvanometer into ammeter.
19. BG – absolute capacitance of a capacitor.
20. BG – comparison mutual inductances.
21. BG – High resistance by leakage.
22. BG – internal resistance of a cell.
23. Hartely Oscillator.
24. Colpitt's oscillator.
25. RC Coupled single stage amplifier (without feedback).



## **CORE PRACTICAL – IV**

### **ELECTRONICS**

1. FET – Characteristics.
2. UJT – Characteristics.
3. UJT – Relaxation oscillators.
4. Differentiating and integrating circuits – using opamp.
5. NAND, NOR as universal gates.
6. Verification of De Morgan's Theorems.
7. Transistor – Phase shift oscillator.
8. Transistor – Wein bridge oscillator.
9. Emitter Follower.
10. OP – Amp – Voltage follower, adder, subtractor, average (inverting mode).
11. OP – Amp – Inverting amplifier with frequency gain response.
12. Half adder and Full adder – using NAND gate only.
13. Half subtractor and Full subtractor – using NAND gate only.
14. RS, Clocked RS, and D Flip Flops using NAND gate only.
15. Four bit ripple counter – 7473 / 7476.
16. Shift Register – Four bit left / right – 7473 / 7476.
17. Micro Processor – 8 bit addition, Subtraction – using BCD & Hexadecimal.
18. Number conversion – 8 bit – BCD to binary, Binary to BCD, Hex to ASCII using 8085.
19. Square and Square root of Hex numbers – 8 bit – using 8085.
20. Micro processor – Sum of N elements

**SKILLED BASED SUBJECT**

**PAPER – 4**

**INSTRUMENTATION TECHNIQUES**

**UNIT – I : ELECTRICAL INSTRUMENTATION**

AC bridges – Measurement of Inductance by Maxwell's Inductance Bridge – Measurement of Capacitance by De Sauty's Bridge – Measurement of Mutual Inductance by carry Foster bridge – ac differential voltmeter – dc differential voltmeter – Analog multimeter.

**UNIT – II : ELECTRONIC INSTRUMENTATION**

Analog to Digital converters – Dual slope ADC and Successive approximation ADC – Digital counter (four bit) – Digital voltmeter – Digital Frequency Meter – Digital Multimeter – Digital Thermometer.

**UNIT – III : ANALYTICAL INSTRUMENTATION**

CRO – measurement of time period and frequency – Distortion analyzer – Wave analyzer – Spectrum analyzer – IR spectrometer – UV spectrometer – Fast Fourier Transform (FFT) analyzer – Ultrasound scanner.

**UNIT – IV : BIO-MEDICAL INSTRUMENTATION**

Bioelectric potentials – resting and action potential – Half cell potential – surface needle and micro electrodes – principle, description, function and recording of ECG, EMG and EEG artificial pace maker – simulators – heart lung machine – kidney machine – pH meter – laser blood flow meter.

Strain gauge and measurement of strain – Measurement of pressure using electrical transducer – Measurement of seismic vibration using seismic transducer – Piezo – electric accelerometer – Measurement of temperature using semiconductor device – Radiation measurement by GM counter.

**Books for study:**

Arumugam M / Biomedical instrumentation / Anuradha Publications, Kumbakonam / 2011.

Sawhney A K / A course in Electrical and Electronics Measurements and Instrumentation / Dhanpat Rai & Co., Delhi / 2003.

Alan S Morris / Measurement & Instrumentation Principles / Elsevier / 2006.

Anand M.M.S. / Electronics Instruments and Instrumentation Technology / PHI, New Delhi / 2006.

## ELECTIVE SUBJECTS

***Students can choose any one of the groups (Elective I, II & III)***

### **GROUP A**

Elective 1: Digital Electronics

Elective 2: Applied Electronics

Elective 3: Microprocessor and its Applications – 8085

### **GROUP B**

Elective 1: Materials Science

Elective 2: Applied Electronics

Elective 3: Laser and Fibre Optic Communication

### **GROUP B**

Elective 1: Fundamentals of Nano Materials and its Characterization

Elective 2: Applied Electronics

Elective 3: Medical Physics

**ELECTIVE**

**GROUP A**

**PAPER – 1**

**DIGITAL ELECTRONICS**

**UNIT – I : DIGITAL FUNDAMENTALS AND LOGIC GATES**

Number systems – decimal, binary, octal and hexadecimal system – Conversion from one number system to another. Codes – BCD code – Excess 3 code, Gray code – ASCII code - Binary arithmetic – Binary addition – subtraction – unsigned binary numbers – sign magnitude numbers – 1's and 2's complement – Binary multiplications and division -

AND, OR circuits using diodes and transistors – NOT using transistors – NAND, NOR and EXOR – functions and truth tables. NAND & NOR as universal gates.

**UNIT – II : BOOLEAN ALGEBRA AND SIMPLIFICATION OF LOGIC CIRCUITS**

Laws and theorems of Boolean algebra – De Morgan's theorems and their circuit implications - Simplification of Boolean equations – Karnaugh map – pairs, quads, octets – 2,3 and 4 variables - Arithmetic building blocks – Half adder – Full adder – parallel binary adder – Half subtractor – Full subtractor – The adder-subtractor – digital comparator – parity checker / generator.

**UNIT – III : DATA PROCESSING CIRCUITS AND SEQUENTIAL LOGICS**

Multiplexers – Demultiplexers – Decoders – 1 of 16 decoder BCD to decimal decoder – seven segment decoder – Encoders – Flip Flops – RS Flip Flop – Clocked RS Flip-flop – D flip-flop – JK flip-flop – JK master slave flip-flop – T type flip-flop.

**UNIT – IV : SHIFT REGISTERS AND COUNTERS**

Types of registers – serial in serial out – serial in parallel out – parallel in serial out – parallel in parallel out – ring counter – asynchronous counter – decoding gates – omitted states – modulus counters – BCD counter – up down counter – synchronous counter – combination counters – decade counter – cascaded counters.

### **UNIT – V : D/A AND A/D CONVERTERS**

Introduction – variable resistor network – binary ladder – D/A converter – D/A accuracy and resolution – A/D converter – simultaneous conversion – A/D accuracy and resolution.

#### **Books for study:**

Malvino and Leech, (2000), Digital Principles and Application, 4<sup>th</sup> Edition, Tata McGraw Hill, New Delhi.

Millman and Halkias, (1972), Integrated Electronics, International Edition, McGraw Hill, New Delhi.

Arul Thalapapathi, Fundamentals of digital computers, Comptek publishers, Chennai, 1995.

#### **Books for Reference:**

Computer architecture and logic design by T C Bartee, McGraw Hill, 1991.2.

Solid state electronics by 1 Agarwal and Anit Agarwal.

Digital integrated electronics by Herbert Taub and Donald Schilling, McGraw Hill.

Anokh Singh and A K Chhabra, (2005), Fundamentals of Digital Electronics and Microprocessors, 2<sup>nd</sup> revised and enlarged Ed., S Chand & Co. Ltd., New Delhi.

Digital fundamentals – Floyd – Pearson Education 8<sup>th</sup> Edition 2004 S Chand Publications.

## **PAPER – 2**

### **APPLIED ELECTRONICS**

#### **UNIT – I : SPECIAL DEVICES AND APPLICATIONS**

FET – Characteristics – parameter FET as amplifier – FET as VVR – MOSFET – Depletion and enhancement – UJT characteristics – UJT as relaxation oscillator – SCR characteristics – SCR as half wave rectifier and full wave rectifier. SCR as static current switch – Firing of SCR using UJT.

#### **UNIT – II : OPERATIONAL AMPLIFIER AND APPLICATIONS**

OPAMP – Parameters – Inverting and Non-inverting amplifier – gain – Miller effect – Virtual ground – Offset voltage – offset current – PSRR – CMRR.

OPAMP – Sign and Scale changer – adder, subtractor and averager – Integrator and differentiator – DC voltage follower – ac voltage follower –

#### **UNIT – III : OTHER APPLICATION OF OPAMP**

OP AMP logarithmic amplifier – antilogarithmic amplifier – Logarithmic multiplier – Logarithmic divider. Comparator – Schmitt trigger – astable multivibrator – monostable multivibrator – Bistable multivibrator.

#### **UNIT – IV : 555 TIMER AND PLL**

555 block diagram and work monostable operation – Astable operation – Schmitt trigger. Phase – Locked Loops (PLL) : Basic principles – Phase Detector.

Comparator – Analog phase detector – Digital phase detector – voltage controlled oscillator (VCO).

#### **UNIT – V : D/ A AND A/D CONVERTER**

Weighted resistor D/A converter – 4-bit R-2R ladder DAC – Analog to Digital converter – Stair case ADC – tracking or servo ADC – Successive approximation ADC – Flash ADC Dual slope ADC.

**Books for Study:**

Basic and Applied Electronics by M. Arul Thalpathi – Comtec Publisher Chennai – 2005.

Digital principles and applications – Malvino Leach – 4<sup>th</sup> Edn. – Tata McGraw Hill 1992.

Integrated Electronics by Jacob Millman and Christos C. Halkias – McGraw Hill International 1971.

Linear Integrated Circuits by D. Roy Choudhury and Shail Jain – New age international (P) Ltd.

OP-AMPS and linear integrated circuits – by Ramakant A. Gayakward – Printice Hall of India 1994.

**Books for Reference:**

Digital Computer electronics by Albert Paul Malvino – TMH Edition 1992.

Electronics – Analog and Digital – IJ Jagrath – Prentice – Hall of India – New Delhi – 1999.

Operational amplifier and linear integrated circuits – Prentice Hall Inc. N.J. 1977.



## **PAPER - 3**

### **MICROPROCESSOR AND ITS APPLICATIONS - 8085**

#### **UNIT – I : MICROPROCESSOR ARCHITECTURE AND ITS OPERATIONS**

Microprocessors – Architecture of 8085 – pin out configurations of 8085 – Bus organization and timings: buses – buffer – address bus, data bus, multiplexing address / data bus and control & status signals – ALU – registers in 8085 – flags – decoding and execution of instruction – Interrupts and its types.

#### **UNIT – II : PROGRAMMING MODEL OF 8085**

Classification of instructions and format – 8-bit data transfer, arithmetic, logical and branch instructions – Addressing modes – 16 bit data transfer and memory related instructions – stack and subroutine instructions – comparison of stack and subroutine instructions – Logical rotate and compare instructions – RIM and SIM interrupt instructions – 8-bit code conversion: Binary to BCD, BCD to binary, binary to ASCII, ASCII to binary.

#### **UNIT – III : TIME DELAY, DESIGN OF COUNTERS AND MEMORY INTERFACE**

Counters – time delay using one and pair of registers – Instruction timings of 8085 – T-states – delay routines and delay calculations.

Memory interface : 2K x 8, 4K x 6 ROM and RAM interface – timing diagram for memory read and memory write cycles – instructions cycle, machine cycle.

#### **UNIT – IV : INTERFACING I/O DEVICES**

Interfacing concepts – peripheral I/O instructions – interfacing input and output using decoders – interface of LED output display for binary data – Memory mapped I/O – LED display of binary data – comparison of peripheral I/O and memory mapped I/O.

#### **UNIT – V : INTERFACING DATA CONVERTERS AND PERIPHERAL DEVICES**

Concepts of D/A and A/D converters and circuits – illustration of interfacing 8-bit D/A - successive approximation A/D converters – interfacing of programmable peripheral device 8255 – Programming 8255A MODE zero – interfacing with ports of 8255 with LED's to run various counters.

**Books for study:**

Microprocessor Architecture, Programming and Applications with the 8085 – R.S. Goankar, 3<sup>rd</sup> Edn. Prentice Hall.

Fundamental of Microprocessor – 8085 – Architecture, Programming and interfacing – V. Vijyendra, S. Viswanathan, Pvt. Ltd., 2003.

**Books for reference:**

Digital computer electronics: an introduction to microcomputers – Malvino, 2<sup>nd</sup> Edn., Tata McGraw Hill.

Fundamental of Microprocessor and Microcomputers – B. Ram.

Computer System Architecture – Moris Mano, 3<sup>rd</sup> Edn., Prentice Hall India.

Introduction to Microprocessors : Software, Hardware, Programming – Lance A. Leventha, Prentice Hall India.

**ELECTIVE**

**GROUP B**

**PAPER – 1**

**A. MATERIALS SCIENCE**

**UNIT – I : MATERIAL SCIENCE**

Classification of materials – Properties of Engineering materials – Materials Structure – Types of Bonds – Bonds Formation – Ionic Bond – Covalent Bond – Metallic Bond – Comparison of Bonds – Secondary Bonds.

**UNIT – II : PHASE DIAGRAM AND TRANSFORMATION**

Basic terms – Solid Solution – Hume – Rothery's rule – Intermediate Phase – Phase Diagrams – Gibb's Phase Rule – Time – Temperature cooling curves – Construction of Phase Diagrams – The Lever Rule – Equilibrium Binary System – Eutectic System – Mechanism of Phase Transformation.

**UNIT – III : VACUUM AND OXIDATION**

History of vacuum technology – units of Vacuum – Kinetic aspects of Gases – Application of Vacuum – Gas flow in vacuum systems – production of vacuum – Measurement of vacuum – Thermal conductivity gauges – Penning Gauge – Oxidation – Oxidation Resistant Materials.

**UNIT – IV : NON-DESTRUCTIVE TESTING (NDT)**

NDT and its advantages – Defects in materials – Selection of the NDT Method – Visual Inspection – Basic Principle – Liquid Penetration Testing – Physical Principle – Magnetic Particle Testing (MPT) – Principle of MPT – Sensitivity – Limitation – Eddy Current Testing (ECT) – Principle – Instrument for ECT – Applications – Limitations – Radiography – Basic Principle – Application – Limitations.

**UNIT – V : ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS**

Dielectrics – Polarization – Temperature and frequency effects – Electric Breakdown – Ferroelectric materials – Electrostriction – Piezoelectricity – Uses of Dielectrics – Magnetic Properties – Classification – Magnetostriction – Soft and Hard Magnetic Materials.

**Books for study:**

Materials Science by G.K.Narula, K.S. Narula, V.K. Gupta, Tata McGraw Hill Publishing, 1994.

Materials Science and Engineering by V. Raghavan, Prentice Hall of India, 2004.

**Books for reference:**

Practical Non-Destructive Testing by Baldevraj, T. Jayakumar, M. Thanvasimuthu, Narosa Publishing House, Chennai, 2002.

Testing of Metallic Materials by A.V.K. Suryanarayana, B.S. Publications, Giriraj lane, Sultan Bazar, Hyderabad – 95, 2003.

## **PAPER – 2**

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#### **UNIT – V : D/ A AND A/D CONVERTER**

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Operational amplifier and linear integrated circuits – Prentice Hall Inc. N.J. 1977.

## **PAPER – 3**

### **LASER AND FIBRE OPTIC COMMUNICATION**

#### **UNIT – I : LASER PHYSICS**

Basic Principle of Laser – Einstein Coefficients – Condition for light amplification – Population Inversion – Threshold Condition – Line Shape Function – Optical Resonators – Three level and four level systems.

#### **UNIT – II : TYPES OF LASERS AND OUTPUT MODULATION METHODS**

Solid State Lasers – Ruby and Nd-YAG Laser – Gas Lasers – He-Ne and Co<sub>2</sub> lasers – semiconductor lasers – Heterojunction Lasers – Liquid Dye Lasers – Q switching and mode locking.

#### **UNIT – III : APPLICATIONS OF LASER**

Application of laser in industry – cutting and welding – Drilling – Surface Hardening – Medical applications – Laser as diagnostic and therapeutic tool – Holography – Theory of recording and reconstruction – application of Holography.

#### **UNIT – IV : OPTIC FIBERS**

Fiber optic revolution – basic characteristics of optical fiber – acceptance angle – numerical aperture – propagation of light through optical fiber – theory of mode formation – classification of fibers – step index and graded index fibers – single mode and multi mode fibers – losses in fibers – fabrication techniques of fibers.

#### **UNIT – V : FIBER OPTIC COMMUNICATION**

Source and detectors for fiber optic communication – Laser and LED – Analog and digital modulation methods – Principle of optical detection – Pin APD photodetectors – Noise – Design consideration of a fiber optic communication system.

**Books for study:**

Laser theory and applications by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.

Introduction to Fiber optics by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.

Optical Fiber Communications by John M. Senior, Cambridge University Press, 1996.

Fiber-Optic Communication Systems, Govind P. Agarwal, John-Wiley & Sons,

**Books for Reference:**

An Introduction to laser : Theory and Applications by M. N. Avadhanulu, S. Chand and Co., New Delhi 2001.

2.P.K. Palanisamy, Physics for Engineering, Scitech Publishing Pvt. Ltd., Chennai



**ELECTIVE**

**GROUP C**

**PAPER – 1**

**FUNDAMENTALS OF NANO MATERIALS AND ITS CHARACTERIZATION**

**UNIT – I : INTRODUCTION TO NANOTECHNOLOGY**

Definition of Nanoscale system – Feymann theory of Nanotechnology – types of nanotechnology – Molecular Nanotechnology – Molecular and atomic size – Surface and dimensional space – opportunities at the Nanoscale.

**Unit – 2: NANO PROPERTIES**

Forces between atoms and molecules, particles and grain boundaries – Vander Waals and electrostatic forces between surface – Nano and Mesopores – size dependent variation in magnetic, electronic transport, resistivity, optical and etc – Misnomers and misconception of Nanotechnology.

**Unit – 3 : QUANTUM CONFINEMENT**

Quantum confinement in one dimension – Quantum wells – Quantum confinement – In two dimensions – Quantum wires – Quantum confinement in three dimensions – Quantum dots – Super lattices band – Band offsets – Quantum dot layers.

**Unit – 4: SYNTHESIS OF NANOMATERIALS AND ITS CHARACTERIZATION**

Basic approaches of synthesis nanomaterials – Bottom up and top down process – fundamental of sol – gel process – Sol – Gel synthesis methods for oxides – Mechanical milling – thermal evaporation – XRD with Debye scherrer formula – SEM- TEM – FTIR – UV.

**Unit – 5: APPLICATION OF NANOMATERIALS**

Implications of Drug delivery – Polymeric Nanoparticles as Drug carriers and controlled release implant devices – Magnetic Data Storage – Magneto optics and magneto – optic recording – Nano Sensors – Physical sensor and chemical sensors.

**Books for Study & REFERENCE:**

1. Nanotechnology : Basic Science and Emergic Technologies – Mick Wilson, Kamli Kannangara, Geoff smith , Michelle Simmons, Burkhard Raguse, overseas press (2005)
2. Nanotechnology : A Gentle introduction to the next big idea, Mark A. Rather, Daniel Rather, Mark Rather, prentice Hall PTR; 1st edition (2002)
3. Robert W. Kel Sall, Mark Geoghenan, In W. Hamley, Nano Scale Science and technology, John Wiley and sons, 2005 ISBN 0470850868.
4. Recent advances I the liquid phase synthesis of inorganic nanoparticles Brain L. Cushing, Valdimir L. Kolesnichenko, Charles J. O\* Connor, Chem Rev 104 (2004)3893- 3946.
5. Nano composite science and technology, Palical M. Ajayan, Linda S. Schadles, Paul V. Braues, Wiley – VCH Verlag WEileim (2003).
6. [www.eng.vcedu/Ngbeaucag/calsses/XRD/Neutron\\_diffraction\\_atLNL.pdf](http://www.eng.vcedu/Ngbeaucag/calsses/XRD/Neutron_diffraction_atLNL.pdf)
7. Nano particulates as Dring Carriers , Edited by Vladimir P. Torchilin, Imperiacal college press, North Einstein university, USA (2006), ISBN 1 – 86094 – 630 – 5.
8. Magnetic materials: Fundamental and device applications Nichola. Ann spaldin, Cambridge University press (2003) ISBN 0521016584.

## **PAPER – 2**

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Electronics – Analog and Digital – IJ Jagrath – Prentice – Hall of India – New Delhi – 1999.

Operational amplifier and linear integrated circuits – Prentice Hall Inc. N.J. 1977.

## **PAPER – 3**

### **MEDICAL PHYSICS**

#### **UNIT – I: X – RAYS**

Electromagnetic spectrum – production of x- rays – s-rys spectra – Brehmsstrahlung – Characteristic x-ray – X-ray tubes – Coolidge tube – x-ray tube design – tube cooling – stationary mode – Retting anode x-ray tubes – Tube rating – quality and intensity of x-ray. X-ray generator circuits – half wave and full wave fectionation.

#### **UNIT – II : RADIATION PHYSICS**

Radiation units – exposure – absorbed dose – rad gray – kera relative biological effectivenss – effective dose – slevert - inverse square law – Interaction of radiation with matter – linear attenuation coefficient. Radiation Detectors.

#### **UNIT – III : MEDICAL IMAGING PHYSICS**

Radiological imaging – Radiography – Filters – grids – cassette – X-ray film – film processing – fluoroscopy – computed tomography scanner –principle function display – generations – mammography. Ultrasound imaging – magnetic resonance imaging – thyroid uptake system – Gamma camera [Only Principle, function and display]

#### **UNIT – IV : RADIATION THERAPHY PHYSICS**

Radiotherapy – kilo voltage machines – deep theraphy machines – tele-cobalt machines – Medical linear accelerator. Basic of Teletherapy units – deep x-ray, telecobalt units, medical linear accelerator – radiation protection – external beam characteristics – phantom –does maxim and build up – bolus – percentage depth dose – tissue – air ration – back scatter factor.

#### **UNIT – V : RADIATION PROTECTION**

Principles of radiation protection – protective materials – radiation effects – somatic, genetic stochastic and deterministic effect, Personal monitoring devices – TLD film badge – pocket dosimeter.

**Book for Study:**

1. Basic Radiological Physics Dr. K. Thayalan – Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
2. Christensen's Physics of Diagnostic Radiology : Curry, Dowdey and Murrey – Lippincot Williams and Wilkins (1990)
3. Physics of Radiation Therapy : FM Khan – Williamd and Wilkins, Third edition (2003)
4. The essential physics of Medical imaging : Bushberg, Seibert, leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
5. HE Johns and Cunningham – The Physics of Radiology.

**Books for Refernece :**

1. Nuclear medicine Physics : Chandra – Lippincot Willams and Wilkins (1998)
2. The Physics of radiology : John R. Gunni ingham and Johns – Charles C Thomas USA (19190)
3. Medical Imaging Physics : William R Hendee – Mosby , 3<sup>rd</sup> edition (1992)
4. Advanced Medical Radiation Dosimetry : Govindarajan KN Prentice – Hall of India Pvt. Ltd. New Delhi (1992)
5. Erric Hall Radio Biology for the Radiologist – Lippincott Williams & Wilkins.
6. The modern Technology of Radiation oncology – Jake VanDyk – Medical Physics Publishing.

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