

**E.S ARTS AND SCIENCE COLLEGE (CO-ED)**

**BACHELOR OF SCIENCE**

**B.Sc. PHYSICS DEGREE COURSE**

**CBCS PATTERN**

**(With effect from 2017 – 2018)**

**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					CIA	Uni. Exam	Total
<b>SEMESTER I</b>									
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	25	75	100
	IV	Allied Practical	Practical-1	3	0		0	0	0
5	IV	Environmental Studies		2	2	Environmental Studies	25	75	100
				<b>30</b>	<b>20</b>		<b>125</b>	<b>375</b>	<b>500</b>
<b>SEMESTER II</b>									
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	25	75	100
12	III	Allied-1	Paper-2	4	4	Chemistry II or Biochemistry II	25	75	100
13	IV	Allied Practical	Practical-1	3	2		25	75	100
14	IV	Value Education		2	2	Value Education	25	75	100
15	IV	Soft Skill		2	1	Soft Skills	25	75	100
				<b>30</b>	<b>25</b>		<b>200</b>	<b>600</b>	<b>800</b>

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

S. NO.	Part	Study Components		Ins. Hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
<b>SEMESTER III</b>							<b>CIA</b>	<b>Uni. Exam</b>	<b>Total</b>
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 and magnetism	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	25	75	100
23	IV	Non-Major Elective	Paper-1	2	2	Renewable Energy Sources	25	75	100
				<b>30</b>	<b>20</b>		<b>150</b>	<b>450</b>	<b>600</b>
<b>SEMESTER IV</b>							<b>CIA</b>	<b>Uni. Exam</b>	<b>Total</b>
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	25	75	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	25	75	100
31	IV	Non-Major Elective	Paper-2	2	2	Basic Physics	25	75	100
				<b>30</b>	<b>25</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER V</b>							<b>CIA</b>	<b>Uni. Exam</b>	<b>Total</b>
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	III	Elective I	Paper-1	3	3	Group (A) or (B) or (C)	25	75	100
39	IV	Skill Based Subject III	Paper - 3	3	3	Astro Physics	25	75	100
				<b>30</b>	<b>22</b>		<b>125</b>	<b>375</b>	<b>500</b>
<b>SEMESTER VI</b>							<b>CIA</b>	<b>Uni. Exam</b>	<b>Total</b>
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	III	Core Theory	Paper-10	5	4	Solid State Physics	25	75	100
36	III	Core Practical	Practical-3	6	3	Any 20 Experiments given in syllabus	25	75	100
37	III	Core Practical	Practical-4		3	Electronics	25	75	100
40	III	Elective	Paper-2	3	3	Group (A) or (B) or (C)	25	75	100
	III	Elective	Paper-3	3	3	Group (A) or (B) or (C)	25	75	100
	IV	Skill based Subject	Paper-4	3	3	Instrumentation Techniques	25	75	100
	V	Extension Activities		-	1		100	-	100
		<b>TOTAL</b>		<b>30</b>	<b>28</b>		<b>300</b>	<b>600</b>	<b>900</b>

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	100	200
	Allied (Even Semester)	2	4	10	100	200
	Allied Practical	1	2	2	100	100
	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	100	100
	Soft skill	1	1	1	100	100
	Value Education	1	2	2	100	100
	Lang. & Others/NME	2	2	4	100	200
	Skill Based	4	3	12	100	400
Part V	Extension	1	1	1	100	100
	<b>Total</b>	<b>40</b>		<b>140</b>		<b>4000</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 C**

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 2017 - 2018)**

#### **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-Applications of surface tension.

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

## **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:**

1. Properties of matter by Murugesan R, S Chand & Co. Pvt. Ltd., New Delhi.
2. Properties of matter by Brij Lal & Subramaniam, N Eurasia Publishing Co., New Delhi, 1989.
3. Text book of sound by Brij Lal & Subramaniam, N Vikas Publishing House, New Delhi, 1982.
4. Text book of sound by M N Srinivasan – Himalaya Publications (1991).
5. Science and Technology of Ultrasonics by Baldevraj, Narosa [2004].

#### **Books for reference:**

1. Elements of Properties of Matter by Mathur D S, Shymlal Charitable Trust, New Delhi, 1993.
2. Fundamentals of General Properties of Matter by Gulati H R, R Chand & Co. New Delhi, 1982.
3. Waves & Oscillations by Subrahmanyam N & Brij Lal, Vikas Publishing House Pvt. Ltd., New Delhi, 1994.
4. A Textbook of Sound by Khanna D R & Bedi R S, Atma Ram & Sons, Jew Delhi 1985.
5. Fundamentals of Physics, 6<sup>th</sup> Edition by D Halliday, R Resnick and J Walker, Wiley NY 2001.
6. Physics, 4<sup>th</sup> Edition vols, I, II & II Extended by D Halliday, R Resnick and K S Krane, Wiley NY 1994.
7. CRC Handbook of Physics & Chemistry, 80<sup>th</sup> ED., CR5 Press, NY, 1999.
8. The Feynman Lectures on Physics, Vols. I, II and III, by R P Feynman, RB Leighton and M Sands, Narosa, New Delhi, 1998.

# ALLIED

## PAPER – 1

### CHEMISTRY – I

#### OBJECTIVE:

- Basic knowledge on Metallurgy, Cycloalkanes, Polarising Effects, Stereochemistry, Chemical Kinetics, Catalysis, Photochemistry, VSEPR Theory, Fuels, Osmosis, Nuclear Chemistry, Petroleum Chemistry, Chemistry of Naphthalene, Conductors and Applications wherever necessary are to be taught for I- Semester.

#### UNIT – I

1.1 General Metallurgy - Extraction of Metals - Minerals and Ores- Difference between Minerals and Ores – Minerals of Iron, Aluminum and Copper - Ore Dressing or Concentration of Ores - Types of Ore Dressing- Froth Floatation process, Gravity separation and Magnetic separation.

1.2 Calcination, Smelting, Roasting, Flux, Slag - Definition - Reduction methods - Goldschmidt Aluminothermic process and Carbon Reduction method - Refining of Metals - Electrolytic, Van Arkel and Zone Refining.

1.3 Ores of Titanium and Cobalt - Extraction of Titanium and Cobalt.

#### UNIT – II

2.1 Cycloalkanes - Preparation – Wurtz reaction and Dieckmann's condensation - Properties of Cycloalkanes – Substitution and Ring opening reactions.

2.2 Polarisation - Inductive effect, Mesomeric effect and Steric effect (Acid and Base Strength).

2.3 Stereoisomerism – Types - Cause of Optical Activity – Enantiomers - Diastereomers - Meso form - Optical Activity of Lactic acid and Tartaric acid - Racemisation and Resolution – Definition and Methods - Geometrical isomerism – Definition and example - Maleic and Fumaric acid – Differences.

#### UNIT – III

3.1 Chemical Kinetics – Rate of a reaction – Definition of Order and Molecularity – Distinction between Order and Molecularity - Derivation of First order rate equation - Half Life Period of first order reaction.

3.2 Catalysis - Catalyst - Autocatalyst - Enzyme catalyst - Promoters - Catalytic poisons – Active Centre - Differences between Homogeneous and Heterogeneous Catalysis - Industrial Applications of Catalysts.

3.3 Photochemistry – Grothus-Draper's law – Stark-Einstein's law - Quantum yield – Photosynthesis - Phosphorescence – Fluorescence.

## **UNIT – IV**

4.1 VSEPR Theory – Hybridisation and Shapes of simple molecules  $\text{BF}_3$ ,  $\text{PCl}_5$ ,  $\text{SF}_6$  and  $\text{XeF}_6$ .

4.2 Fuels – Classification of Fuels - Calorific value of Fuels – Water gas, Carbureted Water gas and Producer gas – Composition and Uses - Non-Conventional fuels - Need of Solar Energy - Applications - Biofuels – Oil gas, Natural gas and LPG – Uses.

4.3 Osmosis - Osmotic pressure - Reverse osmosis – Definition - Desalination of Sea water.

## **UNIT – V**

5.1 Nuclear Chemistry – Atomic number, Mass number - Isotopes, Isobars and Isotones – Definition and Examples - Definition of Half life period - Nuclear Binding Energy, Mass Defect and N/P ratio - Nuclear Fission and Nuclear Fusion (Elementary idea) - Applications of Radioisotopes in Medicine, Agriculture and Industries – Carbon Dating.

5.2 Crude Oil - Petroleum - Petroleum Refining - Cracking - Applications of Cracking – Naphthalene – Preparation – Haworth's method – Properties – Oxidation, Reduction and Uses of Naphthalene - Structure of Naphthalene (Structural elucidation not necessary).

5.3 Conductors, Insulators, Semiconductors, N- and P- Type Semiconductors – Definitions and Examples.



**ALLIED - 1**  
**PAPER - 1**  
**BIOCHEMISTRY I**

**UNIT-I: Chemistry of Carbohydrates**

Definition and Classification of carbohydrate. Monosaccharides - occurrence, structure; physical and chemical properties, linear and ring forms (Haworth formula) for glucose and fructose. Disaccharides - occurrence, structure; physical and chemical properties of sucrose and lactose. Polysaccharides - occurrence, structure, physical and chemical properties of starch.

**UNIT-II: Chemistry of amino acids**

Definition and classification of amino acids. Reaction with ninhydrin, common properties of amino acids, amphoteric nature, isoelectric point, isoelectric pH and Zwitter ion.

**UNIT-III: Chemistry of Proteins**

Classification based on solubility, shape and size. Physical properties: salting in and salting out, denaturation, peptide bond. Structure of protein: primary, secondary, tertiary and quaternary structure.

**UNIT-IV: Chemistry of Lipids**

Definition, classification and functions of lipids. Occurrence, chemistry and biological functions of simple lipids, compound lipids (e.g. phospholipids) and derived lipids: steroids (e.g. cholesterol). Physical property-emulsification. Chemical property-saponification. Functions of bile acids and bile salts.

**UNIT-V: Chemistry of Nucleic acids**

Definition - nucleoside, nucleotide and polynucleotide. Double helical model of DNA and its biological functions. Structure, types and functions of RNA: tRNA, mRNA and rRNA. Differences between DNA and RNA.

**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, and Lange Medical Books. 25<sup>th</sup> 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 AND STATISTICAL PHYSICS**

##### **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 – Derivation of Wiedmann – Franz law and its limitations – 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 PHYSICS**

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 – Maxwell – Boltzmann law-distribution of velocity-Quantum statistics-Fermi-Dirac distribution law-Bose-Einstein distribution law-comparison of three statistics.

**Books for study:**

1. Heat and thermodynamics – Brijlal and Subramaniam, S Chand & Co.
2. Heat and thermodynamics – J B Rajam, S Chand & Co., New Delhi.
3. Thermal Physics – R Murugesan and Kiruthiga Sivaprasad, S Chand & Co., New Delhi.

**Books for Reference:**

1. Heat and thermodynamics – D S Mathur, S Chand & Co., New Delhi
2. Elements of Statistical Mechanics – Gupta and Kumar, Pragati Prakashan, Meerut.
3. Statistical Mechanics – Sathya Prakash and J P Agarwal, Kedar Nath & Ram Nath & Co., Meerut.
4. Introduction to Solid State Physics – C Kittel, Prentice Hall of India.

## CORE PRACTICAL – I

### (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. Thermal conductivity of a good conductor-Forbe's method.
14. Specific heat of liquid – Newtons law of cooling.
15. Sonometer – frequency of tuning fork.
16. Sonometer – RD of a solid and liquid.
17. Focal length – R and  $\mu$  of a long focus convex lens.
  - i Auto collimation method
  - ii Auxillary Lens Method
18. Focal length – R and  $\mu$  of a concave lens.
  - i Combination Method
  - ii Auxillary Lens Method
19. Spectrometer – solid prism-  $\mu$  of material of prism.
20. Spectrometer- Hollow prism -  $\mu$  of a liquid.
21. Potentiometer – Calibration of low range voltmeter.
22. Potentiometer – Internal resistance.
23. Post office box – temperature coefficient of resistance.

**ALLIED**  
**PAPER – 2**  
**CHEMISTRY – II**

**OBJECTIVE:**

- Basic knowledge on Coordination Chemistry, Industrial Chemistry, Carbohydrates, Aminoacids, Proteins, Electrochemistry, Paints and Pigments, dyes, Vitamins, Medicinal Chemistry, Corrosion and Applications wherever necessary are to be taught for II- semester.

**UNIT – I**

1.1 Coordination Chemistry - Nomenclature of Coordination Compounds - Ligands, Central Metal Ion and Complex Ion – Definition and Examples – Coordination Number - Werner’s Theory of Coordination Compounds - Chelates - Functions and Structure of Haemoglobin and Chlorophyll.

1.2 Industrial Chemistry - Fertilisers and Manures – Biofertilisers - Organic Manures and their importance - Role of NPK in plants - Preparation and Uses of Urea, Ammonium Nitrate, Potassium Nitrite 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, Gammexane and Freons.

**UNIT – II**

2.1 Carbohydrates - Definition and Examples - Classification – Oxidation and Reduction Reactions of Glucose - Structure of Glucose (Structural elucidation not necessary) - Uses of Starch - Uses of Cellulose Nitrate and Cellulose Acetate.

2.2 Amino Acids – Definition and Examples - Classification of Amino Acids - Preparation - Gabriel Phthalimide Synthesis – Properties – zwitterion and Isoelectric point - Structure of Glycine.

2.3 Proteins – Definition - Classification of Proteins based on Physical properties and Biological functions - Primary and Secondary Structure of Proteins (Elementary Treatment only) – Composition of RNA and DNA and their Biological role - Tanning of Leather - Alum (Aluminum chloride tanning ) - Vegetable tanning – Chrome Tanning.

### **UNIT – III**

3.1 Electrochemistry - Electrolytes – Definition and Examples – Classification - Specific and Equivalent Conductance - their determination – Variation of Specific and Equivalent conductance with Dilution – Ostwald’s Dilution Law and its Limitations.

3.2 Kohlrausch’s Law - Determination of Dissociation Constant of weak Electrolytes using Conductance measurement - Conductometric titrations.

3.3 pH – Definition and pH determination by indicator method - Buffer solutions - Buffer action - Importance of buffers in the living systems.

### **UNIT – IV**

4.1 Paints - Components of Paint – Requisites of a Good Paint - Pigments – Classification of Pigments on the basis of Colour – Examples - Dyes – Definition – Chromophores and Auxochromes – Examples - Colour and Dyes - Classification based on Constitution and Application – Examples.

4.2 Vitamins – Definition – Classification – Water Soluble and Fat Soluble – Occurrence - Biological Activities and Deficiency Diseases caused by Vitamin A, B, C, D, E and K - Hormones – Definition and Examples – Biological Functions of Insulin and Adrenaline.

4.3 Chromatography - Principles and Applications of Column and Paper chromatography-  $R_f$  value.

### **UNIT – V**

5.1 Drugs - Sulpha Drugs – Preparation and Uses of Sulphapyridine and Sulphadiazine - Mode of Action of Sulpha Drugs - Antibiotics - Uses of Penicillin, Chloramphenicol and Streptomycin - Drug Abuse and Their Implication - Alcohol – LSD.

5.2 Anaesthetics - General and Local Anaesthetics - Antiseptics - Examples and their Applications - Definition and One Example each for Analgesics, Antipyretics, Tranquilizers, Sedatives - Causes, Symptoms and Treatment of Diabetes, Cancer and AIDS.

5.3 Electrochemical Corrosion and its Prevention – Electroplating – Applications.

# **ALLIED**

## **PAPER - 2**

### **BIOCHEMISTRY II**

#### **UNIT-I: Metabolism**

Glycolysis, TCA cycle and its energetics, HMP shunt pathway. Deamination, transamination reaction, transaminase enzymes, Urea cycle.

#### **UNIT-II: Metabolic Disorders**

Diabetes mellitus, Glycogen storage diseases, Glycosuria, Ketosis, Jaundice, Phenyl ketonuria, Alkaptonuria. 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. Michaleis-Menton equation. Enzyme inhibition: competitive, uncompetitive and non competitive. Biological functions of enzymes.

#### **UNIT-IV: Molecular Biology**

Central dogma of molecular biology. DNA and RNA act as genetic material. Replication: Definition, types, mode of action of replication, mechanism of replication. General mechanism of transcription and translation. Genetic code.

#### **UNIT-V: Vitamins**

A brief outline of source, requirement, biological function and deficiency of Vitamins (fat soluble and water soluble vitamins).

#### **References:**

1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan worth Publishers.
2. Harper's Biochemistry-Robert K. Murray, Daryl K. Grammer, McGraw Hill, and 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 III  
PAPER – 3**

**ELECTRICITY AND MAGNETISM**

**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 – capacitance – capacitance of a spherical and cylindrical capacitor – energy of a charged capacitor – loss of energy due to sharing of charges - Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics - Parallel plate capacitor completely filled with dielectric.

**UNIT – II : CURRENT ELECTRICITY & TRANSIENT CURRENT**

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

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.

**UNIT – III : THERMO ELECTRICITY**

Seeback, 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 - thermo electric power and thermo electric diagrams.

**UNIT – IV : ELECTRO MAGNETIC INDUCTION**

Faraday's laws of electromagnetic induction in vector form – Lenz's law - determination of self-inductance by Anderson's bridge method and absolute mutual inductance by BG – Ruhmkorff's induction coil – induction coil and its uses – Coefficient of coupling – Earth inductor - Eddy Currents - Energy stored in a magnetic field.

**UNIT – V : MAGNETISM**

Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.



**Books for study:**

1. R Murugesan – Electricity and magnetism, 8<sup>th</sup> Edn, 2006, S Chand & Co., New Delhi.
2. M Narayanamurthy & N Nagarathnam, Electricity & Magnetism 4<sup>th</sup> Edn, National Publishing Co., Meerut.
3. Duggal and Chhabra, Electricity and Magnetism.
4. Brijlal, N Subramanyan and Jivan Seshan, Mechanics and Electrodynamics [2005], Eurasia Publishing House [Pvt.] Ltd., New Delhi.

**Books for reference:**

1. 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.
2. David J Griffiths, Introduction to Electrodynamics, 2<sup>nd</sup> Edn. 1997, Prentice Hall of India pvt. Ltd., New Delhi.
3. Electricity & Magnetism by K K Tewari, S Chand & Co., 3<sup>rd</sup> Edition, 2001.

**ALLIED  
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 - 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  $\theta$ .

**UNIT-V: DIFFERENTIAL CALCULUS**

Successive differentiation upto third order, Jacobians -Concepts of polar co-ordinates-Curvature and radius of curvature in Cartesian co-ordinates and in polar 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. VikasPublications, 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:**

1. A text book in Electrical Technology – B L Theraja – S chand & Co.
2. A text book in Electrical Technology – A K Theraja.
3. Performance and design of AC machines – M G Say ElBS 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 and vertical triangular lamina- laws of floatation- meta centre and metacentric height of a ship- production of low pressure- rotary pump- diffusion pump- pirani gauge

**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:**

1. Mechanics and mathematical methods by R Murugeshn, S Chand. Elements of mechanics by Gupta.
2. Dynamics by Naranamurthi, National Publishing Company, Chennai. Classical Mechanics by Gupta Kumar and Sharma.
3. Classical Mechanics by B D Gupta and Sathya Prakash, Kedar Nath Ram Nath & Co.,

**Books for Reference:**

1. Mechanics by D S Mathur.
2. Classical Mechanics by Goldstein, Narosa.
3. Mechanics and Properties of Matter, C.L. Arora, S. Chand & Co.

**CORE PRACTICAL – II**

**(Any 16 Experiments)**

1. Young's modulus uniform bending Pin and microscope.
2. Young's 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 – i-d 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 Foster's 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. BG – Figure of merit – Charge sensitiveness.
14. BG – Comparison of capacitances.
15. BG – Comparison of emf of two cells.
16.  $m$  and  $B_H$  – Tan C – deflection magnetometer and vibration magnetometer.
17. Low range power pack – using two diodes.
18. Transistor Characteristics – CE / CB modes.
19. Zener diode as a Voltage regulator.
20. IC Voltage regulator using 7805.

**ALLIED**  
**MATHEMATICS – II**

**Objectives of the Course**

To Explore the Fundamental Concepts of Mathematics

**UNIT-I: 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-II: Partial Differential Equations**

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

**UNIT-III: 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-IV: Vector Analysis**

Scalar point functions - Vector point functions - Gradient ,divergence, curl - Directional derivatives - Unit to normal to a surface.

**UNIT-V: Vector Analysis (continued)**

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:**

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



**SKILL BASED SUBJECT**

**PAPER – 2**

**ELECTRONIC 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 Lissajoué'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:**

1. Principles of Electronics by V K Metha, S Chnd & Co., 5<sup>th</sup> edition 2001.
2. Functional Electronics by Ramanan.
3. Elements of Electronics by Bagde and Singh.
4. Monochrome and Colour TV by Gulati.
5. 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:**

1. The Learner's Series – Everyday Science – Published by INFINITY BOOKS, New Delhi.
2. The Hindu speaks on Science, Vol I & II, Kasturi & Sons, Chennai.

**Books for Reference:**

1. Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker, 6<sup>th</sup> Edition, Wiley, NY (2001).
2. Physics, Vols I, II, III by D. Halliday, R. Resnick and K.S. Krane, 4<sup>th</sup> Edition, Wiley, New York (1994).
3. 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 an optical fibre - Classification of fibres based on Refractive index and number of modes of transmission – Theory of transmission of electromagnetic wave through fibres – Acceptance angle - Numerical aperture – absorption and scattering losses – optical fibre communication system - Application of optical fibres as wave guide and sensors.

**Books for study:**

1. Optics by Subramaniam N & Brij Lal, S Chand & Co. Pvt. Ltd., New Delhi, 1990.
2. Optics by Khanna D R & Gulati H R, S Chand & Co. Pvt. Ltd., New Delhi, 1979.
3. Optics and Spectroscopy by Murugesan, S Chand & Co. Pvt. Ltd., New Delhi.
4. Optical fiber communications –Principles and Practice by John M Senior, Second edition, Prentice Hall, Pearson New Delhi.
5. Optical fiber communications by Gerd Keiser, Second edition, McGraw Hill

**Books for Reference:**

1. Fundamentals of Optics by Jenkins Francis and White E Harvey, McGraw Hill Inc., New Delhi, 1976.
2. Optical Physics by Lipson. S G, Lipson H and Tannhauser D S, Cambridge University Press (1995).
3. Fundamental of Optics by Raj M G, Anmol Publications Pvt. Ltd., (1996), New Delhi.
4. Fundamentals of Physics, 6<sup>th</sup> Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.
5. Physics, 4<sup>th</sup> Edition Vols I, II & II Extended by D Halliday, R Resnick and K S Krane, Wiley, Ny, 1994.
6. CRC Handbook of Physics & Chemistry, 80<sup>th</sup> Ed., CRS Press, Ny, 1999.
7. The Feynman Lectures on Physics, Vols. I, II and III by R P Feynman, R B Leighton and M Sands, Narosa, New Delhi 1998.
8. Fibre Optic Communication System, Govind P. Agarwal, John –Willey & 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 magnetron – 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: LASER PHYSICS**

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:**

1. Modern physics by R Murugesan, S Chand & Co., New Delhi - 2004.
2. Atomic and Nuclear physics by N Subramanian and Brij Lal, S Chand & Co. - 2000.
3. Atomic physics by J B Rajam.
4. Spectroscopy by Gupta & Kumar
5. Spectroscopy by Banewell
6. Laser Fundamentals, by William T. Silfvast, Cambridge University Press,

### **Books for Reference:**

1. Atomic physics by A B Gupta and Dipak Ghosh – Books and Allied Publishers.
2. Modern physics by J H Hamilton and Yang, McGraw Hill Publication 1996.
3. Concepts of Modern physics by A Beiser, Tata McGraw Hill, New Delhi 1997.
4. Fundamentals of physics, 6<sup>th</sup> edition, by D Halliday, R Resnick and J Walker, Wiley NY 2001.
5. Laser and Non Linear Optics by B.B.Laud, New Age international.
6. Laser systems and applications by Niyamad Choudhary and Richa Verma, PHI, New Delhi

**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 – JFET construction and working – types of JFET – biasing – V-I characteristics in common source mode – JFET as amplifier.

**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 – Darlington pair - 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 – RADAR – Range equation – Applications of RADAR.

**Books for study:**

1. 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.
2. Functional electronics by Ramanan. Monochrome and Colour TV by Gulati.
3. Basic and applied electronics by M Arul Thalpathi, Comptek, Publishers, Chennai 2005.
4. Electronic Communication systems, by George Kennedy, Bernard Davis , S R M Prasanna, 5<sup>th</sup> edn, Tata McGraw Hill, India

**Books for reference:**

1. Electronic principles by Malvino.
2. Electronic devices and circuits by Allen Mottershed.
3. Monochrome and colour TV Gulati.
4. Basic Television and videosystems by B Grob.
5. Solid State Electronics by Manna, Tata McGraw Hill.
6. Basic electronics, 6<sup>th</sup> Edition by B Grob, McGraw Hill, NY 1989.
7. Introduction to Radar systems, by Merrill I Skolnik, McGraw Hill.



**SKILL BASED SUBJECT**

**PAPER – 3**

**ASTRO PHYSICS**

**UNIT – I: ASTRONOMICAL INSTRUMENTS**

Optical telescope - reflecting telescope - types of reflecting telescope - advantages of reflecting telescopes - radio telescope - astronomical spectrographs - photographic photometry - photoelectric spectrometry- detectors and image processing.

**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 - Celestic.

**Books for study:**

1. Baidyanath Basu / An introduction to Astrophysics / second printing, Prentice Hall of India Private limited New Delhi – 2001
2. Hewish. A / Physics of the universe / CSIR publication, New Delhi, 1992.
3. Biman Basu / Inside Stars / CSIR Publication, New Delhi, 1992.
4. Biman Basu / Cosmic Vistas / National Book Trust of India, 2002.
5. Krishnasamy K.S. / Astro Physics a modern perspective / New Age International / New Delhi.
6. Murugesan. R / Modern Physics / S. Chand & Co. / New Delhi, 2003.

**Books for reference:**

1. Mohan Sundara Rajan / Space today / National Book Trust of India, 2000.
2. William K. Hartmann / The Cosmic Voyage through time and space / Wads worth Publishing company, California, 1990.

**SEMESTER VI**

**PAPER – 8  
NUCLEAR 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 electron 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 – Nuttal 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:**

1. Modern physics by R Murugesan S Chand & Co.
2. Introduction to Modern Physics by Rich Meyer, Kennard, Coop Tata McGraw Hill Publishing Co.
3. Atomic and nuclear physics by Littlefeld & Thorley.
4. Modern physics by R Murugesan & Kiruthiga, Sivaprasath S Chand & Co. (2006).

**Books for reference:**

1. Nuclear Physics S N Ghoshal – S Chand & Co. Edition 2003.
2. Nuclear Physics D G Tayal – Himalayan Publishing House.
3. Elements of Nuclear Physics – M L Pandya & R P S Yadav Kedar Nath Ram Nath (2000).
4. Nuclear Physics – Irving Keplan.
5. 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 : SCHRODINGER 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 – Stoke's theorem – Green's 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.

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**Books for study:**

1. Quantum Mechanics by V. Devanathan, Narosa, Chennai, 2005.
2. Modern Physics by R Murugesan, Kiruthiga, Sivaprasath S Chand & Co. (2007).
3. Quantum Mechanics by V K Thangappan, Wiley Eastern.
4. A Text Book of Quantum Mechanics by P M Mathews and Venkatesan, McGraw Hill. Mathematical Physical by Sathya Prakash.
5. Mechanics and Mathematical Methods by Murugesan, S Chand Publishing & Co.

**Books for reference:**

1. Mathematical Physics by B D Gupta.
2. Quantum Mechanics by Ghatak and Loganathan, McMillan.
3. Basic Quantum Mechanics by A Ghatak, McMillan India (2002).

**PAPER – 10**

**SOLID STATE 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 Petit'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.

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

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**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**

#### **(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. Spectrometer i – I' Curve.
6. Spectrometer – narrow angled prism – angle of deviation – normal incidence and normal emergence – refractive index.
7. Dispersive power of a prism.
8. Dispersive power of a grating.
9. Spectrometer – Cauchy's constants.
10. Lasers – Determination of Numerical aperture of a fiber
11. Lasers - 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. Hartley 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 op-amp.
5. NAND, NOR as universal gates.
6. Verification of De Morgan's Theorems.
7. Transistor – Phase shift oscillator.
8. Transistor – Wien bridge oscillator.
9. Emitter Follower.
10. Op – Amp – Voltage follower, adder, subtractor, averager (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. Microprocessor – 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. Microprocessor – Sum of N elements

**SKILL 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 slop 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:**

1. Arumugam M / Biomedical instrumentation / Anuradha Publications, Kumbakonam / 2011.
2. Sawhney A K / A course in Electrical and Electronics Measurements and Instrumentation / Dhanpat Rai & Co., Delhi / 2003.
3. Alan S Morris / Measurement & Instrumentation Principles / Elsevier / 2006.
4. 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 C**

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:**

1. Malvino and Leech, (2000), Digital Principles and Application, 4<sup>th</sup> Edition, Tata McGraw Hill, New Delhi.
2. Millman and Halkias, (1972), Integrated Electronics, International Edition, McGraw Hill, New Delhi.
3. Arul Thalapapathi, Fundamentals of digital computers, Comptek publishers, Chennai, 1995.

**Books for Reference:**

1. Computer architecture and logic design by T C Bartee, McGraw Hill, 1991.2.
2. Solid state electronics by 1 Agarwal and Anit Agarwal.
3. Digital integrated electronics by Herbert Taub and Donald Schilling, McGraw Hill.
4. 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.
5. 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.

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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 –

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

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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  
Duel slope ADC.



**Books for Study:**

1. Basic and Applied Electronics by M. Arul Thalpathi – Comtec Publisher Chennai – 2005.
2. Digital principles and applications – Malvino Leach – 4<sup>th</sup> Edn. – Tata McGraw Hill 1992.
3. Integrated Electronics by Jacob Millman and Christos C. Halkias – McGraw Hill International 1971.
4. 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:**

1. Digital Computer electronics by Albert Paul Malvino – TMH Edition 1992.
2. Electronics – Analog and Digital – IJ Jagrath – Prentice – Hall of India – New Delhi – 1999.
3. 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:**

1. Microprocessor Architecture, Programming and Applications with the 8085 – R.S. Goankar, 3<sup>rd</sup> Edn. Prentice Hall.
2. Fundamental of Microprocessor – 8085 – Architecture, Programming and interfacing – V. Vijyendra, S. Viswanathan, Pvt. Ltd., 2003.

**Books for reference:**

1. Digital computer electronics: an introduction to microcomputers – Malvino, 2<sup>nd</sup> Edn., Tata McGraw Hill.
2. Fundamental of Microprocessor and Microcomputers – B. Ram.
3. Computer System Architecture – Moris Mano, 3<sup>rd</sup> Edn., Prentice Hall India.
4. Introduction to Microprocessors : Software, Hardware, Programming – Lance A. Leventhal, Prentice Hall India.

**ELECTIVE**

**GROUP B**

**PAPER – 1**

**MATERIALS SCIENCE**

**UNIT – I : MATERIALS 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:**

1. Materials Science by G.K.Narula, K.S. Narula, V.K. Gupta, Tata McGraw Hill Publishing, 1994.
2. Materials Science and Engineering by V. Raghavan, Prentice Hall of India, 2004.

**Books for reference:**

1. Practical Non-Destructive Testing by Baldevraj, T. Jayakumar, M. Thanvasimuthu, Narosa Publishing House, Chennai, 2002.
2. Testing of Metallic Materials by A.V.K. Suryanarayana, B.S. Publications, Giriraj lane, Sultan Bazar, Hyderabad – 95, 2003.

**PAPER – 2**

**APPLIED ELECTRONICS**

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

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**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 – Hetero junction 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 photo detectors – Noise – Design consideration of a fiber optic communication system.



**Books for study:**

1. Laser theory and applications by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.
2. Introduction to Fiber optics by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.
3. Optical Fiber Communications by John M. Senior, Cambridge University Press, 1996.
4. Fiber-Optic Communication Systems, Govind P. Agarwal, John-Wiley & Sons,

**Books for Reference:**

1. 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 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. [ww.eng.vcedu/Ngbeaucag/calsses/XRD/Neutron\\_diffraction\\_atLNL.pdf](http://ww.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.

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3. 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 fectionification.

**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**

Radio therapy – kilo voltage machines – deep therapy 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 Theraphy : 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.

**ALLIED  
PHYSICS - I**

**UNIT – I: PROPERTIES OF MATTER**

Elasticity : Hooke's Law – Elastic Constants – bending of beam – Bending moment – Cantilever Depression at the loaded end of a cantilever – determination of Young's modulus by non-uniform bending.

Torsion : Torsion couple – Potential energy in a twisted wire – Torsional pendulum – Time period – Determination of rigidity modulus by Torsional oscillation (without masses).

Viscosity: Viscosity of a liquid – Viscous force – Co-efficient of viscosity of a liquid – Poiseuille's formula .

Surface Tension: Surface Tension – Surface Tension and interfacial surface tension by the method of drops.

**UNIT – II: HEAT**

Heat: Specific heat – Newton's law of cooling – determination of specific heat of a liquid using Newton's law of cooling – Emissivity and Emissive Power.

Low Temperature: J.K. Effect – Positive Effect – Negative Effect – Temperature of Inversion – Super conductors. Type I and II – Meisner Effect – Helium I and II.

**UNIT – III: ELECTRICITY AND MAGNETISM**

Electricity: Potentiometer – Principle – Calibration of low range voltmeter – Measurement of internal resistance of cell – measurement of an unknown resistance.

Magnetism – Moment and pole strength of a magnet – Deflection magnetometer – Tan C position – Vibration magnetometer – Theory – Period of Oscillation – Determination of  $M$  and  $B_H$  using the deflection magnetometer in Tan C position and the vibration magnetometer.

**UNIT – IV: SOUND AND ACOUSTICS OF BUILDING**

Sound: Transverse vibration of strings – Velocity and frequency of vibrations of a stretched string – laws – sonometer – A.C. Frequency – Steel Wire – Brass wire.

Ultrasonics – Production by Piezo – electric method – properties and uses.

Acoustics of buildings: Reverberation – Reverberation time – Sabine's formula (definition only) – Sound absorption co-efficient of surface – conditions for the perfect acoustics.



## **UNIT – V: OPTICS**

Interference: Air Wedge – Description – Test for optical flatness of glass plate – Determination of diameter of a thin wire by air wedge.

Diffraction: Theory of transmission grating – Normal Incidence – Determination of Wavelength of monochromatic source and Wavelength of mercury line using a grating by normal Incidence.

Fibre optics: principle-classification of optical fibres-fibre optic communication system block diagram.

### **Books for Study & Reference**

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004).
8. Introduction to Fibre optics- K.Thyagarajan and Ajay Ghatak,Cambridge,University Press(1999).

**ALLIED  
PHYSICS II**

**UNIT – I: WAVE MECHANICS**

Wave Mechanics – De Broglie Waves – Dual Nature – Experimental Study of Matter Waves – Davission and Germer's Experiment – G.P. Thomson's Experiment – Heisenberg's uncertainty Principle – The position and moment of a particle.

**UNIT – II : NUCLEAR PHYSICS**

Particle accelerators – cyclotron, particle detectors – GM Counter Artificial Transmutation – Rutherford's Experiment – The Q value equation for nuclear reaction – Threshold energy – Nuclear Reactions.

Conservation Laws: Conservation of Charge – Conservation of Nucleons – Conservation of Mass – Energy – Conservation of Parity – Quantities conserved and quantities not conserved in a nuclear reaction.

**UNIT – III : ENERGY PHYSICS**

Sources of conventional energy – Need for non-conventional energy resources – solar energy utilization – solar water heater – solar drier – conversion of light into electrical energy – solar cell – merits and demerits of solar energy – wind energy – its conversion systems – energy from Bio mass – Bio gas generation – Industrial and space application.

**UNIT – IV: CRYSTALLOGRAPHY**

Crystallography : The crystal structure – Unit Cell – Bravais lattice- structures of simple cubic-BCC and FCC- coordination number, packing factor calculation for the above structures – Hexagonal closed packed(HCP) structure -Miller indices – concept of Reciprocal Vectors.

**UNIT – V: ELECTRONICS**

Electronics: Transistor characteristics in common base and common emitter mode- Transistor single stage amplifier- Expression for input impedance, output impedance and current gain.

Digital Electronics : NAND and NOR as universal building blocks- De Morgan's theorem –statement and proof- Fabrication of diodes and transistors using Monolithic technology– limitations.

**Books for Study & Reference**

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004).
8. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
9. Introduction to Solid State Physics – C. Kittel, 5<sup>th</sup> Edition Wiley Eastern Ltd.
10. Renewable & Sustainable energy sources – Agarwal.

**ALLIED PRACTICAL**

**PHYSICS**

**(Any 15 Experiments)**

1. Young's modulus – non uniform bending – pin and microscope.
2. Rigidity modulus – Static Torsion Method Using Scale and Telescope.
3. Rigidity modulus – Torsional oscillation method (without symmetric masses).
4. Determination of Co-efficient of Viscosity – Graduated Burette.
5. Surface Tension and Interfacial Tension – By drop weight method.
6. Specific Heat Capacity of a liquid – by Newton's Law of Cooling.
7. Sonometer – Determining A.C. Frequency. (Screw Gauge is given).
8. Sonometer – frequency of tuning fork.
9. Newton's Rings – Radius of Curvature.
10. Air Wedge – Determination of thickness of thin wire.
11. Spectrometer Grating – Minimum Deviation – Mercury Lines.
12. Spectrometer – Refractive Index of a liquid – Hollow Prism.
13. Potentiometer – Calibration of High Range Ammeter.
14. Potentiometer – Calibration of Low Range Voltmeter.
15. Determination of  $M$  and  $B_H$  using Deflection Magnetometer in Tan C position and vibration magnetometer.
16. Figure of merit and voltage sensitiveness of table galvanometer.
17. Construction of AND, OR gates using diodes and NOT by transistors.
18. Zener diode – Voltage Regulation.
19. NAND / NOR as universal gate.
20. Demorgan's theorem verification.

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