

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), COIMBATORE 641 018**

**DEPARTMENT OF PHYSICS**

**B.Sc. PHYSICS CURRICULUM FOR THE STUDENTS ADMITTED FROM 2015-2016 ONWARDS**  
**UNDER CHOICE BASED CREDIT SYSTEM (CBCS)**

<b>SEMESTER - 1</b>	<b>S.No.</b>	<b>Subject Code</b>	<b>Part</b>	<b>Title of the Paper</b>	<b>Credit</b>	<b>Maximum Marks</b>			<b>Hrs/Week</b>	<b>Passing Minimum</b>	
						<b>Internal</b>	<b>External</b>	<b>Total</b>		<b>External</b>	<b>Total</b>
	1.		I	Language I - Tamil - Paper I	3	25	75	100	6	30	40
2.		II	Language II - English - Paper I	3	25	75	100	6	30	40	
3.		III	Core 1: Properties of Matter & Sound	4	25	75	100	6	30	40	
4.		III	Allied I: Allied Mathematics - I	5	25	75	100	8	30	40	
5.		IV	Environmental Studies	2	25	75	100	2	30	40	
			<b>Total</b>	<b>17</b>			<b>500</b>	<b>28</b>			
6.		III	Core Practical I: General Experiments	Examination at the end of SECOND Semester				2			

<b>SEMESTER - 2</b>	<b>S.No.</b>	<b>Subject Code</b>	<b>Part</b>	<b>Title of the Paper</b>	<b>Credit</b>	<b>Maximum Marks</b>			<b>Hrs/Week</b>	<b>Passing Minimum</b>	
						<b>Internal</b>	<b>External</b>	<b>Total</b>		<b>External</b>	<b>Total</b>
	1.		I	Language I - Tamil - Paper II	3	25	75	100	6	30	40
2.		II	Language II - English - Paper II	3	25	75	100	6	30	40	
3.		III	Core 2: Heat and Thermodynamics	4	25	75	100	6	30	40	
4.		III	Allied I: Allied Mathematics - II	5	25	75	100	8	30	40	
5.		III	Core Practical I: General Experiments	5	40	60	100	2	24	40	
6.		IV	Value Education	2	25	75	100	2	30	40	
			<b>Total</b>	<b>22</b>			<b>600</b>	<b>30</b>			

SEMESTER - 3	S.No.	Subject Code	Part	Title of the Paper	Credit	Maximum Marks			Hrs/Week	Passing Minimum	
						Internal	External	Total		External	Total
	1.		I	Language I - Tamil - Paper III	3	25	75	100	6	30	40
2.		II	Language II - English - Paper III	3	25	75	100	6	30	40	
3.		III	Core 3: Mechanics	4	25	75	100	4	30	40	
4.		III	Allied II: Allied Chemistry - I	3	15	60	75	6	24	30	
5.		IV	Skill Based Elective - I: Energy Physics	3	25	75	100	4	30	40	
			<b>Total</b>	<b>16</b>			<b>475</b>	<b>26</b>			
6.		III	Core Practical II: General Experiments	Examination at the end of FOURTH Semester				2			
7.		III	Allied Practical: Allied Chemistry Practical	Examination at the end of FOURTH Semester				2			

SEMESTER - 4	S.No.	Subject Code	Part	Title of the Paper	Credit	Maximum Marks			Hrs/Week	Passing Minimum	
						Internal	External	Total		External	Total
	1.		I	Language I - Tamil - Paper IV	3	25	75	100	6	30	40
2.		II	Language II - English - Paper IV	3	25	75	100	6	30	40	
3.		III	Core 4: Optics	4	25	75	100	4	30	40	
4.		III	Allied II: Allied Chemistry - II	3	15	60	75	6	24	30	
5.		IV	Skill Based Elective -II: Biomedical Instrumentation	3	25	75	100	4	30	40	
6.		III	Core Practical II: General Experiments	5	40	60	100	2	24	40	
7.		III	Allied Practical: Allied Chemistry Practical	4	20	30	50	2	12	20	
8.		V	Extension Activities: NCC/NSS/P.Ed./YRC	1							
			<b>Total</b>	<b>26</b>			<b>625</b>	<b>30</b>			

SEMESTER – 5	S.No.	Subject Code	Part	Title of the Paper	Credit	Maximum Marks			Hrs/Week	Passing Minimum	
						Internal	External	Total		External	Total
	1.		III	Core 5: Mathematical Physics	4	25	75	100	5	30	40
	2.		III	Core 6: Electricity and Magnetism	4	25	75	100	5	30	40
	3.		III	Core 7: Electronics	4	25	75	100	5	30	40
	4.		IV	Skill Based Elective – III: Digital Electronics	3	25	75	100	4	30	40
	5.		IV	Non-Major Elective – I: Principles of Physics – I	2	25	75	100	4	30	40
				<b>Total</b>	<b>17</b>			<b>500</b>	<b>23</b>		
	6.		III	Core Practical III: General Experiments	Examination at the end of SIXTH Semester				2		
	7.		III	Core Practical IV: Electronic Experiments	Examination at the end of SIXTH Semester				2		
8.		III	Project and Viva-voce	Examination at the end of SIXTH Semester				3			

SEMESTER – 6	S.No.	Subject Code	Part	Title of the Paper	Credit	Maximum Marks			Hrs/Week	Passing Minimum	
						Internal	External	Total		External	Total
	1.		III	Core 8: Quantum Mechanics and Relativity	4	25	75	100	5	30	40
	2.		III	Core 9: Solid State Physics and Nuclear Physics	4	25	75	100	5	30	40
	3.		III	Core 10: Atomic Physics and Spectroscopy	4	25	75	100	5	30	40
	4.		IV	Skill Based Elective – IV: Computer Programming in 'C'	3	25	75	100	4	30	40
	5.		IV	Non-Major Elective – II: Principles of Physics – II	2	25	75	100	4	30	40
	6.		III	Core Practical III: General Experiments	5	40	60	100	2	24	40
	7.		III	Core Practical IV: Electronic Experiments	5	40	60	100	2	24	40
	8.		III	Project and Viva-voce	15	20	80	100	3	32	40
			<b>Total</b>	<b>42</b>			<b>800</b>	<b>30</b>			

<b>Subject</b>	<b>Part</b>	<b>Number of Papers</b>	<b>Total Credits</b>	<b>Duration of Examination</b>	<b>Total Marks</b>
Language I: Tamil	I	4	12	3 Hours	400
Language II: English	II	4	12	3 Hours	400
Core	III	10	40	3 Hours	1000
Core Practical	III	4	20	3 Hours	400
Allied – Mathematics	III	2	10	3 Hours	200
Allied – Chemistry	III	2	6	3 Hours	150
Allied Chemistry Practical	III	1	4	3 Hours	50
Project	III	1	15	---	100
Skill Based Elective	IV	4	12	3 Hours	400
Non-Major Elective	IV	2	4	3 Hours	200
Environmental Studies & Value Education	IV	2	4	3 Hours	200
Extension Activities	V		1	---	---
		<b>140</b>		<b>3500</b>	

## **SEMETER 1: CORE 1: PROPERTIES OF MATTER AND SOUND**

### **UNIT 1: Elasticity**

Torsion of a body – Expression for torque per unit twist – Determination of rigidity modulus: Static torsion method (Searle's apparatus - Scale and telescope) and Dynamic torsion method.

Bending of beams – Definitions – Expression for the bending moment – Depression of the loaded end of a cantilever – Depression at the mid-point of a beam loaded at the middle  
Uniform bending of a beam - Measurement of Young's modulus by Non-Uniform bending and Uniform bending – I section of girders

### **UNIT 2: Hydrodynamics and Viscosity**

Equation of continuity – Energy of the liquid – Euler's equation for unidirectional flow – Bernoulli's theorem – Explanation and Applications of Bernoulli's theorem

Coefficient of Viscosity – Poiseuille's formula for the flow of a liquid through a capillary tube – Corrections to Poiseuille's formula – Searle's viscometer: Rotating cylinder method of finding coefficient of viscosity – Modification of Poiseuille's formula for gases

### **UNIT 3: Surface Tension**

Introduction - Explanation of Surface tension on Kinetic theory - Surface energy - Work done in increasing the area of a surface - Work done in blowing a bubble - Angle of contact  
Neumann's triangle - Excess pressure inside a curved liquid surface - Determination of surface tension of a liquid by Jaegar's method - Variation of surface tension with temperature  
Quincke's method and Drop weight method of determining the surface tension of a liquid-  
Problems in Work done and Excess pressure

### **UNIT 4: Gravitation**

Newton's law of gravitation - Kepler's laws of planetary motion - Determination of G by Boy's experiment - Gravitational field and gravitational potential \_Gravitational potential and field due to a spherical shell - Gravitational potential and field due to a solid sphere Variation of g with latitude, altitude and depth - The compound pendulum (theory and experiment).

### **UNIT 5: Sound**

Laws of Transverse vibrations in strings-Determination of frequency by Melde's method.Musical Sound and Noise-Characteristics of Musical Sound-Intensity of Sound.

Acoustics - Reverberation - Sabine's Reverberation formula - Determination of Absorption coefficient.

Ultrasonics - Piezo-electric effect and Magnetostriction effect-Production of Ultrasonics by Piezoelectric oscillator and Magnetostriction oscillator- Detection and Applications of Ultrasonic waves.

**Question number that should be a problem: 13(b)**

### **Books for Study:**

1. Properties of Matter by R. Murugesan (Units 1,2,3and4)
2. A Textbook of Sound by Brijlal and N. Subrahmanyam (Unit5)

### **Books for Reference:**

1. Properties of Matter by N.Subrahmanyam, Brijlal
2. Waves and oscillations by N.Subrahmanyam, Brijlal
3. Properties of Matter and Acoustics by R.Murugesan and KirtithigaSivaprasath



## SEMESTER 2: CORE 2: HEAT AND THERMODYNAMICS

### UNIT 1:

**Thermometry:** Temperature coefficient of Resistance — Platinum Resistance Thermometer — Thermocouple — Seebeck Effect — Peltier Effect — Thermoelectric thermometer **Calorimetry** : Specific heat of solids – Radiation correction – Copper block calorimeter – Nernst vacuum calorimeter – Newton's law of cooling – Specific heat capacity of a liquid by cooling – Specific heat capacity of gases – Relation between them – Jolly's differential steam calorimeter – Continuous flow electric method

### UNIT 2:

**Kinetic Theory of Gases:** Postulates – Mean free path – Degree of freedom – Velocity distribution and Theorem of equipartition of energy – Viscosity of gases – Van der Waals equation – Critical constants and their determination

**Low Temperature Physics:** Joule-Thomson Effect – Liquefaction of air, hydrogen and helium – Helium I and II – Peculiar properties of He II – Adiabatic demagnetization

**Superconductivity:** Discovery – Critical Temperature – Meissner Effect – Isotope Effect – Applications

### UNIT 3:

**Thermodynamics:** Carnot's Theorem – Otto Cycle-Petrol Engine – Diesel engine – Clapeyron's Latent heat equation – Entropy – Change in entropy (Reversible and irreversible process) – Temperature-Entropy diagram – Entropy of a perfect gas – Maxwell's thermodynamical relations and applications – Helmholtz function – Gibb's function – Enthalpy

### UNIT 4:

**Thermal Conduction:** Conduction, convection and radiation – Coefficient of thermal conductivity, thermal diffusivity – Steady state – Lee's disc method of determining the thermal conductivity of a bad conductor – Searle's method – Forbe's method – Spherical Shell method – Cylindrical flow of heat – Thermal conductivity of rubber – Thermal conductivity of glass – Wiedemann-Franz law

### UNIT 5:

**Thermal Radiation:** Black body – Kirchoff's law of heat radiation – Prevost's theory of heat exchange – Stefan's law – Mathematical derivation – Derivation of Newton's law of cooling from Stefan's law – Experimental verification of Stefan's law – Distribution of energy in the spectrum of black body – Derivation of Planck's law – Derivation of Wein's law and Rayleigh-Jean's law from Planck's law – Solar constant – Temperature of the Sun – Angstrom's pyroheliometer Pyrometry – Disappearing filament optical pyrometer

**Question number that should be a problem: 13(b)**

### **Book for Study:**

1. Heat and thermodynamics by Brij lal and Subramaniam

### **Books for Reference:**

1. Thermal Physics by R. Murugesan
2. Text book of heat by JB Rajam
3. Text book of heat by Saha

**CORE PRACTICAL I**  
**(At the end of Second Semester)**  
**(Any 12)**

1. Young's Modulus – Non-uniform bending – Pin and Microscope
2. Young's Modulus – Uniform bending – Optic lever
3. Rigidity Modulus – Static Torsion – Scale and Telescope
4. Young's Modulus, Rigidity Modulus and Poisson's Ratio – Searle's Double Bar
5. Spectrometer – Refractive index of a solid prism
6. Spectrometer – Refractive index of a liquid prism
7. Potentiometer – Calibration of low range voltmeter
8. Post office box – Specific resistance
9. Post office box – Temperature coefficient of resistance
10. Specific heat capacity of liquid – Joule's calorimeter
11. Specific heat capacity of liquid – Newton's law of cooling
12. Latent Heat of fusion of ice
13. Lee's Disc Method – Thermal conductivity of a bad conductor
14. Compound pendulum – Determination of 'g' and 'k'
15. Deflection Magnetometer – Tan C Position – Moment of a magnet
16. Surface Tension of a liquid – Drop weight method
17. Viscosity of highly viscous liquid – Stoke's Method



## **SEMESTER 3: CORE 3: MECHANICS**

### **UNIT 1: System of Particles**

Dynamics of a system of particles and concept of rigid bodies – Centre of mass coordinates – Centre of mass of rigid body – Motion of centre of mass and linear momentum – Angular momentum and torque – Angular momentum of system and centre of mass – Conservation of angular momentum – Collision – Elastic collision – Inelastic collision – Co-efficient of restitution – Rocket

### **UNIT 2: Dynamics of Rigid Bodies**

Rigid bodies – Rotational kinetic energy – Moment of inertia and its physical significance – Angular acceleration – Angular momentum – Law of conservation of angular momentum – Torque – Torque as a cross product of  $F$  and  $r$  – Analogy between translatory motion and rotatory motion – Work done by a Torque – Theorem of perpendicular axes - Theorem of parallel axes Moment of inertia of thin uniform bar , rectangular lamina , ring , circular disc , solid sphere and hollow sphere – Kinetic energy of a body rolling on a horizontal plane – Acceleration of a body rolling down an inclined plane

### **UNIT 3: Oscillations**

Linear harmonic oscillator – Energy of a simple harmonic oscillator - Simple harmonic oscillator of a loaded spring – LC circuit – Simple pendulum – Bar pendulum – Points of suspension and oscillation are interchangeable – Helmholtz resonator – Lissajous' figures – Composition of two simple harmonic motions in a straight line - Composition of two simple harmonic vibrations of equal time periods acting at right angles - Composition of two simple harmonic motions at right angles to each other and having time periods in the ratio 1:2

### **UNIT 4: Statics**

Force of friction – Limiting friction – Laws of friction – Angle of friction and resultant reaction – Cone of friction – Motion of a body on a rough inclined plane when (i) angle of inclination of the inclined plane is equal to angle of friction and (ii) angle of inclination of the inclined plane is greater than the angle of friction - Centre of gravity – Expressions for centre of gravity in the case of a solid cone, solid hemisphere and hollow hemisphere.

### **UNIT 5: Hydrostatics**

Definition and determination of centre of pressure – General case – Expression for centre of pressure of rectangular lamina with one side on the surface of the liquid – Expression for centre of pressure of a triangular lamina in the case of (i) vertex in the surface of the liquid and (ii) base in the surface of the liquid – Laws of floatation – Definition for metacentre and metacentric height – Determination of metacentric height of a ship.

**Question number that should be a problem: 12(b)**

### **Books for study:**

1. Mechanics and Electrodynamics by Brijlal, N.Subramanyam and JivanSeshan, S.Chand, Eurasia Publishing House (Pvt) Ltd. (Unit 1, 2 & 3)
2. A Text book of Mechanics (Statics and Hydrostatics) by Narayanamoorthy and others (Unit 4 & 5)

### **Books for Reference:**

1. Mechanics by R.Murugeshan
2. Mechanics by D.S.Mathur

## **SEMESTER 3: SKILL BASED ELECTIVE – I: ENERGY PHYSICS**

### **UNIT 1: Introduction to Energy Sources**

An Introduction to Energy Sources and their availability-conventional energy sources-non-conventional energy sources-renewable energy sources-advantages of renewable energy-obstacles to the implementation of renewable energy systems – prospects of renewable energy sources.

### **UNIT 2: Solar Radiation and its Measurement**

Introduction – solar constant- solar radiation at the earth's surface-solar radiation measurements-solar radiation data-solar energy collectors-physical principles of the conversion of solar radiation into heat flat-plate collectors-typical liquid collectors-typical air collectors-concentrating collector-focusing and non-focusing types-selective absorber coatings.

### **UNIT 3: Application of Solar Energy**

Solar water heating-space heating – active system and passive system – solar cooling – absorption – air-conditioning system – solar electric power generation – solar photovoltaic cells – agricultural and industrial process heat – solar distillation – solar pumping – solar furnace – solar cooking-simple box type cooker – concentrate parabolic type solar cooker – Multi-reflector type solar cooker.

### **UNIT 4: Wind Energy**

Basic principles of wind energy conversion – wind data and energy estimation-basic components of wind energy conversion system (WECS) – advantages and disadvantages of WECS – types of wind machines-horizontal axis wind machines – vertical axis wind machines – application of wind energy – environmental aspects – global warming.

### **UNIT 5: Renewable Energy Sources, Biomass and Biogas**

Energy from the ocean: ocean thermal electric conversion (OTEC) – tidal energy – geothermal energy, energy from biomass; biomass conversion technologies – wet and dry process-photosynthesis biogas generation ;introduction-basic processes and energetic – advantages of anaerobic digestion – factors affecting the bio-digestion and generation of gas.

### **Books for Study:**

1. Non-conventional energy sources by G.D.RAI

### **Books for Reference:**

1. Solar energy by M.P.AGARWAL
2. Solar energy by S.P.SUHATME
3. Principles of solar engineering by KREITH&KRIDER

## **SEMESTER 4: CORE 4: OPTICS**

### **UNIT 1: Geometrical Optics**

Aberrations – Spherical aberration – Minimization of spherical aberration – Chromatic aberration in lenses – Longitudinal and lateral chromatic aberration – Condition for achromatism when two lenses are separated – Coma, Curvature, Distortion and Astigmatism (Qualitative treatment only)  
Eyepieces – Huygen’s eyepiece – Ramsden eyepiece – Comparison of Ramsden eyepiece with Huygen’s eyepiece.

### **UNIT 2: Interference**

Theory of interference fringes – Fresnel’s bi-prism – Interference due to reflected light – Condition for maxima and minima – Fringes produced due to wedge shaped films – Determination of wedge angle and thickness of the spacer – Michelson’s interferometer – Determination of wavelength of a monochromatic source.

### **UNIT 3: Diffraction**

Distinction between interference and diffraction – Fresnel diffraction – Rectilinear propagation of light – Zone plate – Action of zone plate for an incident spherical wave front – Difference between a zone plate and a convex lens – Distinction between Fresnel diffraction and Fraunhofer diffraction – Fraunhofer diffraction at a single slit – Plane diffraction grating – Theory – Determination of wavelength.

### **UNIT 4: Polarization**

Brewster’s law – Malus law – Double refraction – Huygen’s explanation of double refraction in uniaxial crystals – Optic axis – Positive and negative crystals – Nicol Prism – Nicol Prism as a polarizer and analyser – Quarter wave plate – Half wave plate – Production and detection of Plane, circularly polarized and elliptically polarized light.

Optical activity – Specific rotation – Laurent’s half shade polarimeter – Determination of specific rotatory power of solution.

### **UNIT 5: Lasers and Fibre Optics**

Spontaneous and Stimulated emission – Einstein’s relation – Pumping – Population inversion – He-Ne laser – Carbon-di-oxide laser – Semiconductor laser

Optical Fibre – Principle – Structure – Merits – Total internal reflection – Critical angle – Expression for Acceptance angle – Expression for Numerical aperture – Step index fibre – Graded index fibre – Fibre optic communication system (Block diagram)

**Question Number 12(b) should be a problem.**

### **Book For Study:**

1. A textbook of Optics by N. Subrahmanyam, Brijlal and MN Avadhanulu, S. Chand and Co. Ltd., New Delhi, Ed. 2006

### **Books For Reference:**

1. Optics and Spectroscopy by R. Murugesan, S. Chand & Co. Ltd., New Delhi
2. Optoelectronics by Thiagarajan
3. Fundamentals of Optics by Jenkins and White.

## **SEMESTER 4: SKILL BASED ELECTIVE – II: BIO-MEDICAL INSTRUMENTATION**

### **UNIT 1: Human physiological systems**

Cell and their structure – Transport of ions through cell membrane – Resting and action potential – Characteristics of resting potential – Bio-electric potential – Nerve Tissues and organs – Different systems of human body – Skeletal, Circulatory, Respiratory, Digestive, Excretory and Regulatory systems

### **UNIT 2: Biopotential Electrodes**

Design of medical instruments – Components of the biomedical instrument system – Electrodes – Half cell potential, Electrode paste, Electrode material – Types of electrodes – Microelectrodes – Depth and needle electrodes – Surface electrodes – Chemical electrodes

### **UNIT 3: Transducers**

Transducers – Types – Active transducers – Magnetic induction type – Piezoelectric type – Photovoltaic type – Thermoelectric type – Passive transducers – Resistive Transducers – Strain gauge – Photoresistor – Thermistor – Metallic wire transducers – Capacitive Transducers – Inductive Transducers -LVDT

### **UNIT 4: Biopotential Recorders**

Characteristics of the recording system – Writer and pen damping effects – Electrocardiography – Origin of cardiac action potential – ECG lead configuration – ECG recording setup – Practical consideration for ECG recording – Echocardiography – Electroencephalography – Origin of EEG – Brain waves – Placement of recorders – EEG recording setup

### **UNIT 5: Advance in Biomedical Instrumentations**

Computer in medicine – Lasers in medicine – Endoscopes.

Computer tomography – Principle – Mathematical basis of construction – Block diagram of CT scanner – Data presentation – Scan artifacts – Applications of CT

Ultrasonic imaging system – Construction of ultrasonic transducers – Ultrasonic propagation through tissues – Display – Applications of diagnostic ultrasonics

### **Book for Study:**

1. Biomedical Instrumentation by Dr. M Arumugam, Anuradha Agencies

### **Book for Reference:**

1. Biomedical Instrumentation and Measurements by Cromwell, Weibll and Pfeiffer, Prentice Hall, Inc, 1980
2. EEG Technologies, Cooper, Osselton and Shaw, Butterwoeths, 1987
3. Principles of Biomedical Instrumentation and Measurements by Aston, Merrill Publishing Co. 1990
4. Handbook of Biomedical Instrumentation, RS Khandpur, TMH, 1990

**CORE PRACTICAL II**  
**(At the end of Fourth Semester)**  
**(Any 15)**

18. Spectrometer – Grating – Normal incidence method (Wavelength of Mercury Spectrum)
19. Spectrometer – i-d curve – Refractive index of a prism
20. Spectrometer – i-i' curve – Refractive index of a prism
21. Spectrometer – Narrow angled prism – Minimum deviation method – Refractive index
22. Air Wedge – Thickness of a wire
23. Newton's Rings – Radius of curvature of a convex lens
24. Rigidity Modulus – Torsional Oscillations (With Symmetrical Masses)
25. Sonometer – Determination of frequency of AC mains
26. Melde's String – Frequency of the Bar
27. Melde's String – Relative Density of Solid and Liquid
28. Meter Bridge – Determination of resistance of a coil
29. Potentiometer – Specific Resistance
30. Potentiometer – Calibration of low range ammeter
31. Carey Foster Bridge – Determination of Specific Resistance
32. Field along the axis of the coil – Deflection Magnetometer – Magnetic Moment
33. Field along the axis of the coil – Vibration Magnetometer – Pole Strength
34. Comparison of Surface Tensions of two liquids by Capillary rise method
35. Comparison of radii of two capillary tubes by capillary rise method
36. Coefficient of viscosity of liquid by capillary flow method
37. Ballistic Galvanometer – Figure of Merit
38. Ballistic Galvanometer – Comparison of EMF of two cells
39. Conversion of Galvanometer into Voltmeter and Ammeter
40. Figure of Merit of Table Galvanometer

## **SEMESTER 5: CORE 5: MATHEMATICAL PHYSICS**

### **Unit 1: Vector Calculus in Three Dimensions**

Gradient of a scalar field – Physical interpretation – Divergence of a vector function – Curl of a vector function and its physical significance – Laplacian operator – Laplace's equation – Gauss divergence theorem – Stoke's theorem – Green's theorem

### **UNIT 2: Empirical Laws and Curve Fittings**

Introduction – The linear law – Laws reducible to linear law – Graphical method – Method of group averages – Fitting a straight line – Equations involving three constants ( $y=a+bx+cx^2$ ,  $y=ax^b+c$ ,  $y=ab^x+c$ ,  $y=ae^{bx}+c$ ) – Principle of least squares – Fitting a straight line only – Method of moments – Fitting a straight line and a parabola

### **UNIT 3: Statistics**

**Measures of central tendency:** Mean. Median and Mode – **Measures of Dispersion or Variation:** Range – Mean deviation – Standard deviation – Variance – Simple Problems – **Binomial Distribution:** Definition – moments – mode – Moment Generating Function – Cumulants.

### **UNIT 4: Lagrangian Formulation**

Constraints and their classification – Degrees of freedom – Generalized co-ordinates – Generalized displacement, velocity, momentum and force – Principle of virtual work and D'Alembert's Principle – Lagrangian equation of motion from D'Alembert's Principle – Application of Lagrangian equation to simple pendulum, Compound pendulum, Linear harmonic oscillator and Atwood's machine

### **UNIT5: Hamiltonian Formulation**

Phase space – Hamiltonian function H – Hamilton's canonical equations of motion – Physical significance of H – Applications of Hamilton's equation to Simple pendulum, Compound pendulum, Linear Harmonic Oscillator and Particle in a central force field – Poisson bracket and its properties

### **Books for Study:**

1. Mathematical Physics with Classical Mechanics by Sathyaprakash, Sulthan Chand & Sons (Units 1 and 3)
2. Numerical Methods by P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand & Co, (Unit 2)
3. Classical Mechanics by Gupta, Kumar and Sharma (Units 4 & 5)

### **Books for References:**

1. Mathematical Physics by Rajput, PragatiPrakashan
2. Mathematical Physics by Harper

## **SEMESTER 5: CORE 6: ELECTRICITY AND MAGNETISM**

### **UNIT 1: Electrostatics**

Gauss's Law – Proof – Field due to a uniformly charged hollow cylinder – Mechanical force experienced by unit area of a charged conductor – Calculation of increase in radius of electrified soap bubble – Energy stored per unit volume in the medium surrounding the charged conductor – Deduction of Coulomb's inverse square law from Gauss's Law – Electrical images – Definition – Magnitude and location of image charge – Electric potential and electric field at an external point – Electric field at a point on the surface of the sphere – Surface density of charge on the sphere – Force of attraction between the charge  $+q$  and the sphere by the method of electrical images – Poisson's and Laplace's equations

### **UNIT 2: Capacitors and Electrometers**

Capacitance of a conductor – Principle of a Capacitor – Capacitance of a spherical capacitor (outer, inner sphere earthed) – Capacitance of cylindrical and parallel plate capacitors – Effect of a dielectric – Capacitors in series and parallel – Energy stored in a charged capacitor – Loss of energy on sharing of charges between two capacitors – Polarization of dielectric materials – Guard ring capacitor – Kelvin's absolute electrometer – Measurement of potential difference between two given points – Determination of Relative permittivity of a material – The Quadrant electrometer – Construction and working (no derivation)

### **UNIT 3: Magnetic effects of electric current**

Force on a current carrying conductor in a magnetic field – Force between two parallel current carrying conductors – Force experienced by an electron moving in a magnetic field – Torque on a current loop in a uniform magnetic field – Moving coil Ballistic Galvanometer – correction for damping – Current and Voltage sensitivities of a moving – coil galvanometer – Figure of merit of a B.G. – Comparison of two capacitances using B.G. – Ampere's circuital law – Differential form of Ampere's Law – Magnetic field inside a long solenoid – Magnetic induction due to a toroid.

### **UNIT 4: Electromagnetic Induction and Dynamics of charged particles**

Faraday's laws of electromagnetic induction – Lenz's law – Fleming's right hand rule – Self inductance and its determination by Rayleigh method – Mutual inductance and its experimental determination

Growth and decay of current in a circuit containing a resistance and inductance – Motion of charged particle in uniform constant magnetic field – Motion of charged particle in crossed electric and magnetic fields

### **UNIT 5: Magnetism**

Permeability and susceptibility – Relation between relative permeability and susceptibility – Determination of susceptibility by Curie – balance method – Experiment to draw M-H curve (horizontal model) – Energy loss due to hysteresis – the importance of hysteresis curves – choice of Magnetic materials- magnetic circuit – magnetic circuit of an electromagnet

**Question number that should be a problem: 12(b)**

### **Books for Study:**

1. Electricity and Magnetism by R.Murugesan

### **Books for Reference:**

1. Electricity and Magnetism by Brijlal and Subrahmanyam  
2. Electricity and Magnetism by DC Dayal



## SEMESTER 5: CORE 7: ELECTRONICS

### **UNIT 1: Diodes, Rectifiers And Filters**

Characteristics of PN Junction diode – Half Wave Rectifier – Efficiency and Ripple Factor – Centre Tapped Full Wave Rectifier – Bridge Rectifier – Efficiency and Ripple Factor – Zener Diode – Zener Voltage Stabilization

Filter Circuits: Capacitor Filter – Choke input Filter – Capacitor input Filter (Pi Filter).

Special Purpose Diodes: LED – Photodiode – Tunnel Diode.

### **UNIT 2: Transistors And Transistor Biasing**

Transistor action – Expression for collector current in common base and common emitter connections – Relation between  $\alpha$  and  $\beta$  – Characteristics of CE connection – Transistor line analysis – DC load line – Operating point

Need for transistor biasing – Stabilization – Essentials of transistor biasing circuit – Stability factor – Base resistor method of transistor biasing – Voltage divider biasing.

### **UNIT 3: FET, SCR and UJT**

JFET – Difference between JFET and BJT – Principle and working of JFET – output characteristics – Parameters of JFET.

MOSFET – Working – Depletion and Enhancement mode.

SCR – Working – V-I characteristics of SCR – Important terms – Uses.

UJT – Construction and operation – Characteristics of UJT – Advantages – UJT as Relaxation Oscillator.

### **UNIT 4: Amplifiers And Oscillators**

Classification of amplifiers – RC coupled amplifier – Transformer coupled amplifier – Direct coupled amplifier – Difference between voltage and power amplifiers – Power amplifiers – Class A, B and C amplifier – Maximum collector efficiency of transformer coupled class A power amplifier – push pull amplifier – Thermal runaway – Heat sink.

Sinusoidal Oscillator – Types – Oscillatory circuit – Positive feedback – Barkhausen criterion – Colpitt's oscillator – Hartley oscillator – Phase-shift oscillator – Wein Bridge oscillator.

### **UNIT 5: Modulation, Demodulation And Multivibrators**

Modulation – Types – Amplitude Modulation – Modulation factor – Analysis of AM wave – Side band frequencies in AM wave – Transistor AM modulator – Power – Limitations of AM – FM – Demodulation – Essentials in demodulation – AM diode detector – AM radio receivers – Superheterodyne receiver – Advantages

Multivibrator – types – Astable – Monostable – Bistable multivibrators

**Question number that should be a problem: 15(b)**

#### **Book for Study:**

1. Principles of Electronics by VK Mehta and Rohit Mehta, S. Chand & Co. Ltd., 2005

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

1. Basic Electronics (Solid State) by B.L. Theraja, S. Chand & Co. Ltd.
2. Handbook of Electronics, Gupta and Kumar, Pragati Prakashan, Meerut
3. A textbook of Applied Electronics by R.S. Sedha, S. Chand & Co. Ltd.



## **SEMESTER 5: SKILL BASED ELECTIVE-III: DIGITAL ELECTRONICS**

### **UNIT 1: Number System, Binary Arithmetic and Codes**

Binary numbers – Octal numbers – Hexadecimal numbers (Conversion of one number system into other)

Arithmetic operation – Binary addition – Binary subtraction – 1's complement subtraction – 2's complement subtraction

Codes – Binary coded decimal – BCD addition and subtraction – Weighted binary codes – Non-weighted codes – Excess 3 codes – Gray code – Error detection and correction codes – ASCII & EBCDIC Codes.

### **UNIT 2: Boolean algebra and Minimization techniques**

Boolean logic operations – Logic AND, OR, NOT, ExOR, NOR, ExNOR operations – Basic laws of Boolean algebra – Boolean addition and multiplication – Properties of Boolean algebra – De Morgan's theorems

Minimization and Boolean expressions – Minimization using algebraic method – SOP and POS – Minterm – Maxterm – Karnaugh map (upto four variables only).

### **UNIT 3: Logic gates and Arithmetic circuits**

OR, AND, NOT, NAND, NOR, ExOR, ExNOR gates – Universal building blocks – Mixed logic symbols

Arithmetic circuits – Half adder – Full adder – Half subtractor – Full subtractor – K-map simplifications – Parallel binary adder – Parallel binary subtractor – Binary to Gray code converter – Gray to Binary converter.

### **UNIT 4: Flip-Flops and their applications**

SR flip-flop – Clocked SR flip-flop – D flip-flop – JK flip-flop – T flip-flop – Triggering of flip – flops – Level triggering – Edge triggering – Master-Slave JK flip-flop

Applications: Shift Registers – 3 and 4 bit shift registers – Counters – 4 bit Ripple binary counter – MOD 3 counters – MOD 6 counters and Decade counter (all MOD counters using JK flipflop only).

### **UNIT 5: A/D and D/A Converters and Memory Devices**

A/D Converters – Simultaneous type and counter type – D/A Converters-Weighted resistor type – R-2R ladder type

Memory Devices: Classification of memories – ROM-Architecture of ROM – 32 x 4 ROM using OR gates – Diode matrix ROM-PROM, EPROM, EEPROM, RAM (Basic ideas only).

### **Book for Study:**

1. Digital Circuits and Design by S.Salivahanan and S.Arivazhagan, Vikas Publishing House

### **Books for Reference:**

1. Digital principles and Applications, Malvino and Leach
2. Digital Computer Design by Moris Mano, PHT
3. Digital Electronics by Gothmann, Macmillan Publications

## **SEMESTER 6: CORE 8: QUANTUM MECHANICS AND RELATIVITY**

### **UNIT 1:**

**Wave Properties of Matter:** De Broglie hypothesis – concept of phase velocity- Concept of group velocity- Relation between group velocity and phase velocity- - Experiments of Davisson and Germer and G.P. Thomson- Wave packet

**Heisenberg Uncertainty Principle:** Principle and its proof- Illustrations- Diffraction of electrons by a slit – Gamma ray microscope- Applications of uncertainty principle – Non-existence of electrons in the nucleus – Radius of Bohr's first orbit of hydrogen atom and energy of ground state.

### **UNIT 2:**

**Schrodinger's Wave Equation:** Wave function for a free particle – Schrodinger's one dimensional wave equation-time dependent and independent parts- Physical interpretation of wave function- Operators in Quantum Mechanics- Eigen functions – Eigen value- Eigen value equations- Postulates of quantum mechanics- Orthogonality of eigen functions- probability current density-Ehrenfest's theorem.

### **UNIT 3:**

**Significance of Quantum Numbers:** Significance of various quantum numbers – $n$ ,  $l$ ,  $m_l$ - Electron probability density.

**Commutation Algebra:** Commutation relation between position and momentum,  $H$  and  $p$ , Components of  $L$  and  $L^2$ - Ladder operators  $L_+$  and  $L_-$ .

**Applications of Schrodinger's Equation:** Particle in a box - Potential step –The barrier penetration problem – Linear harmonic oscillator.

### **UNIT 4:**

**Special Theory of Relativity:** Frames of reference- Newtonian Relativity- Galilean Transformation equations- Michelson-Morley experiment and explanation of the negative result – Postulates of special theory of Relativity – Lorentz transformation equations- Length contraction- Time dilation- Addition of velocities

### **UNIT 5:**

**General Theory of Relativity:** Variation of mass with velocity- Mass energy equivalence- Minkowski's four dimensional space- General theory of relativity- Effect of gravitational field on a ray of light- Gravitational red shift- Black hole.

**Question number that should be a problem: 14(b)**

### **Books for Study:**

1. Quantum Mechanics by S.P. Singh and Bagde (Unit 1 & 2)
2. Modern Physics by R.Murugesan and Krithika Sivaprasath (Units 3, 4 and 5)

### **Books for Reference**

1. Quantum Mechanics by Sathyaprakash and Swathi Saluja
2. Relativistic Mechanics by Gupta and Prakash
3. Modern Physics by Beiser

## **SEMESTER 6: CORE 9: SOLID STATE PHYSICS AND NUCLEAR PHYSICS**

### **UNIT 1:**

**Types of Solids:** Crystalline and amorphous solids – Crystal structure: Basis and crystal structure – Primitive lattice cell and unit cell – Bravais lattices in two dimensions and in three dimensions – Lattice planes and Miller indices – Interplanar distance – Spacing between planes in SC, FCC and BCC – Atomic packing – Atomic radius – Lattice constant and density – Crystal structures (SC, HCP, FCC, BCC) – Other cubic structures (Diamond, Sodium Chloride and Cesium chloride)

### **UNIT 2:**

**X-rays:** Bragg's law – Laue Method – Rotating crystal method – Powder Photograph method

**Bonding in Solids:** (Qualitative treatment) Ionic – Covalent – Metallic – Molecular bonds

**Crystal Defects** (Qualitative study): Frenkel defect – Schottky defect – Edge dislocation – Screw dislocation

### **UNIT 3:**

**Nuclear Models:** Liquid drop model – Bohr Wheeler theory – Semi empirical mass formula – Shell model – Nuclear forces – Yukawa's Meson theory of nuclear forces

**Radioactivity:** Law of successive disintegration – Transient and Secular equilibrium – Age of earth – Biological effect of nuclear radiations

Artificial Transmutation: Rutherford's experiment – Bohr's theory of nuclear disintegration – Q-value equation for nuclear reaction – Threshold energy – Nuclear reactions – Conservation laws – Energy balance – Expression for scattering cross-section

### **UNIT 4:**

**Detectors:** Solid state detectors-Proportional counter – Wilson's cloud chamber – Bubble chamber Neutron-Discovery – Properties – Thermal neutrons and fast neutrons – Detection of neutron

**Particle Accelerators:** Linear accelerator – Synchrocyclotron – Betatron

### **UNIT 5:**

**Nuclear Fission:** Nuclear fission-Energy released in fission – chain reaction, Multiplication factor and critical size – Atom bomb – Nuclear reactors – Breeder reactor

**Nuclear Fusion:** Nuclear fusion – Carbon-Nitrogen cycle – Proton-proton cycle – Thermonuclear reactions – Transuranic elements

**Elementary Particles:** Classification – Particles and antiparticles – Fundamental interactions – Elementary particle quantum number – Conservation laws – Quarks.

**Question number that should be a problem: 11(b)**

### **Books for Study:**

1. Solid State Physics by Gupta, Kumar, Nath & Co.(Unit 1)
2. Modern Physics by Murugesan (Units 2, 3,4 & 5)

### **Books for Reference:**

1. Nuclear Physics by Tayal
2. Solid State Physics by Kittel

## SEMESTER 6: CORE PAPER 10: ATOMIC PHYSICS AND SPECTROSCOPY

### UNIT 1:

**Cathode Rays:** Properties- Dunnington's method for determining  $e/m$ -H.A.Wilson's method of determination of electric charge.

**Positive Rays:** Properties- Thomson's method for determining  $e/m$ - Aston's mass spectrograph – Determination of masses of isotopes – Dempster's mass spectrograph.

### UNIT 2:

**Bohr Atom Model:** Postulates - Expression for energy of an electron – Origin of spectral lines – Effect of nuclear motion on atomic spectra – Evidences in favour of Bohr's theory – Ritz combination principle – Bohr's correspondence principle.

**Sommerfeld's Relativistic Atom Model:** Modification of Bohr's theory – Expression for total energy - Sommerfeld's Relativistic Theory – Fine structure of  $H_{\alpha}$  line – Problems in expression for an energy of an electron

### UNIT 3:

**Vector atom model:** Spatial quantization – Spinning electron – Quantum numbers associated with vector atom model – Coupling schemes – L – S coupling – j-j coupling – the Pauli exclusion principle – Magnetic dipole moment due to orbital motion of the electron – Magnetic dipole moment due to spin – the Stern and Gerlach experiment – Spin-Orbit coupling

### UNIT 4:

**Zeeman Effect:** Experimental arrangement for normal Zeeman effect- Lorentz classical theory of normal Zeeman effect- Quantum mechanical explanation of normal Zeeman effect – Explanation of Anomalous Zeeman effect – Stark Effect – Paschen Back effect (qualitative)

**The Free Electron Theory of Metals:** Electrical conduction in metals – Expression for electrical conductivity - Expression for thermal conductivity – Wiedemann Franz law

### UNIT 5:

**Continuous X-ray Spectrum :** Characteristics X-ray spectrum – Auger effect – Moseley's law – Compton scattering – Experimental verification

**Molecular Spectra:** Theory of the origin of pure rotational spectrum of a diatomic molecule – Microwave spectrometer (using Block diagram) – Theory of the origin of the vibrational – rotational spectrum of a diatomic molecule – IR spectrometer (using block diagram) – Raman Effect – Instrumentation – Quantum theory of Raman effect – Distinction between IR and Raman spectra

**Question number that should be a problem: 12 b**

### Books for Study:

1. Modern Physics by R.Murugesan

### Books for Reference:

1. Modern Physics by J.B. Rajam

## **SEMESTER 6: SKILL BASED ELECTIVE-IV: COMPUTER PROGRAMMING IN 'C'**

### **UNIT 1:**

Character set – C tokens – Keywords and identifiers – Constants – Variables – Data types (primary data types) – Declaration of variables  
Relational operators – Logical operators – Assignment operators – Increment and decrement operators – Conditional operators  
Arithmetic expressions – Evaluation of expressions – Precedence of arithmetic operators – Operator precedence and associativity – Mathematical functions.

### **UNIT 2:**

Reading a character – Writing a character – Formatted input – Formatted output – Simple 'if' statement – The 'if...else' statement – Nesting 'if ...else' statement – The 'switch' statement – The 'go to' statement- The 'while' statement – The 'do' statement – The 'for' statement.

### **UNIT 3:**

One dimensional arrays – Two dimensional arrays – Declaring and initializing string variables – Reading strings from terminal – Writing strings to screen – String handling functions – Need for user defined functions – The form of C functions – Category of functions – No arguments and no return values – Arguments but no return values – Arguments with return values.

### **UNIT 4:**

Structure definition – Giving values to members – Structure initialization  
Understanding pointers – Accessing the address of a variable – Declaring and initializing pointers – Accessing a variable through its pointer  
File management – introduction – defining and opening a file – closing a file – input / output operations using fprintf and fscanf functions.

### **UNIT 5:**

Conversion of centigrade temperature to Fahrenheit and Fahrenheit to Centigrade temperature – The acceleration due to gravity as a function of altitude – Solution of quadratic equation – Arranging the elements of an array in the ascending and descending order – Matrix addition, Subtraction and Multiplication.

### **Books for Study:**

- 1) Programming in ANSI C by E. Balagurusamy
- 2) Let us C by Yashavant Kanetkar

### **Books for Reference:**

- 1) The spirit of C by Mullish Cooper
- 2) Programming in C by Kris A .Jansa

## **SEMESTER 3: ALLIED PHYSICS-I (FOR B.Sc. CHEMISTRY AND MATHEMATICS)**

### **UNIT 1: Mechanics**

Impact of elastic bodies - Direct impact of two spheres - Impulse and impact - Loss of kinetic energy due to direct impact of two smooth spheres - Oblique impact of two spheres - Moment of inertia (Definition) - Moment of inertia of a spherical shell about a diameter - Moment of inertia of a uniform solid cylinder - Theory of compound pendulum - Experimental determination of acceleration due to gravity and radius of gyration using compound pendulum

### **UNIT 2: Statics and Hydrostatics**

Laws of friction - Angle and cone of friction - Motion up and down on a rough inclined plane (external force applied parallel to the plane) - Centre of gravity (Definition) - Centre of gravity of a solid cone - centre of gravity of a solid hemisphere

Centre of pressure (Definition) - Centre of pressure of a rectangular lamina - Centre of pressure of a triangular lamina (Vertex in the surface of the liquid) - Stability of equilibrium of a floating body - Metacentre- Metacentric height - Determination of Metacentric height of a ship

### **UNIT 3: General Physics and Sound**

Gravitation - Newton's law of gravitation - Gravitational constant - Determination of G by Boy's method - Variation of 'g' with altitude, depth and latitude

Bending of beams - Bending moment - Depression at the free end of a cantilever - Hooke's law - Kinds of moduli of Elasticity - Experimental determination of Young's Modulus by Uniform and Non-Uniform bending methods

Melde's string - Determination of frequency of a tuning fork (Transverse and longitudinal modes) - Frequency of AC by sonometer- Production of ultrasonic waves by piezo-electric method - Applications of Ultrasonics

### **UNIT 4: Thermal Physics**

Specific heat capacities of a gas ( $C_p$  and  $C_v$ ) - Relation between them - Joule- Kelvin effect - Theory of porous plug experiment - Joule-Kelvin effect: Temperature of inversion - Liquefaction of air (Linde's process) - Liquefaction of hydrogen - Liquefaction of Helium - Properties of liquid Helium I and Helium II

Second law of thermodynamics - Carnot's theorem and its proof

Thermal conductivity of a bad conductor by Lee's disc method

### **UNIT 5: Optics**

Coherent sources - Phase difference and path difference - Theory of interference fringes - Fringes produced by a wedge shaped thin film

Lasers - Basics - Helium Neon Laser, Carbon-di-oxide laser

Polarization - Optical activity - Specific rotation - Laurent's half shade polarimeter - Determination of specific rotation of sugar solution

### **Books for Study:**

1. Mechanics by Narayanamoorthy (Units 1 & 2)
2. Properties of Matter and Sound by R. Murugesan (Unit 3)
3. Heat and Thermodynamics by Brijlal and Subrahmanyam (Unit 4)
4. Optics by Brijlal and Subrahmanyam (Unit 5)

### **Books for Reference:**

1. Engineering Physics by Gaur and Gupta
2. Optics and Spectroscopy by R. Murugesan

## **SEMESTER 4: ALLIED PHYSICS-II (FOR B.Sc. CHEMISTRY AND MATHEMATICS)**

### **UNIT 1: Electricity and Magnetism**

Statement of Gauss Law-Electric field due to an uniformly charged sphere - Principle of a capacitor - Capacitance of a spherical capacitor (Outer and inner sphere earthed) - Energy stored in a charged capacitor-Loss of energy on sharing of charges between two capacitors Magnetic induction – Magnetisation – Magnetic susceptibility – Magnetic permeability – Properties of Dia, Para, Ferro, Ferri and Anti ferromagnetic materials - Definition of Hysteresis - Experiment to draw M H curve - Magnetic properties of soft iron and steel.

### **UNIT 2: Magnetic Effects of Currents**

Biot-Savart law - Fleming's Right hand rule - Magnetic induction at a point on the axis of a circular coil carrying current -- Fleming's Left hand rule - Force on a current carrying conductor in a magnetic field - Force between two parallel current carrying conductors -Definition of ampere - Moving coil ballistic galvanometer: Principle, Construction, Theory and correction for damping - Ampere's circuital law - Magnetic field inside a long solenoid.

### **UNIT 3: Modern Physics**

Properties of cathode rays and positive rays - Positive ray analysis by Thomson's parabola method - Photoelectric effect - Laws of photoelectric emission - Einstein's photoelectric equation - Millikan's Experimental verification - Photoelectric cells  
Natural and artificial radioactivity - Applications of radioisotopes - Nuclear fission - Energy released in fission - Nuclear fusion - Energy released in fusion.

### **UNIT 4: Electronics**

Characteristics of PN Junction diode – Half Wave Rectifier – Efficiency and Ripple Factor – Centre Tapped Full Wave Rectifier – Bridge Rectifier – Efficiency and Ripple Factor – Zener Diode – Zener Voltage Stabilization  
Filter Circuits: Capacitor Filter – Choke input Filter – Capacitor input Filter (Pi Filter).  
Transistor characteristics (CE mode) – RC coupled amplifier - Expression for voltage, power and current gain - Frequency response

### **UNIT 5: Digital Electronics**

Number systems - Binary system - Addition - Subtraction - Complement method of Subtraction-Multiplication - Division - Binary-to-decimal and decimal-to-binary conversion - AND, OR, NOT gates - NAND and NOR as universal gates - XOR gate - Laws of Boolean algebra - Simplification of Boolean expressions - De Morgan's theorems.

### **Books for Study:**

1. Electricity and Magnetism by R. Murugesan (Units 1 & 2)
2. Modern Physics by R. Murugesan (Unit 3)
3. Principles of Electronics by V.K. Metha (Unit 4)
4. Modern Physics by R.Murugesan and KiruthigaSivaprasath (Unit 5)

### **Books for Reference:**

1. Electricity and Magnetism by Brijlal & Subrahmanyam
2. Digital Principles and Applications by Malvino



**NON-MAJOR ELECTIVE – I (SEMESTER 5)**  
**PRINCIPLES OF PHYSICS – I**

**UNIT 1: Mechanics**

Particle – Rest and Motion – Motion in one, two and three dimensions – Position, displacement and distance – Speed and Velocity – Acceleration – Momentum – Force – Equations of Motion – Newton's Laws of motion – Applications of Newton's Laws of motion

**UNIT 2: Electromagnetic Waves**

Characteristics – Hertz experiment – Electro Magnetic Spectrum – uses – types of spectra – Fluorescence – Phosphorescence – Raman effect – Applications

**UNIT 3: Heat**

Heat energy – Units – Specific heat capacity – Newton's law of cooling – Boyle's law – Charle's law – Gas equation – Kinetic theory of gases – Postulates – Degree of freedom – Isothermal and Adiabatic processes

**UNIT 4: Sound**

Transverse and Longitudinal waves – Relation between frequency, wavelength and velocity – Doppler effect (quantitative idea)- Applications – Laws of transverse vibration of stretched strings – Ultrasonics- Applications – Reverberation – Acoustics of buildings

**UNIT 5: Optics**

Lens – Types - Defects of eye – Laws of reflection and refraction – Conditions for total internal reflection – Dispersion – Scattering – Rayleigh scattering – Colour of the sky – Raman effect

**Books for Study:**

1. Textbook of Mechanics Part I and Part II by Narayanamoorthy
2. Heat and Thermodynamics by BrijLal and Subrahmanyam
3. Textbook of Sound by BrijLal and Subrahmanyam
4. Optics and Spectroscopy by R.Murugesan

**Books for Reference:**

1. Principles of Physics by BrijLal and Subrahmanyam



**NON-MAJOR ELECTIVE – II (SEMESTER 6)**  
**PRINCIPLES OF PHYSICS – II**

**UNIT 1: Gravitation**

Newton's law of gravitation – Universal Gravitation constant – Acceleration due to gravity – Variation of 'g' with altitude – Inertial mass – gravitational mass – Orbital velocity – Time period of a satellite – Uses of satellites

**UNIT 2: Properties of Matter**

Elasticity – Stress – Strain – Elastic limit – Hooke's law – Experimental verification of Hooke's law – Three moduli of elasticity – Pascal's law – Applications – Viscosity – Coefficient of Viscosity – Streamline flow and Turbulent flow – Reynold's number – Stoke's law – Surface Tension – Forces of cohesion and adhesion – Experimental determination of surface tension of water by capillary rise method – Applications

**UNIT 3: Electricity and Magnetism**

Electric current – Current density – Ohm's law – Electrical resistivity and conductivity – Resistance – Resistors in series – Resistors in parallel – Kirchoff's law – Faraday's laws – Basic properties of magnets – Magnetic moment – Magnetic field - Magnetic induction – Properties of Dia, Para and Ferromagnetism – comparison – Magnetic lines of force

**UNIT 4: Modern Physics**

Nucleus – Nuclear Structure – Mass number – Atomic number – Nuclear mass – Binding energy – Nuclear fission and fusion – Atom Bomb and Hydrogen Bomb  
X-rays – Properties of X-rays and its applications – Radioactivity – Properties of alpha, beta and gamma rays – Half-life period – Applications

**UNIT 5: Electronics and Digital Electronics**

Intrinsic and Extrinsic semiconductors – P and N type – PN junction diode – Characteristics – Binary numbers – Conversion of binary – to – decimal and decimal – to – binary – logic gates – AND, OR and NOT gates

**Books for Study:**

1. Properties of Matter by R. Murugesan
2. Electricity and Magnetism by BrijLal and Subrahmanyam
3. Modern Physics by R. Murugesan
4. Principles of Electronics by VK Mehta

**Book for Reference:**

1. Principles of Physics by BrijLal and Subrahmanyam

### **CORE PRACTICAL III – GENERAL EXPERIMENTS**

**(At the end of Sixth Semester)**

**(Any 15)**

1. Young's Modulus – Koenig's Method – Uniform bending
2. Young's Modulus – Koenig's Method – Non-uniform bending
3. Young's Modulus – Cantilever – Static Method
4. Young's Modulus – Cantilever – Dynamic Method
5. Interfacial Surface Tension of Liquids by Drop Weight Method
6. Kater's Pendulum – Determination of acceleration due to gravity
7. Spectrometer – Cauchy's Constants
8. Spectrometer – Dispersive Power of Grating
9. Spectrometer – Dispersive Power of Prism
10. Spectrometer – Refractive index of a Small Angled Prism
11. Spectrometer – Solar Spectrum – Wavelength of Fraunhofer lines
12. Spectrometer – Hartmann's Interpolation Formula – Prism, Scale and Telescope
13. Newton's Rings – Refractive index of the lens
14. Potentiometer – Calibration of high range voltmeter
15. Potentiometer – EMF of thermocouple
16. Potentiometer – Reduction factor of tangent Galvanometer
17. Measurement of Capacitance – Anderson's Bridge
18. Measurement of Self-inductance of a coil – Anderson's Bridge
19. Series Resonance Circuit
20. Parallel Resonance Circuit
21. Impedance and Power factor of a coil
22. Ballistic Galvanometer – Comparison of Mutual Inductance of coils
23. Solar Cell Characteristics
24. Polarimeter – Specific Rotatory Power

## **CORE PRACTICAL IV - ELECTRONIC EXPERIMENTS**

**(At the end of Sixth Semester)**

**(Any 15)**

1. Characteristics of Junction and Zener diodes
  2. Construction of IC Regulated Power supply using IC78XX
  3. Transistor characteristics – Common Emitter configuration
  4. Hartley oscillator using Transistor
  5. Verification of truth tables of OR, AND, NOT, NAND, NOR and Ex-OR gates (Using ICs)
  6. Verification of truth tables of OR, AND, NOT, NAND, NOR and Ex-OR gates (Using Discrete Components)
  7. Verification of De Morgan's Theorems
  8. NAND as Universal Building Block
  9. NOR as Universal Building Block
  10. Half Adder and Full Adder
  11. Half Subtractor and Full Subtractor
  12. Binary to Gray and Gray to Binary converters
  13. Single Digit Decade Counter
  14. JFET – Transfer Characteristics
  15. UJT – VI characteristics
  16. Summing and Differential Amplifiers using Operational Amplifier
  17. Integrator and Differentiator using Operational Amplifier
  18. Colpitt's Oscillator using Operational Amplifier
  19. Phase Shift oscillator using Operational Amplifier
  20. Digital to Analog converter
- C. Programs for
21. Conversion of centigrade temperature to Fahrenheit temperature and Fahrenheit temperature to centigrade temperature
  22. Solution of Quadratic equation
  23. Ascending and descending order using an array
  24. Matrix Addition and Subtraction
  25. Factorial Program

**ALLIED PHYSICS PRACTICALS**  
**For B.Sc. Chemistry and Mathematics (Examination at the end of Fourth Semester)**  
**(Any 12)**

1. Young's Modulus – Non-Uniform bending-Pin and microscope
2. Young's Modulus – Uniform bending-optic lever
3. Static Tortion – Regidity modulus
4. Spectrometer – Refractive Index of the Solid prism
5. Spectrometer – Refractive Index of the Liquid Prism
6. Meld's String – Frequency of the bar
7. Sonometer – AC frequency
8. Potentiometer – Calibration of low range voltmeter
9. Potentiometer – Specific resistance
10. Deflection magnetometer – Tan C Position-Moment of magnet
11. Compound Pendulum – Determination of 'g' and 'k'
12. Surface Tension of the liquid – Drop weight method
- 13 Specific capacity of the liquid – Newton's law of Cooling
14. Variation of truth table – AND, OR, NOT logic gates
15. Characteristics of Junction diodes
16. Lee's Disc method – Thermal conductivity of a bad conductor