



**MADURAI KAMARAJ UNIVERSITY**  
University with Potential for Excellence

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DIRECTORATE OF DISTANCE EDUCATION

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**SEMESTER – 1**

**CORE SUBJECT 1**

**CREDIT – 4**

**MECHANICS AND PROPERTIES OF MATTER – BPHYC11**

**Objective:**

- To study the motion of objects, understand the laws of motion and laws of gravitation. To know the principle of conservation of momentum, energy and their consequences.
- To identify the characteristics of solids and fluids in terms of their properties

**Unit I: Laws of motion**

Newton's laws of motion – Force- Impulse of a force - law of conservation of linear momentum –Collision – Elastic and in elastic collision – (Fundamental laws of impact) – Newton's law of impact – coefficient of restitution – Impact of a smooth sphere on a fixed plane – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to impact.

**Unit II Dynamics of rigid body**

Moment of inertia – Theorems of perpendicular and parallel axes – M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes – angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between them – Expression for a acceleration of a body rolling down an inclined body without slipping.

**Unit III Gravitation**

Newton's law of gravitation – G by Boy's method – Mass and density of earth – Acceleration due to gravity – Variation of g with altitude , depth and rotation of earth - Value of g at poles and equator.

Gravitational field – Gravitational potential – Gravitational potential due to spherical shell – Gravitational potential due to a solid sphere (inside and outside)

**Unit IV Elasticity**

Elasticity – Stress, Strain - Hooke's law – Elastic moduli – Poisson's ratio – Beams – bending of beams – Expression for bending moment – Theory of uniform and non – uniform bending - Determination of young 's modulus by uniform and non- uniform bending methods – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body - Rigidity modulus by dynamic torsion method (Torsional pendulum)

**Unit V Surface Tension and Viscosity**

Surface tension – definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – work done in increasing the area of a surface – Excess pressure inside a curved liquid surface – Excess pressure inside a liquid drop and soap bubble.

Viscosity – Co efficient of viscosity – Streamlined and turbulent motion – critical velocity – Bernoulli's theorem – Proof – Applications – Venturimeter – Pitot tube

### **Text Book**

1. Mechanics: D.S. Mathur S. Chand & Co, Edition 2002.
2. Elements of properties of matter – D.S. Mathur – S. Chand & Co., 2004.
3. Properties of matter – R. Murugesan – S. Chand & Co., 2004.

### **Reference Books**

1. Mechanics Part I and Part II, Narayanamoorthy National Publishing Company, 2001.
2. Fundamental of Physics, D. Halliday , Resnick and J Walker, 6<sup>th</sup> Edition, Wiley, New York 2001.
4. Properties of matter – Brijlal and Subramanian S. Chand & Co., 2006.



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SEMESTER I

SKILL BASED -1

CREDIT -2

## PROGRAMMING IN – C – BPHAS11

**Objective:** The purpose of this course is to introduce students about the key features and implementation of C, which is a powerful general purpose programming language available in all platforms and provide an in depth knowledge and skill in it.

### Unit I: Introduction to C

Basic structure of C programs –Character set – C tokens –keyword and identifiers – Constants – Variables – Data types – Declaring variables – Initializing variables – type conversions.

### Unit II: Operators, Expressions & I/O functions

Types of operators – Arithmetic operators - Relational, logical, and assignment operators - Increment and decrement operators – Conditional operators – Bit wise and special operators – arithmetic expressions – Mathematical functions – priority of operators- Data input and output – getchar(), putchar(), gets(), puts() - scanf(), printf() - escape sequence

### Unit III: Control Statements

Simple IF statement – Simple IF- ELSE statement – Block IF Statement – Block IF-ELSE statement – looping operation using while statement – for statement – Break statement – continue statement - Switch statement – Goto statement – Simple programs. (To find the solution of quadratic equation - Fibonacci series – To find the biggest of three nos, factorial of a no, odd or even.)

### Unit IV: Functions

Defining a function – Accessing a function – Category of function – Passing arguments to function –Recursion- Library function. Programs using functions – Binomial coefficient, Sin series, summing the numbers 1 to n using recursion

### Unit V: Arrays

Defining an Array – Processing an array – one, two dimensional arrays – Simple programs using arrays: - (addition of two matrices - subtraction of two matrices – Multiplication of two matrices- ascending and descending order.)

### Text Book

1. Theory and problems of programming with C – By Byron Gottfried Second edition – Tata Megraw Hill, 2004.
2. Programming in C – Pradip Dey and Manas Ghosh, Oxford University Press, Second Edition.

### Reference Books

1. Programming in C – By E. Balagurusamy – Third Edition – Tata Megraw Hill, 2004.

2. Programming in C by S. Ramasamy and P. Radhaganesan, Scitech Publications (India) Private Limited, Chennai and Hyderabad, 2006.



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**SEMESTER – I**

**SKILL BASED -2  
SOLAR ENERGY - BPHAS12**

**CREDIT -2**

**Objective:** To make the students to understand the present day crisis and need for conserving energy alternatives are provided.

### **Unit I**

Various forms of energy – renewable and non renewable energy system – Coal, oil and natural gas – availability – Merits and demerits.

### **Unit II**

Solar energy– Nature of solar radiation– Components– Solar heaters– Crop dryers– space cooling.

### **Unit III**

Solar ponds – Solar cooker – Water desalination – Photo voltaic basics – Merits and demerits.

### **Unit IV**

Geothermal energy– Wind energy– Ocean thermal energy conversion (OTEC)– Energy from waves and tides– (Basic ideas, nature, application, merits & demerits.

### **Unit V**

Biomass energy– classification– photo synthesis– Bio mass conversion– Gobar gas plants– ethanol from wood.

### **Text Book**

1. Non – conventional energy resources B. Khan – Tata McGraw Hill – 2000.

### **Reference Books:**

1. G.D. Rai – solar energy utilization – Edn – 1995.
2. S.P. Sukhetme – Solar Energy Tata McGraw – Edn II 1995
3. Godfrey Byle – Renewable Energy Power for a sustainable nature: Alden Oess limited oxford 1996.



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SEMESTER –I

NON MAJOR ELECTIVE – 1

CREDIT – 2

## FUNDAMENTALS OF PHYSICS –I

**Objective:** To introduce some basic concept of Physics like measurement of physical quantities, states of matter, kinds of energies and energy sources to students studying other than Physics.

### Unit 1

S.I. Units – measurements of length, mass, time and other physical quantities – Dimensional formula for area, volume, density and force – Uses of dimension.

### Unit II

Matter – Solid, Liquid, Gas and Plasma – Application of Plasma – change of state – specific heat capacity – specific latent heat of ice and steam.

### Unit III

Kinds of energy – Mechanical energy, Thermal energy, Optical energy, Sound energy, Electrical energy, Atomic and Nuclear energy, (Examples) – Conservation of energy.

### Unit IV

Renewable and non – renewable energy – Fossil fuel – coal Oil – Solar – Wind – Biomass – OTEC.

### Unit V

Mirror – Laws of reflection – Image formation (Concave and Convex mirror) Lens – Law's of refraction – Image formation (Concave and Convex lens) – Defects of eye and rectification.

### Book for Study

1. First Year B. Sc Physics – B.V. Narayan Rao, New Age International (P) Lt, 1998.

### Reference Books

1. Mechanics – D.S. Mathur – S.Chand & Co., 2002.
2. Properties of matter – D.S. Mathur – S. Chand & Co., 2002.
3. Properties of matter – Brijlal Subramanian – S. Chand & Co., 2006.



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SEMESTER II

CORE SUBJECT – 2

CREDITS -4

## THERMAL PHYSICS AND ACOUSTICS – BPHAC21

**Objective:** To understand the phenomena connected with heat capacities, conduction, convection and radiation, the process of making use of heat energy to do mechanical work.

### Unit I: Calorimetry

Isothermal and adiabatic change- derivation of equations for both-  $C_v$  and  $C_p$  of a gas- Relation between them- Experimental determination of  $C_v$  by Jolly's method- determination of  $C_p$  by Regnault's method- Specific heat of a gas by Calendar and Barnes method.

### Unit II: Transmission of heat

Conduction- Coefficient of thermal conductivity- Lees disc method of determination of thermal conductivity of bad conductor- Convection current in atmosphere- lapse rate- stability of atmosphere- green house effect- atmospheric pollution- Radiation- Stefan's law of radiation- experimental determination of Stefan's constant- derivation of Newton's law from Stefan's law- solar constant- temperature of sun- Angstrom's Pyrheliometer.

### Unit III: Kinetic theory of gases

Postulates of kinetic theory of gases- mean free path- Transport Phenomena- diffusion, viscosity and thermal conductivity of gases- derivation of ideal gas equation- degrees of freedom- Boltzmann's law of equipartition of energy- Maxwell's law of distribution of molecular speed- Atomicity of gases- ratio of specific heat capacity of gases- calculation for monoatomic and diatomic gases.

### Unit IV: Thermodynamics

Zeroth law of Thermodynamics - First law of thermodynamics - Heat engines- Reversible and irreversible process – Carnot's Theorem- Second law of thermodynamics- Entropy- change of entropy in reversible and irreversible process- change of entropy in converting ice to steam- Maxwell's thermodynamical relations- Clausius – Clapeyron latent heat equation.

### Unit V: Acoustics

Expression for velocity of sound in fluid medium- Newton's formula- Laplace correction- effect of temperature, pressure, humidity, density of medium and wind- velocity of longitudinal wave in a rod- Kundt's tube experiment- Laws of transverse vibration in a string- sonometer- Melde's string.

Reverberation- Sabine's Reverberation formula (No derivation) - Acoustics of building- factors affecting acoustics of building- sound distribution in an auditorium- Requisites for good acoustics.

### Text Book:

1. Heat and Thermodynamics : Brijlal & Subramanyam, Chand & co.
2. Heat and thermodynamics : R. Murugesan , S.Chand & co

**Reference Book:**

1. Heat and Thermodynamics : D.S Mathur , Chand & co
2. A text book of Sound : Brijlal & Subramanyam, Chand & co.





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**SEMESTER – II**

**SKILL BASED – 3**

**CREDIT – 2**

## **ASTROPHYSICS - BPHAS21**

### **Unit I**

Birth of Modern Astronomy – Geocentric and Heliocentric — Celestial sphere – Kepler's laws of planetary motion – Newtonian gravitation- Planets-Terrestrial and Jovian planets (Planets individual description is not required in detail) - Asteroids- Meteoroids- Comets.

### **Unit II**

The orientation of Earth in space- Arc and time units- local time-Standard time Elements of the telescope-Properties of images - Kinds of Optical telescopes- Refracting and Reflecting telescopes- Radio telescope- Spectrograph – limitations.

### **Unit III**

Sun- physical properties- composition- Core- Nuclear reactions- Photosphere- Chromosphere- Corona- Sunspots- Sunspot cycle-Solar wind- Auroras.

### **Unit IV**

Classification of Stars-The Harvard Classification system-Hertzprung-Russel Diagram-Luminosity of a Star-Stellar Evolution-White Dwarfs-Neutron stars-Black holes- Physics of Black Holes.

### **Unit V**

Galaxy nomenclature-Types of Galaxies-Spiral-Elliptical-irregular galaxies- Milky Way and its structure- Star clusters-Galactic clusters-Pulsars.

### **TEXT BOOKS:**

1. Niclolas. A. Pananides and Thomas Arny, 1979, Introductory Astronomy, Addison Wesley Publ. Co.
2. A. Mujiber Rahman, Introduction to Astrophysics, KAMS Publications, Uthamapalayam.

### **REFERENCES:**

1. Abell, Morrison and Wolf, 1987, Exploration of the Universe, 5<sup>th</sup> ed., Saunders College Publ.
2. Carrol and Ostlie, 2007, Introduction to Modern Astrophysics, 2<sup>nd</sup> ed., Pearson International.
3. William J. Kaufmann, III, 1977, Macmillan Publishing company, London.
4. Abhyankar, K.D., Universities Press.



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**SEMESTER – II**

**SKILL BASED – 4**  
**MEDICAL PHYSICS - BPHAS22**

**CREDIT – 2**

**Objective:** To understand the basics about the biological systems in our body, their behaviour, and the diagnostic devices.

## **Unit I**

Basic Anatomical Terminology- Modeling and Measurement – Forces on and in the Body – Physics of the Skeleton – Heat and Cold in Medicine- Energy work and Power of the Body

## **Unit II**

Pressure system of the body- Physics of Cardiovascular system- Electricity within the Body – Applications of Electricity and Magnetism in Medicine.

## **Unit III**

Sound in medicine- Physics of the Ear and Hearing- Light in medicine- Physics of eyes and vision.

## **Unit IV**

X-rays- Production of X-rays- X-ray spectra- continuous spectra and characteristic spectra- Coolidge tube- Electro Cardio Graph (ECG) - Block diagram- ECG Leads- Unipolar and bipolar-ECG recording set up.

## **Unit V**

Electro Encephalo Graph (EEG) - origin- Block diagram- Electro Myograph (EMG) – Block diagram- EMG recorder- Computer Tomography (CT) principle- Block diagram of CT scanner.

## **Text Books**

1. Medical Physics –John R. Cameron and James G.Skofronick, 1978, John Willy & Sons.
2. Bio medical instrumentation – E D II, Dr M. Arumugam, Anuradha Agencies 1997.



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**SEMESTER –II**

**NON MAJOR ELECTIVE- II**

**CREDIT – 2**

### **FUNDAMENTALS OF PHYSICS –II**

#### **Unit – I**

Electric current- voltage and resistance- Ohm's law- Kirchoff's law- Resistances in series and in parallel.

#### **Unit – II**

DC Source – Primary cells – Leclanche and Daniel cell – Secondary cells – Lead Acid Accumulator – DC generator.

#### **Unit – III**

Alternating current generation by hydro, thermal and atomic power stations– RMS value – Peak value (Quantitative) – AC generator – no derivation.

#### **Unit – IV**

Measurement of Electric power by Wattmeter- simple calculations- Induction coil- Wattless current- Power factor.

#### **Unit – V**

Simple electrical circuits – resistor, capacitor and inductor connected to AC source (independently) – Relationship between emf and current in each case. Diode – Bridge Rectifier.

#### **Reference Books**

1. Electricity and Magnetism – R. Murugesan – S. Chand & Co 2004.



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SEMESTER I & II

PHYSICSPRACTICAL-I

CREDIT - 3

## BPHAC1P

### LIST OF EXPERIMENTS

ANY FOURTEEN

1. Young's Modulus – Uniform bending – Pin & Microscope
2. Young's Modulus – Non-Uniform bending – Scale and Telescope
3. Young's Modulus – Cantilever – Pin & Microscope
4. Young's Modulus – Cantilever – Dynamic method
5. Rigidity Modulus – Static Torsion – Searle's method
6. Rigidity Modulus – Torsion Pendulum 7. Moment of Inertia – Torsion Pendulum
8. A.C. Frequency – Sonometer
9. Verification of laws – Sonometer
10. Frequency of tuning fork – Sonometer
11. Frequency of vibrator – Melde's Apparatus
12. Velocity of sound – Kundt's tube
13. Compound Pendulum – "g"
14. Thermal conductivity of bad conductor – Lee's Disc
15. Viscosity of liquid – Stoke's method
16. Viscosity of liquid – Burette method
17. Surface Tension – Capillary Rise
18. Surface Tension – Drop weight method



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SEMESTER – III

CORE SUBJECT- 3

CREDIT – 4

### ELECTRICITY AND ELECTROMAGNETISM – BPHAC31

#### Unit I

Coulomb's law- Electric field- Electric field due to a point charge- Electric flux- Gauss law- its proof- Applications of Gauss law- Electric field due to a charged sphere- Electric field due to a plane sheet of charge- Coulomb's theorem- Mechanical force on the surface of a charged conductor- Electric potential- Relation between electric field and electric potential- Potential due to a charged spherical conductor.

#### Unit –II

Capacitance- Principle of capacitor- Expressions for the capacitance of i) spherical capacitor ii) cylindrical capacitor and iii) parallel plate capacitor with and without partly filled dielectrics- Energy of a capacitor- Loss of energy when two charged conductors share the charges- Types of capacitors- fixed capacitor, variable capacitor, electrolytic capacitor and sliding capacitor.

#### Unit – III

Kirchhoff's laws- Application of Kirchhoff's laws to Wheatstone's bridge- sensitiveness of the bridge- Carey Foster's bridge- Determination of the resistance of the given wire with the necessary theory.

Potentiometer- principle of potentiometer- comparison of emfs of two cells using potentiometer- Determination of internal resistance of the cell using potentiometer- Calibration of voltmeter(low range and high range)- Calibration of ammeter.

#### Unit IV

Faraday's laws of Electromagnetic induction, - Lenz's law – self inductance – energy stored in an inductance – Experiment to determine self inductance by Rayleigh method with theory – Mutual inductance – Determination of Mutual inductance using B.G. (with theory) Coefficient of Coupling – Eddy Currents.

#### Unit V

Mean value of alternating emf – RMS value of the alternating current/voltage- Alternating current applied to LR, Cr and LCR circuits – Series Resonance Circuit – Parallel Resonance Circuit – Power in an A.C. Circuit – Wattless Current – Power factor – Q factor – choke – skin effect – A.C. bridges – Maxwell's bridge – Anderson's bridge and owen's bridge.

#### Text Book

1. Electricity and Magnetism by Sehgal, Chopra & Sehgal Sultan, Chand & Sons. 1998.

#### Reference Books

1. Electricity and Magnetism 20<sup>th</sup> revised edition – Brijlal & Subramaniam , Ravi Offset Printers & Publishers Pvt., Ltd., 1997.
2. Electricity & Electromagnetism – R. Murugesan
3. Electricity and Magnetism 2<sup>nd</sup> revised edition – Narayanamoorthy & Nagarathinam , National Publishing & Co. 1997.
4. Electricity & Magnetism – A. Ambrose and T. Vincent Devaraj



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**SEMESTER – IV**

**CORE SUBJECT- 4**

**CREDIT – 4**

## **OPTICS AND SPECTROSCOPY - BPHAC41**

### **Objective:**

- To familiarize the fundamental laws concerning reflection and refraction.
- To understand the phenomena like, interference, diffraction, and polarization.
- To perceive the basic concept of spectroscopy.

### **Unit I:**

Snell's law of reflection and refraction- reflection and refraction at spherical surfaces- Deviation produced by thin lenses- focal length of two thin lenses in and out of contact- Cardinal points- Refraction through a thin prism- Dispersion- deviation without dispersion- dispersion without deviation- Aberration- chromatic aberration in lenses- achromatic combination of two lenses- Spherical aberration and its removal- Aplanatic lenses- Oil immersion objective.

### **Unit II**

Interference- Coherent sources- interference in thin films- Air wedge- Newton's rings- Michelson's interferometer and its application- Fabry- Perot interferometer- sharpness of fringes- Resolution- Holography- Construction and reconstruction of a hologram.

### **Unit III**

Diffraction- Theory of plane diffraction grating(normal incidence only)- Experiment to determine wave length- Zonal plate- Theory- Comparison with convex lens- Fresnel's diffraction- Diffraction at a straight edge- circular aperture- rectangular aperture- Fraunhofer diffraction at a single slit- double slit- Cornu's spiral- Resolving power of optical instruments- Telescope and grating.

### **Unit IV**

Polarization- Polaroid and its application- Double refraction- Nicol Prism- Nicol prism as Polarizer and Analyzer- Huygens explanation of double refraction- QWP and HWP- production and analysis of plane, circularly and elliptically polarized light- Optical activity- Fresnel's explanation- Specific rotation- Lorentz half shade polarimeter

### **Unit V**

Spectroscopy- Introduction – Electromagnetic spectrum – IR radiations – properties, production, detection and uses – UV radiations – properties, production, detection and uses – Raman effect – Theory and experimental study – Applications. Electromagnetic spectrum- IR radiations- properties, production, detection and uses- UV radiations- properties, production, detection and uses – Raman effect – Theory and experimental study- Applications- Raman Effect- theory, experiment, characteristics of Raman lines- Applications- Doppler effect in optics and its application.

**Text Book:**

1. Optics and Spectroscopy – Kakani and Bhandari Sultan Chand & sons New Delhi.
2. Spectroscopy – B. K. Sharma, Goel Publishing House, Meerut 2006

**Reference Books:**

1. Optics - Subramaniam & Brijlal S. Chand & Co 2002
2. Optics and Spectroscopy – R. Murugesan, Vivekananda Press, Madurai.





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SEMESTER III & IV

PHYSICS PRACTICAL-II

CREDIT - 3

## BPHAC2P

ANY FOURTEEN

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| 1. Refractive Index              | : Spectrometer A and D               |
| 2. Grating                       | : Spectrometer - N and $\lambda$     |
| 3. Air Wedge                     | : Thickness of wire                  |
| 4. Newton's Rings                | : Radius and Wavelength measurements |
| 5. Carey Foster Bridge           | : Resistance and specific resistance |
| 6. Carey Foster Bridge           | : Temperature coefficient            |
| 7. Potentiometer                 | : Calibration of low Range voltmeter |
| 8. Potentiometer                 | : Calibration of ammeter             |
| 9. Potentiometer                 | : Comparison of EMF's                |
| 10. Determination of $B_H$       | : Axial coil 11.                     |
| Determination of M               | : Axial coil                         |
| 12. Determination of M and $B_H$ | : Tan C method                       |
| 13. Spot Galvanometer            | : Figure of Merit                    |
| 14. Spot Galvanometer            | : Charge sensitivity                 |
| 15. Spot Galvanometer            | : Comparison of EMF's                |
| 16. Spot Galvanometer            | : Comparison of capacities           |
| 17. Owen's Bridge                | : C1/C2                              |
| 18. De Sauty's Bridge            | : C1/C2                              |



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SEMESTER – V

CORE SUBJECT- 5

CREDIT – 4

## MODERN PHYSICS - BPHAC51

### Objectives:

- To give an introductory account of the basic principles of atomic physics.
- To impart knowledge on the theory of Relativity
- To introduce the origin of Quantum theory

### Unit I

Bohr atom model –Bohr's theory of Hydrogen atom- Bohr - Sommerfeld theory – Somerfield's relativistic atom model – Critical potentials- Experimental determination Davis and Goucher's experiment- Explanation for the fine structure of  $H_{\alpha}$  line- Relativistic variation of atomic mass– Vector atom model– Quantum numbers – coupling schemes – Pauli's exclusion principle – Arrangement of electrons in atoms- Magnetic dipole moment due to orbital motion of the electron – magnetic dipole moment due to electron spin - Stern and Gerlach experiment.

### Unit II

Optical spectra – spectral terms and notations – selection rules -Fine structure of sodium D lines –Zeeman effect – theory and experiment – quantum theory of Zeeman effect – Anomalous Zeeman effect – Stark effect.

X – Ray spectra- Duane and Hunt law- Moseley's law- Bragg's law- Bragg's X-ray spectrometer- measurement of wave length- Compton effect- theory and experimental verification.

### Unit III

Frames of reference- inertial frames of reference- Galilean transformation- Newtonian relativity- Michelson Morley experiment- Postulates of special theory of relativity- Lorentz transformation- Lorentz- Fitzgerald contraction- time dilation- relativistic addition of velocities- variation of mass with velocity- Mass-energy equivalence- Relation between total energy, rest mass energy and momentum

### Unit IV

Planck's quantum theory of radiation – Dual nature of matter and radiation – De-Broglie's hypothesis of matter waves – Expression for wavelength – Davisson's and Germer experiment – G. P. Thomson experiment with relativistic correction- Concept of wave packet– Group velocity, wave velocity and their relation – Heisenberg's Uncertainty principle – Experimental illustration.

### Unit V

Basic postulates of wave mechanics – Derivation of time dependent and time independent Schrodinger's wave equations– wave function - Physical significance of wave function– Eigen functions and Eigen values.

Schrodinger equation for a free particle in one dimensional potential well- Its Eigen function and Eigen value- Applications of Schrodinger wave equation- Particle in one dimensional Box –Barrier penetration problem - Linear harmonic oscillator – The rigid rotator.

**Text Book:**

Modern Physics (sixth revised edition 1998 – R. Murugesan, S. Chand & Company Ltd.)

**Reference Books:**

1. Modern Physics: Seighal Chopra and Seighal
2. Quantum Mechanics : Sathyaprakash, Ratan Prakasan Mandir 1994



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SEMESTER – V

CORE SUBJECT- 6

CREDIT – 4

## NUCLEAR PHYSICS – BPHAC52

**Objective:** The student must be able to

- Understand the basic properties of nuclei and the atomic nucleus
- Describe radioactivity and related phenomena
- Explain the various interactions of nuclear radiation with matter

### Unit I

Isotopes – Isotones – Isobars – Atomic mass unit – Properties of the nucleus – Nuclear Binding Energy – Nuclear forces – Yukawa's theory (no derivations) – theories of nuclear composition – proton – electron hypothesis – Model of nuclear structure - the liquid droop model – Binding energy formula – Shell model – Collective model.

### Unit II

Particle Accelerators – Synchro – cyclotron – Betatron – proton synchrotron – electron synchrotron – detectors – Wilson cloud chamber – bubble chamber – photographic emulsion technique – fundamental particles – particles and antiparticles – particles instability – conservation laws.

### Unit III

Laws of radio activity – Half life period – Mean life – Radio Carbon dating –  $\alpha$  rays – Geiger Nuttal law – experimental determination by Geiger- Nuttal law – a disintegration energy – theory of  $\alpha$  decay,  $\beta$  decay – electron capture,  $\gamma$  rays – determination of wavelength by diamond crystal spectrometer – origin of rays – internal conversion.

### Unit IV

Nuclear transmutations by  $\alpha$  particles, protons, deuterons, neutrons and electrons – Photo disintegration – nuclear fission – energy release. Explanation – (C.N Cycle and P.P Cycle) Nuclear fusion – Thermo nuclear reaction – Controlled thermo nuclear reaction – Cosmic rays – origin – primary – secondary – Azimuthal effect – East-West effect pair production & annihilation - Van Allen Belt.

### Unit V

Utilisation of nuclear energy - principle and action of atom bomb & Hydrogen Bomb – production of electricity from energy – Nuclear reactors – General features of nuclear reactors – Different types of nuclear reactors – Pressurized water reactors – Boiling water reactors – Fast Breeder reactors – Radio isotopes and their application.

**Text Book:**

1. Modern Physics – R. Murugesan, S.Chand & Co., 1998.
2. Modern Physics by Seghal, Choptra and Seghal, Sultan Chand 1998.
3. Nuclear Physics by Keplan.I – Marosa Publishing House, 1995.



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SEMESTER – V

CORE SUBJECT- 7

CREDIT – 4

### ANALOG ELECTRONICS – BPHAC53

**Objective:** To enable the students to understand the aspects of analog electronics in a lucid and comprehensive manner.

#### UNIT I:

Semiconductors- n type and p type- PN junction diode- characteristics- Zener diode characteristics- Full wave rectifiers- Bridge rectifier- Filter circuits- General theory- low pass, high pass, band pass and band elimination filters.

#### UNIT II

Transistors- three types of configuration- relation between  $\alpha$ ,  $\beta$  and  $\gamma$  - Biasing circuits- Field Effect Transistor (FET)- construction – n channel, p channel – FET polarities- working- FET characteristics- MOSFET- characteristics.

#### UNIT III

Amplification - small signal CE amplifier- input impedance, output impedance, current gain, voltage gain and power gain- single stage amplifier- frequency response - push-pull amplifier- Op-amp characteristics- application as adder, subtractor, integrator and differentiator.

#### UNIT IV

Feedback-positive & negative feedback- Barkhausen criteria- transistor oscillators- Hartley, Colpitt's, Phase shift oscillators with mathematical analysis.

#### UNIT V

Modulation-Types of modulation- Modulation Factor-Amplitude modulation-power in AM wave-block diagram of AM transmitters and receivers-Frequency modulation-block diagram of FM transmitters and receivers-Digital modulation(qualitative)-Pulse amplitude modulation-Pulse time modulation.

#### Text Book:

1. Principles of electronics - V.K.Mehta ; S.Chand &co
2. A textbook of applied electronics -R.S.Sedha ;S.Chand & co

#### Reference Books:

1. Basic electronics -B.L. Theraja; S.Chand & co
2. Electronic devices and circuits: Salivahanan, Sureshkumar Tata McGraw Hill
3. Electronic communication system - George Kennedy



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SEMESTER – V

SKILL BASED - 5

CREDIT – 2

## NANOPHYSICS – BPHAS51

### OBJECTIVES

- To create the basic knowledge in nano materials.
- To understand the scientific perspective of nanomaterials.
- To identify the techniques suitable for nanomaterial synthesis.
- To know the significance of nanomaterials.

### **Unit I Nanomaterials**

History of Nanotechnology- Nanostructures- synthesis of oxide nano particles- Synthesis of semiconductor nano particles- Synthesis of metallic nano particles

### **Unit II Quantum Heterostructure**

Super lattice- preparation of Quantum nanostructure- Quantum well laser- Quantum cascade laser-Quantum wire- Quantum dot- Application of Quantum dots

### **Unit III Carbon Nanotubes**

Discovery of Nanotubes- Carbon Allotropes- Types of carbon Nanotubes- Graphene sheet to a single walled nanotube- Electronic structure of Carbon Nanotubes- Synthesis of Carbon Nanotube

### **Unit IV**

Nanocrystalline soft material- Permanent magnet material- Theoretical background- Super paramagnetism- Coulomb blockade-Quantum cellular Automata

### **Unit V Application of nanotechnology**

Chemistry and Environment – Energy applications of nanotechnology- Information and Communication- Heavy industry-Consumer goods- Nanomedicine - Medical application of Nanotechnology

### **Text Book:**

- 1) Text book of Nanoscience and Nanotechnology – B. S. Moorthy, P. Sankar, Baldev Raj, B. B. Rath and James Murdy University Press – IIM
- 2) Nanophysics, Sr. Geradin Jayam, Holy Cross College, Nagercoil (2010)

### **Reference:**

- 1) 'Nanoscience and Nanotechnology: Fundamentals to Frontiers'  
M.S. Ramachandra Rao, Shubra Singh, Wiley India pvt. Ltd., New Delhi. (2013).
- 2) 'Nano the Essentials' - T. Pradeep, Tata Mc.Graw Hill company Ltd (2007)
- 3) 'The Chemistry of Nano materials : Synthesis, Properties and Applications', Volume 1  
C. N. R. Rao, A. Müller, A. K. Cheetham, , Germany (2004).



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SEMESTER – VI

CORE SUBJECT- 8

CREDIT – 4

## CLASSICAL AND STATISTICAL MECHANICS – BPHAC61

### Objective:

- To understand the mechanics of systems of particles and their equations of motion.
- To study the concept of statistics of molecules.

### Unit I

External and Internal force, Centre of Mass – Conservation of Linear momentum- Conservation of Angular momentum – Conservation of Energy (K.E., P.E.) – Work-energy theorem- Conservative forces- examples- constraints- Types of Constraints- Examples- Degrees of freedom under constraints- Generalized Coordinates (Transformation Equations) – generalized velocities- generalized momentum.

### Unit II

Principle of Virtual Work – D'Alembert's principle- Lagrangian Equations from D'Alembert's Principle (Derivation) – Simple applications- Newton's equation of motion, simple pendulum, Atwood's machine, compound pendulum- Hamilton's principle- deduction of Hamilton's principle from D'Alembert's principle- Lagrangian equation from Hamilton's principle- Deduction of Lagrangian equation of motion from variation principle- simple application- simple pendulum, Atwood's machine, compound pendulum.

### Unit III

Hamiltonian Function H- conservation of energy(Jacobi's Integral) – Physical significance- Hamilton's Equations (Derivation) – variation principle- Hamilton's Equation of motion from variation principle- Applications- Harmonic oscillator, motion of a particle in central force field, Charged particle moving in an electromagnetic field, compound Pendulum, Two Dimensional Harmonic Oscillator

### Unit IV

Classical statistics- microscopic and macroscopic systems- ensembles- Basic postulates of statistical mechanics- Probability- Thermodynamic probability- Boltzmann theorem on entropy and probability- Maxwell-Boltzmann statistics- Maxwell-Boltzmann energy distribution law- - Maxwell Boltzmann velocity distribution Law.

### Unit V

Quantum statistics- introduction- phase space- Planck's law of black body radiation (derivation) - Deduction of Wien's and Rayleigh Jean's law- Bose-Einstein statistics- Bose-



Einstein distribution law- Photon gas- Fermi-Dirac Distribution Law- Electron gas- Comparison of the three Statistics.

**TEXT BOOKS:**

1. J.C. Upadhyaya, July 2005, **Classical Mechanics**, Published by Himalya Publishing House, Mumbai
2. Brijlal & Subramaniam, Reprint 1998, **Heat & Thermodynamics**, S. Chand & Company Ltd
3. Agarwal, '**Statistical Physics**' S.Chand & co New Delhi 1996

**REFERENCES:**

1. Gupta, B.D., Satyaprakash, 1991, **Classical Mechanics**, 9th ed., Kadernath Ramnath Publ., Meerut
2. Gupta, Kumar, Sharma, 2005, **Classical Mechanics**, PragatiPrakashan Publ., Meerut.
3. Murray R. Spiegel, 1981, Theoretical Mechanics, Schaum's outline series, Mc Graw Hill Publ. Co., New Delhi.



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SEMESTER – VI

CORE SUBJECT- 9

CREDIT – 4

SOLID STATE PHYSICS - BPHAC62

## Objective:

- To understand the different types of bonding in solid substances,
- To understand the magnetic and dielectric properties of crystalline structures.

## UNIT I:

Bonding in Solids – Types of bonding in solids – ionic, covalent, metallic, molecular and hydrogen bonds – Crystal Structure – Crystal lattice and crystal structure – unit cell – Bravi's lattice, classification of crystals – Miller indices – structure of diamond and zinc blende – Thermal Properties – Concept of phonon – Heat capacity of solids – Limitations of Einstein's theory, Debye's theory of lattice specific heat; thermal expansion of solids (qualitative).

## UNIT II:

Free electron theory of metals; Electron drift, mobility, mean free path, relaxation time, Electrical and Thermal conductivities of metals – Wiedmann Franz law; Sources of resistivity of metals – Metthiessen's rule; Super conductivity – applications, BCS theory.

## UNIT III:

Different types of magnetism – dia, para, ferro, antiferro and fermagnetism: a. Langevin's theory of dia & para magnetism 2. Wie's theory of ferromagnetism – Magnetic materials – Properties and application – hard and soft magnetic materials, magnetostriction materials, ferrites and concepts of domains and hysteresis.

## UNIT IV:

Dielectrics, polarization, polar and non-polar dielectrics – dielectric constant, Polarisability Clausius Mossotti relation – Different types of Polarization – electronic, ionic, orientational, space charge – Dependence of polarization on frequency and temperature; Dielectric loss sources; Dielectric strength and break-down – contributing.

## UNIT V:

Laser materials – Instrumentation of radiation with matter (quantitative) – Emission and absorption of light spontaneous and stimulated emission; Laser Principle – Properties – applications; construction, working and characteristics of Ruby laser, He-Ne laser. Semiconductor laser.

## Text Book:

1. Fundamentals of solid state physics by Saxena, Gupta Saxena – Pragati Prakashan X Revised Edition 1991.
2. Introduction to Solids by Azaraoff – TMH, Reprint 1978.



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**SEMESTER – VI**

**CORE SUBJECT- 10**

**CREDIT – 4**

## **DIGITAL ELECTRONICS – BPHAC63**

**Objective:** To enable the students to understand the aspects of Digital electronics in a lucid and comprehensive manner.

### **UNIT I: Number System**

Number system-Binary, decimal, octal, hexadecimal (conversion from one to another)- binary addition- binary subtraction- binary subtraction by 1's and 2's complement method- Basic laws of Boolean Algebra-properties-Principle of duality- De-Morgan's theorem-proof.

### **UNIT II: Logic Gates**

Positive and negative logic-logic gates-OR, AND, NOT, NAND and EX-OR gates- DRL-OR gate, AND gate-RTL NOT gate-DTL NOR gate- DTL NAND gate- NAND as universal gate- NOR as universal gate--Sum of products(SOP)- Karnaugh's map-2 variable,3 variable and 4 variable-simplification using k-map.

### **UNIT III: Arithmetic circuits**

Half adder- full adder- 4 bit binary adder- half subtractor- full subtractor- 4 bit binary subtractor- Multiplexer(MUX)- 4 to 1 MUX- Demultiplexer (DMUX)- 1 to 4 DMUX- Encoder- 8 to 3 encoder- decimal to BCD encoder- decoder- 3 to 8 decoder- BCD to decimal decoder-BCD to seven segment decoder.

### **UNIT IV: Timers, Flip-flops and registers**

Timer- IC 555 monostable and astable multivibrators- flip flops- RS flip flops (using NAND and NOR)- edge triggered RS flip flop- JK flip flop- JK master slave flip flop- D flip flop- register- serial in serial out shift register.

### **UNIT V: Counters, memories and data converters**

Counters- Ring counter- decade counter-semiconductor memories- ROM-PROM- applications- RAM- Dynamic RAM (DRAM)-Digital to analog converter(D/A)- binary ladder type-analog to decimal converter(A/D)- parallel A/D converter.

### **Text Book:**

1. Digital principles and applications : Albert Paul Malvino , Donald P. Leach , Tata McGraw Hill
2. Digital logic circuits : P. Raja (second ed), Scitech Publications Pvt. Ltd.
3. Digital electronics and logic design :JaydeepChakravorty , University Press.



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**SEMESTER – V**

**SKILL BASED - 6**

**CREDIT – 2**

## **OPTO ELECTRONICS – BPHAS61**

### **Objective:**

- To give an introductory account of the basic principles of Optoelectronic devices
- To understand the principle and working of LASER ➤ To gain information about fibre optic communication

### **Unit I**

Introduction – PN junction as a Light Source (LED) – LED materials – Advantages – LCD \_ Characteristics and action of LCD – Advantages.

### **Unit II**

Laser- Introduction– characteristics of Laser– Spontaneous and stimulated emission– Einstein coefficients- condition for population inversion– three level scheme– semi conductor.

### **Unit III**

Photo detector- characteristics of photo detectors– PN junction photo detector– PIN photo diode- Avalanche photo diode- Photo transistor.

### **Unit IV**

Introduction – principle of optical fibre – light transmission in a optical fibre – Acceptance angle – Numerical aperture.

### **Unit V**

Fibre index profiles – Step index, graded fibre (transmission of signals) – Advantages of fibre optic communications, optical switching – Logic gates.

### **Text Book:**

1. Semiconductor physics and Optoelectronics – P. K. Palanisamy, SCITECH Publication, Chennai 2002.
2. Optical fibres and Fibre Optic Communication – Sabir Kumar Sarkar IV Revised Edition 2003.

### **Reference Books:**

1. Opto Electronics – Wilson & Hawker, Prentice Hall of India 2004.



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SEMESTER V & VI

PHYSICS PRACTICAL-III

CREDIT - 5

## BPHAC3P

ANY FOURTEEN

- |                                |   |
|--------------------------------|---|
| 1. LCR                         | : Series Resonance circuit- L and Q     |
| 2. LCR                         | : Parallel Resonance circuit- L and Q   |
| 3. Spot Galvanometer           | : Determination of mutual inductance    |
| 4. Spot Galvanometer           | : Comparison of mutual inductance       |
| 5. Spot Galvanometer           | : High Resistance by leakage            |
| 6. Spot Galvanometer           | : Internal Resistance of a cell         |
| 7. Anderson's Bridge           | : Self Inductance                       |
| 8. Rayleigh's Bridge           | : Self Inductance                       |
| 9. Maxwell's Bridge            | : Self Inductance                       |
| 10. Small angled prism         | : Refractive Index                      |
| 11. Spectrometer               | : $i - d$ curve                         |
| 12. Spectrometer               | : $i - i'$ curve                        |
| 13. Grating                    | : Minimum deviation                     |
| 14. Spectrometer               | : Cauchy's constant                     |
| 15. Spectrometer               | : Hartmann's Interpolation Formula      |
| 16. Spectrometer               | : Small angled prism - refractive index |
| 17. Impedance and power factor | : LR circuit                            |
| 18. Impedance and power factor | : CR circuit                            |



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**SEMESTER V & VI**

**PHYSICSPRACTICAL-IV  
BPHAC4P**

**CREDIT – 5**

ANY FOURTEEN

1. Transistor characteristics : Common Emitter
2. Zener diode characteristics
3. Zener voltage regulator
4. Single Stage Amplifier : gain and bandwidth
5. Clipper and Clamper : discrete components only
6. FET characteristics
7. Hartley Oscillator : Frequency and Inductance of coil
8. Colpitt's Oscillator : Frequency and Inductance of coil
9. Phase Shift Oscillator : Frequency
10. Wien's Bridge Oscillator : Frequency
11. Astable Multivibrator : using discrete components
12. Monostable Multivibrator : using discrete components
13. Integrator and Differentiator : using discrete components
14. Voltage Doubler and Voltage Tripler
15. Logic gates : using discrete components
16. Full wave rectifier :  $\pi$  filters
17. UJT characteristics
18. SCR characteristics



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**SEMESTER V & VI**

**PHYSICSPRACTICAL-V**

**CREDIT - 5**

**BPHAC5P**

1. Logic Gates : IC
2. NAND as Universal gate : IC
3. NOR as Universal gate : IC
4. Dual Power Supply - IC 7812 and IC 7912
5. De-Morgan's Laws - Verification
6. Half Adder and Full Adder
7. Four bit binary adder
8. Half Subtractor and Full Subtractor
9. Four bit binary subtractor
10. Astable Multivibrator -IC 555
- 11 Schmitt Trigger - IC 555
12. BCD counter
13. Astable Multivibrator -IC 741
14. Integrator and Differentiator -IC 741
15. Adder and subtractor -IC 741
16. Four bit binary counter
17. Ring Counter
18. Voltage Regulator -IC 7805



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### B. Sc. ANCILLARY PHYSICS (SYLLABUS)

#### B.SC., ANCILLARY PHYSICS (SEMESTER) SYLLABUS

SEMESTER – I

CREDIT – 4

#### PAPER I : MECHANICS, PROPERTIES OF MATTERS AND SOUND - BPHAA11

##### Unit I:

Forces in nature – Central forces – Gravitational and electromagnetic – Conservative and Non-Conservative forces – Examples – Nuclear force – Friction – Angle of friction – Motion of bodies along an inclined plane – Work done by a force – Work done by a varying force – Expression for Kinetic energy – Expression for potential energy – Power.

##### Unit II:

Angular velocity – Normal acceleration (no derivation) – Centrifugal and Centripetal forces – Torque and angular acceleration – Work and power in rotational motion – Angular momentum – K.E of rotation – Moment of Inertia – Laws of parallel and Perpendicular axes theorems – M.I of circular ring, Circular Disc, Solid sphere, hollow sphere and cylinder.

##### Unit III:

Kepler's laws of planetary motion – Laws of Gravitation – Boy's method for G – Compound pendulum – Expression for period – Experiment to find g - Variation of g with latitude, altitude and depth – Artificial Satellites.

##### Unit IV:

Elastic moduli – Poisson's ratio – beams – Expression for bending moment – Determination of Young's modulus by uniform and non-uniform bending – I section girders. Torsion – Expression for couple per unit twist - Work done in twisting – Torsional pendulum – Derivation Poiseuille's formula (analytical method) – Bernoulli's theorem – Proof of Application – Venturimeter – Pitot tube.

##### Unit V:

Simple harmonic motions – Progressive Waves Properties – Composition of Two S.H.M and beats stationary waves – Properties – Melde's experiments for the frequency of electrically maintained tuning fork – Transverse and longitudinal modes - Acoustics – Ultrasonic – Properties and Application.

#### Reference Books

1. Mechanics by D.S. Mathur – S. Chand & Co., 2008.
2. Properties of matter by Brijlal & N. Subramanyam 2004, S. Chand.
3. A Text Book of Sound by Brijlal & N. Subramanyam, S. Chand & Co 2004.
4. University Physics by Sears Zemansky and Gound, 6<sup>th</sup> edition (Naresa Publishing House, Chennai 1996)





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SEMESTER – II

CREDIT – 4

### PAPER-II THERMAL PHYSICS – BPHAA21

#### Unit I:

Expansion of Crystals – Determination of  $\alpha$  by air wedge method – Expansion of anisotropic solids – solids of low expansivity and their uses – anomalous expansion of water – thermostats. Isolated and adiabatic changes – Derivation of equation for both  $C_v$ , and  $C_p$  of a gas – relation between them – experimental determination of  $C_v$ , by Joly's method- Determination of  $C_p$  by Regnault's method.

#### Unit II:

Lee's disc method for conductivity of bad conductor – air and cardboard / ebonite – analogy between heat flow and electric current Weidman – Franz law – Convection in atmosphere – lap rate – stability of atmosphere – green house effect – atmospheric pollution.

#### Unit III:

Radiation – Stefan's law – determination of Stefan's constant by filament heating method – solar constant measurement water flow Pyrheliometer – temperature of the Sun – Solar spectrum- energy distribution in black body spectrum – Planck's law (no derivation) – derivation of Wien's and Rayleigh Jeans laws from Planck's law.

#### Unit IV:

Kinetic theory of gases – Mean free Path – transport phenomena – diffusion – viscosity and thermal conductivity – Maxwell's law of distribution of molecular speed – experimental verification – degree of freedom – Boltzmann's law of equipartition of energy – calculation of  $C_p$  for monatomic and diatomic gases.

#### Unit V:

Thermodynamics – Carnot's theorem – Derivation of Efficiency – Second law of thermodynamics – entropy – changes of entropy in Carnot's Cycle – Change of entropy in conversion of ice into steam – Joule – Kelvin effect – simple theory of Porous – Plug experiment adiabatic – diamagnetism – Curie's law Giauque's Methods Superconductivity.

#### Reference Books

1. Heat and Thermodynamics by Brijlal & N. Subramanyam – S. Chand & Co.2004.
2. Ancillary Physics Vol.II by A. Ubald Raj & Jose Robin, Indira Publications, 2002



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**SEMESTER-III**

**CREDIT - 4**

**PAPER-III ELECTRICITY AND ELECTRONICS BPHAA21**

**Unit I:**

Gaus's law – proof – Applications – Field due to a charged sphere and an infinite plane sheet – Field near a charged conducting cylinder – Coulomb's theorem – Electronic potential – Relation between potential and field – Capacitors – Expression for C of parallel plate spherical (outer sphere earthed) and cylindrical capacitors – Energy of charged capacitor – Loss of energy due to sharing of charges.

**Unit II:**

Kirchhoff's laws – application of wheatstone's network – sensitiveness of bridge – Carey Foster Bridge – Measurement of resistance and temperature – Coefficient of resistance – principle of potentiometer – Calibration of ammeter and voltmeter – low and high range – measurement of resistance using potentiometer.

**Unit III:**

Torque on a current loop – mirror galvanometer, dead beat and ballistic – Current sensitiveness – voltage sensitiveness I B.G. theory – damping correction – experiments for charge sensitiveness – comparison of emf's and comparison of capacitors.

Electro motive force generated in a coil rotating in a uniform magnetic field – R.M.S and mean values – LCR circuit – impedances - Series and Parallel resonant circuits – Power factor – Wattless current – Choke.

**Unit IV:**

Junction diodes – Forward and Reverse bias – Diode characteristics – Types of diodes – (LED and Zener) Bridge rectifier using junction – II filter – Transistors- Characteristics (CE modes only) – Biasing and action of a single transistor (CE) amplifier – Frequency response Hartley oscillator – Modulation (qualitative study) – Op-Amp and its characteristics – virtual earth – voltage amplifier in inverting mode - Op-Amp as adder and Subtractor.

**Unit V:**

Binary number system – reason for using binary numbers – binary to decimal and decimal to binary conversions – addition and subtraction of binary numbers. Logic circuits – Boolean algebra – De Morgan's theorem – OR, AND, NOT, NOR and NAND Gates – NOR and NAND gates as universal building blocks – Ex-Or gates.

**Reference Books:**

1. Solid State Electronics - B.L. Theraja S. Chand 2003.
2. Electricity and Magnetism - Brijlal & N. Subramanyam, S. Chand 2007.



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SEMESTER– IV PAPER-IV

CREDIT – 4

## OPTICS, SPECTROSCOPY AND MODERN PHYSICS - BPHAA21

### Unit I:

Deviation produced by thin lens – Focal length of two thin lenses in and out of contact - Cardinal points – Refraction through a thin prism – Dispersion – Dispersive power – combination of thin prisms to produce (a) deviation without dispersion and (b) dispersion without deviation – Direct vision spectroscope – Chromatic aberration in lenses and its removal – Spherical aberration and its removal – Aplanatic surfaces – Oil immersion objective – Theory of primary and secondary rainbows.

### Unit II:

Interference in thin films – Air wedge – Newton's rings (Reflected beam only) – Determination of wavelength – Jamin's Interferometer, principle and use. Diffraction; Theory of plane transmission grating (Normal incidence only) – Experiment to determine wavelengths.

### Unit III:

Double refraction – Nicol prisms, constructions, action and uses – QWP and HWP – Optical activity (No theory) – Biot's laws – Specific rotator power – Half shade polarimeter –Determination of Specific rotator power – Fiber optics – Light propagation in fibers – Fiber optic communication system.

### Unit IV:

Infra red radiations, Production, properties and uses – Ultra violet radiations sources, properties and uses. Quantum theory – Plank's quantum theory – Raman Effect – Simple theory Experimental study (Wood's apparatus) Application. Photo electricity – Laws of photo electricity – Einstein's equation Photocells and their uses, photo emissive, photoconductive and photo voltaic cells.

### Unit V:

De Broglie's theory – Electron diffraction – G.P. Thomson's experiment. Michelson –Morley experiment – Significance of the negative results – Postulates of special theory of relativity – Lorentz transformation equations (No Derivation) – Length Contraction – Time dilation – Variation of mass with velocity and Mass – Energy relation (Simple derivation)

### Reference Books:

1. A text book of Optics by Brijlal & N. Subramanyam, S.Chand 2002.
2. Optics and Spectroscopy by R. Murugesan, Vivekananda Press, Madurai 2004.



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## LIST OF PRACTICAL

SEMESTER I & II

CREDIT – 1

### ANCILLARY PHYSICS PRACTICAL – I

#### Any 14 Experiments

- |   |   |   |
|---|---|---|
| 1. Young's Modulus                        | - | Uniform bending – Pin & Microscope      |
| 2. Young's Modulus                        | - | Non-Uniform bending – Scale & Telescope |
| 3. Acceleration due to gravity            | - | Compound Pendulum                       |
| 4. Determination of G and M. I            | - | Torsion Pendulum                        |
| 5. Verification of laws                   | - | Sonometer                               |
| 6. Frequency of fork                      | - | Melde's Apparatus                       |
| 7. Calibration of low range voltmeter     | - | Potentiometer                           |
| 8. Calibration of ammeter                 | - | Potentiometer                           |
| 9. Resistance and specific resistance     | - | Potentiometer                           |
| 10. Comparison of capacities              | - | Spot Galvanometer                       |
| 11. Comparison of EMF's                   | - | Spot Galvanometer                       |
| 12. Resistance and resistivity            | - | Carey Foster Bridge                     |
| 13. Refractive index of prism             | - | Spectrometer                            |
| 14. Thermal conductivity of bad conductor | - | Lee's Disc                              |
| 15. Viscosity of liquid                   | - | Stoke's method                          |
| 16. Comparison of viscosity               | - | Ostwald's Viscometer                    |



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SEMESTER I & II

CREDIT – 1

## ANCILLARY PHYSICS PRACTICAL – II

### Any 14 Experiments

1. Thickness of wire - Air Wedge
2. Radius of curvature - Newton's Rings
3. Determination of  $N$  and  $\lambda$  -
4. Dispersive power of a prism  
Spectrometer/Grating(Normal incidence)  
- Spectrometer
5. Transistor characteristics -  
Common Emitter
6. Bridge Rectifier along with  
Filter
7. Single Stage Amplifier - Transistor
8. Frequency of oscillation - Hartley Oscillator
9. Verification of Truth table  
discrete  
component - Logic gates(AND, OR, NOT)
10. Verification of Truth table  
component - Logic gates(NAND, NOR) discrete
11. Static characteristics - Zener diode
12. Adder and subtractor - Op-Amp
13. Comparison of capacities - De Sauty's Bridge
14. Determination of  $L$  and  $Q$  - LCR Series Resonance circuit
15. Determination of  $L$  and  $Q$  - LCR parallel Resonance circuit
16. Voltage and current sensitivity - Mirror galvanometer