

MOTHER TERESA WOMEN'S UNIVERSITY

KODAIKANAL – 624 101.

CHOICE BASE CREDIT SYSTEM (CBCS)

Syllabus for candidates admitted from 2015 – 2018

Course Name: B.Sc Physics

Eligibility: Science Students with mathematics at the higher secondary level.

S. No.	Paper Code	Course Title	Credits	Hour	Continuous Internal Assessment (CIS)	End Semester Exam (ESE)	Total
<b>SEMESTER-I</b>							
1		Part I - Tamil	3	6	25	75	100
2		Part II- English	3	6	25	75	100
3		Core I Properties of Matter	4	5	25	75	100
4		Core II Thermal Physics	4	5	25	75	100
5		Allied Mathematics I	4	5	25	75	100
6		Value education	3	3	25	75	100
		<b>Total</b>	<b>21</b>	<b>30</b>			<b>600</b>

SEMESTER II							
7		Part I Tamil	3	6	25	75	100
8		Part II English	3	6	25	75	100
9		Core III Electricity and Electromagnetism	4	6	25	75	100
10		Core Practical I	4	5	25	75	100
11		Allied Mathematics II	4	5	25	75	100
12		Environmental Studies	2	2	25	75	100
		<b>Total</b>	<b>20</b>	<b>30</b>			<b>600</b>
SEMESTER III							
13		Part I Tamil	3	6	25	75	100
14		Part II English	3	6	25	75	100
15		Core IV Optics and spectroscopy	4	5	25	75	100
16		Allied chemistry paper	4	5	25	75	100

17		Elective paper I Solid state physics	3	4	25	75	100
18		SBE I	2	2	25	75	100
19		ONME I	2	2	25	75	100
		<b>Total</b>	<b>21</b>	<b>30</b>			700
20		Part I Tamil	3	6	25	75	100
21		Part II English	3	6	25	75	100
22		Core Mathematical physics V	4	4	25	75	100
23		Core Practical II	4	4	25	75	100
24		Allied Practical	4	4	25	75	100
25		Elective-II Energy physics	3	3	25	75	100
26		Skill based Elective courses II	2	2			
27		ONME II	2	2	25	75	100
		<b>Total</b>	<b>25</b>	<b>30</b>			800

28		Core VI Electronics I	4	5	25	75	100
29		Core VII Classical Mechanics	4	5	25	75	100
30		Core VIII Quantum Physics	4	5	25	75	100
31		Core IX-Fiber optics	4	5	25	75	100
32		Core X Laser Physics	4	5	25	75	100
33		Elective-III-Medical Physics	3	3	25	75	100
34		SBE III	2	2	25	75	100
		<b>Total</b>	<b>25</b>	<b>30</b>			700
35		Core XI Digital Electronics	4	5	25	75	100
36		Core XII Nuclear Physics	4	5	25	75	100
37		Core XIII Atomic	4	5	25	75	100

		Physics					
38		Core Practical III (Non Electronics)	4	5	25	75	100
39		Core Practical IV (Electronics)	4	5	25	75	100
40		Elective IV Astrophysics	3	3	25	75	100
41		SBE IV	2	2	25	75	100
42		Extension Activity	-	2	25	75	100
		<b>Total</b>	<b>28</b>	<b>30</b>			<b>800</b>
		<b>Total Credits</b>	<b>140</b>		<b>4200</b>		

## EVALUATION SCHEME

### INTERNAL

#### THEORY: Test: 20 Marks

(Three theory tests should be conducted and average of best two should be taken into account)

Seminar – Assignment – Attendance – 5 Marks

Total: 25 Marks

#### Practical: Test – 10 Marks

(Three Practical tests should be conducted and average of best two should be taken in

to account)

Observation Notebook: 10 Marks

Attendance and Performance in the laboratory – 5 Marks

Total – 25 Marks

EXTERNAL

Theory Question Pattern

Section – A

(Answer any ten out of 16 questions (open choice) each questions carries two marks)

(10X2 = 20 marks)

Section – B

(Answer any 5 out of 8 questions, each questions carries five marks) (5X5 =25 marks)

(open choice)

Section – C

Answer all the three questions, each questions carries ten marks) (3X10 =30) either

(a) or (b) type questions)

External Practical – 75

Theory - 25+75

Practical - 25+75

## SEMESTER –I

**BPH12**

**PROPERTIES OF MATTER**

**5 Hours/4 Credits**

### **Objectives:**

1. To refresh the knowledge of undergraduate students on fundamental properties of matter.
2. Conceptual understanding of gravitation, elasticity, viscosity and diffusion.
3. Determination of various physical quantities related to matter.
4. Students will be able to apply theoretical concepts to solve numerical and practical based problems.

### **Unit – I**

#### **Acceleration due to gravity**

Acceleration due to gravity – The simple pendulum- Borda's pendulum Compound

Pendulum – Interchangeability of the Centre of suspension and oscillation – Centre of

Percussion –other points. Variation of the value of  $g$  at sea- Local and temporal changes in the value of  $g$ .

### **Unit II**

#### **Gravitation**

Historical – Kepler's laws- Note on Newton's deductions from Kepler's laws- Newton's Law of Gravitation – Determination of the gravitational constant – Density of the Earth- Qualities of Gravitation- Law of Gravitation and theory of relativity –Gravitational field- Intensity of the field – Gravitational potential – Potential energy – Gravitational potential at a point distant  $r$  from a body of mass  $m$  – Velocity of escape – Equipotential Surface - Potential at a point outside and inside a Spherical Shell. Gravitational field inside a spherical shell or a hollow sphere – Potential and field intensity due to a solid sphere at a point(i) inside the sphere (ii) outside the sphere.

## **Unit III**

### **Elasticity**

Introductory- Stress and strain – Hook's law- Three types of elasticity – Equivalence of a shear to a compression and an extension at right angles to each other - Shearing stress equivalent to an equal linear tensile stress and an equal compression stress at right angles to each other- Work done in unit volume in a strain- Deformation of a cube- Bulk Modulus- Modulus rigidity Young's Modulus- Relation connecting the elastic constant – Poisson's ratio – Determination of Young's modulus- Determination of Poisson's ratio for rubber.

## **Unit IV**

### **Flow of Liquids – Viscosity**

Rate of flow of liquid – lines and tubes of flow- energy of the liquid – Bernoulli's theorem and its important applications of Bernoulli's equation - Viscosity – Coefficient of viscosity – Fugitive elasticity – Critical Velocity – Poiseuille's equation for flow of liquid through a tube –Experimental determination of a liquid- poiseuille's method – motion in a viscous medium- Determination of a coefficient of a viscosity of a liquid – Stoke's Method – Rotation Viscometer – Variation of viscosity of a liquid with temperature Comparison of viscosities – Ostwald Viscometer. Determination of viscosity of gases.

## **Unit V**

### **Diffusion and Osmosis**

Diffusion – Fick's law – relation between time of diffusion and length of column. Experimental measurement of diffusivity – Graham's law for diffusion of gases – Effusion – Transpiration and Transfusion and Osmotic pressure – Laws of Osmotic Pressure Kinetic theory of solutions – Osmosis and Vapor pressure of a solution – Osmosis and boiling point of a solution. Osmosis and freezing point of a solution.

### **Books for study**

1. Elements of Properties of Matter D.S. Mathur

Unit I – Chapter – VI

Unit II – Chapter – VII

Unit III – Chapter – VIII

Unit IV – Chapter – XII

Unit V – Chapter – XIII

**Books for Reference:**

1. Mechanics – Prof. D.S Mathur. Revised by : Dr. P.S. Hemne. S. Chand and Co. New Delhi. First edition 1981, Reprint 2015
2. Properties of matter – Brij Lal and Subramanyam. Eurasia publishing house (pvt.) LTD. New Delhi. Sixth Edition 1991.

**SEMESTER –I**

**BPH11**

**THERMAL PHYSICS**

**5 Hours/4 Credits**

## **Objectives:**

1. This course aims to study the response of gases, liquids and solids to heat both at the macroscopic and at the microscope level.
2. They will learn basic concepts of heat conduction and famous laws of thermodynamics.
3. Low temperature physics and superconductivity will be introduced to them.
4. Students will be able to apply theoretical concepts in performing thermal conductivity experiments.

## **Unit 1**

### **Calorimetry**

$C_v$  and  $C_p$  of a gas Meyer's relation experimental determination of  $C_v$  by expand method – specific heat of gas by Calender Barn's method.

## **Unit – II**

### **Transmission of heat conduction**

Conduction Co-efficient of thermal conductivity- cylindrical flow of heat – K of rubber-K of bad conductor – Lee's disc method. Blank body – Stefan's law – Experimental determinations of Stefan's constant – Mathematical derivation of Stefan's constant – Solar constant temperature of the sun – solar spectrum

## **Unit- III**

### **Kinetic theory of Gases**

Derivation of ideal gas equation- degrees of freedom- Maxwell's law of equi-partition energy- Ratio of specific heat capacities- Maxwell's Law of distribution of molecular velocities- Experimental verification- Mean free path – Transport phenomena – Diffusion viscosity and Thermal conduction of gases.

## **Unit IV**

### **Low temperature Physics**

Joule Kelvin effect – Simple theory of porous plug experimental adiabatic demagnetization – Curie's Law – Giauque's method- Superconductivity

## **Unit V**

### **Thermodynamics**

I law of thermodynamics – gas equation during an adiabatic process determined by Clement and Desorme's method.

II Law of thermodynamics and entropy – Change of entropy in reversible and irreversible process- Maxwell's thermodynamical relations- Application to Joule Kelvin effect – Claudius Claperyron equation.

### **Books for study**

1. Heat and Thermodynamics – D.S. Mathur, Sultan Chand & Sons – Tb, 2014

### **Books for reference**

1. Thermal Physics – A.B.Gupta and H.P. Roy- Books and Allied PVT Ltd, 3rd Revised edition edition
2. Heat and Thermodynamics – Brij lal and Dr.N. subrahmanyam, P.S. Hemne.  
S.Chand and Co. New Delhi. First Edition 1968. Reprint 2015
3. Thermal physics – S.C Garg, Tata Mcgraw Hill Education Private Limited, 1st, 2007

## SEMESTER II

BPH21

ELECTRICITY AND MAGNETISM

6 Hours/4 Credits

### Objectives:

1. To give the students a firm understanding of the basics of Electricity and Magnetism.
2. To disseminate the knowledge on various current laws and magnetic laws.
3. To introduce to the students the application of Electricity and Magnetism and firm their understanding on alternating currents
4. Students will be capable to apply their knowledge in performing electricity and magnetism based experiments have firm base in theory.

### UNIT I

#### Electrostatics

Electric field and flux – gauss law – application of gauss law – field due to a charged sphere – coulomb's theorem – mechanical force on the surface of charged conductor. Electrical potential – equipotential surface – relation between field and potential – electric potential energy. Capacity of a parallel plate capacitor – spherical, cylindrical and parallel plate capacitors – types of condensers – energy stored in a capacitor.

## **UNIT II**

### **Current electricity**

Current – current density – expression for current density – kirchoff's laws – Wheat stone's network – Carey Foster's bridge – Determination of resistivity and temperature coefficient of resistance – potentiometer: principle – calibration of ammeter, voltmeter.

## **UNIT III**

### **Magnetic fields of electric current**

Magnetic field – flux – Biot-Savart law – magnetic induction due to straight conductor – force on a current element – torque on current loop – ampere's law – Maxwell's equations – magnetic induction due to circular loop – solenoid and toroid moving coil galvanometer's dead beat and ballistic. Properties of magnetic material: the three magnetic vectors – dia – para – ferromagnetism.

## **UNIT IV**

### **Electromagnetic induction**

Law of electromagnetic induction – Maxwell equation self and mutual induction – determination of L by Rayleigh's methods – determination of M coefficient of coupling – Eddy current – uses.

## **UNIT V**

### **Alternating currents**

AC circuits RC, RL series, parallel – power of an ac circuit – Q factor – Bridges – Owen – Anderson's Maxwell bridges.

### **Books for study**

1. Basic electrical, electronic and computer engineering – R. Muthusubramaniam, s. Salivahanan, K.A.Muraleedharan., 1994

### **Books for references**

1. Electricity and Magnetism – D.Chattopadhyay & P.C. Rakshit – New Central Book Agency Pvt.Ltd.,2015

**I B.SC. PHYSICS**

## SEMESTER II

### CORE PRACTICAL-I

5 Hours/4 Credits

#### Any Twelve

**Objective :** It is aimed at exposing the under graduate students of the Physics department to the techniques of handling equipments, making error free measurements and error analysis

1. Estimation of errors
2. Young's modulus – Uniform bending pin and microscope method
3. Young's modulus – Non Uniform bending pin and microscope method.
4. Young's modulus – Uniform bending optical lever method.
5. Young's modulus – Non Uniform bending optical lever method.
6. Compound Pendulum –  $g$  and  $k$ .
7. Spectrometer – Dispersive power of prism .
8. Spectrometer – Grating minimum deviation.
9. Potentiometer – Low range voltmeter calibration.
10. Potentiometer – Low range ammeter calibration .
11. Sonometer – Laws verification.
12. Sonometer – Frequency of the tuning fork.
13. Melde's Experiment.
14. Determination of coefficient of viscosity – Stoke's method.
15. Potentiometer - resistivity & comparison of resistance.
16. Potentiometer – Ammeter calibration.
17. Potentiometer – EMF.
18. Newton's law of cooling.
19. Tensional Oscillation-n,l

20. Thermal conductivity of rubber.

### **SUGGESTED BOOKS**

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990).
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II ( 1996)
- 3.S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25<sup>th</sup>,Edition (2002)

### **SEMESTER III**

**BPH31**

**OPTICS AND SPECTROSCOPY**

**5 Hours/4 Credits**

#### **Objectives:**

1. To expose the students to the fundamentals of light optics and related phenomenas.
2. Deep knowledge in physical and classical optics.
3. Concept of polarization and its applications is introduced.
4. Basic concepts of molecular spectroscopy is known.

#### **Unit I**

##### **Geometrical optics**

Lens-refraction through lenses- Aberration-chromatic aberration-spherical aberration-minimization of aberrations-coma astigmatism. Ramsdens eyepiece-Huygens eyepiece-

oil immersion objective-dispersion-dispersion through a prism-Cauchy's dispersion formula-Theory of rainbows – primary and secondary rainbow.

## **Unit II**

Photographic camera-depth of focus- f number shutter speed- j photographic film- photographic process. Colours of thin film- Air Wedge – determination of diameter of thin wire- Newton's rings – determination of refractive index for liquid- Michelson's interferometer – determination of  $\lambda$  and  $d\lambda$  –uses.

## **Unit III**

### **Diffraction**

Fresnel and Fraunhofer classes of diffraction – Fresnel's explanation for the rectilinear propagation of light zone plate- Fresnel's diffraction at a straight edge – Theory of diffraction grating- determination of wavelength – dispersive and Rayleigh's criterion for resolving power of grating – comparison between prism and grating spectra.

## **Unit IV**

### **Polarisation**

Double refraction Huygen's explanation – production , detection and analysis of plane, circularly and elliptically polarized light – quarter and half wave plates- optical rotation – Biot's law – Laurent half shade polarimeter – Fresnel's theory of optical rotation.

## **Unit V**

### **Spectroscopy**

Classification of line, band and continuous spectra- Infrared spectroscopy - application Raman effect experimental set up characteristics of Raman lines – basis concepts of resonance spectroscopy.

### **Books for study:**

1. Optics and Spectroscopy – Brij Lal and Subramanian

### **Books for Reference:**

1. Optical fibre Communications principles and practices-john Senior, PHI1984
2. Fundamental of fiber optics in telecommunications and sensor systems. B.P.Pal,Wiley Eastern, 1992.



## SEMESTER IV

**BPH41**

**MATHEMATICAL PHYSICS**

**5 Hours/4 Credits**

### **Objectives:**

1. Clear understanding of vector analysis, matrices and problems related to them.
2. Infinite series and their convergence are learnt.
3. Complex variables of various Physics problems are understood also, Fourier series and integrals are introduced.
4. To introduce the undergraduate students with various mathematical concepts and tools to solve numerical problems of physics.

### **Unit I**

#### **Vectors**

Gradient of a scalar field - line, surface and volume Integrals – Divergence of vector function- Curl of a vector function and its physical significance- Gauss divergence theorem – Stoke's theorem – Green's theorem.

## **Unit II**

### **Matrices**

Algebraic operation on matrices- transpose of a matrix – the conjugate of matrix – the conjugate transpose of a matrix- symmetric and anti-symmetric matrix- hermitian and skew- hermitian matrix- determinant of matrix – co-factor of a determinant-minors of a matrix- singular and non- singular matrix – adjoint matrix – invertible matrix- inverse of a matrix- orthogonal matrix – unitary matrix.

## **Unit III**

### **Fourier series**

Fourier series- Change of interval form – complex form of Fourier series- Fourier series of a function  $f(x)$  - Fourier series in interval – Uses of Fourier series – Physical examples of Fourier series- properties of Fourier series.

## **Unit IV**

### **Beta and Gamma Function**

Definition – Symmetry property of Beta function – Evaluation of Beta function – Transformation of Beta function – Evaluation and transformation of Gamma function – relation between Beta and Gamma function.

## **Unit V**

### **Differential equation**

Partial Differential equation

### **Books for study:**

1. Mathematical Physics – Sathyaprakash, Sultan Chand and Sons, New Delhi. First Edition

1985-86, Reprint -2013.

2. Mathematical Physics – B.D.Gupta, Vikas Publishing house PVT Ltd. Fourth Edition.

**Books for reference:**

1. Mathematical Physics – H.K. Dass , Dr. Rama Verma. S. Chand and Co. New Delhi. First

Edition 1997. Reprint 2014.

**SEMESTER III****ANCILLARY PHYSICS****UPHA33 MECHANICS, PROPERTIES OF MATTER, ELECTRICITY, ELECTRONICS AND MODERN PHYSICS****5 Hours/4 Credits**

**Objective:** To impart preliminary knowledge on basic concepts of physics to chemistry and mathematic students to make them understand the fundamentals of core physics.

**Unit I****Force, work, power and energy**

Forces in nature—central force-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 inclined plane- work done by a varying force- expression for kinetic energy- expression for potential energy- power.

**Rotational motion**

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 a circular ring. Circular Disc, solid spheres, Hollow spheres and Cylinder.

## Unit II

### Gravitation

Kepler's Law of planetary motion – law of gravitation-Boy's Method –determination of g - compound pendulum- expression for period experiment to find g- variation of g with latitude, attitude and depth- artificial satellites.

## Unit III

### Electrostatics

Gauss law (no proof)- application field due to a charged sphere and an infinite plane sheet – field near a charge conducting cylinder coulomb's theorem – electric potential capacitors- expression for  $\pi$  of parallel plate.

## Unit IV

### Electronics

Junction diodes- forward and reverse bias – diode characteristics- types of diodes- LED and Zener diode- bridge rectifier using junctions diodes-  $\pi$  filter- basic gates- Universal gates- Demorgan's theorem.

## Unit V

### Photoelectricity

Laws of photoelectricity, Einstein's equation photo cells and their uses, photoemissive, photoconductive and photovoltaic cells – solar cells-photo detectors – fibre optics- light propagation in fibers- fiber optic communication systems.

### Reference:

1. Mechanics – Prof. D.S Mathur. Revised by : Dr. P.S. Hemne. S. Chand and Co. New Delhi. First edition 1981, Reprint 2015.
2. Properties of matter – Brij Lal and Subramanyam. Eurasia publishing house (pvt.) LTD. New Delhi. Sixth Edition 1991Solid State Electronics- B. L. Theraja

3. Electricity and Magnetism – D.Chattopadhyay & P.C. Rakshit – New Central Book Agency Pvt.Ltd.,2015
4. Ancillary Physics- M. Palinappan, LMN Publication, 1993.
5. University Physics with Modern Physics - Sears zemansky and Ground, 13<sup>th</sup> edition,2013.
6. Modern Physics- R. Murugesan, S. Chand Publishing, 2011.
7. Optics and Spectroscopy- R. Murugesan, S. Chand Publishing,1997.

## **SEMESTER V**

**BPH51**

**ELECTRONICS 1**

**5 Hours/4 Credits**

### **Objectives :**

1. It is aimed at exposing the under graduate students of the Physics department to the fundamentals of analog and digital electronics.
2. They will learn basics of semiconductors
3. Familiarise them with the concepts of amplifiers, oscillators and OPAMPS
4. The various topics have been selected to augment the electronics experiment they will be doing in their practical sessions

### **Unit I**

#### **Band Structures of Semiconductor**

Band structures- carrier energy distribution – carrier concentration in an intrinsic crystal.

Donor and acceptor impurities – Fermi level continuity equation – theory of Tunnel diode – Avalanche and Zener Break down – Zener Diode. Photodiode.

## **Unit II**

Two port network analysis – h - parameter – transistors – input and output characteristics – load line – quiescent point – fixed bias – universal divider bias – Emitter feedback bias- Amplifiers – C.E. amplifiers-C.E.Amplifiers-class A and class B- push pull amplifiers-frequency response of amplifiers.

## **Unit III**

### **Oscillators**

Feedback – types of feedback – advantage of negative feedback – Barkhausen criterion - Hartley, colpitt and phase shift oscillators – Multivibrators using transistors.

## **Unit IV**

### **Modulation and detection**

Amplitude modulation-percentage of modulation AM spectrum –AM modulating circuits -filtering of AM signals-suppressed components envelope detector-single side band transmission-methods of amplitude modulation-frequency modulation(qualitative)- digital modulation(qualitative)-AM detectors.

## **Unit V**

Op- amp characteristics – Expression for gain (inverting mode only) – application as adder, subtractor, integrator and differentiator – analog computer.

**Books for study:**

1. Electronic devices and circuits – S. Salivahana, N. Suresh kumar and Villa Raj, McGraw Hill Publishing co.Ltd., New Delhi 1998.
2. Principles of Electronics- V.K.Mehta S. Chand and Co. New Delhi. 2014.

**Books for references:**

1. Text book of applied Electronics – R.S.Sedha, Edition, 2. Publisher, S.Chand Limited, 2008.
2. Electronics Principles- 8<sup>th</sup> Edition,By Albert Malvino and David Bates ,Copyright: 2016 .
3. Basic Electronics for Scientist and Engineers J.J.Brophy – TMH, 2007
4. Basic Electronics – A. Ubald Raj and G. Jose Robin. Indira Publications, Marthandam. First Edition 2014
5. Basic electrical and electronics engineering – R. Muthusubramanian and S. Salivahanan. Mc Graw Hill education, New Delhi. 2015.
5. Electronics Fundamentals and Applications – Millman and Halkias, McGraw-Hill, 1976.
6. Transistors circuit approximations – Malvino. TMH, A.P. Publisher: TMH 1980Edition:
7. Elements of Solid State Electronics – Ambrose and Vincent Devaraj, Mera publications -1993.

**Objectives:**

1. To develop familiarity with the physical concepts of classical mechanics
2. Facility with the mathematical methods of classical mechanics.
3. To introduce statistical mechanics to them.
4. To develop skills in formulating and solving physics problems.

**Unit I****D'Alembert's principle and Lagrange's equation**

Mechanics of system of particles – constraints – D'Alembert's principle and Lagrange's equations – velocity dependent potential and dissipation functions – application of Lagrange's formulation.

**Unit II****Variational principles and Lagrange's equations:**

Hamiltonian's principle – some techniques of the calculus of variations – derivation of Lagrange's equation Hamiltonian's principle – extension of Hamilton's principles to non holonomic systems. Advantages of the variational principles formulation- conservation theorem – symmetry properties.

**Unit III****The two-body central force problem**

The Kepler problems – derivation of Kepler's law (I, II, III law) – center of mass – motion of the center of mass of a system of particles – two body problem and the reduced mass. – Kinetic energy of a system of particles.

## Unit IV

### Statistical Physics

Equilibrium of distribution and partition function – molecular energies in an ideal gas- equipartition theorem – Einstein and Debye's theory of specific heat capacity – thermal properties of non - metals (no derivations) and metals.

## Unit V

### Classical and quantum statistics

Phase space – probability of distribution – Maxwell's Boltzmann's statistics – Bose Einstein statistics – Planck's radiation – Fermi Dirac statistics – Fermi energy – electron gas in metals.

### Books for study

Unit-I D Lambert's principle and Lagrange's Equation

Classical mechanics-Gupta, Kumar, Sharma

Classical mechanics-G.Aruldas

Unit-II Variational principle and Lagrange's Equation

Classical mechanics-H.Goldstein

Classical mechanics-N.CRana & PS Jog

Unit-III Two- body central force problem

Classical Mechanics -H.Goldstein

Unit-IV &Unit-V Statistical physics & Classical and quantum statistics

Statistical mechanics –B.B.Laud

### Books for Study:

1. Classical Mechanics- H.Goldstein, Narusa publisher, new delhi. Second Edition.2001.
2. Statistical Mechanics – Gupta and Kumar. Pragati prakashanm Meerut. 2009

**Books for references:**

1. Thermodynamics, Kinetic theory of Statistical thermodynamics – E.W.Sears and G.L.Salinger – Edition III, Narosa Publishing House, 2013
2. Classical mechanics, Rana, Jog, Mcgraw Higher Ed, 1st Edition, 20

**SEMESTER V****BPH53****QUANTUM PHYSICS****5 Hours/4 Credits****Objectives:**

- 1.To make the students understand the basic concepts of Quantum Mechanics.
- 2.To make them understand failure of classical and evolution of quantum physics.
- 3.To introduce the wave mechanics, eigen functions and eigen values and problems based on that.
- 4.Know thoroughly the applications of Quantum Mechanics.

**Unit I****Origin of the quantum mechanics**

Limitations of classical physics –Planck' quantum hypothesis – Quantum theory of specific heat – Bohr Model of hydrogen atom – existence of stationary states- Wilson Somerfield quantization rule-elliptic orbits of hydrogen atom- the rigid rotator – particle in the box- the correspondence principle – The stern Gerlach experiment – inadequacy of quantum theory.

**Unit II**

## **Wave mechanical concepts**

Wave nature of particles – the uncertainty principle- the of superposition – wave packet- time dependent schrodinger equations – interpretation of wave functions – Ehrenfest's theorem –time independent schrodinger equation.

## **Unit III**

### **General formalism of quantum mechanics**

Linear vector space – linear operator – Eigen functions and eigenvalues – Hermitian operator- postulates of quantum mechanics- simultaneous measurability of observables- general uncertainty relation – Dirac's notation – equations of motion – momentum representation.

## **Unit IV**

### **One dimensional energy eigenvalue problems**

Square well potential with rigid walls- square well potential with finite walls-kronig penney square well periodic potential – linear harmonic oscillator-Schrodinger method – linear harmonic oscillator – operator method – free particle.

## **Unit V**

### **Three-dimensional energy eigenvalue problems**

Particle moving in spherically symmetric potential – system of two interacting particles- Rigid rotator – hydrogen atom – hydrogenise orbital's – the free particle – three dimensional square well potential – the deuteron.

### **Books for study:**

1. Quantum mechanics – G.Aruldas second edition –PHI learning private ltd. New Delhi, 2009.
2. Modern Physics – Richmaire, Kennard and cooper, Mcgraw Hill , 2015

## CHAPTERS TAKEN FROM

Quantum mechanics – G.Aruldhas second edition –PHI learning private ltd. New Delhi,2009.`

Unit I – Chapter – I

Unit II – Chapter – II

Unit III – Chapter – III

Unit IV – Chapter – IV

Unit V – Chapter – V

### **Books for reference:**

1. Quantum Mechanics – S.L. Kakani and H.M. Chandalia. S. Chand and Co. New Delhi. 2007.
2. Quantum mechanics – Leonard I Schiff – 3<sup>rd</sup> edition. TATA Mc Graw Hills, 4<sup>TH</sup> Edition, 2014.
3. Quantum Mechanics - A. Ubald Raj and G. Jose Robin. Indira Publications, Marthandam. First Edition 2014
4. Quantum Mechanics – P.M. Mathews and K. Venkatesan. McGraw Hill Education Pvt, New Delhi. 2013.
5. Introduction to quantum mechanics – David J.Griffiths – 2<sup>nd</sup> edition – publishing by Dorling Kindersley Pvt Ltd, 2004.

## SEMESTER V

### ELECTIVE PAPER I

**BPH54**

**FIBER OPTICS**

**4 Hours/3 Credits**

**Objectives:** The main objective of this course is to introduce the basic concept of fiber optics to them so that they can understand the deep theory and working of optical communications.

#### **Unit I**

##### **Optical fibers**

Advantages of optical fiber communication – optical fiber waveguide: single mode fiber – step index fiber – graded index fiber – characteristics of optical fiber.

#### **Unit II**

##### **Transmission characteristic of optical fiber:**

Attenuation – Material absorption losses – linear scattering losses – Non – linear scattering losses – Dispersion – intermodal dispersion – intramodal dispersion.

#### **Unit III**

##### **Preparation techniques**

Preparation of optical fibers – liquid phase techniques – vapour phase deposition techniques – cable design – fiber splices – fiber connection

#### **UNIT IV**

## **Lasers**

Lasers – induced absorption – spontaneous and stimulated emission – Ruby laser – He-Ne lasers – semiconductor laser – properties of laser beam

## **UNIT V**

### **Optical sources:**

Semiconductor injection laser – Light emitting diode(LED) structures – LED characteristics – optical detector – P-N photo diode – P-I-N photo diode – Avalanche photo diodes – planer wave guides

### **Books for study**

1. Optical fiber communication principles and practice – John M. Senior. Dorling Kindersley

Pvt. India. 2012.

2. Optical fiber communications – Gerd Keiser, Mc-Graw Hill, 2<sup>nd</sup>, Edition, 1991

**UNIT I:** Chapter 1 & Chapter IV: Optical Fiber Communications Principles and Practice Third edition John M. Senior

**UNIT II:** Chapter 3: Optical Fiber Communications Principles and Practice Third edition John M. Senior

**UNIT III:** Chapter 4: Optical Fiber Communications Principles and Practice Third edition John M. Senior

**UNIT IV:** Chapter 22: A text book of Optics –Dr. N.Subramanyan , Brij Lal, and Dr. M.N. Avadhanulu. S.Chand and Co. New Delhi. 24<sup>th</sup> revised Edition 2010. Reprint 2012.

**UNIT V:** Chapter 8: Optical Fiber Communications Principles and Practice Third edition John M. Senior

### **Books for references**

1. Optical fiber and fiber optic communication systems- subir kumar sarkar. S. Chand

and Co. New Delhi. 2008.

2. Fundamentals of fiber optics in telecommunications and sensor systems – B.P. Pal, Wiley Eastern, 1992.
3. Applied Physics for engineering course (Photography) – Dr.P. Murugakoothan, Dr S. Sivasankaran, Dr.K.Sadayandi

## **SEMESTER V**

**BPH55**

**LASER PHYSICS**

**5 Hours/4 Credits**

### **Objectives:**

The learning objectives of the course are that the student demonstrates the ability to:

1. Explain and use most basic principles of laser physics and laser spectroscopy.
2. Will learn characteristics of lasers, notably the coherence and intensity.
3. By studying the basic physics of laser media together with the system configurations that facilitate a range of desirable options for their operation.
4. They will have vivid knowledge of holography and deep insight into optical fibre communication.

### **Unit I**

#### **Introduction**

Directionality – Intensity – Monochromaticity – Coherence

### **Unit II**

#### **Einstein's Quantum theory of Radiation**

Einstein coefficients – momentum transfer – life time - possibility of amplification.

### **Unit III**

#### **Interaction of radiation with matter**

Time dependent perturbation theory- Creations and annihilation operators – Fock States – Quantization of the field – Zero – point energy – Coherent – state description of the electromagnetic field- Interaction of radiation with matter.

### **Unit IV**

#### **Maser**

The two – level Maser system . Ammonia maser – hydrogen maser – The three level maser system.

### **Unit V**

#### **Theory Some Simple Optical Processes**

Waves and interference – Coherence – Coherence of the field and the size of the source- Visibility and the size of the source – Coherence and monochromaticity – shape and width of spectral lines – line broadening mechanisms – Natural or intrinsic broadening – Collision broadening Doppler broadening.

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

1. Laser and nonlinear optics – B.B.Laud, New age international publications, New Delhi. Third Edition. 2011.
2. Lasers: Fundamentals and applications – Ajay Ghatak, 2<sup>nd</sup> edition, 2010

## SEMESTER VI

BPH61

DIGITAL ELECTRONICS

5 Hours/4 Credits

**Objectives:** Explain concepts and terminology of digital electronics. Application of logic to design and creation, using gates, to solutions to a problem.

### Unit I

#### Binary Number System

Number system – conversion of decimal number into binary number – binary to decimal conversion – binary addition - binary subtraction's complement methods – binary multiplication and divisions – hexa decimal number binary coded decimals.

### Unit II

#### Logic Gates

Basic logic gates – implementation – OR and AND gates using diodes and transistors – NOT using Transistors – Characteristics of logic gates – Calculation of input voltage in OR and AND gates – logic family TTL and DTL universal logic gates NOR and NAND logic gate – Exclusive OR gates.

#### De Morgan's Law and Applications:

Boolean algebra – De Morgan's law – Applications – different expression for Ex-OR gate – binary adders – Half adder – Full adder.

### Unit III

#### Multivibrators

Schmit trigger (555 timer) monostable and astable Multivibrators using 555 timer - logic gate Flip – flops – R.S. Flip – Flop – J.K. Flip - Flop – R.S.Master slave Flip – Flop

– J.K.Master slave Flip – Flop.

## **Unit IV**

### **Counters and Registers**

Types of counters – Binary Counter – Decade counter – four bit binary counter – shift register – ring counter – memory systems in computers – magnetic core as memory device magnetic disc memories – floppy disc.

## **Unit V**

### **D/A and A/D Converter**

Binary weighted resistor – D/A converter – R2R Resistive ladder D/A converter – Counter type A/D converter – successive approximation A/D converter – Dual Slope A/D converter parallel comparator A/D converter.

## **Books for study**

Unit-I Binary number system

Digital circuits and design by S.Salivahanan and S.Arivazhagan

Unit-II Logicgates and Demorgan's law and applications

Digital principles and applications

Donald P.Leach Albert Paul Malvino Goutam saha

Unit-III Multivibrators

Digital principles and applications

Donald P.Leach Albert Paul Malvino Goutam saha

Unit-IV &Unit-V Counters and Registers & D/A and A/D converter

Digital circuits and design by S.Salivahanan and S.Arivazhagan

**ALL UNITS Covered in the book Fundamental of Digital circuits- A.Anandkumar**

**Books for study:**

1. Digital circuits and design – S.Salivagahanan and S.Arivazhagan. Vikas publishing house pvt ltd . Third Edition 2007.
2. Digital principles and computer design – Malvino and Leech, Mcgraw Higher Ed, 8th Edition, 2014

**Books for Reference:**

1. Digital electronics circuits and systems – V.K. Puri. Tata McGraw – Hill publishing company limited, New Delhi. 1997.
2. Digital Electronics - A. Ubald Raj and G. Jose Robin. Indira Publications, Marthandam. First Edition 2014.
3. Integrated Electronics - Milman and Halkies, Mcgraw Higher Ed, Edition: 2, 2011.
4. Digital principles and computer design – Morris Mano, Pearson India, 1stEdition, 1979.

**Objectives:**

1. To enable the students to understand and appreciate the fundamental concepts of Nuclear Physics.
2. Problem solving capability is increased.
3. Concept of elementary particles and radioactivity is understood.
4. They will learn practical applications of nuclear reactors and accelerators and detectors.

**Unit I****Structure and Properties of Nucleus**

Nuclear mass – Bain Bridge Astors – mass spectrum – Radius , mass defect – Binding energy – Einstein's mass energy relation – Nuclear moments Isotopes – Isobars.

**Unit II****Radio Activity**

Natural radioactive series , age of earth- carbon dating – successive radioactivity transient and secular equilibrium – Gieger – Nuttal rule – Decay Gamov's theory of decay – spectrum of rays – neutrino hypothesis.

**Unit III****Accelerators and Detectors**

Cyclotron- bunching effect – synchro cyclotron – Betatron – linear accelerators – basic ideas on GM counter – cloud chamber – photographic emulsion.

**Unit IV****Nuclear Reactor**

Four factor formula – moderator - coolant reactor assembly, thermo nuclear reaction – Bathe's theory for fusion energy – Hydrogen cycle – atom bomb – Hydrogen bomb.

## **Unit V**

### **Sub Nuclear Reactions**

Cosmic ray shower – pair production – annihilation – Van Allen belt – mesons – Muon (muonium atom) – classification of elementary particles – conservation laws.

### **Books for study:**

1. Nuclear Physics - D.C.Tayal, Himalaya publishing house. 2013.

### **Books for Reference:**

1. Nuclear Physics – R.R. Roy and B.P. Nigam. New age international pvt. 2011.
2. Nuclear physics – S.N. Ghoshal. S. Chand and Co., New Delhi. 2012.
3. Nuclear Physics and particle physics- Satya prakash., Sultan Chand and Sons, 2014
4. Modern Physics – R. Murugesan and Er. Kiruthiga sivaprasath. S. Chand and Co., New Delhi. 2015.



## SEMESTER VI

**BPH63**

**ATOMIC PHYSICS**

**5 Hours/4 Credits**

### **Objectives:**

- 1.To enable the students to understand the basic concept of atoms and its primitive models.
2. Also to introduce them with the powerful phenomenas of relativity and wave mechanics.
- 3.Origin of X-Rays will be introduced.
- 4.will thouroughly understand the structure of atoms and tools to study their phenomenas.

### **Unit I**

#### **Structure of the Atom**

Critical potentials – Frank and Hertz experiments –Discovery of Photoelectric effect – results on photo electric effect – failure of the electromagnetic theory – Einstein’s photoelectric effect – Milliken’s experiment – photoelectric cell.

### **Unit II**

#### **X-rays**

Diffraction of X – ray – Bragg’s law – X- ray spectrometer – X- ray spectra-characteristics of X-ray spectrum – Mosley’s law – Compton scattering – theory of experimental verification.

### **Unit III**

#### **Atom models**

Review of Bohr atom model – Sommerfeld's relativistic model – vector atom model – various quantum number – LS and JJ coupling – Pauli's exclusion principle – electronic configuration of elements – magnetic dipole moment due to orbital motion and spin motion – Bohr magneton – Stern Gerlach experiments.

## **Unit IV**

### **Theory of relativity**

Michelson – Morley experiment – interpretation of the Michelson Morley experiments – relative time – the Lorentz transformation – the relativistic velocity transformation – time dilation – illustration of time dilation – the twin paradox – length contraction – relativity of mass – mass – energy equivalence.

## **Unit V**

### **Wave Mechanics**

De- Broglie's concept of matter wave – De- Broglie wavelength – Characteristics of De- Broglie matter wave. Davisson and Germaer's experiments – G.P.Thomson's experiments – Heisenberg uncertainty principle principle – basic postulates of wave mechanics – derivation of time dependent form of Schrodinger's equation.

### **Books for study:**

1.Modern Physics – Richtmyer , Kennard and cooper, McGraw-Hill, 1969.

### **Books for Reference:**

1. Modern Physics – R. Murugesan and Er. Kiruthiga sivaprasath. S. Chand and Co.,  
New Delhi. 2015.

2.Modern Physics – Sehgal, Chopra, S. Chand Publishing,2013.

## SEMESTER III

### ELECTIVE PAPER - I

#### SOLID STATE PHYSICS

4 Hours/4 Credits

#### Objectives:

1. To give the students a firm understanding of the basics of fundamental building blocks atoms and crystal structure through introduction of Solid State Physics.
2. To introduce the students the application of Solid State Physics.
3. The various physical properties of solids will be introduced.
4. They will be able to identify the various crystal structures and solve xrd based problems.

#### Unit I

##### Crystal Structure

Introduction – lattice translation – vectors – lattices – the basis – crystal structure, Fundamentals types of lattices – Three dimensional lattice types – simple crystal structure – NaCl – hexagonal close packed, diamond structure – Miller indices.

#### Unit II

##### Electron Theory of Solids

Introduction – Classical free electron theory, Quantum theory- Thermionic emission- photoelectric emission – Electric work function in metals – field emission – Schottky Richardson equation – Tunnel Diode.

#### Unit III

##### Crystal binding

Crystal of inert gases – Vander walls – London interaction – repulsive interaction – cohesive energy – covalent crystal –hydrogen bonded crystals.

## **Unit IV**

### **Thermal Properties of Solids**

Anharmonic crystal interaction – Thermal expansion, thermal conductivity – Lattice thermal resistivity – Umklapp processes – imperfections.

## **Unit V**

### **Dielectric and ferro electrics**

Macroscopic electric field – depolarization field – local electric field at an atom – Lorentz field – dielectric constant and polarisability – electronic polarisability.

### **Books for Study:**

1. Solid State Physics – S.O.Pillai. New age international publishers, 6<sup>th</sup> Edition.2012.
2. Introduction to Solid State Physics – Charles Kittel, Seventh Edition. 2011.

### **Books for References:**

1. Solid State Physics Principles and Applications – R. Asokamani, Anamaya Publishers, New Delhi, cop. 2007. Edition/Format:

## **SEMESTER VI**

### **ELECTIVE PAPER – II**

#### **ENERGY PHYSICS**

**3 Hours/3 Credits**

## **Unit I**

### **Potential Energy**

Introduction- conservation and non-conservation forces-potential energy-graviational energy-elastic potential energy-internal work and internal energy-mass and energy.

## Unit-II

### Types of energy

Introduction-mechanical energy-nuclear energy-transmission of energy-other forms of energy-chemical energy-wave energy-photo cells-laws of conservation energy – efficiency- collisions-energy and transport- future trends in energy production.

## Unit-III

### Solar energy

Solar cell-solar radiation-solar energy collectors-storage of solar energy.

## Unit-IV

### Renewable energy

Energy-energy changes and energy conservation- internal energy and state function –expansion of work energy and enthalpy-the thermodynamic standard scale-enthalpies of physical and chemical changes-calorimetry and heat capacity-heiss law.

## Unit-V

### Nuclear energy

Introduction-neutron induced fission-A symmetrical fission-mass yield-emission of decayed neutrons by fission fragments-energy released in the fission of U235-Fission of Lighter Nuclei-Fission chain reaction-Neutron cycle in a thermal nuclear reactor-Nuclear reactor.

### Reference:

1. Physics- Gilbert Rowell
2. Nuclear Physics- S.B.Patel.

## SEMESTER VI

### ELECTIVE PAPER – III

#### ASTRO PHYSICS

3 Hours/3 Credits

**Objectives:** Students in the undergraduate will learn how to unravel the secrets of the

universe. The primary learning objectives are: Apply basic physical principles from a broad range of topics in physics to astronomical situations.

## **Unit I**

### **Introduction**

Sunlight and Spectroscopy – Atoms and Matter a Model of the atom – Simple spectroscopy – Analyzing sunlight – Kirchhoff's Rules – The conservation of energy – electromagnetic Spectrum .

## **Unit II**

### **Our Star: The Sun**

Ordinary Gases – The Sun's continuous spectrum – The solar absorption line spectrum – energy flow in the sun – The solar Interior – The active sun.

## **Unit III**

### **The Universe of Stars**

Birth of Stars – energy generation and the chemical composition of stars – Stellar Evolution and the hertz sprung (Russell Diagram) – Stellar Anatomy – Star models – theoretical Evolution of solar Mass star observational Evidence for Stellar Evolution.

## **Unit IV**

### **Solar System**

#### **The Earth and the Moon**

History of the Earth – Temperature of a planet – the atmosphere – pressure and Temperature distribution – the magnetosphere – The magnetosphere – the Moon – The Lunar surface – the lunar interior.

### **Galaxies**

Introduction – Classification of Galaxies – Milky way galaxies – Over View – Differential galactic rotation – Rotation and Mass distribution – rotation curve and Doppler shift – Determination of the Rotation curve – Average gas distribution – spiral structure in the milky way – optical traces of spiral structure – Radio tracers of spiral structure – The galactic center – Distribution of Material near the center – A massive black hole.

## **Unit V**

### **Cosmology**

Introduction – cosmological models – steady state model – Big Bang theory.

#### **Book for study:**

1. Introduction to Advanced Astrophysics – Kurganoff. V, D. Reidel Publication company, 1980.

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

1. Astronomy – The Evolving Universe – Michael Zeilik, 1976.
2. Astronomy – A Physical Perspective – Mark L. Kutner, 2<sup>nd</sup> edition, 1987.

**Objectives:** The aim of this course is to introduce the student to a number of applications of physics to medicine with particular emphasis on those commonly used in the work of the medical physicist

## Unit I

### Human Physiological systems

Cells and their structure – transport of ions through Membrane – resting and action potential – bioelectric potentials – nerve fissures and organs – difference systems of human body.

## Unit II

### X – Ray and Radio Isotope Instrumentation

Generation of ionizing Radiation – Detection of Radiation – Instrumentation for diagnostic

X-rays – visualization of X- rays – X-ray machines - Special techniques – Instrumentation for the medical of radio isotopes

## Unit III

### Measurements in the Respiratory System

The Physiology of the Respiratory system – Tests and instrumentation for the Mechanics of breathing – Mechanical measurements – Instrumentation for Measuring the mechanics of Breathing – measurements of residual volume

## Unit IV

### Patient care and monitoring

The elements of intensive care monitoring – patient monitoring display – diagnosis calibration and repairability of patient Monitoring equipment – the organization of the hospital for patient care monitoring.

## **Unit V**

### **Operation theater equipments**

Surgical diathermy – short wave diathermy – microwave diathermy – ultrasonic diathermy.

### **Bio- telemetry**

Basic and design of a bio-telemetry system – Radio Telemetry systems – Single channel telemetry system – transmission of bioelectric variables – active and passive measurements – tunnel diode FM transmitter – radio telemetry with sub carrier – multiple channel telemetry system.

### **Books for Study:**

1. Biomedical Instrumentations – M. Arumugam- Anuradha agencies, Kumbakonam,2002.

### **Books for reference:**

1. Bio Medical Instrumentations and measurement Leslicromwell, Leslie Cromwell. Edition, illustrated. Publisher, Prentice-Hall, 1973

2. Principles of applied biomedical Instruments – Geddes & Bakker, Wiley, New York, 1968.

3. Medicine and clinical Engineering – Prentice Hall of India, Prentice Hall (1 March 1977)

4. Bio Medical Telemetry: Sensing and Transmitting– Mackay, Stuart & John Wiley, Wiley-IEEE Press, 2nd Edition,. 1968.

5. Bio Medical Instrumentation – Chandpur, 3<sup>rd</sup> Edition, 1987

**SEMESTER III  
SKILL BASED ELECTIVE PAPER II**

**UPHS42**

**BIOMEDICAL INSTRUMENTATION**

**2 Hours/2 Credits**

**Objective:** To introduce the undergraduate students with important biomedical instruments to know their body functions and its measurements through technical instruments.

**Unit I**

**Bio-Potential Electrodes**

Electrodes- half of potential – purpose of electrode paste- Electrode material- types of electrode.

**Unit II**

Microelectrode-Metal microelectrode, Micropiper, depth and needle electrodes, surface electrodes.

**Unit III**

Metal plate electrodes, multi point electrode, chemical electrode, hydrogen electrode.

**Unit IV**

System Characteristics for ECG, EEG, EMG, ERC- EOC.

**Unit V**

Pace Maker- Pace Maker batteries- defibrillators, synchronized and square pulse defibrillators- nerve and muscle stimulators.

Books for study:

1. Biomedical Instrumentations – M. Arumugam- Anuradha agencies, Kumbakonam,2002.

## SEMESTER IV

### SKILL BASED ELECTIVE PAPER I

UPHS31

HOME APPLIANCES

2 Hours/2 Credits

**Objective :** To introduce students with conceptual knowledge and skills regarding simple home appliance and its working.

#### UNIT I:

Electric circuit -0 open , close, short circuit – switches , types of switches.

#### UNIT II:

**Fuses** – Two types of switches – circuit breaker – relays.

#### UNIT III:

Introduction using materials and accessories – types of wiring – basic principles of earthing.

#### UNIT IV:

Heating – resistance welding – scan welding – induction heaters

#### UNIT V:

UPS – high voltage transmission

**SEMESTER V**  
**SKILL BASED ELECTIVE PAPER III**

**UPHS53**

**ENTERTAINMENT ELECTRONICS**

**2 Hours/2 Credits**

**Objective:** To impart knowledge on basic electronic devices used for media and entertainment. Also to make them learn its construction and working in detail.

**UNIT I :**

Television, tape recorder and loud speaker, public address system, basic theory and working

**UNIT II:**

Introduction to DVD, Cameras-film and digital camera

**UNIT III:**

Basic theory of VCD and Computer

**UNIT IV:**

i-pod, i-phone, cell phone and laptop

**UNIT V:**

Internet and its application

**SEMESTER VI**

**SKILL BASED ELECTIVE PAPER IV**

**UPHS64**

**MICROPROCESSOR**

**2 Hours/2 Credits**

**Objective:** To make undergraduate students of physics aware of basic concepts of microprocessor, Architecture of 8085 and its applications, solve simple numerical using the concept.

### **Unit I**

Architecture of 8085 – Register organization – Concept of buses – control signals

### **Unit II**

Pin Configuration of 8085 – Addressing mode of 8085 with examples.

### **Unit III**

Instruction Set – Types of Instruction – Classification – Classification of Instruction

### **Unit IV**

Data Transfer Instruction – Branch Instruction – Arithmetic and Logic Instruction

### **Unit V**

Sub-routines – Assemble Language – programming Simple Programs

### **Books for Study:**

1. Microprocessor – B. Ram, Dhanpat Rai Publications, 2005.
2. Microprocessor, Architecture, Programming and Applications – Ramesh Goanker, Wiley Eastern Ltd, Wiley Eastern Ltd. (1993).

**SEMESTER III**  
**NON MAJOR ELECTIVE PAPER I**

**UPHN31**

**FUNDAMENTALS OF PHYSICS**

**2 Hours/2 Credits**

**Objective:** To introduce non physics students with the basic concepts of physics

**Unit I**

Keplar's law – first law , II,III law

**Unit II**

Newton's I, II,III law

**Unit III**

Gravitational force – Newton’s law of gravitation

#### **Unit IV**

Electromagnetic force – Nuclear force- Central force – conservative force – Non conservative force

#### **Unit V**

Work – Work done by a varying force – Energy – Kinetic Energy, Potential Energy – Power.

#### **Reference:**

1. Mechanics – Prof. D.S Mathur. Revised by : Dr. P.S. Hemne. S. Chand and Co. New Delhi. First edition 1981, Reprint 2015.
2. D.S.Mathur, Elements of properties of matter, S.Chand and Co., New Delhi, 1949.
3. C.Kittel , Introduction to solid state physics – Wiley eastern 6<sup>th</sup> edition, 1953.
4. Physics of particles, Matter and the Universe: Roger J Binstoyle - Institute of Physics Publishing, Bristol (1997)
5. Science Matters, Robert’ M. Hazen & James Trefil - Universities Press (India) Ltd., (1991)
6. Almost Everyone’s guide to science, John Gribin - Universities Press (1998)
7. Inside Science, Edited by John Allen - BBC Books, (1988).
8. Physical Science Fundamentals, John J Merrill, W Kenneth Hamblin, James M Thorne -Macmillan, NY (1982)

**SEMESTER IV**  
**NON MAJOR ELECTIVE PAPER II**

**UPHN42**

**PHYSICS IN DAILY LIFE**

**2 Hours/2 Credits**

**Objective:** To make non physics students understand basic electronic concepts and its applications in daily life.

**UNIT I**

Fan – grinder – mixie – refrigerator – washing machine.

**UNIT II**

Induction stove – electric cooker.

**UNIT III**

Telephone – cell phone - satellite

**UNIT IV**

Scanner – projector – OHP – LCD

Fax – Xerox machine

**UNIT V**

**Books for Study and reference:**

1. S.S. Kamble – Electronics and Mathematics Data Book – Allied Publishers Ltd – 1997
2. William David Cooper, Electronic and Instrumentation and Measurement Technique (2<sup>nd</sup> Edition), 1978

**II B.SC. PHYSICS**

**SEMESTER IV**

**UPHP42**

**CORE PRACTICAL-II**

**4 Hours/4 Credits**

**Any Twelve**

**Objective** :-It is aimed at exposing the under graduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical and optical properties of matter

Spectrometer – Prism – i-d curve to find  $\mu$ .

Spectrometer – i-d curve – i-i' curve.

Spectrometer – Grating – resolving power & dispersive power.

Galvanometer / B.G – conversion Ammeter.

Galvanometer / B.G – conversion Voltmeter.

Galvanometer Emfs.

Galvanometer Comparison of capacitances.

Carey Foster Bridge – P and r.

Carey Foster Bridge – temperature coefficient .

Galvanometer / B.G Charge sensitivity.

L- Owen' bridge.

LCR – series Resonance Circuit.

LCR – Parallel Resonance Circuit.

L-Anderson's Bridge.

L. Maxwell's Bridge.

L. Rayleigh's Bridge.

Spectrometer – Cauchy's Constant.

Spectrometer – Resolving power of prism.

### **SUGGESTED BOOKS**

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990).
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II ( 1996)
- 3.S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25<sup>th</sup>,Edition (2002)

## SEMESTER IV

UPHA41

ANCILLARY PHYSICS PRACTICAL

4 Hours/4 Credits

### Any 12 experiments

**Objective** :-It is aimed at exposing the non physics under graduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical, electrical and optical properties of matter

1. Estimation of Error
2. Compound Pendulum – g and unknown mass determination
3. Young's Modulus – Uniform bending – pin and microscope method
4. Young's Modulus – Uniform bending – Optic lever method
5. Young's Modulus – Non Uniform bending – pin and microscope method
6. Viscosity –Stoke's Method
7. Viscosity – Poiseuille's method
8. Sonometer – frequency of a lining fork
9. Calibration of Voltmeter – potentiometer
10. Calibration of ammeter – potentiometer
11. Comparison of capacitances – B.G
12. Dispersive power of prism – Spectrometer
13. Logic Gates – AND, OR, NOT using discrete components
14. Logic Gates – NAND, Nor – using IC, s
15. Diode Characteristics
16. Zener diode Characteristics
17. Newton's rings of a liquid

## SUGGESTED BOOKS

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990).
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II ( 1996).
- 3.S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25<sup>th</sup>,Edition (2002).
- 4.A. P. Malvino, Electronics, cybergear, 2010.
- 5.John Morris, Analog Electronics, Import, 1999.
- 6.Electrical Machines S.K. Bhattacharaya, (TTTI Chandigarh) - TMH 1998

### III B.SC PHYSICS SEMESTER VI

UPHP63      CORE PRACTICAL III    NON-ELECTRONICS      5 Hours/4 Credits

#### Any 12 Experiments

**Objective** :-It is aimed at exposing the under graduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical, electrical and optical properties of matter

1. LCR – Series Resonance
2. LCR – Parallel Resonance
3. Spectrometer –  $i - d$  curve
4. Spectrometer –  $i - i'$  curve
5. Spectrometer – small angled prism
6. L – Anderson's bridge

7. L – Maxwell's bridge
8. L – Rayleigh's bridge
9. Potentiometer – high range ammeter
10. C1/C2 – Desauty's bridge
11. L – Owens's bridge
12. Impedance and power factor – LR circuit
13. B.G. – Absolute capacity of a condenser
14. Field along the axis of a coil – determination of B & M
15. M.G – emf of a thermocouple
16. M1/M2 – B.G.

#### **SUGGESTED BOOKS**

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990).
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan  
Publisher-Part II ( 1996)
- 3.S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25<sup>th</sup>,Edition (2002)

**III B.SC. PHYSICS**

**SEMESTER VI**

**Any Fifteen**

**Objectives:** Provide opportunity for students to learn about basic concepts of electronics through practical settings eg test conductors, insulators and semiconductors for their various properties and characteristics.

Zener diode – break down voltage.

Zener diode – voltage regulation.

Transistor characteristics – CE mode.

Transistor characteristics – CC mode.

Transistor characteristics – CB mode.

Single stage amplifier.

Two stage amplifier.

Two stage amplifier – without feedback.

LC- II filters.

Clippers and clampers using diode and CRO.

Colpitt's oscillator – L.Determination.

Hartley oscillator – L.Determination.

UJT relaxation oscillator.

Voltage doubler.

Dual power supply – IC 7812 IC 7912.

Astable multivibrator – transistor/ IC 555.

Monostable multivibrator – transistors.

Bistable multivibrator - RS flip flop (transistors)

Op-amp IC 741 – characteristics.

Op-amp IC 741 – differentiator and integrator.

Op-amp IC 741 – adder and subtractor.

All gates – using discrete components.

XOR and XNOR gates – using IC's – truth table verification.

Universal NAND gate.

Universal NOR gate.

Verification of demorgan's theorem.

RS,D and JK flip flop.

Design of half adder.

Design of full adder.

Design of half subtractor.

Design of full subtractor.

## **TEXT BOOKS**

1. Adrian C. Melissinos, Jim Napolitano, Experiments in Modern Physics, 2003.

2. Paul B. Zbar and Albert B. Malvino, Basic Electronics (A Text-Lab Manual), Tata McGraw Hill, Edition, 5. Publisher, 1983.

3. A. P. Malvino, Electronics, cybergear, 2010.

4. John Morris, Analog Electronics, Import, 1999.





