MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL – 624 101.

CHOICE BASE CREDIT SYSTEM (CBCS)

Syllabus for candidates admitted from 2018 – 2019

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
	SEMESTER-I						
1	ULTA11	Part I - Tamil	3	6	25	75	100
2	ULEN11	Part II- English	3	6	25	75	100
3	UPHT11	Core I Properties of Matter	4	5	25	75	100
4	UPHT12	Core II Thermal Physics	4	5	25	75	100
5	UPHA11	Allied Mathematics I	4	5	25	75	100
6	UVAE11	Value education	3	3	25	75	100
		Total	**21**	**30**			600
	SEMESTER II						
7	ULTA22	Part I Tamil	3	6	25	75	100
8	ULEN22	Part II English	3	6	25	75	100
9	UPHT21	Core III Electricity and Electromagnetism	4	6	25	75	100
10	UPHP21	Core Practical I	4	5	25	75	100
11	UPHA22	Allied Mathematics II	4	5	25	75	100
12	UEVS21	Environmental Studies	2	2	25	75	100
		Total	**20**	**30**			600
	SEMESTER III						
13	ULTA33	Part I Tamil	3	6	25	75	100
14	ULEN33	Part II English	3	6	25	75	100
15	UPHT31	Core IV Mathematical Physics	4	5	25	75	100
16	UPHA33	Allied chemistry paper	4	5	25	75	100

17	UPHE31	Elective paper I Fiber optics	3	4	25	75	100
18	UPHS31	SBE I	2	2	25	75	100
19	UPHN31	ONME I	2	2	25	75	100
		Total	**21**	**30**			700
	SEMESTER IV						
20	ULTA44	Part I Tamil	3	6	25	75	100
21	ULEN44	Part II English	3	6	25	75	100
22	UPHT41	Core V Solid State Physics	4	4	25	75	100
23	UPHP42	Core Practical II	4	4	25	75	100
24	UPHA41	Allied Practical	4	4	25	75	100
25	UPHE42	Elective-II-Solar thermal and renewable energy systems	3	3	25	75	100
26	UPHS42	Skill based Elective courses II	2	2			
27	UPHN42	ONME II	2	2	25	75	100
		Total	**25**	**30**			800
	SEMESTER V						
28	UPHT51	Core VI Electronics I	4	5	25	75	100
29	UPHT52	Core VII Classical Mechanics	4	5	25	75	100
30	UPHT53	Core VIII Quantum Physics	4	5	25	75	100
31	UPHT54	Core IX-Laser Physics	4	5	25	75	100
32	UPHT55	Core X Optics and Spectroscopy	4	5	25	75	100
33	UPHE53	Elective-III-Medical Physics	3	3	25	75	100
34	UPHS53	SBE III	2	2	25	75	100
		Total	**25**	**30**			700
	SEMESTER VI						
35	UPHT61	Core XI Digital Electronics	4	5	25	75	100
36	UPHT62	Core XII Nuclear Physics	4	5	25	75	100
37	UPHT63	Core XIII Atomic Physics	4	5	25	75	100
38	UPHP63	Core Practical III (Non Electronics)	4	5	25	75	100
39	UPHP64	Core Practical IV	4	5	25	75	100

		(Electronics)					
40	UPHE64	Elective IV Astrophysics	3	3	25	75	100
41	UPHS64	SBE IV	2	2	25	75	100
42	UEAS61	Extenssion Activity	-	2	25	75	100
		Total	**28**	**30**			800
	Total Credits			**140**		**4200**	

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

UPHT11 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 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.

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 and an extension at right angles to each other- Shearing stress equivalent to an equal linear 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 Viscosity – Coefficient of viscosity – Fugitive elasticity – Critical Velocity – Poiseuille's equation for flow of liquid through a tube –Determination of coefficient of viscosity of

a liquid – Stoke's Method – Rotation Viscometer – Variation of viscosity of a liquid with temperature Comparison of viscosities – Ostwald Viscometer.

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. Fist edition 1981, Reprint 2015
2. Properties of matter – Brij Lal and Subramanyam. Eurasia publishing house (pvt.) LTD. New Delhi. Sixth Edition 1991.

SEMESTER –I

UPHT12 **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 theroretical concepts in performing thermal conductivity experiments.

Unit- I

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 – 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

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.

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

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.

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

UPHT21 ELECTRICITY AND MAGNIETISM 6 Hours/4 Credits

Objectives:

1. To give the students a firm understanding of the basics of Electricity and Magnetism.
2. To dessimate 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 capble to apply their knowledge in performing electricity and magnetism based experiments have firm base in theory.

UNIT I

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 II

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 III

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 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

UPHP21 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

Estimation of errors
Young's modulus – Uniform bending pin and microscope method
Young's modulus – Non Uniform bending pin and microscope method.
Young's modulus – Uniform bending optical lever method.
Young's modulus – Non Uniform bending optical lever method.
Compound Pendulum – g and k.
Spectrometer – Dispersive power of prism .
Spectrometer –Grating minimum deviation.
Potentiometer – Low range voltmeter calibration.
Potentiometer – Low range ammeter calibration .
Sonometer – Laws verification.
Sonometer – Frequency of the tuning fork.
Melde's Experiment.
Determination of coefficient of viscosity – Stoke's method.
Potentiometer - resistivity & comparision of resistance.
Potentiometer – Ammeter calibration.
Potentiometer – EMF.
Newton's law of cooling.

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 – 25th,Edition (2002)

SEMESTER III

UPHT31 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 matices- transpose of a matrix – the conjugate of matrix – the conjugate transpose of a matrix- symmetric and anti-symmetric matrix- hermition and skew- hermition 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

Partial Differential equation in Physics

Solution of Partial Differential Equation by the method of separation of Variables – Solution of Laplace's Equation in Two – dimensional cylindrical co-ordinates (r,θ): Circular Harmonics. – Solution of Laplace's Equation in General Cylindrical Co-ordinates – Solution of Laplace's Equation in Spherical Polar Co-ordinates – Spherical Harmonics.

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.

Viscosity

Derivation of poiseuille's formula (analytical method)-Bernoulli's theorem- proof- applications-Venturimeter- pitot tube.

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 π of parallel plate.

Magnetic Effect

Torque on a current loop, galvanometer, dead beat and ballistic- current sensitiveness- experiment- charge sensitiveness- damping – damping correction- experiments for charge sensitiveness- comparision of emf's and comparision of capacitors.

Unit IV

Electronics

Junction diodes- forward and reverse bias – diode characteristics- types of diodes- LED and Zener diode- bridge rectifier using junctions diodes- π 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. Fist 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, 13th edition,2013.

6. Modern Physics- R. Murugesan, S. Chand Publishing, 2011.

7. Optics and Spectroscopy- R. Murugesan, S. Chand Publishing,1997.

SEMESTER III
ELECTIVE PAPER I

UPHE31 FIBER OPTICS 4 Hours/3 Credits

Objectives: The main objective of this course is to introduce the basic concet 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.

Unit II
Transmission characteristic of optical fiber:
Attenuation – Material absorption losses – linear scattering losses – Non – linear scattering losses- Dispersion – intermodal dispersion – intermodal 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, 2nd, 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^{th} 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 senor systems – B.P. Pal, Wiley Eastern, 1992.
3. Applied Physics for engineering course (Photography) – Dr.P. Murugakoothan, Dr S. Sivasankaran, Dr.K.Sadayandi

SEMESTER III
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:
Electrical wiring – Earthing -switches & sockets-fuse-circuits breaker
wiring of tube lights

UNIT II:
Geiser- protection –washing machine-top loading & front loading –drier-dish washer

UNIT III:
Microwave oven- induction stove-conventional oven- bread toaster- electric cooker-mixer grinder- vacuum cleaner

UNIT IV:
Emergency lamp-UPS-automatic street light- refrigerator

UNIT IV:
Air-conditioner- window & spilt- air cooler- electric chimney- exhaust fans

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

Atomic constituents - Duality - Particles and waves - Uncertainty principle Phases of matter Internal energy and temperature - If Law of Thermodynamics - Conductors, Insulators & Semi-conductors Superconductivity and super fluidity**.**

Unit II

Particle dynamics: Displacement, velocity and acceleration- distance –time graph-velocity – time graph – projectile motion – uniform circular motion – tangential acceleration in circular motion – relative velocity and acceleration

Unit III

Gravitational force – Newton's law of gravitation – Electromagnetic force – Nuclear force- Central force – conservative force – Non conservative force – Work – Work done by a varying force – Energy – Kinetic Energy, Potential Energy – Power.

Unit IV

Crystal structures: Introduction – periodic array of atoms – crystal lattice – unit cell – basis – symmetry considerations – classification of crystals – Bravais lattices in three dimensions – crystal planes and Miller indices – simple crystal structures.

Unit V

Conservation of energy - Planck's hypothesis - Mass-energy equivalence - Nuclear energy – Solar energy - Non-conventional sources of energy

Reference:

1. Mechanics – Prof. D.S Mathur. Revised by : Dr. P.S. Hemne. S. Chand and Co. New Delhi. Fist 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^{th} edition, 1953.
4. Physics of particles, Matter and the Universe: Roger J Blinstoyle - 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 Merill, W Kenneth Hamblin, James M Thorne -Macmillan,NY (1982)

SEMESTER IV

UPHT41 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 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

X-Ray Diffraction and Reciprocal Lattice

X- Ray diffraction –Bragg's law –Bragg's X-ray spectrometer- Powder crystal method – Rotating crystal method-Reciprocal Lattice vector – Diffraction conditions –Brillouin zones-Reciprocal lattice to sc., bcc., fcc., lattice.

Unit III

Phonons

Vibrations of crystals with monatomic basis: First Brillouin zone-group velocity- long wavelength limit-derivation of force constants from experiment. Two atoms per primitive basis-quantization of elastic waves- phonon momentum- inelastic scattering by phonons.

Unit IV

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 V

Thermal Properties of Solids

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

Books for Study:

1. Solid State Physics – S.O.Pillai. New age international publishers, 6^{th} 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:

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 μ.
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.
Zener diode – break down voltage.
Zener diode – voltage regulation.
Transistor characteristics – CE mode.
Transistor characteristics – CC mode.
Transistor characteristics – CB mode

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 – 25th,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 – 25th,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

SEMESTER IV

ELECTIVE PAPER II

UPHE42 SOLAR THERMAL & RENEWABLE ENERGY SYSTMES

3 Hours/3 Credits

Objectives: The objective of this paper is to impart knowledge to students on energy and is resources, also they will be introduced with conventional and non conventional resources of energy.

Unit I

Solar Radiation and its Measurement – Solar constant – Solar Radiation at the Earth's surface, Solar Radiation Geometry – Measurements and Data. Estimation of average Solar Radiation and Solar radiation on titled surfaces.

Unit II

Solar energy Collectors

Physics Principles of the conversion of solar radiation into heat – Flat Plate collector (FPC) – Performance analysis of FPC – Concentrating collector (CC) over FPC – Selective coatings – Photo voltaic Cell.

Unit III

Application of Solar energy

Solar water heating – Space heating – Space Cooling – Solar Electric Power generation – agricultural and industrial process heat – Solar distillation – Solar Pumping – Solar furnace – Solar cooking.

Unit IV

Wind energy

Basic principles of wind energy conversion – Nature of the wind – the power in the wind – forces on the blades and thrust on turbines – wind energy conversion (WEC) – basic components of wind energy conversion – classification of types of WEC systems – advantages and disadvantages of WECs.

Unit V

Biomass

Introduction – biomass conversion technologies – photosynthesis – biogas generation – factors affecting biodigestion on generation of gas – classification and types of biogas plants – advantages and disadvantages of floating drum plant and fixed dome type plant

Book for study

1. Solar energy utilization – G.D. Rai, Edition, 3. Publisher, Khanna Publishers, 1987.
2. Non-Conventional Energy Sources", G.D. Rai ,4th Edition, Khanna Publishers, 2000.

SEMESTER IV
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
NON MAJOR ELECTIVE PAPER II

UPHN42 ELECTRONICS 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
FUNDAMENTALS

Electrical and Electronic symbols – Resistors - Capacitors – Resistance wale – Capacitor wale – Electrical quantities – Electrical formulas – Magnetism – Meters – Fuse wire Transistors – Integrated chips.

UNIT II
ELECTRICAL APPLIANCES

Switchboard – Main box – Metal circular breakers (MCB) – AC – DC currents – Two phase – Three phase electrical connections – generators – uninterrupted power supply (UPS) – stabilizer – voltage regulators – Electrical devices – Iron box – Fan

UNIT III
ELECTRONIC HOME APPLIANCES

Radio – Audio taper veaulem, speaker – televisions – VCR – CD Player –DVD – calculators – Computers – Block diagram of a computer – Input device – Memory device – control unit – Arithmetic and logic unit – output device – microprocessor – RAM –ROM – scanner – printer – Digital camera – LCD Projectors – Display devices

UNIT IV
COMMUNICATION ELECTRONICS

Principles of optical fiber cables(OFC) – Telephone – Mobile Phones – wire less phone – Antenna – Internet – Intranet

UNIT V
SAFETY MECHANISM

Handling electrical appliances – power saving methods – hazards prevention methods – protection of Hi-Fi electronic devices.

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 (2nd Edition), 1978.

SEMESTER V

UPHT51 ELECTRONICS 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. Donar 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.

Unit III

Amplifiers

Cascade amplifier: RC coupled- transformed coupled - direct coupled – power amplifier : class A and Class B – Push pull amplifiers – frequency response of amplifiers.

Unit IV

Oscillators

Feedback – types of feedback – advantage of negative feedback – Barkhausan criterion - Hartley, colpitt and phase shift oscillators – Mulltivibrators using transistors: Astable, Monostable and bistable.

Unit V

Integrated Electronics

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- 8th 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.

SEMESTER V

UPHT52 CLASSICAL AND STASTICAL MECHANICS 5 Hours/4 Credits

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 – contraints – D'Alembert's principle and Langrange'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 holonamic systems. Advantages of the variational principles formulation- conservation theorem – symmetry properties.

Unit III

The two- body central force problem

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

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 Alambert's principle and Lagrange's Equation

Classical mechanics-Gupta, Kumar, Sharma

Classical mechanics-G.Aruldhas

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, 2001

SEMESTER V

UPHT53 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.Aruldhas second edition –PHI learning private ltd. New Delhi, 2009.
2. Modren 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 – 3rd edition. TATA Mc Graw Hills, 4TH 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 – 2nd edition – publishing by Dorling Kindersley Pvt Ltd, 2004.

SEMESTER V

UPHT54 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 – Monochromacity – Coherence – Principles, population inversion- Laser pumping.

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 – Frock States – Quantization of the field – Zero – point energy – Coherent – state description of the electromagnetic field- Interaction of radiation with matter.

Unit IV

Lasers: Types and applications of Lasers

Solid state lasers: Ruby Laser- Nd: YAG Lasers - Gas Lasers: Helium –Neon Laser, Argon Ion Laser- CO_2 Laser - Semiconductor Lasers: Doped semimconductor – condition for Laser action - Liquid Lasers- Dye Lasers - Application of Lasers in Industry, Medicine and Communication.

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 monochromacity – 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, 2nd edition, 2010

SEMESTER V

UPHT55 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

Interference

Introduction: Light Waves; Superposition of Waves; Interference; Young's Double slit Experiment – Wavefront Division; Coherence; Conditions for Interference; Techniques of Obtaining Interference; Fresnel Biprism; Lloyd's Single Mirror; Fresnel's Double Mirror; Achromatic Fringes; Non- Localized Fringes; Visibility of Fringes; Fringe Pattern with white Light; Interferometry.

Unit II

Interference in thin films

Colours of thin film- Air Wedge – determination of diameter of a thin wire- Newton's rings – determination of refractive index for liquid- Michelson's interferometer – determination of λ and $d\lambda$ –uses.

Unit III

Diffraction

Fresnel and Fraunhofer classes of diffraction – Frenel's explanation for the rectilinear propagation of light zone plate- Frenel'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 – Frenel'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. A text book of Optics –Dr. N.Subramanyan , Brij Lal, and Dr. M.N. Avadhanulu. S. Chand and Co. New Delhi. 24th revised Edition 2010. Reprint 2012.

Books for Reference:

1. Optics and Spectroscopy – R. Murugeshan . Mrs . M. Shantha, Madurai. First Edition 2003.
2. Optics – A. Ubald Raj and G. Jose Robin. Indira Publications, Marthandam. First Edition 2016.
3. Spectroscopy - A. Ubald Raj and G. Jose Robin. Indira Publications, Marthandam. First Edition 2014.

SEMESTER V
ELECTIVE PAPER – III

UPHE53 MEDICAL PHYSICS 3 Hours/3 Credits

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 Reparatory 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, 3rd Edition, 1987

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:
Introduction to Internet-film and video projector-DTH

SEMESTER VI

UPHT61 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 resister – 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.

SEMESTER VI

UPHT62 NUCLEAR PHYSICS 5 Hours/4 Credits

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 - coolent reactor assembly, thermo nuclear reation – 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 – Mu meson (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. Moden Physics – R. Murugeshan and Er. Kiruthiga sivaprasath. S. Chand and Co., New Delhi. 2015.

SEMESTER VI

UPHT63 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 – Somerfield'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 magnetron – Stren 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

uncertinity 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. Moden Physics – R. Murugeshan and Er. Kiruthiga sivaprasath. S. Chand and Co., New Delhi. 2015.
2.Modern Physics – Sehgal, Chopra, S. Chand Publishing,2013.

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 – 25th,Edition (2002)

III B.SC. PHYSICS
SEMESTER VI

UPHP64 CORE PRACTICAL- IV – ELECTRONICS 5 Hours/4 Credits

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.

SEMESTER VI
ELECTIVE PAPER – IV

UPHE64 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, 2nd edition, 1987.

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).