VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN

(AUTONOMOUS)

SCHEME OF EXAMINATIONS UG

PG AND RESEARCH DEPARTMENT OF PHYSICS

B.Sc., DEGREE - CBCS SYLLABUS

2016 - 2017

B.Sc. (Physics)

I. SCOPE OF THE COURSE

B.Sc. (Physics), the recent developments in Physical sciences, has been included in the enriched syllabus to meet out the present day needs of academic and research, institutions and industries*.* The program expects a serious commitment of the student to take up challenging study schedules and assignments. The course involves a blend of theoretical education and practical training which run concurrently for a period of three years and equips a student with knowledge, ability, skills and other qualities required for a professional accountant.

The uniqueness of the program is its content and topic coverage, the teaching methodology and the faculty. The syllabus has been designed at a level equal to that of professional courses. The teaching methodologies include classroom lectures, industrial visits, orientation, internship, case study and research work. Focus is also on developing soft skills of the students. For Core subjects, Outsource Guest Lectures by Industrialists and Professional Men will be arranged to enable the students to get wider exposure.

II. SALIENT FEATURES

- ✓ Course is specially designed for a higher level Career Placement.
- ✓ Special Guest lectures from Industrialists will be arranged.
- ✓ Exclusively caters to students interested in pursuing higher studies.
- ✓ Special Industry Orientations and Training are parts of the Degree Course.
- ✓ Project work is included in the syllabus to enhance conceptual, analytical & deductive skills.

III. OBJECTIVES OF THE COURSE

- ✓ The new syllabus throws light on the recent and emerging areas of Physics.
- ✓ Enable the students understand Physics and make them more relevant to the society.
- ✓ Develop the analytical ability in students so that they are become objective in solving problems.
- ✓ Help the students learn practical skills in a better way.
- ✓ Inculcate research aptitude in students.
- ✓ Enable the students to go to higher levels of learning Physics.
- ✓ Improve the employability of the students.

✓ To inspire the students to apply their knowledge gained for the development of society in general.

IV. ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the first year Degree course (B.Sc. Physics) shall be required to have passed Higher Secondary Examination with Physics as one of the Subjects conducted by the Government of Tamil Nadu.

V. DURATION OF THE COURSE

✓ The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to March.

✓ The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University.

✓ Each subject will have six hours of lecture per week apart from practical training at the end of each semester.

VI. CONTINUOUS INTERNAL ASSESSMENT

The performance of the students will be assessed continuously and the Internal Assessment Marks will be as under:

1. Average of two Tests - 10 Marks
2. Seminar   - 5 Marks
3. Assignment   - 5 Marks
4. Attendance   - 5 Marks

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    Total   = 25 Marks

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The distribution of attendance marks is given as follows,

76-80 %   - 1 Mark

81-85 %   - 2 Marks

86-90 %   - 3 Marks

| 91-95 % | - 4 Marks |
| 96-100 % | - 5 Marks |

VII. Question Paper Pattern:

Question Paper Pattern for the examinations

Time: 3 Hours, Maximum Marks: 75

Part A Answer all of the following   (10 x 2 = 20 Marks)

Part B Answer all questions (Either or type)   (5 x 5 = 25 Marks)

Part C Answer any three of the following questions (3 x 10 = 30 Marks)

VIII. PASSING MINIMUM

In the University Examinations, the passing minimum shall be 40 % out of 75 Marks for theory (30 marks) and 40% out of 60 marks for practical. (24 Marks).

IX. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on earning 75 % of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

X. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of Core Courses (main and allied subjects) and securing marks

a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
b) 60% and above but below 75 % shall be declared to have passed the examinations in first class without Distinction.
c) 50%and above but below 60% shall be declared to have passed the examinations in second class.
d) All the remaining successful candidates shall be declared to have passed the examinations in third class.
e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for University rank.

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2016-17 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2016-17 and thereafter.

Sem	Subject code	Part	Course	Subjects	Hrs/ week	Credits	Int. marks	Ext. marks	Tot. mar ks
I	14U1LT01	I	Language-I	Tamil-I	6	3	25	75	100
	14U1LH01			Hindi-I					
	14U1LM01			Malayalam-I					
	14U1LE01	II	English-I	English-I	6	3	25	75	100
	14U1MAA01	III	Allied-I	Allied- Mathematics-I	5	3	25	75	100
	14U2MAAP01		Allied	Allied Mathematics Practical	3	-	-	-	-
	14U1PHC01	III	Core-I	Major-I- Properties of matter & Acoustics	5	5	25	75	100
	14U2PHCP01		Core	Major Practical-I	3	-	-	-	-
	14U1VE01			Value education – (Yoga)	2	2	25	75	100
				Total	**30**	**16**	**125**	**375**	**500**
II	14U2LT02	I	Language-II	Tamil-II	6	3	25	75	100
	14U2LH02			Hindi-II					
	14U2LM02			Malayalam-II					
	14U2LE02	II	English-II	English-II	6	3	25	75	100
	14U2MAAP01	III	Allied	Allied Mathematics Practical	3	3	40	60	100
	14U2MAA02		Allied-II	Allied- Mathematics-II	5	3	**25**	**75**	**100**
	14U2PHC02	III	Core-II	Major-II- Heat and Thermodynamics	5.	5	25	75	100
	14U2PHCP01		Core	Major Practical-I	3	4	40	60	100
	14U2ES01	IV		Environmental studies	2	2	25	75	100
				Total	**30**	**23**	**205**	**495**	**700**
III	14U3LT03	I	Language-III	Tamil-III	6	3	25	75	100
	14U3LH03			Hindi-III					
	14U3LM03			Malayalam-III					
	14U3LE03	II	English-III	English-III	6	3	25	75	100
	14U3CHA01	III	Allied-III	Allied Chemistry-I	4	3	25	75	100
	14U4CHAP01		Allied	Allied chemistry Practical	2	-	-	-	-
	14U3PHC03	III	Core-III	Major-III- Optics	4	5	25	75	100
	14U4PHCP02		Core	Major Practical-II	3	-	-	-	-
	14U3PHS01	IV	SBEC-I	Laser and spectroscopy	3	3	25	75	100
	14U3PHN01	IV	NMEC-I	Essentials of Electricity	2	2	25	75	100
				Total	**30**	**19**	**150**	**450**	**600**
IV	14U4LT04	I	Language-IV	Tamil-IV	6	3	25	75	100
	14U4LH04			Hindi-IV					
	14U4LM04			Malayalam-IV					
	14U4LE04	II	English-IV	English-IV	6	3	25	75	100
	14U3CHA02	III	Allied-IV	Allied Chemistry-II	4	3	25	75	100
	14U4CHAP01		Allied	Allied chemistry Practical	2	3	40	60	100
	14U4PHC04	III	Core-IV	Major-IV- Mechanics	4	5	25	75	100
	14U4PHCP02	III	Core	Major Practical-II	3	4	40	60	100
	14U4PHS02	IV	SBEC-II	Energy Physics	3	3	25	75	100
	14U4PHN02	IV	NMEC-II	Physics in Everyday Life	2	2	25	75	100
				Total	**30**	**26**	**230**	**570**	**800**

	14U5PHC05	III	Core-V	Major-V- Electricity and magnetism	6	5	25	75	100
	14U5PHC06	III	Core-VI	Major-VI- Basic electronics	5	5	25	75	100
V	14U5PHC07	III	Core-VII	Major-VII- Quantum mechanics and its relativity	5	5	25	75	100
	14U5PHE01	III	Elective-I	Elective-I- Solid state physics	5	5	25	75	100
	14U5PHS03	IV	SBEC-III	Electrical Appliances	3	3	25	75	100
	14U6PHCP03	III	Core	Major Practical-III	3	-	-	-	-
	14U6PHCP04	III	Core	Major Practical-IV	3	-	-	-	-
				Total	**30**	**23**	**125**	**375**	**500**
	14U6PHC08	III	Core-VIII	Major-VIII- Atomic Physics	6	5	25	75	100
	14U6PHC09	III	Core-IX	Major-IX- Nuclear Physics	5	5	25	75	100
	14U6PHE02	III	Elective-II	Elective- Numerical methods	5	5	25	75	100
VI	14U6PHE03	III	Elective-III	Elective -Digital electronics and Microprocessor	5	5	25	75	100
	14U6PHS04	IV	SBEC-IV	Bio-medical instrumentation	3	3	25	75	100
	14U6PHCP03	III	Core	Major Practical-III	3	4	40	60	100
	14U6PHCP04	III	Core	Major Practical-IV	3	5	40	60	100
	14U6EX01	-	-	Extension activity	-	1	-	-	-
				Total	**30**	**33**	**205**	**495**	**700**
			Overall Total		**180**	**140**	**1040**	**2760**	**3800**

XIII. LIST OF ELECTIVES

S.No	Code	Course Title
1.	14U5PHE01	Solid State Physics
2.	14U6PHE02	Numerical methods
3.	14U6PHE03	Digital electronics and Microprocessor
4.	14U5PHE04	Nanoscience
5.	14U6PHE05	Astrophysics
6.	14U6PHE06	Mathematical Physics
7.	14U6PHE07	Non-Linear dynamics
8.	14U6PHE08	Electronics and Communication

XIV. LIST OF SKILL BASED ELECTIVES

S.No	Code	Course Title
1	14U3PHS01	Laser and spectroscopy
2	14U4PHS02	Energy Physics
3	14U5PHS03	Electrical Appliances
4	14U5PHS04	Bio-medical instrumentation

XV. NON MAJOR ELECTIVE COURSE

S.No	Code	Course Title
1	14U3PHN01	Essentials of Electricity
2	14U4PHN02	Physics in Everyday Life

PROPERTIES OF MATTER AND ACOUSTICS

Subject Description: This paper presents the principle of motion of rigid bodies, liquids and sound energy.

Goal: To enable the students in order to learn the basic principles, theory and concepts of Matter and sound.

Objectives
- ➢ Students will get information to analyze the properties of a mystery substance to determine its state of matter
- ➢ acquire basic knowledge of properties of matter such as elasticity, Surface tension, Viscosity etc.

I Elasticity   **12**

Stress-strain diagram-Different moduli of Elasticity-work done per unit volume in shearing strain-Relation between Elastic moduli-Poisson's ratio-Twisting couple on a wire-work done in twisting-Torsional pendulum-determination of rigidity modulus-static torsion method with scale and telescope-Torsional oscillation of a body–Rigidity modulus by torsion pendulum with mass.

II Bending Of Beams   **12**

Expression for bending moment-Depression of the loaded end of the cantilever-Uniform-Nonuniform bending - theory-experiment pin and microscope and scale and telescope method-Work done in uniform bending-Searle's method-Koenig's method.

III Surface Tension   **12**

Definition and dimensions of surface tension-Angle of contact and its determination-formation of drops- excess pressure inside the soap bubble - excess pressure inside the curved liquid surface- Experiment study of variation of surface tension with temperature-drop weight method of determining surface tension and interfacial surface tension –Quincke's method-angle of contact of mercury.

IV Viscosity   **12**

Coefficient of critical velocity-Poiseuille's formula coefficient of viscosity-correction for the formula-determination of co-efficient of viscosity by capillary flow method-comparison of viscosities –Oswald's viscometer-Stoke's method for the coefficient of a highly viscous liquid-variation of viscosity with temperature and pressure-viscosity of gases-Mayer's formula for the rate of flow of a gas through a capillary tube.

V Sound and Acoustics   **12**

Theory of free,damped and forced vibration- resonance-sharpness of resonsance-Fourier's theorem-application for sawtooth wave-square wave-Sonometer-determination of frequency - Melde's apparatus – transverse and longitudinal waves.

Acoustics of buildings - reverberation time- derivation of Sabine's formula-determination of absorption Coefficient.

Books for Study:
1. Elements of properties of matter by D.S Mathur.,S.Chand and co.,, 10th edition,(1984)
2. Properties of Matter by R.Murugesan., S.Chand and co.,(2004)
3. Properties of Matter by Brijlal & N.Subramaniam., S.Chand and co.,(2005)
4. Properties of Matter and Acoustics by R.Murugesan., S.Chand and co.,(2005)
5. A Text Book of Sound by N.Subramaniam and Brijlal., S.Chand and co.,(2004)

Books for Reference:
1. Fundamentals of General Properties of Matter, H.R.Gulati, S.Chand and co.,(2005)
2. A Text Book of Sound, R.L.Saighal, S.Chand and co., (2005).

HEAT AND THERMODYNAMICS

Paper Code: 14U2PHC02

Subject Description: It is an active area of Physics deals with behavior of matter in the presence of heat.

Goal: To enable the students in order to learn the basic principles and concepts of Heat and Thermodynamics

Objectives
The aim is to provide the students
- ➢ mechanism of conversion of heat into work.
- ➢ These studies of energy conversion provide knowledge about the working principles of household appliances.

Unit I: Thermometry and Calorimetry 12

Platinum resistance thermometer, correction, disadvantages, definition of specific heat capacity, determination of specific heat capacity by Newton's law of cooling, two specific heat capacities of gas, determination of C_v by Joly's differential steam calorimeter, determination of C_p by Regnault's method.

Unit II: Low Temperature Physics 10

Joule Thomson effect, Porous plug, theory, experiment, liquefaction of gases, air by Linde's process, Helium by K. Onne's method, Helium I and II, adiabatic demagnetization, practical applications of low temperature, electroflux refrigerator, air conditioning machines.

Unit III: Thermodynamics 14

Zeroth, first and second laws of thermodynamics, reversible and irreversible processes, heat engine, Carnot's, petrol and diesel engines, efficiency, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics, temperature entropy diagram.

Unit IV: Conduction and Radiation 14

Thermal conductivity, definition, thermal conductivity of a bad conductor, Lee's disc method, good conductor- Searle's method, radiation, black body radiation, definition.

Wien's displacement law, Rayleigh Jean's law, Stephan's Law, solar constant, temperature on the sun by Angstroms pyroheliometer.

Unit V: Statistical Thermodynamics 10

Bose-Einstein Distribution law-Fermi-Dirac Distribution Law-Energy relations. Derivation of Maxwell's Thermodynamic Relations, Helmholtz function, Gibb's function, enthalpy, Tds equation, Clausis-Clapeyron latent heat equation, specific heat relation.

Books for Study:

1. Heat and Thermodynamics, Brij Lal and Subramaniam, S. Chand and Co (2004).

2. Heat and Thermodynamics, D.S. Mathur, S. Chand and Co (2004).

3. Thermal physics, R. Murugesan, S.Chand and Co

CORE PRACTICALS – I

PAPER CODE: 14U2PHCP01

1. Young's modulus-uniform bending-scale& telescope method.
2. Torsion pendulum-rigidity modulus-dynamic method.
3. Surface tension& interfacial surface tension-drop weight method.
4. Sonometer-frequency of a fork.
5. Spectrometer-refractive index of the prism.
6. Potentiometer-calibration of low range voltmeter.
7. Compound Pendulum
8. Lee's Disc
9. Field along the axis of a coil-deflection magnetometer.
10. Air wedge-thickness of a wire using traveling microscope.
11. Verification of basic gates NOT,AND,OR,NAND,NOR
12. NAND & NOR as universal gates
13. Zener diode-voltage regulation.
14. Low range power pack-using two diodes-voltage regulation.
15. Focal length of concave lens

ALLIED PHYSICS - I

Paper Code: 14U1PHA01

Subject Description: This paper presents the traditional topics of basic physics. This papers equips the Maths and Chemistry majored students with basic ideas of physics.

Goal & Objectives
To acquire knowledge about
- ➢ Different topics such as Mechanics which deals with principle and working of machines,
- ➢ Properties of matter which deals with behavior of matter, and also the principle of heat,
- ➢ a small introduction about optics and optical devices and also basic concepts of electricity.

UNIT-I   **12**

Properties of Matter: Elasticity-Three types of elastic modulus - Poisson's ratio-Newton's law of gravitation, determination of gravitational constant, Boys method, Uniform and Non-uniform bending-theory and experiment-torsion-expression for coupled per unit twist-torsion pendulum-theory of rigidity modulus by static torsion, surface tension-drop weight method.

UNIT-II   **10**

Laser and its applications: Basic Principle of Laser - condition for light amplification - Population Inversion - Threshold Condition-He-Ne laser-CO_2 laser-Ruby Laser-Applications of laser in medicine and industries.

Unit - III   **10**

Heat: Specific heat-determination of C_p and C_v,- Van der walls equation, critical constant and their determination- expression for critical constant, thermal conductivity of bad conductor-Lees disc method, Joule Thomson effect-Porous plug experiment-theory-inversion temperature.

Unit – IV   **14**

Optics: -Introduction – condition for interference – Fresnel's biprism – Airwedge – thickness of wire– diffraction of light – Fresnel and Fraunhofer diffraction –-Difference between interference and diffraction-Polarization-Nicol Prism polarizer and analyzer-quarter wave plate, half wave plate. Optical activity, analysis of light by Laurent's half side polarimeter.

Unit – V   **14**

Electricity: Theory measurement of resistance, Potentiometer, low range voltmeter and ammeter calibration, Choke coil, LCR circuits, Transformer, construction, theory, energy loss and uses. Electrometer-quadrant electrometer, measurement of potential, ionization, current and dielectric constants.

Books for Study:

1. Properties of Matter, R. Murugeshan, S. Chand and Co (2004).
2. Modern physics – R.Murugesan, S.Chand & Co, Twelth Edition, (2004).
3. Heat and Thermodynamics, Brij Lal and Subramaniam, S. Chand and Co (2004).
4. Brijlal and Subrahmaniyam, Optics, S.Chand & Company (P) Ltd., 1987.
5. Optics and Spectroscopy, R. Murugeshan and Krithika, S. Chand and Co (2006).
6. Electricity and Magnetism, Brij Lal and Subramaniam, S. Chand and Co (2005).

ALLIED PHYSICS –II

Paper Code: 14U2PHA02

Subject Description: This paper presents the different branches of modern physics. This papers equips the Maths and Chemistry majored students with basic ideas of different branches of physics.

Goal & Objectives
To acquire knowledge about
- ➢ Atomic physics which deals with the structure and functions of atoms.
- ➢ Nuclear physics which offers the idea about various nuclear models.
- ➢ Solid State Physics which deals with the structyure and behavior of solids.
- ➢ Basic and digital electronics which gives an idea about electronic circuits.

UNIT-I   **12**

Atomic Physics: Introduction to atomic physics- Bohr's theory and Somerfield theory-Vector atom model-Spatial quantization-Spinning electron-Quantum numbers associated with Vector atom model- Pauli's exclusion principle- Stern-Gerlach experiments.

UNIT-II   **10**

Nuclear Physics: Introduction- Classification of nuclei- General properties of nucleus- Binding energy- Nuclear stability- Nuclear models-liquid drop model- Shell model- Nuclear radiation detectors-Ionization chamber-Geiger Muller counter.

UNIT-III   **10**

Solid State Physics: Introduction to crystals-Periodic array of atoms-Unit cell-Basis-lattice-types-Two dimensional and three dimensional lattices- Seven crystal systems-Bonding in crystals-ionic bond-covalent bond-metallic bond-molecular bond- hydrogen bond.

UNIT-IV   **14**

Basic Electronics: Semi Conductor Physics – Intrinsic and Extrinsic semi conductor – P type and N type semi conductor-construction and characteristics of FET - Operational amplifiers- basic operations

UNIT-V   **14**

Digital Electronics: Binary, Octal, Hexadecimal number and their inter conversion-Laws of Boolean algebra- De Morgans theorem –NAND/NOR gate as universal building blocks-   Simplification of Boolean expression- Amplitude modulation – Modulation factor- Frequency modulation.

BOOKS FOR STUDY:

1. Modern physics – R.Murugesan, S.Chand & Co, Twelth Edition, (2004).

2. Digital principles and applications – Malvino & Leach, TMH, (2000).

3. Principles of Electronics – V.K. Metha, S.Chand & Co (2001).

4. Solid state Physics- S. L. Kakani, C. Hemrajani, Sultan Chand & Sons, Fourth edition, 2005.

5. Solid state Physics- S.O. Pillai, New Age International Publishers, Sixth edition, 2011.

ALLIED PHYSICS – PRACTICALS

Paper Code: 14U2PHAP01

List of Experiments:

1. Young's Modulus –non uniform bending-scale and telescope
2. Young's Modulus –uniform bending-scale and telescope
3. Torsion Pendulum-rigidity modulus
4. Surface Tension and interfacial surface tension-drop weight method
5. Sonometer-frequency of fork
6. Air wedge-thickness of wire
7. Focal length of convex lens
8. Spectrometer- μ of the prism
9. Potentiometer- Low range voltmeter calibration
10. Potentiometer-Low range ammeter calibration
11. Zener diode-characteristics
12. Low range power pack-using two diodes
13. Verification of basic gates NOT,AND & OR
14. Field along the axis of the coil-B_H
15. Lee's Disc-Thermal conductivity.

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Credit: 5

Max. Hours: 60
</div>

OPTICS

Subject Description To study the optical instrument, objects in images, propagation of light, nature and behaviour of light, laser and its application

Goal and objectives
- ➢ To provide a good foundation in optics
- ➢ To provide a knowledge to handle optical devices.

UNIT I Introduction to Optics

Electromagnetic radiation – characteristics - reflection, refraction - interference, diffraction and polarization of light-black body radiation. Coherence-phase difference and path difference.

12

UNIT II Interference and Diffraction

Superposition of waves – Young's double slit experiment – wavefront divisions – coherence – condition for interference – techniques for obtaining interference Fresnel's biprism- Determination of wave length of monochromatic light - Michelson Interferometer and its applications- Fabry perot interferometer.Zone plate – Fresnel & Fraunhofer diffraction-Rectilinear propagation of light- - Fraunhofer diffraction at a single slit – Theory of plane transmission grating-Normal incidence and oblique incidence- Condition for absence of spectra- Over lapping Spectra- Diffraction due to Straight edge- Prism & Grating Spectra. Dispersive power of a grating-Grating at oblique incidence-Determination of wavelength of light using transmission grating (normal incidence).

UNIT III Polarization   12

Polarization-transverse wave-Double refraction- Ordinary ray and extra ordinary ray- Huygens explanation in uniaxial crystals-Quarter wave plate & half wave plate-Production and detection of Plane, circularly, elliptically polarized light-Nicol prism-Optical Activity-Babinets Compensator-Specific rotation-Laurent's half shade polarimeter.

UNIT – IV Geometrical Optics

Dispersion through a prism – Dispersive power- Combination of two small angled prisms to produce dispersion without deviation – Constant Deviation Spectrometer- Deviation without dispersion –Direct vision Spectrometer- Spherical aberration in lenses – Methods of minimizing sphericl aberration – Condition for minimum spherical aberration in the case of two lenses

separated by a distance – Chromatic aberration in lenses – Condition for achromtism of two thin lenses (in contact and out of contact) – coma .

UNIT V Optical Instruments   **10**

Eye pieces-Huygens and Ramsens-Comparison - Resolving Power- Rayleigh's criterion – Resolving power of telescope, microscope, grating and Prism – Holography - Principle-Recording and reconstruction- Properties- applications.

Book for Study:

1. A text book of Optics – Subramanyam, Brij Lal, Avadhanulu – S. Chand & Co. Delhi (2007).
2. Optics and spectroscopy R. Murugesan and Kiruthiga Sivaprasath, S.Chand & Co, New Delhi (2006)

Book for Reference:

1. Optics by Ghatak .A, Tata McGraw Hill, New Delhi.(2009).
2. Optics - Eugene Hecht, Fourth Edition, Pearson Education, New Delhi., (2007)
3. Optics - Abbe

Credit: 5

Max. Hours: 60

MECHANICS

Subject Description: It is a traditionally organized branch of Physics which presents the behavior of Physical bodies when subjected to forces and the subsequent effects of the bodies on their environment.

Goal: To enable the students in order to learn the basic principles, theory and concepts of mechanics.

Objectives

To gain knowledge by the students in order to
  ➢   learn the operating principles of machines used in daily life.
  ➢   acquire basic knowledge of working of machines.

UNIT I VECTORS   12

Motion in a straight line – instantaneous velocity – acceleration – motion in two and three dimensions – relative motions – uniform circular motion – force and motions – Newton's law – mass inertia and force – gravitational force – applications of Newton's second law.

UNIT II Law of Conservation   10

Law of conservation of mass, energy – work energy theorem – centre of mass – collision – kinetic energy in collision – angular momentum – law of conservation of angular momentum – angular acceleration and torque

UNIT III Dynamics of Rigid Bodies   14

Moment of inertia – theorems of moment of inertia – energy of a rotating rigid body – gyroscopes – spin precision in constant magnetic field – nature of central forces – motion under central forces – Newton's law of universal gravitastion – inertial and gravitational mass – motion in gravitational field – Kepler's Law

UNIT IV   10

Center of Pressure: Definition- Determination of Center of Pressure- center of pressure of a rectangular lamina and triangular lamina.

Hydrodynamics: Steam line flow- Equation of continuity of flow – energy of liquid, Bernoulli's theorem- Applications of Bernoulli's theorem to gas, venturimeter, pitot tube,.

Classical Mechanics: Mechanics of system of particles, conservation theorem for angular momentum and energy, constraints, classification, generalized coordinates, transformation equation, principle of virtual work, D'Alembert's principle, derivation of Lagrangian formulation of conservation theorems, generalized momentum, energy and linear momentum- Application-Atwood's machine.

Books for Study:

1. Mechanics and Mathematical Methods, R. Murugeshan, S. Chand and Co (2005).
2. Dynamics, Narayanamurthy, National Publishing Company, Eighth Edition, (2005).
3. Statics, Hydrostatics and Hydrodynamics, Narayanamurthy and Nagarathnam, National Publishing Company (2002).

Books for Reference:

1. Classical Mechanics by H.Goldstein Addition Wesley Publications (2005)
2. Mechanics by D.S. Mathur , S. Chand and Co (2006)

MAJOR PRACTICAL-II

1. Young's modulus – Uniform bending – Pin and Microscope
2. Torsion Pendulum – MI and Rigidity modulus – Symmetrical masses.
3. Static Torsion – Rigidity Modulus
4. Coefficient of Viscosity of a Liquid – Graduated Burette – Radius by Microscope
5. Newton's law of cooling
6. Spectrometer – Grating – Normal incidence
7. Newton's rings – Radius of curvature of lens
8. Potentiometer – Ammeter calibration
9. Potentiometer – Resistance and Specific resistance
10. Carey Foster's Bridge – Resistance and Specific resistance
11. Deflection magnetometer – M & B_H determination - Tan A and Tan B position
12. Operational amplifier- Inverting and Non-Inverting amplifier.
13. OP-AMP – Adder and Subtractor.
14. Half – Adder and Full Adder.
15. Half Subtractor and Full Subtractor.

Credit: 3

Max. Hours: 36

LASER AND SPECTROSCOPY

Subject Description: This paper provide the solid understanding of the fundamental principles underlying the operation of lasers and their Spectroscopic applications.

Goal & Objectives
Students should able to
  ➢ describe the various interactions of light and matter.
  ➢ Understand the use of laser technology in spectroscopic and industrial applications.

UNIT I Fundamentals of Laser   **7**

Introduction - Monochromaticity, Coherence, Directionality – High intensity – Principles of laser: Stimulated absorption , Spontaneous emission, Stimulated emission, Population inversion, Einsteins A & B coefficients and related between them.

UNIT II Types of Laser   **8**

Gas laser: HeNe laser – Solid State laser: Ruby laser , Nd:YAG laser Semiconductor laser – Other laser devices : Iron and Metal vapour laser, CO_2 laser, The liquid Dye laser, Free electron laser , Chemical laser.

UNIT III Applications of laser   **7**

Applications in Industry – Cutting- Drilling- Welding- Medicine and Surgery – Laser printing – Super market's bar code , Entertainment industry – Meteorology – Distance measurement, Velocity measurement- Laser Hazards.

UNIT IV Spectroscopy   **7**

Introduction – Nature of Electro magnetic radiations- Spectral regions- Atomic spectra: Introduction –Types of atomic spectra – emission spectra, absorption spectra – Wave number.

Molecular spectra: The Born-Oppenherimer approximation.

UNIT V Types of Spectroscopy   **7**

IR Spectroscopy, UV Spectroscopy – Raman effect – Experimental study – NQR , NMR & Mossbauer Spectroscopy and Applications.

Books for study:

1. Optical fibre and Laser principles and Applications – Anuradha De New Age International Pvt Ltd(2010)
2. Optics and Spectroscopy – R.Murugeshan & Kiruthiga Sivaprasath, S.Chand & Company(2010).
3. Elements of Spectroscopy – Gupta , Kumar & Sharma, Pragathi prakashan(2009)
4. An introduction to LASERS – N.Avadhanulu , Chand & Company(2001).

ENERGY PHYSICS

Subject Description: This paper gives an idea about energy production, storage and conservation systems.

Goal: To enable the students to aware about renewable energy types, energy resources and conservation of energy.

Objectives
To acquire knowledge about
  - ➢ Energy resources around us.
  - ➢ Threatening to our energy resources.
  - ➢ How to conserve energy.

UNIT I Introduction to Energy Sources   **8**

Classification of Energy sources- Energy consumption as a measure of prosperity- Worlds reserve of commercial energy sources and their availability- wind energy-ocean thermal energy conversion(OTEC)-Tidal energy(basic ideas)- Geothermal energy-Global warming- Renewable energy resources- advantages- Obstacles

UNIT II Solar thermal energy   **7**

Renewable energy sources - Solar radiation at the Earth's surface – Applications: Solar water heater, Solar space heating and cooling, distillation, green houses - solar thermal technologies-solar cooker - merits and demerits of solar energy.

UNIT III Solar cell   **7**

Photo voltaic effect - performance of cell-choice of materials for a solar cells-Basic requirement for obtaining an effective solar cell-Principles, types and power generation.

UNIT IV Biomass energy Fundamentals   **7**

Biomass energy–classification- Photosynthesis- Biomass conversion technology – Biogas generation-applications-Advantages and Disadvantages.

UNIT V Energy consumption,Conservation and Options   **7**

Conservation of energy-Patterns of Energy consumption in domestic, Industrial, transportation and agricultural sectors- conservation principles and energy audit in these sectors-Energy options for developing countries.

Books for Study:
1. S.P.Sukhatme, Solar energy, Tata McGraw Hill Publishing company,Ed.,(1997)
2. G.D. Rai, Non Conventional Energy Sources,Ed.IV,Khanna publishers,(2007)
3.D.S.Chauhan, S.K.Srivastava,Non Conventional Energy Sources Ed.V,(2004).
4. G.N. Tiwari, solar energy, Ed.,2004.

Books for reference:
1. G.D .Rai ,Solar energy utilization,Ed.V, Khanna publishers,1995.
2. B.H. Khan, Non Conventional Energy Sources, Tata McGraw Hill, Ed.,II,(2012).

14U3PHN01

ESSENTIALS OF ELECTRICITY

Subject Description: This paper presents the fundamental principle of electricity and basic knowledge about electrical goods.

Goal & Objectives

To acquire knowledge about
- ➢ Handling and identifying electrical instruments.
- ➢ Know about the principle used in the storage of electricity.

UNIT I Electricity- An Introduction   **4**

.Electricity- Ohms law- Electric charge- Coulomb's law- Principle and types of resistors and capacitors.

UNIT II Electricity- Units and Measurements   **5**

Current- Voltage- Units and Measuring meters- Galvanometer- Voltmeter- Ammeter- Multimeter.

UNIT III Generation of Electricity   **5**

Preference for electricity- Sources of generation of electricity- Conventional-Nuclear Power stations- Non-conventional- Photovoltaic or Solar cells.

UNIT IV Storage and Conservation of Electricity   **4**

Primary cells- Daniel cell- Lechlanche cell- Secondary cells- Lead cell- Nickel-Cadmium cell- Rechargeable cell- Conservation of electricity.

UNIT V Domestic Electrical Appliances   **6**

Principle and Operation of electrical bulbs- fans- Mixer grinder- Refrigerator- Air conditioner- UPS- Stabilizer- Microwave Oven..

Books for study :

1. A Text Book of Electrical Technology, Theraja. A. L, Theraja. B. K, S. Chand & Co (2010).

2. Electricity and Magnetism- N. Nagarathinam and N. Lau, S. Chand & Sons (2007).

3. Electricity and Magnetism- R. Murugesan, S.Chand & Co (2005).

4. Electricity and Magnetism- Brijlal and Subramaniam, S. Chand & Co (2005).

Credit: 2

Max. Hours: 24

PHYSICS IN EVERYDAY LIFE

Subject Description: This NMEC course presents the traditional topics of basic physics. This papers equips the Chemistry majored students with basic ideas of physics.

Goal & Objectives
To acquire knowledge about
- ➢ Different topics such as Mechanics which deals with principle and working of machines,
- ➢ Properties of matter which deals with behavior of matter, and also the principle of heat, a small introduction about optics and optical devices and also basic concepts of electricity.

UNIT I Mechanics   **4**

Motion, Force , Work, Power and Energy- Weight & mass-Newton's law of motion. System of Forces - weight of a body in a lift. Gravitation.- planetary motion and earth satellites – communication satellites

UNIT II Properties o Matter & Sound   **5**

Three states of matter - binding forces –Archimed's Principle - applications - Pascal law - Archimedes principle – capillary action - Surface Tension – Dimension of Surface Tension- Bernoulli's principle - Viscosity.

Sound and music - reverberation - acoustics of building –intensity of sound – loudness of sound – noise pollusion.

UNIT III Heat   **5**

Definition- Measurement of heat and temperature – types of thermometers- platinum resistance thermometer- Clinical Thermometer-Expansion of solid ,liquid & gas- Change of sign conversion.

UNIT IV Light   **5**

Reflection-Refraction- Laws of refraction-Reflection through a lens- Image formation by a lens- Effect of silvering one of the refracting surface of a lens- determination of focal length of a convex lens by displacement method- Refractive index.

UNIT V Electricity and Magnetism   **5**

Colomb's law - Ohm's law - electric power - electrical safety - electromagnetic induction - Faraday's Law - Lenz Law - transformers . Carey-Foster Bridge - theory - temperature coefficient of resistance – potentiometer. Properties of dia, para, ferro magnetism

Books for study:

1. A text book of physics-D.C.Agarwal (Volume-I)
2. A text book in electrical technology – B.L. Teraja, S. Chand & Co., New Delhi.(2006)
3. Electricity and Magnetism, Brijlal and Subramaniam, S.Chand & Co
4. Optics & Spectroscopy , R. Murugesan,
5. Properties of Matter & Acoustics , R. Murugesan.

ELECTRICITY

Paper Code: 14U5PHC05

Subject Description: This paper presents the basic principle of charged body, when they are in rest and also under motion.

Goal: To enable the students in order to learn the basic principles theory and concepts of Electricity.

Objective
- ➢ To gain knowledge about the principle and working of electrical circuits.
- ➢ acquire basic knowledge about handling electrical circuits.
- ➢ Know about types of electricity.

I Electrostatics   12

Coulomb's law- electric intensity and electric potential- electrical images-electric intensity and potential due to an earthed conducting sphere applying the principle of electrical images- electric dipole- potential and intensity due to a dipole- capacity- Capacitance of a spherical and cylindrical capacitor- energy of a charged capacitor-loss of energy due to sharing of charges.

II Current electricity   12

Current density-resistivity-Kirchhoff's laws- Whetstone's Bridge- Sensitiveness of Whetstone's Bridge-Carey –Foster's Bridge-determination of temperature coefficient-potentiometer-Calibration of voltmeter-Calibration of ammeter-comparision of resistances- Kelvin's double bridge method of very low resistances- high resistance by leakage.

Thermoelectricity

Thermoelectricity-Peltier coefficient and Thomson coefficient-Application of thermodynamics to thermocouple-thermo-electric power- thermo-electric diagrams and uses.

III Measuring Instruments   12

Magnetic field intensity due to a solenoid carrying current- Effect of iron core in a solenoid-moving coil ballistic galvanometer-Damping correction-Uses of B.C .Determination of absolute 'C'&'M'.Expression for self inductance of a coil-Expression for mutual inductance of a pair of co-axial coils–Coefficient of coupling- Induction coil and its uses.

IV Transient Currents   12

Growth and decay of charge in a inductance L and resistance R Circuit with steady emf- Growth and decay of charge in a RC Circuit- Growth and decay of charge in a LCR Circuit-conditions for the discharge to be oscillatory- Frequency of oscillation. Importance in Wireless telegraphy.

Power factor and current values in AC circuits containing series and parallel resonant circuits, RMS, average value of current and emf- power in AC circuits – Power factor in LR and CR circuits- AC and Dc motors. Types of windings–series, parallel and compound windings-transformers- Three phase, delta and star connections–choke-Skin effect.

Books for Study

1. Electricity and magnetism – R.Murugesan, S.Chand & Co,
2. Electricity and magnetism - Brijlal and subramaniam, Ratan Pragham Publishing Ltd., Agra

Books For reference

1. Electricity and magnetism- D.N. Vasudeva, S.Chand & Co Ltd, 2011
2. Electricity and magnetism- Nagaratanam and Lakshminarayanan, National Publishing Company -
3. Electricity and magnetism- K.KTewari, S.Chand Limited, 2nd Edition, 2007.
4. Electricity and Magnestsim- Tayal, Himalaya Publishing House, 2nd Edition,

BASIC ELECTRONICS

Subject Description: This paper presents the fundamentals of electronics and its theory which will be used for studies solving problems during research work.

Goal: To enable the students to acquire the knowledge of electronics and to apply the principles for the situation of different physical problems.

Objectives
To acquire knowledge and apply it to
- ➢ Various electronics instruments
- ➢ To apply the development of the electronic instruments.
- ➢ To motivate the students to apply the principles of electronics in their day – to – day life.

I Semiconductors and diodes   10

Intrinsic and extrinsic semi conductor – PN junction diode – Biasing of PN junction – VI Characteristics of diode – Rectifiers – Half wave – full wave and bridge rectifiers and their efficiency calculation– ripple factor-Break down mechanisms – Zener diode characteristics of Zener diode – Zener diode as voltage regulator-LED-Photo diode-Tunnel diode-varactor diode.

II Transistors   12

Transistor action- Basic Configuration- Relation between α and β- CB,CE and CC mode – operating point-thermal runaway-DC load line – DC bias and stabilization – fixed bias – voltage divider bias – Transistor as an amplifier – Transistor as a two port network – h-Parameters-Equivalent circuit-Determination-h parameters of a transistor –transistor circuit performance-experimental determination.

III Amplifiers and Oscillators   14

Single stage CE amplifier –Gain calculation– Class A,B,C and voltage & Power amplifiers– General theory of feedback – Properties of negative feedback – Advantages-Emitter follower-Criterion for oscillations (positive-feedback) – Hartley oscillator – Colpitt's oscillator-wien's bridge oscillator.

IV Special Semiconductor devices   14

Construction and working-FET – JFET – MOS FET – FET parameters – Comparison between FET and Transistor – Photo transistor – SCR – SCR as a switch – UJT – UJT relaxation oscillator.

V Multivibrators and Operational Amplifiers 10

      Multivibrator-types- astable, monostable and bistable multivibrator using transistor.

Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non- inverting amplifier – Applications. Adder – substractor – Integrator – Differentiator – Unity gain buffer.

Books for study and References:

1) Metha V.K., Principles of Electronics, S.Chand and company Ltd, 2001.
2) Chattopadhyay, D., Raxshit, P.C., Sara, B.and Purkait, New Age International (P) Ltd, 2000
3) Theraja . B.L., Basic electronics and solid state, S.Chand and Company Ltd (2002).

4) Sedha R.S., A text book of applied Electronics, S.Chand & company Ltd (2002).

SOLID STATE PHYSICS

Subject Description: This paper presents the fundamentals of solids and its bond theory which will be used for studying solids and how they are formed.

Objectives
To acquire knowledge of
  ➢ to know the formation and structure of different solid materials.
  ➢ to motivate the students in order to apply the principles of Solid State Physics in their research studies.

I Crystal Structure   **10**

Crystal classes and symmetry – 2D, 3D lattices – Bravais lattices – Symmetry point groups – Space groups – Reciprocal lattice – Ewald's sphere construction – Bragg's law – Systematic absences – Atomic scattering factor – Diffraction – Structure factor – Experimental techniques – Laue, Powder, Rotation methods – Phase problem – Electron density distribution (elementary ideas only).

II Lattice Vibrations and Thermal Properties   **12**

Vibration of monoatomic lattices – Lattices with two atoms per primitive cell – Quantization of lattice vibrations – Phonon momentum – Inelastic scattering of neutrons by phonons -- Lattice heat capacity – Einstein model – Density of modes in one-dimension and three-dimension – Debye model of the lattice heat capacity – Thermal conductivity – Umklapp process.

III Free Electron Theory, Energy Bands and Semiconductor Crystals   **12**

Energy levels and density of orbitals – Fermi-Dirac distribution – Free electron gas in three-dimensions – Heat capacity of the electron gas – Electrical conductivity and Ohm's law – Motion in magnetic fields – Hall effect – Thermal conductivity of metals – Nearly free electron model – Electron in a periodic potential – Semiconductors – Band gap – Effective mass – Intrinsic carrier concentration.

IV Diamagnetism, Paramagnetism, Ferro magnetism and Antiferromagnetism   **12**

Langevin classical theory of Diamagnetism and paramagnetism – Weiss theory - Quantum theory of paramagnetism – Demagnetization of a paramagnetic salt – Paramagnetic susceptibility of conduction electrons - Hund's rules - Ferroelectric order – Curie point and the exchange integral – Temperature dependence of saturation magnetization – Magnons – Ferromagnetic

order – Antiferromagnetic order –Ferromagnetic domains – Origin of domains – Coercive force and hysteresis.

V: Dielectrics and Ferroelectrics and Superconductivity **14**

Macroscopic electric field – Local electric field at an atom – Dielectric constant and polarizability – Clausius-Mossotti equation – Polarizaion catastrophe – Occurrence of Superconductivity – Meissner effect – Thermodynamics of superconducting transition – London equation – Coherence length – BCS theory – Flux quantization – Type I and Type II Superconductors – Josephson superconductor tunneling – DC and AC Josephson effect – SQUID – Recent developments in high Temperature Superconductivity–Application of superconductors.

Books for Study

1. C. Kittel, Introduction to Solid State Physics (Wiley Eastern, New Delhi, 1977).

2. S. O. Pillai, Solid State Physics (New Age International, New Delhi, 1995).

Books for Reference

1. N. W. Ashcrof and N. D. Mermin, Solid State Physics (Holt, Rinehart And Winston, Philadelphia), 1976

2. J. S. Blakemore, Solid State Physics (Cambridge University Press, Cambridge, 1974).

3. A. J. Dekker, Solid State Physics (McMillan, Madras, 1971).

4. M. M. Woolfson, An Introduction to X-ray Crystallography (Cambridge University Press, Cambridge, 1991).

ATOMIC PHYSICS

Paper code: 14U6PHC08

Subject Description

Analysis of positive rays, Isotopes, atomic structures, models in various aspects, spectral lines subjected to magnetic fields, light inducing electron emission, X –rays and their diffraction.

Goals and Objectives

- ➢ To provide a detailed study of atom and its properties.
- ➢ To learn the matter-matter and light-matter interactions and therefore understanding the working of atomic power stations.
- ➢ To learn the behavior of atom in various states

I Positive Ray Analysis   10

Properties of positive rays– e/m of positive rays - Thomson's Parabola method – Aston's, Bain's bridge's – Determination of Critical Potential – Franck and Hertz's experiment.

II Photo Electricity   12

Photoelectric emission – laws – Lenard's experiment – Richardson & Compton experiment - Einstein's Photoelectric equation – Experimental verification of Einstein's Photoelectric equation by Millikan's experiment – Photoelectric cells and applications.

III Vector Atom Model   10

Various quantum numbers, L-S and j-j couplings – Pauli's exclusion principle – electronic configuration of elements and periodic classification – magnetic dipole moment of electron due to orbital and spin motion – Bohr magnetron – Stern and Gerlach experiment.

IV Fine Structure of spectral Lines   15

Spectral terms and notations – Selection rules – intensity rule and interval rule – Fine Structure of sodium D lines – Alkali spectra – Fine structure in Alkali spectra – Spectrum of Helium – Zeeman effect – Larmour's theorem – Debye's quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – theoretical explanation, Lande's 'g' factor and explanation of splitting of D1 and D2 lines of sodium – Paschen back effect and Stark effect.

X-Rays - Bragg's Law – Bragg's X-ray spectrometer – origin and analysis of continuous X-ray spectrum and characteristic X-ray spectrum –Mosley's law and its importance – Compton effect – derivation of expression for change in wavelength – its experimental verification.

Books for Study and References:

1. Modern Physics by R.Murugeshan, S.Chand & Co , 8th Edition 2001.

2. Modern Physics – J.B. Rajam, S.Chand& Co , 10th Edition, 1984.

Books for Reference:

1. Atomic and Nuclear Physics – N.Subramaniam and Brijlal, S.Chand & Co Ltd, 2007.

2. Arthus Beiser, "Concept of Modern Physics: McGraw Hill Ed. V, (1999).

NUCLEAR PHYSICS

Paper Code: 14U6PHC09

Subject Description: This paper presents the fundamentals of formation of nucleus, composition of nucleus with their energy.

Goal: To enable the students to acquire knowledge of the nuclear energy, fission and fusion with particle accelerator.

Objectives
To acquire knowledge and apply it to
- ➤ Study the structure of nucleus
- ➤ Know the formation of nucleus and their binding energy
- ➤ To motivate the students to analyze the energy released by the nucleus during the fission and fusion process and therefore understanding the working of Nuclear power stations.

I Nuclear Properties   **10**

Nuclear size, shape, mass – Charge distribution – Spin and parity – Binding energy – Semi empirical mass formula – Nuclear stability – Mass parabola – Nuclear isomerism-Nuclear forces – Meson theory – Magnetic dipole moment of nuclei.

Nuclear models: liquid drop model- Shell model- Collective model-Optical model

II Nuclear radiations   13

Detectors : Basic principles of particle detectors – Ionization chamber – Proportional counter - G.M counters – Bubble chamber- Solid state detectors – Scintillation counters .

Accelerators:

Vande graaff generator- Linear accelerators --Cyclotron – Synchrocyclotron – Synchrotron – Betaron.

III Radioactive Decays   **10**

Alpha decay– Geiger-Nuttal law – Gamow theory – Neutrino hypothesis – Magnetic spectro graph- Neutrino theory of beta decay – Selection rules – Non conservation of parity – Gamma emission – Selection rules - Interaction of charged particles with matter-Internal conversion – Law of radioactive disintegration- Law of successive disintegration .

III Nuclear Reactions   12

Types of nuclear reactions -Q-value equation –Nuclear transmutations –Scattering cross section.

Nuclear fission and fusion

Bohr-Wheeler's theory – Chain reactions-Atom bomb – Basic fusion processes - Stellar energy – Thermo nuclear reactions.

Nuclear Reactor:

Principle – pressurized water reactor – Boiliing water reactor – Fusion Reactor.

V Elementary Particles   15

Classifications – Fundamental interactions – Quantum Numbers- Baryon-Lapton- Strangeness- Hyper charge-iso spin-Quark Model- conservation law- Parity- Charge-CPT theorem – Violation of CP.

Books for Study

1. Modern Physics By R.Murugasen ,S.Chand& Co , 8th Edition, 2001.
2. V. Devanathan, Nuclear Physics, Narosa Publishing House (2006)

Books for Reference

1. S. B. Patel, Nuclear Physics: An Introduction (Wiley-Eastern, New Delhi, 1991).
2. B. L. Cohen, Concepts of Nuclear Physics (Tata McGraw Hill, New Delhi, 1988).
3. H. S. Hans, Nuclear Physics: Experimental and Theoretical (New Age International Publishers, New Delhi, 2001).
4. D. C. Cheng and G. K. O'Neill, Elementary Particle Physics: An Introduction (Addison- Wesley, 1979).
5. D. Griffiths, Introduction to Elementary Particles (Wiley International, New York, 1987

PAPER CODE: 14U6PHP03

CORE PRACTICAL –III

1. Cantilever – Young's modulus mirror and telescope dynamic method

2. Coefficient of viscosity – Ungraduated burette

3. Comparison of mutual inductance - BG

4. Spectrometer – i-i' curve

5. Spectrometer small angled prism

6. Potentiometer – calibration of high range voltmeter

7. Lee's disc – thermal conductivity of a bad conductor

8. Deflection magnetometer M& Bh TAN C position.

9. FET Characteristics

10. UJT Characteristics

11. Hartley oscillator

12. Colpitt's oscillator

CORE PRACTICAL –IV

1. Koenig's method –Uniform Bending

2. Koenig's method –Non-Uniform Bending

3. Cantilever – dynamic method

4. Bifilar pendulum – Parallel threads

5. Newton's rings – Refractive index of liquid

6. Spectrometer - Dispersive power of a Grating

7. Spectrometer – Cauchy's constant

8. Potentiometer EMF of a thermocouple

9. Field along the axis of coil – Vibration Magnetometer

10. Carey foster bridge – temperature coefficient of resistance

11. Astable multivibrator using 555 timer

12. Monostable multivibrator using 555 timer

QUANTUM MECHANICS AND ITS RELATIVITY

Paper code: 14U5PHE01

Subject Description: This paper presents the fundamentals of wave mechanics, Schrödinger's wave equation and its applications.

Goal: To enable the students to acquire the problem solving ability and to apply the Schrödinger's wave equation for the situation of different physical problems.

Objectives
To acquire knowledge and apply it to
   ➢ Various physical problems
   ➢ To develop the problem solving ability.
   ➢ To motivate the students to apply Schrödinger's equation or solving problems in wave mechanics, nuclear physics etc.,

I Wave Nature Of Matter   **10**

Foundation of Wave mechanics – inadequacy of classical mechanics – dual nature of matter – expression for de-broglie wavelength - Davisson and Germer's experiment – normal incidence and oblique incidence – G.P Thomson experiment – wave velocity and group velocity for de Broglie waves – wave packet.

II Wave Mechanics -I   **12**

Heisenberg's uncertainity principle – physical significance of Heisenberg's uncertainity relation – illustration of uncertainity principle - Heisenberg's gamma ray microscope – operators in quantum mechanics – operators for momentum, K.E, total energy –linear operator – adjoint operators- Commutators –commutation relation between position and momentum.Ladder operators L+,L-.

III Wave Mechanics –II   **14**

Wave function for a free particle – physical interpretation of the wave function – equation of motion of matter wave – schroedinger'equation (time independent, time dependent and for free particle) – orthogonal, normalized and orthonormal wave function– Expectation values of dynamical quantities – probability current density – Ehrenfest's theorem – eigen value and eigen function equation.

IV Application Of Wave Mechanics   **12**

Application of Schrodinger's equation to one dimensional problems – free particle – particle in a bound state – particle in a rectangular potential step – reflection and transmission co-efficient of rectangular potential barrier –application of a barrier penetration -α decay - linear harmonic oscillator –rigid rotator-hydrogen atom.

V Relativity   **12**

Reference systems-inertial frames- gallien invariance and conservation laws – propagation of light – Michelson-Morley experiment- postulates for the special theory of relativity- Lorentz transformation – length contraction – time dilation – velocity addition theorem – variation of mass with velocity - mass-energy relation.

Books for study:

1. Mordern physics,R.Murugesan.S.Chand & Co.,New Delhi, 8th Edition, 2001.

2. A text book of quantum mechanics,Matheews & Venkatesan,Tata McGraw Hill,New Delhi, 2002.

Books for Reference:

1. Quantum Mechanics, Ghatak and Loganathan, Macmillan India.

2. Quantum Mechanics, Aruldhas, Prentice Hall of India.

3. Quantum mechanics,Satya Prakash and C.K.Bagde,

ELECTRONICS AND COMMUNICATIONS

Paper code: 14U6PHE02

Subject Description: This paper presents the fundamentals electronics communication systems.

Goal: To enable the students to acquire the knowledge about the types of communication systems, elements used in communication systems and modes of communications.

Objectives
To acquire knowledge about
  ➢ The working principles of communication systems.
  ➢ How to handle the communication elements.

I Modulations   10

Communication – Components of a communication system – Wireless communication system – Necessity for modulation – Modulation – Amplitude modulation principle – Frequency modulation principle –Phase modulation - Modulation factor – Percentage of modulation – Assignable frequency spectrum. Detector – AM detector – AGC.

II AM Transmitter and Receiver Fundamentals: 13

   Low level modulation – High level modulation – Exciter –The driver– The modulator – Direct neutralization. TRF receiver – Superheterodyne principle – Superheterodyne receiver – Double conversion receiver – Image frequency rejection – S/N ratio – Sensitivity – Selectivity – RF amplifier – Mixer – Local oscillator – IF amplifier working.

III Communication Elements: 11

Variable frequency oscillator – Reactance modulator- PLL – Frequency multiplier – Power output amplifier – FM limiter- The discriminator – The ratio detector –AFC - Balanced modulator principle – Phase modulator – Frequency divider.

IV Antennas and Propagation   12

The half wave dipole – Its Characteristics -Impedance and radiation pattern – The folded dipole – Characteristic impedance and radiation pattern – Parabolic reflector antenna - Parasitic array antenna- Features and applications Transmission line – Cable types – Co- axial and wire - pair – Maximum power transfer.

V Communication Types   12

RADAR principle – Satellite communication fundamentals – Up Link – Down Link –Transponder – Multiplexing technique – Basic PCM technique – Basic ideas of cell phone and FAX – Fibre optic communication fundamentals – Advantages and disadvantages.

Books for Study

1. Electronic communication, Modulation and Transmission - Robert J. choenbeck –Universal Book Stall, Delhi, 1992

2. Electronic Communication Systems –George Kennedy, Tata McGraw Hill 4th edition, 1999.

Books for References

1. Principles of Communication Engineering – Anokh Singh, S.Chand &Co. Delhi, 1999.

2. Communication Electronics – N.D. Despande and others – Tat McGraw Hill, 2004.

3. Electronic Communication, Dennis Roddy and John Coolen, Prentice Hall Career and Technology, 4th edition, 1995

NUMERICAL METHODS

Paper code: 14U6PHE03

Subject Description: This paper presents the mathematical aspects to solve the physical problems.

Goal & Objectives:
To acquire knowledge about
- ➢ Mathematical equations which can be applied in physical problems.
- ➢ To motivate the problem solving ability of students.

I Curve Fitting: 10

Method of averages – Least square fitting – Normal equations – Straight line fit - curve fitting – parabola and exponential.

II Numerical Solution of Algebraic and Transcendental Equations: 12

The iteration method – Newton – Raphson method – Iterative rule – General iterative process – Modified Euler'method-Runge kutta method(second and third orders only)-Regula Falsi method.

III Simultaneous Linear Equations 12

Solution of simultaneous linear equation –iterative method-Gauss elimination method – Jacobi method modification – Gauss–Seidel method of iteration – Matrix method of inversion-eigen value and eigen vectors of a matrix.

IV Interpolation 12

Linear interpolation – Lagrange interpolation method – Newton forward and backward interpolation formula – Newton's interpolation formula for unequal intervals.

V Numerical Integration 12

Gaussian quadrature formula - Newton's forward and backward difference formula to compute derivatives – Numerical integration: the trapezoidal rule - Simpson's 1/3 rule – Simpson's 3/8 rule- Extended Simpson's rule.

Books for Study
1. Introductory Methods of Numerical analysis – S.S. Sastry, Prentice – Hall of India, New Delhi (2003) 3rd Edition.

2. Numerical Methods A.Singaravelu – Meenakshi Agency,Chennai 2001 .

Books for Reference

1. M.K. Jain, S.RA.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, 2003
2. J.H. Mathews, Numerical Methods for Mathematics, Science and Engineering (Prentice-Hall of India, New Delhi, 1998)
3. S.D. Conte, C. Boor, Elementary Numerical Analysis (McGraw –Hill, Singapore, 1981) 3rd edition

Nanoscience

Paper Code: 14U5PHE04

Subject Description: This gives a basic knowledge about Nanotechnology, its characterization and applications.

Goal & Objectives

- ➢ To provide the basic skills required to understand, develop, and design Nanomaterials.
- ➢ To enhance the research interest in Nanotechnology.

I Introduction: **14**

Introduction, classification of nanomaterials, nano particles and nano powders, nanostructured materials, zero, one, two and three dimensional nanostructures, mechanism of formation of nanostructures.

II Synthesis Techniques: **12**

Top down and bottom up approach, sol gel synthesis, spin coating, spray pyrolysis, hydrothermal synthesis, electrochemical deposition, electrospinning, Molecular beam epitaxy (PVD), chemical vapour deposition (CVD),

III Fullerenes: **10**

Synthesis and purification of fullerenes, pressure effects, optical and some unusual properties, ferromagnetism in fullerenes.

Synthesis and purification of Carbon nanotubes, mechanism of growth, electronic structure, transport properties, mechanical properties, physical properties, applications.

IV Nanomagnetism: **10**

Importance of nanoscale magnetism, magnetism in particles with reduced size and dimension, variation of magnetic moments with size, magnetism in clusters of non magnetic solids, magnetic behaviour of small particles.

V Applications: **14**

Applications of nano in colorants and pigments, electronics and magnetic, nano bio sensors
- Drug delivery, DNA array devices, MEMs, NEMs.

Books for Study:

1. Nano: The Essentials, T. Pradeep, TMG Hill.

2. Nanoscale materials in chemistry, Kenneth, John Wiley and Sons.

3. Science and technology of nanostructured magnetic materials, George, Plenum
    Press, New York.

4. Nanobiotechnology: Concepts, Applications, Perspectives, Christof, and Chad.

ASTROPHYSICS

Subject Description:

This paper deals with the space science.

Objective:

To impart an understanding of the great number of diverse phenomena in the Universe through Physics.

I Astronomical instruments

Optical telescope - reflecting telescope - types of reflecting telescope - advantages of reflecting telescope - Radio telescopes – astronomical spectrographs - photographic photometry - photo electric photometry - detectors and image processing.

II Solar system

The sun-physical and orbital data - Photosphere - Chromosphere - corona - solar prominences - sunspot - sunspot cycle - theory of sunspots - solar flare - mass of the sun - solar constant - temperature of the sun - source of solar energy - solar wind. Other members of the solar system - Mercury - Venus - Earth - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto - Moon - Bode's law - Asteroids - comets - Meteors.

III Stellar Evolution, Binary and variable stars

Birth of a star - Death of a star - Chandrasekhar limit - white dwarfs – Neutron stars - black holes - Quasars - Nebulae – Supernovae Binary stars - Origin of Binary stars. Variable stars - Cepheid variables – RV Tauri variables - long period variables - irregular variables - flare stars.

IV Magnitudes, distance and spectral classification of stars

Magnitude and brightness - apparent magnitude of stars - absolute magnetic of stars - relation between apparent magnitude and absolute magnitude of stars - Luminosities of stars - measurement

of stellar distance - Geometrical parallax method - distance from red shift measurement - Harvard system of spectral classification.

V Theories of the universe, galaxies and star clusters

Origin of the universe - the big bang theory - the steady state theory – the oscillating universe theory - Hubble's law. Galaxies - types of galaxies - Milky Way - star clusters - open clusters – globular clusters.

BOOK FOR STUDY

Astrophysics of the Solar System – KD Abhyankar, University Press Pvt. Ltd., Hyderabad, 1999

BOOK FOR REFERENCE

1. K.S. Krishnasamy, 'Astro Physics a modern perspective,' Reprint, New Age International (p) Ltd, New Delhi,2002.
2. Baidyanath Basu, 'An introduction to Astro physics', second printing, prentice - Hall of India Private limited, New Delhi,2001.
3. R. Murugesan, ' Modern Physics', Eleventh revised edition, S. Chand & Company Ltd, New Delhi, 2003.

MATHEMATICAL PHYSICS

Subject Description:

This paper presents the mathematical aspects to solve the physical problems.

Goal & Objectives:

- ✓ To impart knowledge about physical phenomena to solve physical problems.
- ✓ To provide basic skills to learn and appreciate physics through mathematics.

UNIT - I Functions and Multiple Integrals

Functions – Graphs of Elementary functions – Continuity of Functions – Total Differential of a function – Change of variables. Double Integrals – Double Integrals in Polar coordinates – Applications. Triple Integrals – Triple Integrals in Spherical Coordinates – Applications

UNIT - II Field Theory

Line and Surface Integrals – Differential Operators - Grad, Div and Curl – Vector Relations – Gauss Theorem – Stokes Theorem - Green's Theorem – Physical Interpretation - Applications.

UNIT - III Special Functions

Definitions - simple properties of Gamma, Beta, Delta and Error functions – series solutions of Legendre and Hermite differential equations - Orthogonality properties, Generating functions and Rodrigue's Formula (Expressions only).

UNIT - IV Fourier Series and Fourier Transform

Dirichlet's Conditions – Definition of Fourier Series – Determination of Fourier Coefficients – Fourier series for odd and even functions – Applications (Half wave, Full wave, square wave, saw tooth and triangular wave) – Fourier Transform – Definition – Theorems – Fourier Transform of Slit function and Delta function.

UNIT – V Numerical Methods

Transcendental Equation - Solving by Graphical Method – Newton Raphson method. Numerical Integration – Trapezoidal and Simpson's 1/3 rule - Numerical Method of solving differential equation – Euler's Method – Runge-Kutta IV order method – applications.

BOOK FOR STUDY & FOR REFERENCE:

1. BS Rajput and Yoga Prakash, Mathematical Physics, Pragati Prasashan, Meerut, 1989.
2. Sathiya Prakash, Mathematical Physics, S Chand, New Delhi, 2/e, 2004.