VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN

(AUTONOMOUS)

SCHEME OF EXAMINATIONS UG

PG AND RESEARCH DEPARTMENT OF PHYSICS

B.Sc., DEGREE – SYLLABUS

2017 - 2018

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 2017-18 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2017-18 and thereafter.

Sem	Subject code	Part	Course	Subjects	Hrs/ week	Credits	Int. marks	Ext. marks	Tot. marks
I	17U1LT01	I	Language-I	Tamil-I	6	3	25	75	100
	17U1LH01			Hindi-I					
	17U1LM01			Malayalam-I					
	17U1LE01	II	English-I	English-I	6	3	25	75	100
	17U1MAA01	III	Allied-I	Allied- Mathematics-I	5	3	25	75	100
	17U2MAAP01		Allied	Allied Mathematics Practical	3	-	-	-	-
	17U1PHC01	III	Core-I	Major-I- Properties of matter & Acoustics	5	5	25	75	100
	17U2PHCP01		Core	Major Practical-I	3	-	-	-	-
	17U1VE01			Value education – (Yoga)	2	2	25	75	100
				Total	**30**	**16**	**125**	**375**	**500**
II	17U2LT02	I	Language-II	Tamil-II	6	3	25	75	100
	17U2LH02			Hindi-II					
	17U2LM02			Malayalam-II					
	17U2LE02	II	English-II	English-II	6	3	25	75	100
	17U2MAAP01	III	Allied	Allied Mathematics Practical	3	3	40	60	100
	17U2MAA02		Allied-II	Allied- Mathematics-II	5	3	**25**	**75**	**100**
	17U2PHC02	III	Core-II	Major-II- Heat and Thermodynamics	5.	5	25	75	100
	17U2PHCP01		Core	Major Practical-I	3	4	40	60	100
	17U2ES01	IV		Environmental studies	2	2	25	75	100
				Total	**30**	**23**	**205**	**495**	**700**
III	17U3LT03	I	Language-III	Tamil-III	6	3	25	75	100
	17U3LH03			Hindi-III					
	17U3LM03			Malayalam-III					
	17U3LE03	II	English-III	English-III	6	3	25	75	100
	17U3CHA01	III	Allied-III	Allied Chemistry-I	4	3	25	75	100
	17U4CHAP01		Allied	Allied chemistry Practical	2	-	-	-	-
	17U3PHC03	III	Core-III	Major-III- Optics	4	5	25	75	100
	17U4PHCP02		Core	Major Practical-II	3	-	-	-	-
	17U3PHS01	IV	SBEC-I	Laser Technology	3	3	25	75	100
	17U3PHN01	IV	NMEC-I	Essentials of Electricity	2	2	25	75	100
				Total	**30**	**19**	**150**	**450**	**600**
IV	17U4LT04	I	Language-IV	Tamil-IV	6	3	25	75	100
	17U4LH04			Hindi-IV					
	17U4LM04			Malayalam-IV					
	17U4LE04	II	English-IV	English-IV	6	3	25	75	100
	17U3CHA02	III	Allied-IV	Allied Chemistry-II	4	3	25	75	100
	17U4CHAP01		Allied	Allied chemistry Practical	2	3	40	60	100
	17U4PHC04	III	Core-IV	Major-IV- Mechanics	4	5	25	75	100
	17U4PHCP02	III	Core	Major Practical-II	3	4	40	60	100
	17U4PHS02	IV	SBEC-II	Energy Physics	3	3	25	75	100
	17U4PHN02	IV	NMEC-II	Physics in Everyday Life	2	2	25	75	100
				Total	**30**	**26**	**230**	**570**	**800**

B.Sc., Physics, VICAS - Autonomous

				Major-V- Electricity and magnetism	6	5	25	75	100
V	17U5PHC05	III	Core-V						
	17U5PHC06	III	Core-VI	Major-VI- Basic electronics	5	5	25	75	100
	17U5PHC07	III	Core-VII	Major-VII- Quantum mechanics and its relativity	5	5	25	75	100
	17U5PHE01	III	Elective-I	Elective-I- Solid state physics	5	5	25	75	100
	17U5PHS03	IV	SBEC-III	Electrical Appliances	3	3	25	75	100
	17U6PHCP03	III	Core	Major Practical-III	3	-	-	-	-
	17U6PHCP04	III	Core	Major Practical-IV	3	-	-	-	-
				Total	**30**	**23**	**125**	**375**	**500**
VI	17U6PHC08	III	Core-VIII	Major-VIII- Atomic Physics	6	5	25	75	100
	17U6PHC09	III	Core-IX	Major-IX- Nuclear Physics	5	5	25	75	100
	17U6PHE02	III	Elective-II	Elective- Numerical methods	5	5	25	75	100
	17U6PHE03	III	Elective-III	Elective -Digital electronics and Microprocessor	5	5	25	75	100
	17U6PHS04	IV	SBEC-IV	Bio-medical instrumentation	3	3	25	75	100
	17U6PHCP03	III	Core	Major Practical-III	3	4	40	60	100
	17U6PHCP04	III	Core	Major Practical-IV	3	5	40	60	100
	17U6EX01	-	-	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.	17U5PHE01	Solid State Physics
2.	17U6PHE02	Numerical methods
3.	17U6PHE03	Digital electronics and Microprocessor
4.	17U5PHE04	Nanoscience
5.	17U6PHE05	Astrophysics
6.	17U6PHE06	Mathematical Physics
7.	17U6PHE07	Non-Linear dynamics
8.	17U6PHE08	Electronics and Communication

XIV. LIST OF SKILL BASED ELECTIVES

S.No	Code	Course Title
1	17U3PHS01	Laser and spectroscopy
2	17U4PHS02	Energy Physics
3	17U5PHS03	Electrical Appliances
4	17U5PHS04	Bio-medical instrumentation

XV. NON MAJOR ELECTIVE COURSE

S.No	Code	Course Title
1	17U3PHN01	Essentials of Electricity
2	17U4PHN02	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: 17U2PHC02

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: Thermodynamics   **10**

Zeroth and first law of thermodynamics-reversible and irreversible processes- second law of thermodynamics-Carnot's engine- efficiency.

Entropy-change of entropy in reversible and irreversible processes- temperature-entropy diagrams–third law of thermodynamics-Maxwell's thermodynamic relations

Unit III: Low Temperature Physics   **14**

Joule–Thompson effect- porous plug experiment-liquefaction of gases- Helium I & II–adiabatic demagnetization–superconductivity–refrigerator.

Unit IV: Transmission of Heat   **14**

Definition–conduction, convection and radiation-thermal conductivity-Lee's disc method–lapse rate–stability of the atmosphere-Greenhouse effect - Radiation- black body radiation Wein's law–Raleigh Jean's law–Planck's law–Stefan's law– pyrometry –solar constant–Angstrom pyrheliometer-water flow pyrheliometer.

Unit V: Statistical Thermodynamics   **10**

Bose-Einstein Distribution law-Fermi-Dirac Distribution Law-Energy 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., (2004).

4. University Physics, Richard Wolfson, Addison Wesley-Pearson (2011).

Books for References:

1. BrijLal and Subramaniam & P. S. Hemn, Heat and Thermodynamics, Revised and Multicolour Edition (2007).
2. D.S. Mathur, Heat and Thermodynamics S. Chand & Company, 5th Edition (2008).
3. Sharma J.K & Sarkar K.K. Thermodynamics and Statistical Physics Himalaya Publishing House, 3rd Edition (1991).

CORE PRACTICALS – I

PAPER CODE: 17U2PHCP01

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. Viscosity of liquid by graduated burette method.

ALLIED PHYSICS - I

Paper Code: 17U1PHA01

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- 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-

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: 17U2PHA02

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 -zenor diode -low range power pack -inverting and non inverting - 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: 17U2PHAP01

<u>**List of Experiments:**</u>

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. verification of Demorgans theorem

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 NAND NOR gates

14 FET Charateristics

15. Field along the axis of the coil-B_H

16.. Lee's Disc-Thermal conductivity.

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 and Interference   **12**

Black body radiation. Coherence-phase difference and path difference - Fresnel & Fraunhofer diffraction-Rectilinear propagation of light- Zone plate -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 II Diffraction   **12**

Superposition of waves – Young's double slit experiment – wavefront divisions – 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.

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   **12**

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

spheric 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   **12**

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. New 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)

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 Laws of Motion 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 - collision – kinetic energy in collision.

UNIT II Conservation Laws and Centre of Gravity 12

Law of conservation of mass, energy - angular momentum – law of conservation of angular momentum – angular acceleration and torque.

Centre of gravity of a body – distinction between centre of gravity and centre of mass – centre of gravity of solid cone, solid hemisphere, hollow hemisphere and a tetrahedron.

UNIT III Dynamics of Rigid Bodies 12

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 gravitation – inertial and gravitational mass – motion in gravitational field – Kepler's Law.

UNIT IV Friction and Hydrodynamics 10

Friction : Laws of friction, angle of friction, cone of friction, equilibrium of a body on a rough inclined plane acted upon by an external force – friction dynamometer – friction clutch.

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.

UNIT V   **14**

Classical Mechanics: Mechanics of system of particles – 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)

Credits: 4

Max. Hours: 36

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. Joule's calorimeter – specific heat capacity of a liquid

5. Newton's law of cooling – spherical calorimeter

6. Spectrometer – Grating – Normal incidence - wavelength

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 –Tan C

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.

17U3PHS01

Credit: 3

Max. Hours: 36

LASER TECHNOLOGY

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 Basic Concepts

Quantum transitions in absorption and emission of light: Energy levels of atoms and molecules, Absorption and Emission of Light, spontaneous and stimulated emission. Active medium, Population inversion. Pumping mechanisms, Einstein's coefficients and relation between them. (8)

UNIT II Laser Characteristics

Basic characteristics, Spatial and temporal coherence, Beam quality and output characteristics. Beam divergence and focusing using optical system. Types of laser based output beam: continuous, pulsed lasers, ultra short pulses.   (7)

UNIT III Solid State Lasers

Introduction, Nd : Glass, Nd: YAG and semiconductor diode lasers, construction, energy level diagram, excitation mechanisms and output characteristics.   (7)

UNIT IV Gas And Liquid Lasers

He-Ne, CO_2, Excimer and dye laser, construction, energy level diagram, excitation mechanisms and output characteristics.   (7)

UNIT V Laser Applications

Industrial applications: laser welding, laser heat treatment, laser cutting and drilling. Lasers in communication, Lasers in medicine.   (7)

B.Sc., Physics, VICAS - Autonomous

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(200

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.

UNIT III Photovoltaics   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 – characteristics, efficiency of solar cell generation

UNIT IV Biomass energy Fundamentals   7

Biomass energy–classification- Photosynthesis- Biomass conversion technology – Biogas generation-applications

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).

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- Bunsen Burner

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.- digital camera

UNIT V Domestic Electrical Appliances   **6**

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

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).

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 AND MAGNETISM

Paper Code: 17U5PHC05

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.

Unit - I: Electrostatics   12

Introduction - Electric field and Electric intensity – Energy of a system of charges-Gauss theorem - Applications of gauss theorem - Coulomb's law-Mechanical force experienced by unit area of a charged surface - Energy stored per unit volume in an electric field – Capacitor - Capacitance of a spherical and cylindrical capacitor - energy of a charged capacitor - loss of energy due to sharing of charges.

Unit - II: Magnetic Effect of Electric Current   12

Faraday's law of electromagnetic induction - Lenz law - Fleming's right hand rule - Oersted's experiment-Laplace's law or Ampere's law - Magnetic field at the centre of a circular coil carrying current-Magnetic field at a point due to a straight conductor carrying current - Magnetic field at a point on the axis of a circular coil carrying current – Magnetic induction – magnetization – Magnetic susceptibility – Permeability - Magnetic field at a point on the axis of a Solenoid - Force experienced by a conductor carrying current placed in a magnetic field of Uniform Intensity - Force between two conductors carrying current – Langevin theory of dia & para – experiments – Energy loss due to hysteresis – Importance – determination of Susceptibility by curie balance method – uses.

Unit - III: Heating Effectn of Electric Current   12

Introduction – Heat developed in a conductor carrying current – Callendar and Barnes Continues flow method - Temperature of a conductor carrying electric current - Applications of heating effect of electric current - Measurement of Electric power.

Thermoelectricity - Laws of thermo emf-intermediate metals, intermediate tempetarure - S.G. Starling method for Peltier and Thomson effect - Thermodynamics of thermocouple - Thermoelectric diagrams and their uses.

Unit - IV: Alternating Current Circuits   12

AC- measurement of AC - Power factor – RMS, Average value of current and emf - LR, LC and LCR Circuits (Series and Parallel) - Growth and decay - 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 coil – Tesla coil- Skin effect.

Unit - V: Electrical Measurements   12

Definitions - Practivcal units - Laws of resistance - Current density - Kirchaff' laws - Whestone Bridge - Sensitiveness of a Wheatstone's Bridge - Carey-Foster's Bridge - Determination of temperature coefficient - Kelvin's Double Bridge – Potentiometer - determination of internal resistance of a cell - Comparison of EMF's of Two cells - Measurement of thermo emf - Measurement of potential difference and current – Calibration of Voltmeter and Ammeter (High and low range).

Books for Study:

1. Electricity and Magnetism – R.Murugesan, S. Chand, (2008).
2. Electricity and Magnetism - Brijlal and Subramaniam, S.Chand & Co New Delhi, (2003).
3. Electricity and Magnetism, Brijlal and Subramaniam, S. Chand & Co, New Delhi (2016).

Books for Reference:

1. Fudamentals of Magnetism and Electricity - D.N.Vasudeva S.Chand, (2002).
2. Electricity and Magnetism - Nagaratanam and Lakshminarayanan, 3rd revised edition, The National Pub. Co. (1994).
3. Electricity and Magnetism - K.K Tewari, S.Chand, (2009).
4. Electricity and Magnestsim – D C Tayal, 2nd revised edition, Himalaya Pub House, (1990

BASIC ELECTRONICS

Paper Code: 17U5PHC06

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.
- ➢

Unit - I: Introduction to Semiconductor   **10**

Semiconductors -Introduction- Energy band diagram description of semiconductors-Intrinsic semiconductor - Extrinsic Semiconductor – n-type semiconductor - p-type semiconductor - Charge on n-type and p-type semiconductors - Majority and minority carriers – pn junction - Volt-ampere   I-V characteristics of pn junction - Zener diode - LED - Photo diode – Schottky diode Tunnel diode.

Unit - II: Transistor   12

Transistor - Basic configurations - CB,CE and CC mode - Transistor action - Relation between α, β and γ - DC load line - DC bias and stabilization -operating point- AC load line, transistor biasing - Fixed bias - Voltage divider bias – Transistor as a two part network - h parameter –Field Emission Transistor (FET) – principle and working.

Unit - III: Amplifiers and Oscillators   14

Amplifiers:

Amplifiers – Definition of gain, Frequency response, decibel and band width - Classification of amplifiers - Single stage and Multi stage RC couples CE amplifier - Class A,B,C - Power amplifiers - Feedback amplifier - General theory of feedback - Principles of negative voltage feedback – Advantages - Emitter follower.

Oscillators:

Oscillators - Criteria for oscillation - Construction and operation of Hartley Oscillator - Colpitt's

Oscillator - Wien's Bridge Oscillator - Phase Shift Oscillator - Piezo-Electric Oscillator.

Unit - IV: Semiconductor Devices   14

Construction, working, characteristics, parameters and applications of FET – MOSFET - Comparison between FET and Transistor – Solar cell Photodiode - LED - Tunnel diode – Photo transistor - UJT - UJT relaxation oscillator – SCR - SCR as a switch.

Unit - V: Linear ICs and Operational Amplifiers   10

Op amp - Pin configuration - Characteristics of Op amp - Virtual ground -Off-set voltage - Inverting amplifier - Non- inverting amplifier - Differential amplifier - Common mode rejection ratio – Application - op-amp as Adder-Subtractor – Integrator – Differentiator – Comparotor- Multivirators- IC 741 Astable, Monostable and Bistable multivibrators.

Power point presentation, Seminar, Quiz, Assignment

Books for Study:

1.V K Mehta, Principles of Electronics, S.Chand and Company Ltd., (2012).

2.B.L. Theraja, Basic Electronics (Solid state), S. Chand & Co., (2006).

Books for References:

1. Hand book of Electronics by Gupta Kumar, Published by Pragati Prakashan, (2010).

2. D. Chattopadhyay et al., Foundations of Electronics 2nd edition, Wiley Eastern   Ltd, New Delhi, (1988).

3. Gupta & Kumar, Hand book of Electronics, Pragati Prakhasan, Meerut,   (2012).

SOLID STATE PHYSICS

Paper Code: 17U5PHC07

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.

Unit - I: Crystal Structure   **14**

Crystalline and Amorphous solids - Crystal structure: basis and crystal structure - Primitive lattice cell and unit cell - Bravais lattices in two dimensions and in three dimensions – Lattice planes and Miller indices - interplanar distance - spacing between planes in SC, FCC and BCC - Atomic packing - Atomic radius-lattice constant and density - Crystal structures (SC, HCP, FCC, BCC) - other cubic structures Diamond, Sodium chloride and Cesium chloride.

Unit - II: Crystallography and Crystal Imperfections   **12**

X-rays: Bragg's law - Laue method - Rotating crystal method - Powder photograph method.

Bonding in Solids: (Qualitative Treatment) Ionic-Covalent - Metallic-Molecular bonds.

Crystal Defects: (Qualitative Study): Frenkel defect - Schottky defect - Edge dislocation - Screw dislocation.

Unit - III: Magnetic Properties   **12**

Different types of magnetic materials - classical theory of diamagnetism (Langevin's theory) - Langevin's theory of paramagnetism - Weiss theory of paramagnetism - quantum theory of ferromagnetism - anti ferromagnetism - ferrites-general properties of superconductivity - Meissner effect - BCS theory - entropy and heat capacity - Energy gap - Type I and II superconductors.

Unit - IV: Dielectrics   **12**

        Definition of dielectrics - Different types of electric polarization - Frequency and temperature effects on polarization - Dielectric loss - Clausius - Mosotti relation - Determination of dielectric constant - Dielectric breakdown - Properties of different types of insulating materials.

Unit - V: Advanced Materials   **10**

        Polymers – Ceramics - super strong materials - cermets high temperature materials - thermoelectric materials – electrets - nuclear engineering materials - plastics metallic glasses - optical materials - fiber optic materials & uses.

Books for Study:

  1Solid State Physics by Gupta, Kumar, Nath & Co., (2013).

  2 Modern Physics R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Co, New Delhi, (2016).

  3.Material Science - M. Arumugam, Anuradha Agencies, (2004).

  4. Solid State Physics, S. O. Pillai, New Age International (P) Limited, (2006).

Books for Reference:

  1. Introduction to Solid State Physics, Charles Kittel, John Wiley & Sons, 8th Edition, (2004).

  2. Materials Science and Engineering, V. Raghavan, Prentice Hall (India) Ltd., (2004).

  3.Introduction to Solids - Leonid V. Azaroff, Tata Mc-Graw Hill, (2004).

  4. Solid State Physics - A.J. Deckker, Macmillan India, (2004).

QUANTUM MECHANICS AND RELATIVITY

Paper code: 17U5PHE01

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.,

Unit - I: Wave Nature of Matter   **10**

Mechanics - Comparison of Classical and Quantum ideas - Dual Nature of Matter - Expression for de-Broglie wavelength – G.P Thomson experiment - Expression for group velocity - Group Velocity for de Broglie waves - Relation between wave velocity and group velocity - Wave packet.

Unit - II: Wave Mechanics – I   **12**

Heisenberg's Uncertainty Principle - physical significance of Heisenberg's Uncertainty relation - Illustration of Uncertainty principle - Heisenberg's gamma ray microscope - Diffraction of a beam of electrons by a slit - Operators in quantum mechanics - Operators for Momentum, K.E, Total energy - Linear operator - Adjoint operators – Commutators - Commutation relation between position and momentum - Commutation relation between Spin and Angular momentum - Ladder operators L_+, L_-.

Unit - 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 - Helium atom - Eigen value and Eigen function equation.

Unit - IV: Applications of Wave Mechanics   **12**

Application of Schrodinger's equation to one dimensional problems - free particle - finite square potential well - 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.

Unit - V: Relativity   **12**

Special theory of relativity - Postulates of special theory of relativity - length contraction - time dilation - reference systems - inertial and non-inertial frames - Galilean transformation equations - Lorentz transformation equations - the Ether hypothesis - the Michelson - Morley experiment-– variation of mass with velocity - Mass-Energy relation- Elementary ideas of general theory of relativity.

Books for Study:

1. Modern Physics, R. Murugesan, S.Chand & Co., New Delhi, (2005).

2. Modern Physics, R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Co, New Delhi, (2016).

3. V.K. Thangappan, Quantum mechanics, New Age International, (1993).

4. G. Aruldass, Quantum Mechanics, Prentice–Hall of India Pvt. Limited, (2002).

5. Relativity and Quantum Mechanics, P.K. Palanisamy, Scitech Publications (India) Pvt Ltd, Kumbakonam, (2007).

Books for Reference:

1. A text book of quantum mechanics, P.M Matheews & K.Venkatesan,Published by Tata McGraw Hill, New Delhi, (1989).

2. Quantum Mechanics, Satya Prakash, Swati Saluja, Published by Kedar Nath Ram Nath, (2019).

3. Quantum Mechanics, V. Devanathan, Narosa Pub. House, Chennai, (2005).

4. Quantum Mechanics, S. P. Singh, M. K. Bagde, S. Chand & Co, New Delhi, (2002).

DIGITAL ELECTRONICS

Paper code: 17U5PHS03

Subject Description: This paper presents basic principles of digital electronics. This paper gives deep knowledge to the students regarding number system, arithmetic building blocks, memories and data processing circuits.

Goal: To enable the students to learn the basic principles, theory and concepts of number system memories and data processing circuits counters

Objectives

To give description for the students in order to

- ➢ Learn the logic circuits
- ➢ Acquire basic knowledge of binary addition
- ➢ Understand the action and application of counters
- ➢ Get a deep knowledge of various memories used in computer circuits

Unit – I: Number System   **5**

       Binary number system - Conversion - binary to decimal - decimal to binary - octal numbers - hexadecimal numbers, ASCII Code.

Unit – II: Logic Gates   **5**

       The basic Gates (OR, AND, NOT), Universal logic gates - NAND/NOR- DEMORGAN'S Theorems - XOR and XNOR Gates - Half adder - Full adder - Half subtractor - Full subtractor using logic gates.

Unit – III: Combination of Logic Circuits   **5**

       Boolean algebra - Solving boolean equations - Karnaugh map method for simplifying expressions - Product of sums (POS) - Sum of products (SOP), NAND - NAND, NOR - NOR Gates.

Unit – IV: Registers   **4**

       Shift registers - Series and Parallel loading – Counters - 4 bit binary ripple counter - BCD counter - Ring counter.

Unit – V: Timing Circuits and Flip-Flops   **5**

      555 Timer – Astable, Monostable and Bistable - Multivibrators - R-S Flip-Flop, D Flip-Flop, J-K Flip-Flop, Master-Slave Flip-Flop.

Books for Study:

1.Digital Principles and Applications, Donald P. Leach and Albert P. Malvino, 5th (1994).

2.Digital Electronics, D. A. Godse and A.P. Godse, Technical Publlsher, Pune, (2008).

3.Digital Electronics, Virendra Kumar, New Age International Publishers, (2007).

4.Digital Electronics, Avinashi Kapoor and L. K. Maheswari, Principles and Practice, Macmillan India Limited, (2004).

5.V. Vijayendran, Digital Fundamentals. S. Viswanathan Printers and Publishers Pvt. Ltd., (2009).

Books for References:

1.Integrated circuits, K.R Botkar, Khanna Publications, (1987).

2.Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and C. C. Halkias, Tata McGraw - Hill Education, New Delhi, (1991).

3.Morris Mano, Digital Logic and Computer Design, Pearson Education (2004).

Credit: 2

Max. Hours: 24

BIO - MEDICAL INSTRUMENTATION

Paper code: 17U5PHS04

Unit – I: Biopotential Electrodes   **5**

Design of medical instruments - Components of the bio-medical instrument System – Electrodes – Theory - Micro electrodes – depth and needle electrodes.

Unit – II: Biopotential Recorders   **5**

Electrocardiography (ECG) - - Electroretinography (ERG)   - Electrooculography (EOG).

Unit – III: Physiological Aid Devices   **4**

Pacemakers - Different modes of operation -- Artificial heart valves - Anesthesia machine – Measurement of Blood Pressure

Unit - IV: Specialised Medical Equipment   **4**

Blood cell counter - Electron microscope - X-Ray machine – Image intenisifiers – Angiography.

Unit – V: Safety Instrumentation   **6**

Radio Monitoring instruments - Microshock and Macroshock – Endoscopes - Computer Tomography - Ultrasonic image instrumentation - MRI instrumentation.

Books for Study:

1. Bio-Medical Instrumentation, Dr. M. Arumugam, Anuradha Agencies, (2002).

2. Bio Instrumentation, John G. Webster, editor John Wiley & Sons, Inc, (2004).

3. Biological Instrumentation and methodology, P.K. Bajpai, S Chand & Co, (2010).

Books for Reference:

1. Bio-medical instrumentation, Dr. M. Arumugam, Anuradha Agencies, (2009).
2. Handbook of Biomedical Instrumentation, Dr R.S. Khandpur: Blood Cell Counters, Chapter (McGraw-Hill Professional, Third Edition, (2014).
3. Handbook of Biomedical Instrumentation, Dr R.S. Khandpur, McGraw Hill.

ATOMIC PHYSICS

Paper code: 17U6PHC08

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, nucleus and their properties.
- ➤ To learn the matter-matter and light-matter interactions and therefore understanding the working of atomic power stations.
- ➤ To learn the behaviour of atom in various states.

Unit - I: Positive Ray Analysis   **10**

Discovery-Properties of positive rays– e/m of positive rays - Thomson's Parabola method – Aston's mass spectrograph - Bain's bridge's mass spectrograph -Critical potential – Ionization potential – Excitation potential-Methods of excitation - Determination of Critical Potential – Franck and Hertz's experiment.

Unit - I: 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 - Photo electric cells and its application.

Unit - III: Vector Atom Model   **10**

Introduction-Sommerfield atom model-Rutherford atom model-Bohr atom model-Various quantum numbers, - LS and JJ coupling – 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.

Unit - IV: Fine Structure of Spectral Lines **15**

Spectral terms and notations – Selection rules – intensity rule and interval rule – Fine Structure of sodium D lines –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.

Unit - V: X- Rays **13**

-Production of X-Rays -Absorption of 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 – Compton effect – Derivation of expression for change in wavelength - its experimental verification.

Books for Study:

1. Modern Physics, R. Murugesan, Published by S. Chand & Co., New Delhi, (2005).

2. Modern Physics, R. Murugeshan and Kiruthiga Sivaprasath, Published by

   S. Chand &Co, New Delhi, (2016).
3. Modern Physics, J.B. Rajam, Published by S. Chand & Co, (2004).

4. Atomic and Nuclear Physics – N. Subramaniam and Brijlal, Published by

   S. Chand & Company Pvt Ltd., (2004).

Books for References:

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

2. Atomic and Nuclear Physics by H. Semat and J.R. Albright, Chapman and

   Hall, (2003).

   1. Atomic and Nuclear Physics by S.N. Ghoshal, Published by S. Chand & Co, (2004).

NUCLEAR PHYSICS

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.

Unit –I: Nuclear Properties   **10**

-Classification and Properties of nuclei **-** Binding energy-Nuclear stability - Mass parabola -Nuclear isomerism-Nuclear forces-Magnetic dipole moment of nuclei- **Nuclear models:** Liquid drop model - Shell model-

Unit–II: Nuclear Radiations   **13**

Detectors: Basic principles of particle detectors-Ionization chamber-G.M counter-Characteristics-Proportional counter-Wilson cloud chamber-Bubble chamber - Scintillation counters

Accelerators: Synchrocyclotron–Synchrotron–Electron and proton synchrotron –

Unit – III: Natural Radioactivity   **10**

Alpha decay-Geiger-Nuttal law-Gamow's theory -Neutrino theory of beta decay Half life period–Mean life–Decay constant–-Fajan's Soddy displacement law - Magnetic Spectrograph-Gamma emission– Selection rules-Interaction of charged particles with matter-Internal conversion-Law of radioactive disintegration- Law of successive disintegration–Carbon dating.

Unit – IV: Nuclear Reactions   **15**

Nuclear reactions–Types-Nuclear energy equations-Calculation of Q–value- Nuclear artificial transmutations -Transuranic elements.

Nuclear Fission and Fusion

      Bohr-Wheeler's theory–Fission Process-Chain reactions-Nuclear Reactor-Principle-Pressurized water reactor-Boiling water reactor-Fusion Reactor-Atom bomb-Fusion process–Hydrogen bomb-Carbon-nitrogen cycle, proton-proton cycle -Thermo nuclear reactions -Stellar energy.

Unit – V: Elementary Particles   **12**

      Fundamental interactions - Quantum Numbers – Baryon – Lepton – Strangeness – Hypercharge – Isospin - Quark Model - Conservation law – Parity – Charge - CPT Theorem.

Books for Study:

1. Modern Physics by R. Murugasen, S. Chand & Co, 8th Edition (2001).

2. V. Devanathan, Nuclear Physics, Narosa Publishing House, (2006).

3. Nuclear physics by D. C. Tayal, Himalaya Publishing house, 5th edition, (2018).

4. Nuclear Physics: An Introduction, S. B. Patel, Wiley-Eastern, New Delhi, (1991).

5. Concepts of Nuclear Physics, Bernald. L, Cohen, TMH, (1971).

Books for Reference:

1. Concepts of Nuclear Physics, B. L. Cohen, Tata McGraw Hill, New Delhi, (1988).

2. Nuclear Physics: Experimental and Theoretical H. S. Hans, New Age International Publishers, New Delhi, (2001).

3. Elementary Particle Physics: An Introduction, D.C. Cheng and G.K. O'Neill, Addison-Wesley, (1979).

4. Introduction to Elementary Particles, D. Griffiths, Wiley International, New York, (1987).

5. Basic Nuclear Physics and Cosmic rays, B.N. Srivatsava, Pragati Prakashan, (2016).

ELECTRONICS AND COMMUNICATION

Paper code: 17U6PHE02

Unit – I: Modulation and Demodulation   **10**

Modulation–Necessity for modulation–Principles & representation of AM, FM and PM-Modulation factor–Percentage of modulation–Advantage and disadvantage– Demodulation –AM detector –AGC.

Unit – II: AM Transmitter and Receiver Fundamentals   **13**

Low level modulation–High level modulation–TRF receiver–Super heterodyne principle–Super heterodyne receiver–Double conversion receiver–Image frequency rejection–S/N ratio–Sensitivity–Selectivity–RF amplifier–Mixer–Local oscillator–IF amplifier.

Unit – 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.

Unit – 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.

Unit – V: Communication Types   **12**

Communication–Components of a communication system–Wireless communication system Satellite communication fundamentals–Up Link–Down Link–RADAR-principle-transmitting systems–Fibre optic communication fundamentals–Advantages and disadvantages.

Books for Study:

1. Electronic Communication, Modulation and Transmissio-Robert J.
   Schoenbeck, Universal Book Stall, Delhi, (1992).

2. Electronic Communication Systems–George Kennedy, Tata McGraw Hill, 4th
   Edition, (2006).

3. Hand book of Electronics-Gupta & Kumar, Pragati Prakashan, (2005).

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: 17U6PHE03

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.

Unit – I: Curve Fitting 12

Introduction-Normal equations-Method of averages–Least square fitting– Straight line fit–nonlinear curve fit.

Unit – II: Numerical Solution of Algebraic and Transcendental Equations 12

The iteration method–-Newton–Raphson method–Runge kutta method for (Second and third orders).

Unit – III: Simultaneous Linear Equations 12

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

Unit – IV: Interpolation 12

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

Unit – V: Numerical Integration 12

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–Gaussian quadrature formula.

Books for Study:

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

2. M.K. Jain, S.RA.K. Iyengar and R.K. Jain, Numerical Methods for Scientific
 and Engineering Computation, New Age International, (2003).

3. S.D. Conte, C. Boor, Elementary Numerical Analysis, McGraw –Hill,
   Singapore, 3rd edition, (1981).

Books for Reference:

1. Numerical Methods A. Singaravelu – Meenakshi Agency, Chennai, (2001).
2. J.H. Mathews, Numerical Methods for Mathematics, Science and Engineering
   Prentice-Hall of India, New Delhi, (1998)

MICROPROCESSOR AND ITS APPLICATIONS

Paper code: 17U6PHS05

Subject Description: This subject deals with the functions and principles of Micro Processors.

Goal: To learn about function of micro processors and operate them by learning with different features.

Objectives: On successful completion of this subject the student should have

➢ The basic knowledge of computers and its processors.

➢ To operate the processors with basic idea.

Unit – I: Introduction   **3**

Microprocessor-Evolution of microprocessor-Organization of microcomputer - Microprocessor programming-Assembly language programming.

Unit – II: Architecture   **4**

Intel 8085 Microprocessor Architecture-ALU-Timing and Control unit-Data and Address bus-Pin Configuration-PSW.

Unit - III: Instruction Set   **5**

Intel 8085 Instructions-Opcode and Operands-Instruction word size-Instruction cycle-Timing diagram-Addressing modes.

Unit - IV: Memories   **5**

Counter-Stack–Subroutines-Stack pointer-Internal data bus–Mnemonics- Communication with microprocessor.

Unit – V: Simple Programs   **7**

Programs for 8-bit (i) Addition (ii) Subtraction (iii) Multiplication (iv) Division (v) Greatest and Smallest number in an array of 8-bit unsigned numbers (vi) Arranging numbers in Ascending and Descending order (vii) Sum of N-numbers

Books for Study:

1. P. Mathur, Introduction to Microprocessor, TMH, 3rd edition, (2006).

2. M. Gilmore, Microprocessor Principles and Application, TMH, 2nd edition, (1995).

3. B. Ram, Fundamentals of Microprocessor and Microcomputers, Dhanpat Rai Publications, (2005).

Books for Reference:

1. Ramesh Gaonkar, Microprocessor Architecture Programming and application, Prentice Hall PTR, 5th edition, (2002).

2. A.K. Roy and K.M. Bunchandi, Advanced Microprocessor and peripherals, TMH, 2nd edition, (2005)

Credit: 2
Max. Hours: 24

ELECTRICAL APPLIANCES

Paper code: 17U6PHS06

Subject Description: This paper presents the fundamental principle and working of electrical appliances

Goal & Objectives: To acquire knowledge about

➢ Handling household appliances.

➢ Know about the principle behind the working of appliances used in daily life.

Unit – I: Heating 5

Electrical heating-modes of transfer of heat-methods of electric heating-resistance heating-induction heating-high frequency eddy current heating- dielectric heating.

Unit – II: Welding 5

Resistance welding-Electric arc welding-DC and AC welding equipment-Energy storage welding-Occupational hazards due to chemical reactions- Industrial heating and welding.

Unit – III: Electricity 4

Electrification by friction-Two kinds of electricity-Principle and types of Capacitor and resistance.

Unit – IV: Domestic Appliances I 5

Theory and principle of operation of fans - Wet grinder - Mixer grinder - Refrigerator - Air conditioner and Air cooler-

Unit – V: Domestic Appliances II 5

Theory and principle of operation of DVD player-Washing machine- Induction stove-Iron box -Microwave oven.

Books for Study:

1. A text book in Electric power, P.L. Soni, P.V. Gupta & V.S. Bhatnagar, 2nd Edition (1995).

2. Utilisation of Electrical Energy, E.O. Taylor, Orient Longman, Orient Blackswan, (1971).

3. A Course in Electrical Power, J.B. Gupta, M/s. B.D. Jaataris & Sons, S. K. Kataria & Sons, (2009).

4. A text book in Electrical Technology, B.L. Teraja, S. Chand & Co., New Delhi Vol-1, (2010).

Books for Reference:

1. Electricity & Magnetism, R. Murugesan, S. Chand & Co., New Delhi, (2007).

2. Performance and design of A.C. Machines, M.G. Say, ELBS Third edition, (1980).

3. Theory of alternating current Machinery, Alexander Langsdort, 2nd edition, (2001).

Credit: 4

Max. Hours: 36

PAPER CODE: 17U6PHCP03

CORE PRACTICAL – III

Any 12 Experiments

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

2.Deflection magnetometer–M and B_H–TAN C position.

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 good conductor.

8.Co-efficient of viscosity-under graduated Burette-Radius by Mercury pellet method.

9.FET - Characteristics.

10.UJT - Characteristics.

11.Hartley oscillator.

12.Colpitt's oscillator.

13.SCR – Characterisitics.

14.Microprocessor 8085–Addition and Subtraction.

15.Microprocessor 8085–Multiplication and Division.

Book for Refernces:

1. Practical Physics – C. C. Ouseph, U. J. Rao, V. Vjiayendran, 1st Edition, (2015).

2. Advanced Practical Physics, S.P Singh and Pragati Prakashan, 17th Edition,   Vol–I, II.

3.   P. R. Sasi Kumar, Practical Physics–PHI, (2011).

CORE PRACTICAL – IV

PAPER CODE: 17U6PHCP04

Any 12 Experiments

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.

13.Operational amplifier: Intergrator and differentiator.

14.V-I characteristics of LED.

15.RS Flip-Flop using NAND and NOR gates.

Book for Refernces:

1. Practical Physics – C. C. Ouseph, U. J. Rao, V. Vjiayendran, 1st Edition, (2015).

2. Advanced Practical Physics, S.P Singh, and Pragati Prakashan, 17th Edition, Vol–I, II.

3. P. R. Sasi Kumar, Practical Physics – PHI, (2011).