SHRIMATI INDIRA GANDHI COLLEGE

(Nationally Accredited at "A" Grade (3rd Cycle) by NAAC)

Chatram Bus Stand, Tiruchirappalli – 620002.

CRITERION - II

2.6.2. PO CO MAPPING FOR PHYSICS

Shrimati Indira Gandhi College, Tiruchirappalli - 620 002

(Nationally Accredited at 'A' Grade (3rd Cycle) By NAAC)

DEPARTMENT OF PHYSICS

B.Sc Physics

Programme Outcome of B.Sc Physics (PO)

PO1. To explain the concepts and significance of the various physical phenomenon.

PO2. To describe the laws and concept of physics.

PO3. To implement the theories learnt and skills required to solve real time problems.

PO4. To select and apply appropriate techniques resources and modern science.

PO5. To investigate various concepts of B.Sc programme effectively using examples.

Programme Specific Outcome of B.Sc Physics (PO)

PO1. To apply the theories learnt and the skills acquired to solve real time problems.

PO2. To develop analytical and logical skill for higher education.

PO3. Enhance laboratory skills, enabling them to take measurements in a physics laboratory and analyse to draw valid conclusions.

PO4. Demonstrate a proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.

PO5. The students will be eligible to take up competitive exams.

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DEPARTMENT OF PHYSICS

Year : I

Subject code-16SCCPH1

Semester-I

CORE COURSE -I

PROPERTIES OF MATTER AND ACOUSTICS

Objective:

To identify the characteristics of matter in terms their properties and to know the basic principles of acoustics.

UNIT I Elasticity

Hooke's law – Stress-Strain diagram – Factors affecting elasticity- Different moduli of elasticity - Relation between the elastic moduli – Poisson's ratio –- Twisting couple on a cylinder – Determination of rigidity modulus by static torsion – Work done in twisting a wire -Torsional oscillations of a body- Torsion pendulum - Determination of rigidity modulus and moment of inertia.

UNIT II Bending of Beams

Bending of beams - Expression for bending moment – Cantilever – Expression for depression of the loaded end of a cantilever — Young's modulus by measuring the tilt in a loaded cantilever – Oscillation of a cantilever - Non-uniform bending – Expression for depression- Uniform bending – Expression for elevation –Experimental determination of Young's modulus using pin and microscope method (Non-uniform bending – Uniform bending) - Determination of Young's modulus by Koenig's method.

UNIT III Surface Tension

Definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – Work done on increasing the area of a surface - Angle of contact - Neumann's triangle- Excess pressure inside a liquid drop and soap bubble - Excess pressure inside a curved liquid surface - Force between two plates separated by a thin

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layer of a liquid - Experimental determination of surface tension - Jaegar's method - Drop- weight method - Capillary rise method - Variation of surface tension with temperature.

UNIT IV Viscosity

Newton's law of viscous flow – streamlined and turbulent motion – Reynold's number - Poiseuille's formula for the flow of a liquid through a horizontal capillary tube – Experimental determination of co-efficient of a liquid by Poiseuille's method - Ostwald's viscometer – Terminal velocity and Stokes' formula - Viscosity of gases – Meyer's formula - Rankine's method - Variation of viscosity with temperature and pressure - Lubrication.Equation of continuity of flow – Euler's equation for unidirectional flow - Bernoulli's theorem – Filter pump and Wings of aeroplane - Torricelli's theorem - Pitot tube

UNIT V Acoustics

Formula for velocity of sound –Effect of Temperature, Pressure, Humidity , Density of medium and Wind - Musical Sound and Noise – Speech- Characteristics of Musical sound – Intensity of sound – Measurement of intensity of sound :Decibel and Phon- Bel.Reverberation – Sabine's Reverberation formula – Factors Affecting the Acoustics of Buildings – Sound distribution in an Auditorium Requisites for good acoustics – Ultrasonics – Production and detection – Medical applications of Ultrasonic waves – Acoustic Grating.

CO

1. Differentiate the moduli of elasticity of different materials.
2. Analyze the moduli of elasticity of materials made in the form of beams.
3. Understand the practical applications of surface tension in real life.
4. Acquire the knowledge of the flow of liquids based on their viscous nature and the variation of viscosity with temperature and pressure.
5. Understand the various characteristics of sound and their practical implications.

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DEPARTMENT OF PHYSICS

Year : I

Subject code-16SCCPH1

Semester-I

CORE COURSE -I

PROPERTIES OF MATTER AND ACOUSTICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH1.1	3	3	3	3	3	3	3	3	3	3
16SCCPH1.2	3	3	3	-	3	3	3	3	3	3
16SCCPH1.3	3	3	3	3	2	3	3	3	3	-
16SCCPH1.4	3	3	2	3	3	-	3	3	3	3
16SCCPH1.5	3	3	3	2	3	3	3	-	3	3
Average	3	3	2.8	2.8	2.8	3	3	3	3	3

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DEPARTMENT OF PHYSICS

Year : I
Subject code-16SCCPH3

Semester -III

CORE COURSE III

THERMAL PHYSICS

Objective :

To understand the phenomena connected with heat as radiation, conduction, different thermal capacities of substances and the converse process of making heat to do mechanical work.

UNIT I Specific Heat

Specific heat of solids – Method of mixtures – radation correction – Dulong and Petit's law - Quantum theory - Einstein's theory of specific heat – Debye's theory of specific heat– Specific heat of liquids – Newton's law of cooling - Specific heat of gases – Mayer's Relation – Quantization of various contributions to energy of diatomic molecules – Specific heat of diatomic gases.

UNIT II Conduction.

Coefficient of Thermal Conductivity - Rectilinear Flow of Heat along a Bar - Thermal conductivity of good conductors - Lee's method for metals – Forbe'smethod to find K – Lee's disc method for Bad Conductors – Heat Flow Through a Compound wall – Accretion of Ice on Ponds – Wiedemann-Franz law – Practical applications of conduction of heat.

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UNIT III Radiation

Radiation – Stefan's law - Deduction of Newton's law from Stefan's law – Boltzmann's law – Block body radiation – Wein's law – Rayleigh-Jean's law – Planck's law – Angstrom Pyrheliometer – Solar constant – Surface temperature of sun - Sources of solar energy – Photo voltaic cell – Greenhouse effect.

UNIT IV Low Temperature

Joule – Thomson's effect – Porous plug experiment – Liquefaction of gases –Linde's method – Liguefaction of hydrogen - Adiabatic demagnetization – Liquefaction of He– Practical applications of low temperature – Refrigerating mechanism – Air conditioning mechanism – solid carbon dioxide(dry ice).

UNIT V Thermodynamics

Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process - Carnot's theorem – Second law of thermodynamics - Thermodynamic Scale of temperature – Entropy – Change of entropy in reversible and irreversible processes – Temperature – entropy diagram (T.S) – Law of increase of entropy – Maxwell's thermo dynamical relations – Clausius' - Claypeyron's latent heat equations.

CO

1.Understand and to define heat, work, thermal efficiency.
2.To understand various thermodynamic processes like isothermal, isobaric, isochoric processes and laws of thermodynamics.
3.To understand the concept of entropy.
4.To understand Carnot's cycle, Heat engines and Refrigerators.
5.Understanding the low temperature physics.

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DEPARTMENT OF PHYSICS

Year : I

Subject code-16SCCPH3

Semester -III

CORE COURSE III

THERMAL PHYSICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH3.1	3	2	3	3	2	2	3	3	3	3
16SCCPH3.2	2	2	3	3	2	3	3	3	3	3
16SCCPH3.3	3	3	-	3	3	3	3	3	3	3
16SCCPH3.4	3	3	3	3	3	3	3	3	3	3
16SCCPH3.5	3	3	2	-	3	3	3	2	-	3
Average	2.8	2.6	2.8	3	2.6	2.8	3	2.8	3	3

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DEPARTMENT OF PHYSICS

Year : IIII

Subject code-16SCCPH5

Semester -V

CORE COURSE-V
OPTICS

Objective :

To familiarize the fundamental laws concerning reflection, refraction, interference, diffraction, polarization, spectrum and allied phenomena.

UNIT I Geometrical optics

Spherical aberration - Spherical aberration of a thin and thick lens – Methods of reducing Spherical aberration – Coma – Aplanatic surface – Astigmatism – Curvature of the field – Meniscus lens – Distortion – Chromatic aberration - Chromatic aberration in a lens – Circle of least Chromatic aberration – Achromatic lenses.

UNIT II Interference

Air wedge – Newton's rings – Haidinger's fringes – Brewster's fringes – Michelson Interferometer and its applications – Fabry- Perot Interferometer – Interference filter – Stationary waves in light – Colour photography (qualitatively) – Holography – Construction and reconstruction of a hologram

– Applications.

UNIT III Diffraction

Fresnel's diffraction – Diffraction at a (1) circular aperture (2) Straight edge

(3) narrow wire – Fraunhofer diffraction at a single slit – Double slit – Missing orders in a Double slit, Diffraction pattern – Grating (theory) – Oblique incidence – Overlapping of spectral lines - Resolving power – Rayleigh's criterion of resolution- Resolving power of a Telescope and Grating – Dispersive power and resolving power of a grating.

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UNIT IV Polarization

Nicol prism – Nicol prism as an analyzer and polarizer – Huygens's explanation of Double refraction in uniaxial crystals – Double Image polarizing prisms – Elliptical and Circularly polarized light – Production and detection – Quarter wave and half wave plates – Babinets compensator – Optical activity – Fresnel's explanation of optical activity – Laurent's Half shade polarimeter.

UNIT V Optical Instruments

Microscopes – Simple Microscope (Magnifying glass) – Compound Microscope – Ultra-Microscope – Eyepieces - Huygen's Eyepiece - Ramsden's Eyepiese — Comparison of Eyepieces – Telescope – Refracting astronomical telescope – Abbe Refractometer – Pulfrich refractometer - Photographic Camera – Prism binoculars.

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CO

1. Distinguish the different types of aberrations and achromatism.
2. Use different types of eyepieces according to their application.
3. Calculate wavelength difference and fringe width from the interference.
4. To know the concept and study of polarization.
5. Understand the resolving power of different optical instruments.

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Year : I

Subject code-16SCCPH5

Semester -V

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH5.1	3	3	3	3	3	3	3	3	3	3
16SCCPH5.2	3	3	3	2	3	3	-	2	3	3
16SCCPH5.3	-	3	-	3	3	3	3	3	3	-
16SCCPH5.4	3	3	3	3	3	3	3	-	2	3
16SCCPH5.5	3	3	3	-	3	3	3	3	2	3
Average	3	3	3	2.8	3	3	3	2.8	2.6	3

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DEPARTMENT OF PHYSICS

Year : III

Subject code-16SCCPH6

Semester -V

CORE COURSE VI
ATOMIC AND MOLECULAR PHYSICS

Objective:

The purpose is to understand the outgrowth of the structure ,extra nuclear part of the atom and origin of the spectra.

UNIT I Cathode and Positive Ray - Analysis

Production and Properties of Cathode rays - Electronic charge - Millikan's oil- drop method - Production and properties of positive rays - Thomson's parabola method - Aston's, Dempster's and Bainbridge's mass - spectrographs (e/m) – Mass defect and Packing Fraction.

UNIT II Atom model

Bohr atom model – Critical Potentials - Experimental determination of critical potentials - Franck and Hertz's experiment -Sommerfield's Relativistic atom model - Vector atom model - Quantum numbers associated with vector atom model - Pauli's exclusion principle - Electronic configuration of elements and periodic table - Magnetic dipole moment due to orbital motion and spin of the electron - The Stern and Gerlach experiment - Zeeman effect - Experimental arrangement for the normal Zeeman effect - Larmor's theorem - Quantum mechanical explanation of the normal Zeeman effect - Anomalous Zeeman effect- Paschen Back Effect – Stark effect.

UNIT III X-Rays

X-rays - production - detection and properties -Bragg's law - Bragg's X-ray spectrometer - Laue's experiment - The Powder crystal method –Rotating crystal method -X-ray spectra - Characteristics of

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X-ray spectrum - Moseley's law - Compton effect - Determination of wavelength - Symmetry operations and elements of Symmetry.

UNIT IV Photoelectric Effect and Free Electron theory of metals

Free electron theory of metals - Properties of metals - Drude and Lorentz theory - Electrical and thermal conductivities - Wiedemann and Franz law.

Photoelectric effect - Lenard's experiment - Richardson and Compton experiment - Experimental investigations on the photoelectric effect - Laws of photoelectric emission - Einstein's photoelectric equation - Experimental verification - Millikan's experiment - Photoelectric cells - Photoemissive cell - Photovoltaic cell - Photoconductive cell - Applications of Photoelectric cells.

UNIT V Molecular Physics

Induced absorption - Spontaneous emission - Stimulated emission - Ruby laser - He laser - Semiconductor laser - Properties of laser beam – Applications of LASER in Medicine and Industry - Theory of the pure rotational spectrum of a molecule - Theory of the origin of the vibration - rotation spectrum of a molecule - Electronic spectra of molecules - Molecular orbital theory of Hydrogen molecule ion - Heitler-London theory of Hydrogen molecule - Theory of ESR .

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CO

1.Understand the properties of positive rays, experimental proof by frank and hertz method .

2. Analyse the relationship between various types of couplings .

3.Understand the properties of x-ray 's verification.

4. Understand the laser action phenomena, properties of laser.

5.Understand the Photoelectric Effect.

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DEPARTMENT OF PHYSICS

Year : III

Subject code-16SCCPH6

Semester -V

CORE COURSE VI

ATOMIC AND MOLECULAR PHYSICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH6.1	3	2	2	3	3	2	3	2	3	2
16SCCPH6.2	-	3	2	3	3	2	3	3	3	2
16SCCPH6.3	3	-	2	3	3	2	3	3	3	2
16SCCPH6.4	3	3	2	3	3	-	3	3	3	2
16SCCPH6.5	3	3	2	3	3	2	3	3	-	2
AVERAGE	3	3	2	3	3	2	3	3	3	2

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DEPARTMENT OF PHYSICS

Year : III **Semester -V**

Subject code-16SCCPH7

CORE COURSE VII
ELECTRONICS

Objective:

To enable the students to understand all aspects of electronics in a lucid and comprehensive manner.

UNIT I Semiconductors, diodes and Bipolar Transistors

Intrinsic and extrinsic semi -conductors –PN junction diode – Biasing–V-I Characteristics– Rectifiers – Half wave – full wave and Bridge rectifiers – Break down mechanisms – Zener diode- characteristics of Zener diode – Zener diode as voltage regulator-Bipolar junction transistor – Basic configurations - Relation between α and β – Characteristic curves of transistor – CB, CE mode – DC load line – DC bias and stabilization – fixed bias – voltage divider bias.

UNIT II Amplifiers and Oscillators

Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class A,B & C Power amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.

UNIT III Number Systems, Logic Gates and Boolean Algebra

Introduction to decimal, binary, octal, hexadecimal number systems – Inter conversions– 1's and 2's complements –Logic gates, Symbols and their truth tables – AND, OR, NOT, NAND, NOR, XOR, and XNOR – Universality of NAND and NOR gates.Boolean algebra – De-Morgan's theorems -Reducing Boolean expressions using Boolean laws – SOP forms of expressions (minterms) – Karnaugh map simplification(Four variables).

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UNIT IV Combinational and Sequential Digital Systems

Half and full adders – Half and full subtractors – Decoder(2:4 line) – Encoder (4:2 line)– Multiplexer(4:1 line) – Demultiplexer (1:4 line) - Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops – Counters – Four bit asynchronous ripple counter – Mod-10 counter — Synchronous counter – Ring counter - Shift registers – SISO and SIPO shift registers.

UNIT V Operational amplifier

Operational amplifier - Characteristics – Inverting and Non-inverting amplifier – Voltage follower – Adder, Subtractor, Integrator and Differentiator circuits – Log & antilog amplifiers – Op- amp as Comparator – Filters-low, bandpass, high pass filters -A/D conversion – Successive approximation method – D/A conversion – R-2R ladder network.

CO

1. Understand the characteristics of diode and working of rectifier circuits **.**

2. Analyse the characteristics of transistor and transistor biasing circuits.

3.Understand the binary arithmetic , logics and boolean functions.

4. Understand the fundamentals of codes and number system.

5. To know the concept of operational amplifier and its applications.

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DEPARTMENT OF PHYSICS

Year : III **Semester -V**

Subject code-16SCCPH7

CORE COURSE VII

ELECTRONICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH7.1	3	3	3	3	3	2	3	3	3	3
16SCCPH7.2	2	3	3	-	3	3	3	3	3	3
16SCCPH7.3	-	3	3	3	3	3	3	3	3	3
16SCCPH7.4	3	3	3	3	2	3	3	-	3	3
16SCCPH7.5	3	-	3	3	3	3	3	3	-	3
Average	2.8	3	3	3	2.8	2.8	3	3	3	3

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DEPARTMENT OF PHYSICS

Year : III **Semester -V**

Subject code-16SMBEPHI

ELECTIVE PAPER

MATERIAL SCIENCE

Objectives:

To develop knowledge in material science and to understand the relationship between properties and material characteristics.

UNIT I Crystal Structure

Types of crystals-space lattice-basis- unit cell and lattice parameters – Bravais lattices-Lattice planes and Miller indices-inter planar spacing in a cubic lattice- cubic lattice-SC – BCC – FCC- Sodium chloride and Diamond crystal structure – Bonding of solids (Ionic , Covalent , Metallic , Hydrogen and Van der Waal).

UNIT II Super Conducting Materials

Superconductivity – Properties-Meissner's effect- London equations - types of superconductors Type I and Type II –High temperature superconductors - Josephson effects and its applications – SQUIDS - Applications of superconductor.

UNIT III Nano Materials

Nanoscience and nanotechnology – Nanomaterials- Properties of nanomaterials (size dependent) - synthesis of nanomaterials- Fullurenes-Application of nanomaterials – Carbon nanotubes- Fabrication and structure of carbon nano tubes - Properties of carbon nanotubes (Mechanical and Electrical) - Applications of CNT's.

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UNIT IV Smart Materials

Metallic glass and its applications — Fiber reinforced metals – SAW Materials and its applications – Biomaterials – Ceramic-Nuclear engineering materials-Nanophase materials - SMART materials-Conducting polymers- Optical materials - Fiber optic materials and their applications.

UNIT V Mechanical Behavior Of Materials

Different mechanical properties of engineering materials – creep – Fracture- technological properties – factors affecting mechanical properties of material-Heat treatment-cold and hot working-types of mechanical tests- metal forming process- deformation of metals-Deformation of crystals and polycrystalline materials.

*****

CO

1.Know about various types of bonding.

2. Distinguish between various types of crystal imperfection.

3. The course provides an overview of nanomaterials.

4. Understand the applications of fibre optic materials

5.Study the mechanical behaviour of materials.

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DEPARTMENT OF PHYSICS

Year : III **Semester -V**

Subject code-16MBEPHI

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SMBEPH1.1	3	3	3	3	3	2	3	3	3	3
16SMBEPH1.2	-	3	3	3	3	3	3	3	3	3
16SMBEPH1.3	3	3	-	3	3	-	3	3	3	3
16SMBEPH1.4	3	3	3	3	2	3	3	3	3	3
16SMBEPH1.5	3	3	3	3	3	3	-	3	3	-
Average	3	3	3	3	2.8	2.8	3	3	3	3

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DEPARTMENT OF PHYSICS

Year : III **Semester -V**

Subject code-16SCCPH3P

CORE PRACTIAL III

(Any Twelve Experiments)

Objective:

To promote scientific temper and to learn physical concepts through these experiments.

1. Spectrometer- i-d curve.

2. Spectrometer - i-i' curve.

3. Spectrometer - small angle prism.

4. Field along the axis of a coil – determination of M.

5. Potentiometer - EMF of a thermocouple.

6. Potentiometer -Temperature coefficient of thermistor.

7. Ballistic Galvanometer-Figure of merit

8. Ballistic Galvanometer-Absolute Determination of Mutual Inductance.

9. Anderson's bridge – Self-inductance of a coil.

10. Series resonance circuits.

11. Parallel Resonance circuits.

12. Regulated power supply using Zener diode - Percentage of regulation.

13. Single stage - RC coupled amplifier – Transistor.

14. Hartley oscillator using transistor.

15. FET Characteristics.

16. AND, OR and NOT gates using discrete components

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17. AND, OR and NOT gates using IC's.

18. Op - Amp -Adder and Subtractor.

19. Op - Amp - Integrator and Differentiator.

20. Construction of Half wave rectifier.

21. Half Adder and Full adder circuits using logic gates.

22. Half Subtractor and Full Subtractor circuits using logic gates.

******

CO

1.To determine the figure of merit of a galvanometer.

2.Calibration of high voltmeter by using a potentiometer.

3. Understand half adder and full adder.

4. To design and study OPAMP as an adder and Subtractor.

5. To determine i-d curve using spectrometer.

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DEPARTMENT OF PHYSICS

Year : III **Semester -V**

Subject code-16SCCPH3P

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PCO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH3P.1	3	3	3	3	2	3	3	3	3	2
16SCCPH3P.2	3	3	3	3	3	3	3	3	3	3
16SCCPH3P.3	3	-	3	3	-	3	3	3	3	2
16SCCPH3P.4	3	3	3	2	3	3	3	3	3	3
16SCCPH3P.5	3	3	3	3	3	-	3	3	-	-
Average	3	3	3	2.8	2.8	3	3	3	3	2.6

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DEPARTMENT OF PHYSICS
EVEN SEMESTER (2021-2022)

B.SC PHYSICS

PROGRAMME OUTCOME:

PO1. To explain the concepts and significance of the various physical phenomenon.

PO2. To describe the laws and concept of physics.

PO3. To implement the theories learnt and skills required to solve real time problems.

PO4. To select and apply appropriate techniques resources and modern science.

PO5. To investigate various concepts of B.Sc programme effectively using examples.

PROGRAMME SPECIFIC OUTCOME:

CO1. To apply the theories learnt and the skills acquired to solve real time problems.

CO2. To develop analytical and logical skill for higher education.

CO3. Enhance laboratory skills, enabling them to take measurements in a physics laboratory and analyse to draw valid conclusions.

CO4. Demonstrate a proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.

CO5. The students will be eligible to take up competitive exams

SEMESTER-II
CORE COURSE II
MECHANICS

Objective:

An attempt is made to give a better insight of the change of position of any physical object or event and their consequences.

UNIT I Projectile, Impulse and Impact

Projectile - particle projected in any direction - Path of a projectile is a parabola - Range of a projectile on plane inclined to the horizontal - Maximum range on the inclined plane - Impulse of a force - Laws of impact - Direct impact between two smooth spheres - oblique impact between two smooth spheres - Impact of a smooth sphere on a smooth fixed horizontal plane - Loss of KE due to direct impact - Oblique impact.

UNIT II Motion on a plane curve

Centripetal and centrifugal forces - Hodograph - Expression for normal acceleration - Motion of a cyclist along a curved path - Motion of a railway carriage round a curved track- upsetting of a carriage - Motion of a carriage on a banked up curve - Effect of earth's rotation on the value of the acceleration due to gravity - Variation of 'g' with altitude, latitude and depth.

UNIT III Gravitation

Newton's law of gravitation - Mass and density of earth - Inertial and Gravitation mass - Determination of G-Boy's experiment -Kepler's Laws of planetary motion -Deduction of Newton's law of gravitation from Kepler's Law - Gravitation - Field - potential -Intensity of Gravitational field - gravitational potential due to a point mass - Equipotential surface - Gravitational potential and field due to a spherical shell and solid sphere – Escape velocity –Orbital velocity.

UNIT IV Dynamics of rigid body and Friction

Moment of Inertia - Kinetic energy and angular momentum of rotating body- Theorems of perpendicular and parallel axes - Acceleration of a body rolling down an inclined plane without slipping - Oscillations of a small sphere on a large concave smooth surface - Compound pendulum - Centre of suspension and centre of oscillation - Centre of percussion - Minimum period of a compound pendulum - Kater's pendulum. Friction - Laws of friction - Resultant reaction - Angle and cone of friction - Equilibrium of a body on a rough plane inclined to the horizontal - The friction clutch.

UNIT V Atmospheric pressure

Centre of gravity of a body - Centre of gravity of a trapezoidal lamina - C.G. of a solid hemisphere - C.G. of a solid tetrahedron - C.G. of a solid cone.Centre of pressure - rectangular lamina - triangular lamina - triangular lamina immersed in a liquid. Conditions of equilibrium of a floating body - Stability of equilibrium of a floating body - Metacentre - Experimental determination of a metacentric height of a ship.The barometer - Fortin's barometer - Correction for a barometer - Faulty barometer - Variation of atmospheric pressure with altitude.

*****

COURSE OUTCOME:

CO1 :Use the principles of projectiles to explain the manner in which gravity affect projectile motion.
CO2:Gain a deeper knowledge of mechanics and its fundamental concepts.
CO3:Acquire the knowledge of gravitational force between objects and the centre of mass of objects.
CO4:Learn rigid body dynamics in terms of moment of inertia and also analyze thecenter of gravity of different bodies.
CO5:Analyze the special theory of relativity and its applications.

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH1.1	3	3	3	3	3	3	3	3	3	-
16SCCPH1.2	3	2	3	-	3	3	3	3	3	3
16SCCPH1.3	3	3	3	3	-	3	3	3	3	3
16SCCPH1.4	3	2	2	3	3	-	3	3	3	3
16SCCPH1.5	3	3	-	2	3	3	3	-	3	3
Average	3	2.5	2.8	2.8	3	3	3	3	3	3

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CORE PRACTICAL I
(Any Twelve Experiments)

Objective:

To motivate and educate the students to acquire skill in physics Experiments.

1. Measurements of length (or diameter) using Vernier calipers, Screw gauge and Travelling microscope.
2. Non uniform bending - Pin & Microscope Method.
3. Cantilever depression—Scale and Telescope Method.
4. Surface Tension, Interfacial Surface Tension – Drop weight Method.
5. Surface Tension by Capillary rise method
6. Joule's Calorimeter - determination of Specific heat capacity of liquid.
7. Compound pendulum - g & k determination.
8. Specific heat capacity of liquid - Newton's law of cooling.
9. Coefficient of viscosity of liquid—Poiseuille's flow method.
10. Spectrometer - determination of μ of a solid prism.
11. P.O box – determination of Temperature coefficient.
12. Meter bridge - Specific resistance determination.
13. Comparison of Viscosities of two liquids – Ostwald's Viscometer/ HARE's appartus
14. Long focus convex lens - f, R, refractive index-determination.
15. Concave lens – Focal length determination.
16. Determination of the Elastic Constants of a Wire by Searle's method.
17. Determine the frequency of a given tuning fork – Sonometer.

COURSE OUTCOME:

In this lab course, the students will gain hands-on experience in performing different experiments, such as,

CO1. To determine the acceleration due to gravity by Compound pendulum,

CO2. To determine the Young's modulus of a wire by Non uniform bending method.

CO3. To determine the refractive index of a material of a prism by using a Spectrometer.

CO4. To determine the temperature of coefficient of thermistor using PO box.

CO5. To determine the focal length of concave lens.

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH1P.1	3	2	3	3	3	2	3	3	3	3
16SCCPH1P.2	-	2	3	3	2	3	3	3	3	3
16SCCPH1P.3	3	3	-	3	3	3	3	3	3	3
16SCCPH1P.4	3	3	3	3	3	3	3	3	3	-
16SCCPH1P.5	3	3	2	-	3	3	3	2	-	3
Average	3	2.6	2.8	3	2.8	3	3	2.8	3	3

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SEMESTER-IV
CORE COURSE IV
ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

Objective:

This course provides an in depth coverage of behaviour of stationary electric charges, electricity, magnetism and how they are connected.

UNIT I Electrostatics

Coulomb's Law – Gauss's Law and its applications (Electric Field due to a uniformly charged sphere, hollow cylinder & solid cylinder)– Electric Potential – Potential at a point due to a uniformly charged conducting sphere – Principle of a capacitor– Capacity of a spherical and cylindrical capacitors – Energy stored in a charged capacitor–Loss of energy on sharing of charges between two capacitors.

UNIT II Current Electricity

Ampere's circuital law and its applications -Field along the axis of a circular coil and Solenoid–Theory of Ballistic Galvanometer –Figure of merit– Damping Correction– Ki rchhoff ' s Laws of Electricity –Wheatstone's Bridge–Carey Foster's Bridge–Potentiometer– Calibration of Ammeter – Calibration of Voltmeter (Low range and High range) – Comparison of Resistances.

UNIT III Electromagnetic Induction

Laws of electromagnetic induction– Self and mutual induction– Self-inductance of a solenoid– Mutual inductance of a pair of solenoids–Coefficient of coupling– Experimental determination of self (Rayleigh's method) and mutual inductance– Growth and decay of current in a circuit containing L and R–Growth and decay of charge in a circuit containing C and R– Measurement of High resistance by leakage.

UNIT IV AC Circuits

Alternating EMF applied to series circuits containing LC, LR and CR– Alternating EMF applied to circuits containing L, C and R–Series and Parallel resonance circuits– Sharpness of resonance–Q factor– Comparison between Series and Parallel resonant circuits –Power in AC circuits (R, L-R, L-C-R only) – Power factor– Wattlesscurrent – Choke Coil – Transformer – Uses of Transformers – Skin Effect.

UNIT V Magnetism

Intensity of Magnetization– Magnetic Susceptibility– Magnetic Permeability – Types of magnetic materials– Properties of para, dia and ferromagnetic materials– Langevin's theory of dia and para magnetism– Weiss's theory of ferromagnetism – B-H curve–Energy loss due to magnetic hysteresis – Ballistic Galvanometer method for plotting B-H curve - Magnetic properties of iron and steel.

COURSE OUTCOME:

CO1. Study the laws of electricity and magnetism and its applications.
CO2. Understand the properties of magnetic materials.
CO3. To understand the concept and study Biot-Savart's law and its application.
CO4. To study the self-inductance(L) and mutual inductance(M).
CO5. To study the current rise and decay in LR,CR and LCR-circuit.

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

B.Sc. PHYSICS

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH4.1	3	2	3	3	3	3	3	3	3	3
16SCCPH4.2	3	3	3	2	3	3	3	3	3	3
16SCCPH4.3	3	3	3	2	3	3	3	3	3	3
16SCCPH4.4	3	3	3	3	3	3	3	3	3	3
16SCCPH4.5	3	3	3	3	2	2	3	3	2	3
Average	3	2.8	3	2.6	2.8	2.8	3	3	2.8	3

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CORE PRACTICAL-II

(Any Twelve Experiments)

Objective:

To enhance the knowledge in experimental physics.

1. Uniform bending –Pin and Microscope.
2. Static Torsion -Determination of Rigidity modulus (n).
3. Torsional Pendulum – Rigidity modulus (n) and moment of inertia (I).
4. Stoke's method - Viscosity of highly viscous liquid.
5. Coefficient of viscosity of highly viscous liquid –Searle’s viscometer method.
6. Emissive power of a surface - Spherical calorimeter.
7. Thermal conductivity of a bad conductor -Lee's disc method.
8. Carey Foster's Bridge –specific resistance determination.
9. Potentiometer - Ammeter calibration.
10. Potentiometer - Voltmeter calibration - low range.
11. Potentiometer - determination of resistance.
12. Figure of merit of a mirror Galvanometer.
13. Spectrometer -Determination μ of a liquid.
14. Spectrometer- Grating--normal incidence method.
15. Air Wedge - determination of Thickness of a thin wire.
16. High resistance by leakage – Using BG.
17. Characteristics of Junction and Zener diodes.

COURSE OUTCOME:

CO1.To draw the characteristics curves of semiconductor diode and Zener diode.
CO2. To determine a resistance by Carey-Foster Bridge.
CO3. Deal with liquids based on their viscosity
CO4. To gain practical knowledge about young's modulus by bending of beam.
CO5. To determine the refractive index of a material of a liquid prism using a Spectrometer.

MAPPING

CO - PO – PSO matrices of course
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH2P.1	3	3	3	3	3	3	3	3	3	3
16SCCPH2P.2	3	-	2	2	3	3	-	2	3	3
16SCCPH2P.3	3	2	2	3	3	-	3	3	3	2
16SCCPH2P.4	3	3	3	3	3	3	3	-	-	3
16SCCPH2P.5	3	3	3	3	3	3	3	3	2	2
Average	3	2.8	2.6	2.8	3	3	3	2.8	2.8	2.6

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SEMESTER-VI
CORE COURSE -VIII
NUCLEAR PHYSICS

Objective:

To emphasize the understanding of nuclear forces and models, elementary particles and Accelerators.

UNIT I General Properties of Nuclei and Nuclear Models

Constituents of nuclei-Classification of nuclei - Nuclear mass and binding energy - Binding energy and stability of nucleus, Mass defect and Packing fraction, Binding fraction Vs Mass number curve - Nuclear size - Nuclear spin-nuclear energy levels - Nuclear magnetic moment --Parity of nuclei - Nuclear forces - Yukawa's model of nuclear force.Nuclear Models - Liquid drop model, Semi-empirical mass formula - Shell model- Salient features of shell model.

UNIT II Radioactivity

Radioactive decay law-Half life and Average life - Activity or strength of a radio – sample - Successive transformation - Radioactive chain- Radioactive equilibrium - Radioactive dating - α- decay - Geiger-Nuttall law - Tunnel effect - Gamow's theory of α decay - β-decay - Energetics of β-decay - Continuous β-spectrum - Inverse β-decay -Parity violation in β-decay - Neutrino hypothesis - Properties of neutrino - Gamma rays-origin of the gamma rays - Internal conversion.

UNIT III Particle Accelerators and Detectors

Linear accelerator – Cyclotron – Betatron - Electron synchrotron - Accelerators in India.
Radiation Detectors - Ionisation Chamber - Proportional counter – G.M. Counter-Cloud chamber - Scintillation counter - Solid state track detector – Semiconductor detector.

UNIT IV Nuclear Reactions and Nuclear Reactors

Nuclear reactions - Types of nuclear reactions – Conservation laws in nuclear reactions -Energetic of nuclear reactions - Kinematics of nuclear reactions -Threshold energy of nuclear reactions - Solution of the Q- value equation - Cross-section of nuclear reactions.Nuclear fission - fission of light nuclei - Prompt and delayed neutrons - Neutron speed , classifications - Nuclear chain reaction - Neutron cycle - Nuclear reactor - Types of reactor -Fission bomb - Nuclear power in India- Fusion-Thermonuclear reaction - Hydrogen bomb -Possibility of fusion reac

UNIT V Elementary Particles

Classification of elementary particles – Pions and Muons - K-mesons – Hyperons- Conservation laws - Exact laws - Approximate conservative laws- Fundamental interactions – Antiparticles -Resonance particles – Hyper- nucleus - Symmetry classification of elementary particles - Quark model.

COURSE OUTCOME:

CO1. Explain the origin of radioactivity, liquid drop and shell model of nucleus.
CO2. To study the concept of fission and fusion.
CO3. To know the concept of nuclear model.
C**O4.** To know the concept of particle accelerators.
CO5. To know the concept of Elementary particle .

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH8.1	3	3	3	3	3	2	3	3	3	3
16SCCPH8.2	3	3	3	-	3	3	3	3	3	3
16SCCPH8.3	-	3	3	3	3	3	3	3	3	3
16SCCPH8.4	3	-	3	3	3	3	3	3	-	3
16SCCPH8.5	3	3	3	3	3	3	3	3	3	-
Average	3	3	3	3	3	2.8	3	3	3	3

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CORE COURSE- IX

THEORETICAL PHYSICS

Objective:

To know the facts and develop a unified and logical treatment of the subject matter with clarity and conciseness.

UNIT I Fundamental Principles and Lagrangian Formulation

Mechanics of a particle and system of particles – Conservation laws – Constraints – Generalized coordinates – Principle of virtual work-D' Alembert's principle and Lagrange's equation – Hamilton's principle –Lagrange's equation of motion – conservation theorems and symmetry properties – Atwood's machine – Simple pendulum.

UNIT II Hamilton's Formulation

Hamilton's canonical equations of motion – Hamilton's equations from variational principle –Principle of least action – Phase space – Generalized momentum – Cyclic co-ordinates –Conservation theorem for generalized momentum – Conservation theorem for energy

UNIT III Dual Nature of Matter

De Broglie concept of matter waves – De Broglie wavelength – Wave velocity and group velocity for the De Broglie waves – Experimental study of matter waves – Davison and Germer experiment – G.P. Thomon's experiment for verifying De Broglie relation – Heisenberg's uncertainty Principle – Electron microscope – Gamma ray microscope.

UNIT IV Basics of Quantum Mechanics

Basic postulates of wave Mechanics – Development of Schrödinger wave equation – Time independent and dependent forms of equations – Properties of wave function – Orthogonal and normalized wave function Eigen function and eigen values – Expectation values and Ehrenfest's theorem.

UNIT V Exactly Solvable Quantum Systems

Linear harmonic oscillator – Particle in a box –Rectangular barrier potential –Rigid rotator – Hydrogen atom.

COURSE OUTCOME:

CO1. Understand the basic significance of mechanics of a system of particles.
CO2. Perform the theories of quantum mechanics into Schrodinger wave equation.
CO3. To study the Hamilton's equations of motion.
CO4. Students have knowledge of approximation method of quantum mechanics, that is Time independent equations.
CO5. Understand the concept of matter waves.

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH9.1	3	3	3	3	3	3	2	3	3	3
16SCCPH9.2	3	3	3	3	3	3	2	3	3	3
16SCCPH9.3	3	3	3	-	3	3	2	-	3	3
16SCCPH9.4	3	3	3	3	3	3	2	3	3	3
16SCCPH9.5	3	3	3	3	3	3	2	3	3	3
Average	3	3	3	3	3	3	2	3	3	3

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ELECTIVE PAPER

MICROPROCESSOR AND 'C' PROGRAMMING

Objective:

The purpose of this course is to introduce students about the key features and implementation of C language and 8085 Microprocessor assembly.

UNIT I Basics of Digital Computer

Basic components of a digital computer - Evolution of microprocessors - Important INTEL microprocessors - Hardware, Software and Firmware - Memory - Semiconductor memories - RAM,ROM - Flash memory – CCD memory – Cache memory - Buses.

UNIT II Intel 8085 and its Architecture

INTEL 8085 - Pin Diagram - Architecture - Various registers - Status Flags - Interrupts and their order of priority - Addressing modes - Direct,Register, Register indirect, Immediate and implicit addressing - Instruction set - Data transfer group - Arithmetic Group - Logical group - Branch group, Stack, I/O and Machine control group.

UNIT III Assembly Language Programming

Addition - subtraction - multiplication -division of two 8- bit numbers - Finding the largest and smallest number in a data array-Arranging a list of numbers in ascending or descending order-complement – shift – mask-look up table– multibyte addition and subtraction –decimal addition - subtraction.

UNIT IV Introduction To C

Basic Structure of C Programs – Character set – C tokens - Keywords and identifiers – constants – variables – Data types – declaration of variables – Assigning values to variables – Symbolic constants – Operators and Expressions - Arithmetic operators - Relational, Logical and Assignment operators, Increment and Decrement operators – Conditional operator, Bitwise and Special operators– Arithmetic Expressions – Mathematical functions.

UNIT V Preliminaries And Functions

Data input and output – getchar, putchar, scanf, printf, gets, puts functions – Decision making and branching –if, if…else, else if ladder, switch, break, continue, goto – Decision making and looping – while, do… while, for, nested loops –Arrays (one-, two- and multi-dimensional arrays)- Declaration, Initialization of arrays.

COURSE OUTCOME:

CO1. Understand the basic concepts of INTEL 8085.
CO2. To know about basics of Digital computer.
CO3.List and describe memory and addressing modes.
CO4.To know about preliminaries and functions.
CO5.Execution of simple C Programme.

MAPPING
CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO										
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SMBEPH2.1	3	3	2	3	3	3	2	3	3	3
16SMBEPH2.2	3	3	2	3	3	3	2	3	3	3
16SMBEPH2.3	3	3	-	3	3	3	2	3	3	3
16SMBEPH2.4	3	3	2	3	3	3	-	3	3	3
16SMBEPH2.5	3	3	2	3	3	3	2	-	3	-
Average	3	3	2	3	3	3	2	3	3	3

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ELECTIVE PAPER

COMMUNICATION PHYSICS

Objective:

To promote scientific temper among students and update the basic functioning of various communication systems.

UNIT I Radio transmission and reception

Transmitter-modulation-need for modulation- types of modulation- amplitude,frequency and phase modulation- modulation factor-sideband frequencies in AM wave-limitations of amplitude modulation - frequency modulation-block diagram of AM and FM Transmitter.

Receiver- demodulation-AM & FM radio receivers-super heterodyne radio receiver.

UNIT II Fiber Optic Communication

Introduction –structure of optical fiber –total internal reflection in optical fiber – principal and propagation of light in optical fiber - acceptance angle - numerical aperture – types of optical fibers based on material – number of modes – refractive index profile - fiber optical communication system (block diagram) - fiber optic sensors – Temperature sensor – fiber optic endoscope.

UNIT III Radar Communication

Basic radar system -Radar range –Antenna scanning – Pulsed radar system - A- Scope- Plan position indicator- Tracking radar- Moving target indicator- Doppler effect-MTI Principle- CW Doppler Radar- Frequency modulator CW Radar.

UNIT IV Satellite Communication

Introduction – history of satellites – satellite communication system – satellite orbits – classification of satellites – types of satellites – basic components of satellite communication – constructional features of satellites- multiple access – communication package – antenna- power source – satellite foot points- satellite communication in India.

UNIT V Mobile Communication

GSM – mobile services- concept of cell – system architecture – radio interface – logical channels and frame hierarchy – protocols – localization and calling – Handover- facsimile (FAX) – application – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television) – Wi-Fi - 3G (Basic ideas only).

COURSE OUTCOME:

CO1. Explain the concept of amplitude and frequency modulation
CO2. Know fundamental of AM radio receiver and superhetrodyne receiver.
CO3. Compare working principle of single mode and multimode optical fibres.
CO4. Understand about Satellite communication.
CO5.To know about basic ideas of mobile services,wifi-3G.

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SMBEPH3.1	3	3	3	3	2	3	3	3	-	3
16SMBEPH3.2	3	-	3	3	2	3	3	3	2	3
16SMBEPH3.3	3	3	3	3	2	3	3	-	2	3
16SMBEPH3.4	3	-	3	3	2	3	3	3	2	3
16SMBEPH3.5	3	3	3	3	2	3	3	-	2	-
Average	3	3	3	3	2	3	3	3	2	3

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CORE PRACTICAL -IV

(Any Twelve Experiments)

Objective:

To provide an in depth knowledge and skill in Electronics, C- Programming and Micro Processor.

SECTION – A

(Any Eight Experiments)

1. Koenig's method – Uniform bending.
2. Spectrometer - Grating-minimum deviation method
3. Spectrometer – Grating - dispersive power.
4. Spectrometer - Cauchy's constants.
5. M and H - Absolute determination using deflection and vibration magnetometer.
6. Potentiometer - High range Voltmeter calibration.
7. B.G. Absolute capacity of condenser.
8. Emitter follower amplifier - Frequency response.
9. Colpitt's oscillator using transistor.
10. Astable multi-vibrator using Transistor/op.amp
11. Monostable multi-vibrator using Transistor/op.amp.
12. FET amplifier – Common source.
13. Verification of Boolean Laws (any four.)
14. NAND as universal gate.
15. NOR as universal gate.

SECTION - B - MICROPROCESSOR 8085.(Any Two)

1. 8-bit addition and 8-bit subtraction.
2. 8-bit multiplication and 8-bit division.
3. Conversion from decimal to hexadecimal system.
4. Conversion from hexadecimal to decimal system.
5. Conversion from binary to hexadecimal.
6. Conversion from hexadecimal to binary.

SECTION- C - COMPUTER PROGRAMMING IN C (Any TWO)

1. Conversion of Centigrade into Fahrenheit.
2. Arranging numbers in ascending order/descending order.
3. Calculation of volume of sphere/cone/cube/rectangular cuboid.
4. Solving quadratic equation.

5. Sum of digits of a series.

COURSE OUTCOME:

CO1. To verify and design AND,OR,NOT and XOR gate using NAND gates.
CO2. To verify and design AND,OR, NOT and XOR gate using NOR gates.
CO3. To design and study the FET amplifier.
CO4. Write a program to ADD the 8 bit number.
CO5.Execution of simple „C" Programme.

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
16SCCPH4P.1	3	3	3	3	3	3	3	3	3	3
16SCCPH4P.2	3	-	2	2	2	3	-	3	3	3
16SCCPH4P.3	3	3	2	3	3	-	3	3	3	2
16SCCPH4P.4	3	3	3	3	3	3	3	3	-	3
16SCCPH4P.5	3	3	3	3	3	3	3	3	2	2
Average	3	3.0	2.6	2.8	3	2.8	3	3	2.8	2.6

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(Nationally Accredited at 'A' Grade (3rd Cycle) By NAAC)
Department of Physics

M.Sc Physics

Programme Outcome of M.Sc. Physics (PO):

PO1: Identify, formulate and analyse physical problems using basic principles of physics.

PO2: Create, apply disseminate knowledge leading to innovation.

PO3: Think critically, explore possibilities and exploit opportunities positively.

PO4: Apply various modern technique for research and analysis purpose.

PO5: Recognize the need for, and have the preparation and ability to engage in independent and lifelong

learning.

Programme Specific Outcome of M.Sc. Physics (PSO):

PSO1: The students would gain substantial knowledge in various branches of physics : Mathematical
physics, Classical mechanics, Statistical Mechanics, Electromagnetic theory, Solid state physics
Quantum mechanics Nuclear and particle physics.

PSO2: Develop working knowledge of experimental, computational techniques and instrumentation
required to work independently

PSO3: Equip students for seeking suitable careers in physics.

PSO4: Perform basic applied and collaborative research.

PSO5: Become socially and environmentally responsible citizen.

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Department of Physics

Year: I **Semester: I**

Subject Code: P16PY11

CORE COURSE I

MATHEMATICAL PHYSICS

Objective:-

To learn various mathematical concepts and techniques in vector space, groups and functions of special types to solve physical problems.

Unit I Vector Analysis

Concept of vector and scalar fields – Gradient, divergence, curl and Laplacian – Vector identities – Line integral, surface integral and volume integral – Gauss theorem, Green's theorem, Stoke's theorem and their applications – Definitions in linear independence of vectors – Schmidt's orthogonalisation process – Schwartz inequality.

Unit II Matrix Theory and Tensors

Matrix Theory: Characteristic equation of a matrix – Eigenvalues and eigenvectors – Cayley–Hamilton theorem -Reduction of a matrix to diagonal form – Jacobi method – Sylvester's theorem.

Tensors: Contravariant, covariant and mixed tensors – Rank of a tensor – Symmetric and antisymmetric tensors – Contraction of tensor – Quotient law.

Unit III Group Theory

Basic definitions – Multiplication table – Subgroups, cosets and classes – Point and space groups – Homomorphism and isomorphism – Reducible and irreducible representations – Schur's lemma -- The great orthogonality theorem (qualitative treatment without proof) – Formation of character table of C_{2v} and C_{3v} -- Elementary ideas of rotation groups.

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Unit IV Complex Analysis

Cauchy-Riemann conditions – Complex integration – Cauchy's integral theorem and integral formula – Taylor's and Laurent's series – Residues and singularities - Cauchy's residue theorem – Evaluation of definite integrals.

Unit V Special Functions

Basic properties of gamma and beta functions -- Legendre, Bessel, Laugerre and Hermite differential equation: Series solution, Rodriguez formula, generating function, recurrence relations and orthogonality relations.

CO

On the successful completion of the course, students will be able to

1. Acquire the essential mathematical skills to solve problems in various branches ofphysics.
2. Understand the usefulness of vector integration theorems and their utility in solvingphysics problems arising in electromagnetic theory and other branches of physics.
3. Know the usefulness of matrices and matrix operations in solving physics andengineering problems.
4. Attain sound knowledge of classical orthogonal polynomials and their applicationsin quantum physics.
5. Solve various kinds of differential equations that model a variety of natural systems.

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Subject Code: P16PY11

CORE COURSE I - MATHEMATICAL PHYSICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

I M.Sc. Physics

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY11.1	3	3	2	3	3	3	3	3	3	3
P16PY11.2	3	-	2	3	3	3	3	3	3	3
P16PY11.3	3	3	-	3	3	3	-	3	3	3
P16PY11.4	3	3	2	3	3	3	3	3	3	3
P16PY11.5	3	3	2	3	3	3	3	3	-	3
Average	3	3	2	3	3	3	-	3	3	3

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Department of Physics

Year: I **Semester: I**

Subject Code: P16PY12

CORE COURSE II

CLASSICAL DYNAMICS AND RELATIVITY

Objective;-

To learn various mathematical techniques of classical mechanics and their applications to physical systems and introduce relativistic dynamics.

Unit I Fundamental Principles and Lagrangian Formulation

Mechanics of a particle and a system of particles – Conservation laws – Constraints – Generalized coordinates – D'Alembert's principle and Lagrange's equation – Hamilton's principle – Lagrange's equations of motion – Conservation theorems and symmetry properties – Applications to linear harmonic oscillator, pendulum, compound pendulum, charged particles in an electromagnetic field and Atwood's machine.

Unit II Motion Under Central Force

Conservation of energy and angular momentum – Inverse square law – Kepler's problem – Virial theorem – Scattering in a central force field – Artificial satellites – Geo stationary satellites – Eccentricity of orbit of satellites – Escape velocity.

Unit III Rigid Body Dynamics and Oscillatory Motion

Euler's angles – Moments and products of inertia – Euler's equations - Symmetrical top – Theory of

small oscillations – Normal modes and frequencies – Linear triatomic molecule – Wave equation and motion – Phase velocity – Group velocity -- Dispersion.

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Unit IV Hamilton's Formulation

Hamilton's canonical equations of motion – Hamilton's equations from variational principle – Principle of least action – Canonical transformations – Poission bracket – Hamilton--Jacobi method – Action and angle variables – Kepler's problem in action angle variables – Applications of Hamilton's equations of motion to linear harmonic oscillator, pendulum, compound pendulum and charged particles in an electromagnetic field.

Unit V Relativistic Mechanics

Reviews of basic ideas of special relativity – Energy momentum four -vector – Minkowski's four-dimensional space – Lorentz transformation as rotation in Minkowski's space – Composition of Lorentz transformation about two orthogonal directions – Thomas precession – Elements of general theory of relativity.

CO

On the successful completion of the course, students will be able to

1.Solve problems involving Lagrangian and Hamiltonian mechanics.

2. Attain sound knowledge of the basic formalism and geometric aspects of classical mechanics.

3. Understand the usefulness of variational calculus in formulating themechanical laws of motion.

4. Find solutions to problems in the normal mode analysis and its applications.

5. Get familiarized with the dynamical systems.

Year: I **Semester: I**

Subject Code: P16PY12

CORE COURSE I - CLASSICAL DYNAMICS AND RELATIVITY

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

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I M.Sc. Physics

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY12.1	3	3	3	3	3	3	2	3	3	3
P16PY12.2	-	3	3	3	3	3	2	3	3	3
P16PY12.3	3	3	3	-	3	3	2	3	3	3
P16PY12.4	3	3	3	3	3	3	2	3	3	-
P16PY12.5	3	3	3	3	3	3	-	3	3	3
Average	3	3	3	3	3	3	2	3	3	3

Year: I **Semester: I**

Subject Code: P16PY13

CORE COURSE III

ELECTRONICS

Objective;-

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To understand the working of advanced semiconductor devices and digital circuits and the utility of OP-AMP and learn the basics of integrated circuit fabrication, applications of timer IC-555 and building block of digital systems.

Unit I Semiconductor Devices

Varactor, Schottky, tunnel, Gunn, optoelectronic, LASER, LED and photo diodes – Hall effect in a semiconductor -- Depletion and enhancement type MOSFFT – Characteristics of UJT and SCR – Power control DIAC and TRIAC.

Unit II Operation Amplifier

Wien bridge and phase-shift oscillators – Triangular, saw-tooth and square-waves generators – Schmitt trigger – Voltage control oscillator – Phase-locked loops -- Weighted resistor and binary R-2R ladder digital to analog converters -- Counter type and successive approximation analog to digital converters -- Solving simultaneous and differential equations

Unit III Digital Circuits-I

Digital comparator – Parity generator/checker – Data selector -- BCD to decimal decoder –Seven segment decoder – Encoders – RS, JK, D and JK master-slave flip-flops.

Unit IV Digital Circuits-II

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Serial-in serial-out, serial-in parallel-out and parallel-in serial-out shift registers – Synchronous, asynchronous, ring and up/down (using mod 10) counters -- Multiplexers – Demultiplexers.

Unit V IC Fabrication and IC Timer

Basic monolithic ICs – Epitaxial growth – Masking – Etching impurity diffusion – Fabricating monolithic resistors, diodes, transistors, inductors and capacitors – Circuit layout – Contacts and inter connections – Charge coupled device – Applications of CCDs -- 555 timer: Description of the functional diagram, applications of monostable and astable operations and pulse generation.

CO
On the successful completion of the course, students will be able to

1. Understand the basic principle and the underlying concepts of electronic devices.
2. Gain a clear understanding of the operations of electronic circuits.
3. Design and analyze electronic circuits.
4. Learn the applications of the operational amplifier and IC 555 anddemonstrate them in timer.
5. Realize the digital circuits and communication circuits.

Year: I **Semester: I**

Subject Code: P16PY13

CORE COURSE III - ELECTRONICS

MAPPING

CO - PO – PSO matrices of course

1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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If there is no correlation, put "-"

M.Sc. Physics

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY13.1	3	3	3	2	3	3	3	3	2	3
P16PY13.2	3	3	3	2	3	3	3	3	2	3
P16PY13.3	3	3	3	2	3	3	3	3	2	3
P16PY13.4	3	3	3	2	3	3	3	3	2	3
P16PY13.5	3	3	3	2	3	3	3	3	2	3
Average	3	3	3	2	3	3	3	3	2	3

Year: I **Semester: I**

Subject Code: P16PY14

CORE COURSE IV

METHODS OF SPECTROSCOPY

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Department of Physics

Objective;-

To familiarize with the basic principles of various spectroscopic techniques and the applications in the determination of atomic structure, chemical composition and physical properties of materials.

Unit I Atomic Spectroscopy

Quantum states of an electron in atom – Hydrogen atom spectrum – Electron spin -- Stern—Gerlach experiment – Spin-orbit interaction – Two electron system -- LS-JJ coupling schemes – Spectroscopic terms and selection rules - Hyperfine structure – Zeeman and Paschen—Back effect of one and two electron systems – Selection rules – Stark effect.

Unit II Microwave and Infrared Absorption Spectroscopies

Microwave Spectroscopy: Rotation of diatomic molecules – Rotational spectra of polyatomic molecules – Spectrum of nonrigid rotator – Experimental technique – Polyatomic molecules – Linear, symmetric top and asymmetric top molecules.

Infrared Absorption Spectroscopy: Vibrating diatomic molecule – Anharmonic oscillator – Diatomic vibrating rotator – Vibration-rotation spectrum of carbon monoxide – Influence of rotation on the spectrum of polyatomic molecules – Linear and symmetric top molecules – Influence of nuclear spin -- FT techniques.

Unit III Raman Spectroscopy

Quantum theory of Raman effect – Classical theory of Raman effect – Pure rotational Raman spectra – Linear molecules – Symmetric top molecules – Vibration Raman spectra – Rotational fine structure – Structural determination – Raman spectra – Instrumentation – Raman effect and molecular structure – Raman activity of molecular vibrations -

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- Surface enhanced Raman spectroscopy.

Unit IV Nuclear Magnetic Resonance Spectroscopy

Basic principles -- Bloch equations and solutions – Shielding and deshielding effects – Chemical shift – Spin lattice and spin-spin relaxation – Coupling constants – Experimental technique – Double coil method – Structural diagnosis and hydrogen bonding. 7

Unit V UV and ESR Spectroscopies UV: Theory and instrumentation – Types of transition in inorganic work – Change in position and intensity of absorption – Charge transfer transition – Molecular weight data.

ESR: Theory of ESR – Resonance conditions – Experimental study – ESR spectrometer – Crystalline solids and free radicals in solution – Determination of g factor.

CO

To familiarize with

1: Basic principles of various spectroscopic technique

2: Application in determination of atomic structure

3: Study the Raman and electronic spectra of molecules

4: Study the microwave and infrared spectroscopy.

5: Understand the basic concept of NMR and ESR spectroscopy.

Year: I **Semester: I**

Subject Code: P16PY14

CORE COURSE III - METHODS OF SPECTROSCOPY

MAPPING

CO - PO – PSO matrices of course

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1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY14.1	3	3	3	3	2	3	3	3	2	3
P16PY14.2	3	3	3	3	2	3	3	3	2	3
P16PY14.3	3	3	3	3	2	3	3	3	2	3
P16PY14.4	3	3	3	3	2	3	3	3	2	3
P16PY14.5	3	3	3	3	2	3	3	3	2	3
Average	3	3	3	3	2	3	3	3	2	3

Year: I **Semester: I**

Subject Code: P16PY13P

CORE PRACTICAL I

PHYSICS PRACTICAL I (GENERAL AND ELECTRONICS)

OBJECTIVE

The Head
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Experimental determination of certain physical constants and propertiesand verification of characteristics and applications of electronic componentsand devices.

Any **TWELVE** experiments (Six experiments from each part)

A. General Experiments

1. Determination of q, n, by elliptical fringes method
1. Determination of Stefan's constant
2. Determination of bulk modulus of a liquid by ultrasonic wave propagation
3. Determination of Rydberg's constant
4. Study of Hall effect in a semiconductor
5. Determination of dielectric constant at high frequency by Lecher wire
6. Michelson interferometer -- Determination of wavelength ofmonochromatic source.
7. Determination of wavelength of monochromatic source using biprism
8. Charge of an electron by spectrometer
9. Dissociation energy of iodine molecule -- Absorption spectrum
10. Spectrum photo -- Cu/Fe arc spectrum
11. Polarization of light -- Verification of Malus law and Brewster angleof glass.
12. BH loop – Energy loss of a magnetic material – Anchor ring usingB.G./CRO
13. Determination of e/m of an electron by magnetron method
14. Determination of dielectric loss using CRO

B. Electronics Experiments

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1. Construction of dual regulated power supply
2. Astable and monostable multivibrators using IC555
3. Characteristics of UJT
4. Characteristics of SCR
5. Design and study of Wein bridge oscillator using op-amp
6. Design and study of square and triangular waves generators using op-amp
7. Solving ordinary differential equation using op-amp
8. V-I characteristics of a solar cell
9. Up/down counter using mod 10
10. Operation of shift register using serial-in serial-out, serial-in parallel-outand parallel-in serial-out.

CO

1: To acquire hands of knowledge of characteristics of UJT.

2: To understand the different moduli using elliptical fringes.

3: To gain knowledge of the hydrogen spectrum.

4: To study the operation of shift register.

5: To study the Astable Multivibrator using 555 Timer.

Year: I **Semester: I**

Subject Code: P16PY13P

CORE PRACTICAL I -

PHYSICS PRACTICAL I (GENERAL AND ELECTRONICS)

OBJECTIVE

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MAPPING

CO - PO – PSO matrices of course

1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY13P.1	3	3	2	3	3	3	2	3	3	3
P16PY13P.2	3	3	2	3	3	3	2	3	3	3
P16PY13P.3	3	3	2	3	3	3	2	3	3	3
P16PY13P.4	3	3	2	3	3	3	2	3	3	3
P16PY13P.5	3	3	2	3	3	3	2	3	3	3
Average	3	3	2	3	3	3	2	3	3	3

Year: I **Semester: III**

Subject Code: P16PY31

CORE COURSE VII

STATISTICAL MECHANICS

Objectives:-

The Head
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To learn the basics of classical and quantum statistical mechanics and to understand some of their applications.

Unit I Thermodynamics

Thermodynamical laws and their consequences – Entropy -- Changes in entropy in reversible processes -- Principle of increase of entropy -- Thermodynamic functions -- Enthalpy, Helmholtz and Gibbs functions -- Phase transitions -- Clausius Clayperon equation -- van der Wall equation of state.

Unit II Kinetic Theory

Boltzmann transport equation and its validity -- Boltzmann's H-theorem -- Relation between H-function and entropy -- Maxwell--Boltzmann distribution -- Mean free path – Conservation laws -- Transport phenomena – Viscosity of gases -- Thermal conductivity -- Diffusion process.

Unit III Classical Statistical Mechanics

Review of probability theory -- Macro and micro states – Phase space -- Statistical ensembles -- Density function -- Liouville's theorem -- Maxwell--Boltzmann distribution law -- Micro canonical ensemble – Ideal gas – Entropy – Partition function – Equipartition theorem -- Canonical and grand canonical ensembles.

Unit IV Quantum Statistical Mechanics

Basic concepts -- Ideal quantum gas – Bose--Einstein statistics -- Photon statistics -- Fermi--Dirac

statistics -- Sackur-Tetrode equation – Equation of state -- Bose-- Einstein condensation -- Comparison of classical and quantum statistics.

Unit V Applications of Quantum statistical Mechanics

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Ideal Bose System: Photons – Black body and Planck radiation – Specific heat of solids – Liquid helium.

Ideal Fermi System: Properties – Degeneracy – Electron gas -- Pauli paramagnetism. **Ferromagnetism:** Ising and Heisenberg models.

CO

1. To Understand Thermodynamical laws
2. Understand the concepts of Elements of ensemble theory – A system in micro canonical, canonical, and grand canonical ensembles
3. To understand Application of Quantum Statistical Mechanics.
4. To Learn Fermi Dirac and Bose-Einstein distributions.
5. Understand the concepts of statistical mechanics: macroscopic and microscopic states.

Year: I **Semester: III**

Subject Code: P16PY31

CORE COURSE VII - STATISTICAL MECHANICS

MAPPING

CO - PO – PSO matrices of course

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1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY31.1	3	3	2	3	3	3	2	3	3	3
P16PY31.2	3	3	2	3	3	3	2	3	3	3
P16PY31.3	3	3	2	3	3	3	2	3	3	3
P16PY31.4	3	3	2	3	3	3	2	3	3	3
P16PY31.5	3	3	2	3	3	3	2	3	3	3
Average	3	3	2	3	3	3	2	3	3	3

Year: II **Semester: III**

Subject Code: P16PY32

CORE COURSE VIII

SOLID STATE PHYSICS

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Objective ;-

To learn the basics of crystal structure and underlying theoretical development for the description of certain properties and phenomena of solid states.

Unit I Crystal Structure

Basics of crystal systems – Bravias lattices – Defects and Dislocations – Bonding of Solids – Reciprocal lattice – Ewald's sphere construction – Bragg's law – Atomic scattering factor – Diffraction – Structure factor – Experimental techniques – Laue, Powder, Rotation methods – Translational and orientational orders - Kinds of liquid crystalline order and quasicrystals.

Unit II Lattice Vibrations and Thermal Properties

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.

Unit III Free Electron Theory, Energy Bands and Semiconductor Crystals

Energy levels and density of orbitals – Fermi-Dirac distribution – Free electron gas in 3D – Heat capacity of electron gas – Electrical conductivity – Motion in magnetic fields – Hall effect – Thermal conductivity – Nearly conductivity of metals – Nearly free electron model – Electron in a periodic potential – Semiconductors – Band gap – Effective mass – Intrinsic carrier concentration.

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Unit IV Dia, Para, Ferro and Antiferro-Magnetisms

Langevin classical theory of dia- and para-magnetisms – Weiss theory – Quantum theory of paramagnetism – 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. 16

Unit V Ferroelectricity and Superconductivity

General properties and classification of ferroelectric materials – Dipole theory of ferroelectricity **–** Ferroelectric domains – 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 – Applications of superconductors.

CO

1. To learn experimental Determination of certain physical constants and properties hyperbolic Fringes.

2. Study the electrical and magnetic behaviour of materials by four probe and hall experiment.

3. Verification of characteristics and application of electronic components LED,LASER Diode .

4. Study of Flip-Flop .

5. Study of Schmitt trigger using OPAMP.

Year: II **Semester: III**

Subject Code: P16PY32

CORE COURSE VIII - SOLID STATE PHYSICS

MAPPING

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Department of Physics
CO - PO – PSO matrices of course

1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

M.Sc. Physics

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY33P.1	3	3	3	3	3	3	2	3	-	3
P16PY33P.2	3	3	3	3	3	3	2	3	-	3
P16PY33P.3	3	3	3	3	3	3	2	3	-	3
P16PY33P.4	3	3	3	3	3	3	2	3	-	3
P16PY33P.5	3	3	3	3	3	3	2	3	-	3
Average	3	3	3	3	3	3	2	3	-	3

Year: II **Semester: III**

Subject Code: P16PY33P

CORE PRACTICAL III

PHYSICS PRACTICAL III (GENERAL AND ELECTRONICS)

Objective:

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Experimental determination of certain physical constants and properties and verification of characteristics and applications of electronic components and devices.

Any FIFTEEN experiments (At least SIX experiments from each part)

A. General Experiments

1. Determination of q, n, □ by hyperbolic fringes method
2. Determination of thermal conductivity of a good conductor – Forbe's method
3. Determination of bulk modulus of a liquid using ultrasonic interferometer
4. Planck's constant - Photoelectric cell
5. Band gap energy of a semiconductor -- Four-probe method
6. Determination of L of a coil by Anderson's method
7. Determination of e/m of an electron by Thomson's method
8. Determinations of wavelength of a laser source using plane diffraction grating and thickness of a wire
9. Polarizability of liquids by finding the refractive indices at different wavelengths
10. Study of a fiber optic cable -- Numerical aperture and other parameters
11. Magnetic susceptibility of a paramagnetic solution using Quincke's tube method
12. Determination of specific rotator power of a liquid using polarimeter
13. Four-probe method – Determination of resistivities of powdered samples
14. Determination of magnetic susceptibility of liquid by Guoy method
15. Determination of coefficient of coupling by AC bridge method

B. Electronics Experiments

1. Characteristics of LED and photo diodes
2. Characteristicsof laser diode and tunnel diode

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3. Digital to analog converters using op-amp

4. Study of phase-shift oscillator using op-amp

5. Design and study of Schmitt trigger using op-amp

6. Flip-flops -- - RS, JK and D

7. Decoder and encoder

8. Temperature coefficient using 555 timer

9. Design of pre-emphasis and de-emphasis circuits

10. Pulse-width and pulse-position modulations

****

CO

1. 1.To learn experimental Determination of certain physical constants and properties hyperbolic fringes .

2. Study the electrical and magnetic behaviour of materials by four probe and hall experiment.

3.Verification of characteristics and application of electronic components LED,LASER Diode .

4.Study of Flip-Flop .

5.Study of Schmitt trigger using OPAMP.

Year: II
Semester: III

Subject Code: P16PY33P **MAPPING**

CO - PO – PSO matrices of course

1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY33P.1	-	3	3	2	3	3	3	3	2	3
P16PY33P.2	3	3	3	2	3	3	3	3	-	3
P16PY33P.3	3	3	3	2	3	3	3	3	2	3
P16PY33P.4	3	3	3	2	3	3	3	3	2	3
P16PYE33P.5	-	3	3	2	3	3	3	3	-	3
Average	3	3	3	2	3	3	3	3	2	3

Year: II **Semester: III**

Subject Code: P16PYE3

ELECTIVE COURSE III

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Department of Physics
Crystal Growth and Thin Film Physics

Objective;

To understand the theoretical concepts involved in crystal growth and thin film sciences and to learn the basic characterizing techniques of materials.

Unit I Basic Concepts, Nucleation and Kinetics of Growth

Ambient phase equilibrium – Super saturation – Equilibrium of finite phases - Equation of Thomson-Gibbs – Types of nucleation – Formation of critical nucleus – Classical theory of nucleation – Homo and heterogeneous formation of 3D nuclei – Rate of nucleation – Growth from vapor phase, solutions and melts – Epitaxial growth – Growth mechanism and classification – Kinetics of growth of epitaxial films – Mechanisms and controls for nanostructures in 0 and 1 dimensions.

Unit II Crystallization Principles and Growth Techniques

Classes of crystal system – Crystal symmetry – Solvents and solutions – Solubility diagram – Super solubility – Expression for super saturation – Metastable zone and induction period – Miers TC diagram – Solution growth – Low and high temperatures solution growth – Slow cooling and solvent evaporation methods – Constant temperature bath as a crystallizer.

Unit III Gel, Melt and Vapor Growth Techniques

Principle of gel technique – Various types of gel -- Structure and importance of gel – Methods of gel

growth and advantages -- Melt technique – Czochralski growth – Floating zone – Bridgeman method – Horizontal gradient freeze – Flux growth – Hydrothermal growth –

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Vapor-phase growth – Physical vapor deposition – Chemical vapor deposition – Stoichiometry.

Unit IV Thin Film Deposition Techniques

Vacuum evaporation -- Hertz-Knudsen equation -- Evaporation from a source and film thickness uniformity -- E-beam, pulsed laser and ion beam evaporations -- Glow discharge and plasmas -- Mechanisms and yield of sputtering processes – DC, rf, magnetically enhanced, reactive sputterings – Spray pyrolysis – Electro deposition – Sol-gel technique.

Unit V Characterization Techniques

X–ray diffraction – Powder and single crystal – Fourier transform infrared analysis – Elemental dispersive X-ray analysis – Transmission and scanning electron microscopy – UV-vis-NIR spectrometer – Chemical etching –Vickers micro hardness – Basic principles and operations of AFM and STM -- X-ray photoelectron spectroscopy for chemical analysis -- Ultraviolet photoemission spectroscopy analysis for work function of the material -- Photoluminescence – Thermoluminescence.

CO

1. To understand the theoretical concepts
Crystallozation Principle.
2. To Know the Various Growth Technique.
3. To Learn Thin Film Deposition Technique.
3. To understand Methods of Gel growth.
4. To study FT-IR analysis.
5. To understand X-ray analysis.

Year: II **Semester: III**

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Subject Code: P16PYE3

ELECTIVE COURSE III - Crystal Growth and Thin Film Physics

MAPPING

CO - PO – PSO matrices of course

1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

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PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PYE3.1	-	3	3	2	3	3	3	3	2	3
P16PYE3.2	3	3	3	2	3	3	3	3	-	3
P16PYE3.3	3	3	3	2	3	3	3	3	2	3
P16PYE3.4	3	3	3	2	3	3	3	3	2	3
P16PYE3.5	-	3	3	2	3	3	3	3	-	3
Average	3	3	3	2	3	3	3	3	2	3

Year: II **Semester: III**

Subject Code: P16PYE4

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Department of Physics
ELECTIVE COURSE IV

NONLINEAR OPTICS

Objective;-

• To learn the basic principles and working of lasers, basic processes and features of nonlinear optical materials and fiber optics.

Unit I Lasers

Gas lasers – He-Ne, Ar^+ ion lasers – Solid state lasers – Ruby – Nd:YAG, Ti sapphire – Organic dye laser – Rhodamine – Semiconductor lasers – Diode laser, p-n-junction laser and GaAs laser.

Unit II Basics of Nonlinear Optics

Wave propagation in an anisotropic crystal – Polarization response of materials to light – Harmonic generation – Second harmonic generation – Sum and difference frequency generation– Phase matching – Third harmonic generation – Terahertz -- Bistability – Self-focusing.

Unit III Multiphoton Processes

Two photon process – Theory and experiment – Three photon process - Parametric generation of light – Oscillator – Amplifier – Stimulated Raman scattering – Intensity dependent refractive index -- Optical Kerr effect -- Foucault effect – Photorefractive, electronic and optic effects.

Unit IV Nonlinear Optical Materials

Basic requirements – Inorganics – Borates – Organics – Urea, Nitroaniline – Semiorganics – Thoreau complex – Laser induced surface damage threshold.

Unit V Fiber Optics

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Step – Graded index fibers – Wave propagation – Fiber modes – Single and multimode fibers –Numerical aperture – Dispersion – Fiber bandwidth – Fiber losses -- Scattering, absorption, bending, leaky mode and mode coupling losses -- Attenuation coefficient -- Material absorption.

CO

1. To learn the basic principles and working of Lasers.
2. To learn Multiphoton Process.
3. To acquire Non linear optic basics and material.
4. To Study fiber optics materials .
5. To Learn types of fibres.

Year: II

Semester: III

Subject Code: P16PYE4

ELECTIVE COURSE IV - NONLINEAR OPTICS

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MAPPING

CO - PO – PSO matrices of course

1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PYE4.1	-	3	3	3	2	3	3	3	2	3
P16PYE4.2	3	3	3	3	2	3	3	3	2	3
P16PYE4.3	3	3	3	-	2	3	3	3	2	3
P16PYE4.4	3	3	3	3	2	3	3	3	-	3
P16PYE4.5	3	3	3	3	2	3	-	3	2	3
Average	3	3	3	3	2	3	3	3	2	3

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M.Sc Physics

Programme Outcome of M.Sc. Physics (PO):

PO1: Identify, formulate and analyse physical problems using basic principles of physics.

PO2: Create, apply disseminate knowledge leading to innovation.

PO3: Think critically, explore possibilities and exploit opportunities positively.

PO4: Apply various modern technique for research and analysis purpose.

PO5: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning.

Programme Specific Outcome of M.Sc. Physics (PSO):

PSO1: The students would gain substantial knowledge in various branches of physics : Mathematical physics, Classical mechanics, Statistical Mechanics, Electromagnetic theory, Solid state physics Quantum mechanics Nuclear and particle physics.

PSO2: Develop working knowledge of experimental, computational techniques and instrumentation required to work independently

PSO3: Equip students for seeking suitable careers in physics.

PSO4: Perform basic applied and collaborative research.

PSO5: Become socially and environmentally responsible citizen.

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Department of Physics

Year: I **Semester: II**

Subject Code: P16PY21

CORE COURSE V

ELECTROMAGNETIC THEORY

Objective;-

To learn the theory for the fields produced by stationary and moving charge and charged systems and propagation of electromagnetic fields.

Unit I Electrostatics and Polarization

Gauss's law – Field due to an infinite, straight, uniformly charged wire – Multipole expansion of a charge distribution -- Field inside a uniformly polarized sphere – Electric field inside a dielectric – Electric displacement and polarizability – Claussius Mossotti relation – Polarization of polar molecules and Langevin equation and Debye relation – Electrostatic energy.

Unit II Boundary Value Problems in Electrostatics

Boundary conditions – Potential at a point between the plates of a spherical capacitor – Potential at a point due to uniformly charged disc – Method of image charges – Point charge in the presence of a grounded conducting sphere -- Point charge in the presence of a charged, insulated conducting sphere -- Conducting sphere in a uniform electric field – Laplace equation in rectangular coordinates.

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Unit III Magnetostatics

Magnetic scalar and vector potentials – Magnetic dipole in a uniform field – Magnetization current – Magnetic intensity – Magnetic susceptibility and permeability – Hysteresis – Correspondences in electrostatics and magnetostatics.

Unit IV Field Equations and Conservation Laws

Continuity equation – Displacement current – Maxwell's equations and their physical significance – Poynting theorem – Energy in electromagnetic fields – Electromagnetic potentials – Maxwell's equations in terms of electromagnetic potentials – Lorentz and Coulomb gauges.

Unit V Electromagnetic Waves and Wave Propagation

Electromagnetic waves in free space – Propagation of electromagnetic waves in isotropic dielectrics and in anisotropic dielectrics – Reflection and refraction of electromagnetic waves: Kinematic and dynamic properties – TM and TE modes – Propagation in rectangular waveguides – Cavity resonator.

CO

1. To learn the theory for the fields produced by stationary and moving charge and charged system.

2. Propagation in Rectangular wave guides.

3. Study the Maxwell equation.

4. To understand electromagnetic waves in free space.

5.To know the hysteresis.

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Department of Physics

Year: I **Semester: II**

Subject Code: P16PY21

CORE COURSE V - ELECTROMAGNETIC THEORY

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY21.1	3	3	2	3	3	3	2	3	3	3
P16PY21.2	3	3	2	3	3	3	2	3	3	3
P16PY21.3	3	3	2	3	3	3	2	3	3	3
P16PY21.4	3	3	2	3	3	3	2	3	3	3
P16PY21.5	3	3	2	3	3	3	2	3	3	3
Average	3	3	2	3	3	3	2	3	3	3

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Department of Physics

Year: I **Semester: II**

Subject Code: P16PY22

CORE COURSE VI

QUANTUM MECHANICS

OBJECTIVE

• To learn the fundamental concepts and certain theoretical methods of quantum mechanics and their applications to microscopic systems.

Unit I Schrödinger Equation and General Formulation

Schrödinger equation and its plane wave solution – Physical meaning and conditions on the wave function – Expectation values – Hermitian operators and their properties – Commutator relations -- Uncertainty relation -- Bra and ket vectors -- Hilbert space – Schrödinger, Heisenberg and interaction pictures.

Unit II Exactly Solvable Systems

Linear harmonic oscillator: Solving the one-dimensional Schrödinger equation and abstract operator method – Particle in a box -- Rectangular barrier potential – Rigid rotator – Hydrogen atom.

Unit III Approximation Methods

Time-independent perturbation theory: Non-degenerate (first-order) and degenerate perturbation theories -- Stark effect – WKB approximation and its application to tunneling problem and quantization rules**.**

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Time-dependent perturbation theory: Constant and harmonic perturbations -- Transition probability – Sudden approximation.

Unit IV Scattering Theory and Angular Momentum

Scattering theory: Scattering amplitude and cross-section – Green's function approach -- Born approximation and its application to square-well and screened Coulomb potentials.

Angular momentum: Components of orbital angular momentum – Properties of **L** and $\mathbf{L}^2$ -- Eigenpairs of $\mathbf{L}^2$ and L_z – Spin angular momentum.

Unit V Relativistic Quantum Mechanics

Klein--Gordon equation for a free particle and its solution – Dirac equation for a free particle and Dirac matrices -- Charge and current densities – Plane wave solution – Negative energy states – Zitterbewegung – Spin of a Dirac particle – Spin-orbit coupling.

CO

1. Study the basic physical concept of quantum mechanics
2. To understand the fundamental concepts such as Schrodinger equation
3. To verify the first order and second order Perturbations theory .
4. Understand the basic ideas of spin angular momentum.
5. To Understand Heisenberg principle.

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Subject Code: P16PY22

CORE COURSE VI - QUANTUM MECHANICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY22.1	3	3	3	3	3	3	2	3	3	3
P16PY22.2	3	3	3	3	3	3	2	3	3	3
P16PY22.3	3	3	3	3	3	3	2	3	3	3
P16PY22.4	3	3	3	3	3	3	2	3	3	3
P16PY22.5	3	3	3	3	3	3	2	3	3	3
Average	3	3	3	3	3	3	2	3	3	3

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Department of Physics

Year: I **Semester: II**

Subject Code: P16PY23P

CORE PRACTICAL II- PHYSICS PRACTICAL II (MICRPROCESSOR AND PROGRAMMING)

Objective

To develop programming skills of microprocessor and C++ programming insolving some mathematical problems and their applications.

Any **FIFTEEN** experiments (At least SIX experiments from each part)

A. Microprocessor (8085)

1. Finding the largest and smallest numbers in a data array
2. Arranging a set of numbers in ascending and descending orders
3. Study of multibyte decimal addition
4. Study of multibyte decimal subtraction
5. Interfacing hexakey board (IC 8212)
6. Study of seven segment display
7. Study of DAC interfacing (DAC 0900)
8. Study of ADC interfacing (ADC 0809)
9. Study of timer interfacing (IC 8253)
10. Study of programmable interrupt controller (IC 8259)
11. Traffic control system Digital clock Generation of square and sine waves using DAC0800

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12. Digital thermometer (temperature controller)
13. Control of stepper motor using microprocessor

B. C++ Programming

1. Least-squares curve fitting – Straight-line fit
2. Least-squares curve fitting – Exponential fit
3. Real roots of one-dimensional nonlinear equations -- NewtonRaphson method
4. Complex roots of one-dimensional nonlinear equations -- Newton--Raphson method
5. Interpolation – Lagrange method
6. Numerical integration – Composite trapezoidal rule
7. Numerical integration – Composite Simpson's 1/3 rule
8. Solution of a second-order ODE – Euler method
9. Solution of a first-order ODE – Fourth-order Runge--Kutta method
10. Uniform random number generation – Park and Miller method
11. Gaussian random number generation – Box and Muller method
12. Evaluation of definite integrals – Monte Carlo method
13. Calculation of mean and standard deviation of a set of uniform randomnumbers
14. Computation of eigenvalues of linear harmonic oscillator by numerically solving Schrödinger equation
15. Monte Carlo simulation of electronic distribution of hydrogen atom

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CO:

1. Developing Programming skills of microprocessor 8085and study of interfacing kits.

2. Solving mathematical problems using C++ such as Least Square Fit.

3. Apply C++ program to solve Lagrange method.

4. To Solve Euler method using C++.

5. To Evaluate RungeKutta method using C++.

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Year: I **Semester: II**

Subject Code: P16PY23P

CORE PRACTICAL II- PHYSICS PRACTICAL II (MICRPROCESSOR AND PROGRAMMING)

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY23P.1	3	3	3	3	3	3	2	3	3	3
P16PY23P.2	3	3	3	3	3	3	2	3	3	3
P16PY23P.3	3	3	3	3	3	3	2	3	3	3
P16PY23P.4	3	3	3	3	3	3	2	3	3	3
P16PY23P.5	3	3	3	3	3	3	2	3	3	3
Average	3	3	3	3	3	3	2	3	3	3

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Year: I **Semester: II**

Subject Code: P16PYE1

ELECTIVE COURSE I

MICROPROCESSOR AND MICROCONTROLLER

OBJECTIVE

• To learn basic principles of architecture and functioning of microprocessor and microcontroller and programming and interfacing aspects of them. **Unit I Microprocessor Architecture and Interfacing**

Intel 8085 microprocessor architecture – Pin configuration – Instruction cycle – Timing diagram – Instruction and data formats – Addressing modes -- Memory mapping and I/O mapping I/O scheme -- Memory mapping I/O interfacing -- Data transfer schemes -- Synchronous and asynchronous data transfer – Interrupt driven data transfer - Interrupts of Intel 8085.

Unit II Assembly Language Programs (8085 only)

BCD arithmetic -- Addition and subtraction two 8-bit and 16-bit numbers -- Largest and smallest numbers in a data set – Ascending order and descending order – Sum of a series of a 8-bit numbers – Sum of a series of multibyte decimal numbers – Square root of a number – Block movement of data -- Time delay – Square-wave generator.

Unit III Peripheral Devices and Microprocessor Applications Generation of control signals for memory and I/O devices -- I/O ports -- Programmable peripheral interface -- Architecture of 8255A -- Control word -- Programmable interrupt controller (8259) -- Programmable counter -- Intel 8253 -- Architecture, control word and operation – Block diagram and interfacing of analog to digital converter (ADC 0800) – Digital to analog converter (DAC 0800) – Stepper motor – Traffic control.

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Unit IV Microcontroller 8051

Features of 8051 – Architecture – Pin configuration – Memory organization -- External data and program memory -- Counters and timers – Serial data input/output – Interrupt structure – External interrupts – Addressing modes -- Comparison between microprocessor and microcontroller.

Unit V 8051 Instruction Set and Programming

Instruction set – Data transfer, arithmetic and logical instructions – Boolean variable manipulation instructions – Program and machine control instructions – Simple programs – Addition and subtraction of two 8-bit and 16-bit numbers – Division – Multiplication -- Largest number in a set – Sum of a set of numbers.

CO

Gained knowledge in

1. 8085 microprocessor and its architecture,
2. 8085 Programming and its Peripherals.
3. 8051 Microcontroller, its architecture and Programming.
4. To Learn Instruction cycle and timing diagram 8085.
5. To Study 8051 addressing mode.

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Department of Physics

Year: I **Semester: II**

Subject Code: P16PYE1

ELECTIVE COURSE I

MICROPROCESSOR AND MICROCONTROLLER

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

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PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PYE1.1	-	3	3	2	2	3	3	3	2	3
P16PYE1.2	3	3	3	2	-	3	3	3	2	3
P16PYE1.3	3	3	-	2	2	3	3	3	2	3
P16PYE1.4	3	3	3	2	2	3	3	3	2	3
P16PYE1.5	3	3	3	2	-	3	3	-	2	-
Average	3	3	3	2	2	3	3	3	2	3

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Year: II **Semester: IV**

Subject Code: **P16PYE2**

ELECTIVE COURSE II

NUMERICAL METHODS AND C++ PROGRAMMING

Objective ;-

To learn numerical methods of computing certain mathematical quantities, construction and evaluation of a function and solution of an ordinary differential equation and C++ computer programming necessary for numerical simulation of physical problems.

Unit I Programming in C++

Constants and variables -- I/O operators and statements -- Header files -- Main function – Conditional statements -- Switch statement -- Void function -- Function program -- For, while and do-while statements -- Break, continue and goto statements -- Arrays.

Unit II Curve Fitting and Interpolation

Curve fitting: Method of least-squares - Straight-line fit -- Exponential and power law fits.

Interpolation: Newton interpolation polynomial: Linear interpolation, Higher-order polynomials and first-order divided differences – Gregory--Newton interpolation polynomials – Lagrange interpolation.

Unit III Solutions of Linear and Nonlinear Equations

Simultaneous linear equations: Upper triangular form and back substitution – Augmented matrix -- Gauss elimination method -- Jordan's modification -- Inverse of a matrix by Gauss--Jordan method.

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Roots of nonlinear equations: Newton--Raphson method -- Termination criteria -- Pitfalls – Order of convergence.

Unit IV Numerical Integration and Differentiation

Numerical integration: Trapezoidal and Simpson's 1/3 rules -- Errors in the formulae -- Composite trapezoidal and Simpson's 1/3 rules -- Errors in the formulae. **Numerical differentiation:** Two- and four-point formulae for first-order derivative -- Three- and five-point formulae for second-order derivative.

Unit V Numerical Solution of Ordinary Differential Equations First-order equations: Euler and improved Euler methods – Local and global truncation errors -- Fourth-order Runge--Kutta method -- Geometric description of the formula.

Second-order equations: Euler methods and fourth-order Runge--Kutta method.

CO

To learn Numerical Methods of computing in C++

1. Curve fitting and interpolation

2. Solution of Linear and non linear equations

3. Numerical Integration and Differentiation

4. Numerical Solution of Ordinary Differential Equations

5. Understand the theory for Gauss Forward and Backward difference rule

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Year: II **Semester: IV**

Subject Code: P16PYE2

ELECTIVE COURSE II

NUMERICAL METHODS AND C++ PROGRAMMING

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PYE2.1	3	-	3	3	2	3	3	3	2	3
P16PYE2.2	3	3	3	3	2	3	3	3	2	3
P16PYE2.3	3	3	-	3	2	3	3	3	2	3
P16PYE2.4	3	3	3	3	-	3	3	3	2	3
P16PYE2.5	3	3	3	3	2	3	3	-	2	-
Average	3	3	3	3	2	3	3	3	2	3

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Department of Physics

Year: II **Semester: IV**

Subject Code: P16PY41

CORE COURSE IX

NUCLEAR AND PARTICLE PHYSICS

Objective;-

To learn the various aspects of nucleus and its behavior under various conditions.

Unit I Nuclear Properties

Nuclear energy levels - Nuclear angular momentum, parity, isospin – Nuclear magnetic dipole moment – Nuclear electric quadropole moment - Ground state of deuteron – Magnetic dipole moment of deuteron – Proton-neutron scattering at low energies – Scattering length, phase shift – Nature and properties of nuclear forces – Spin dependence – Charge symmetry – Charge independence – Repulsion at short distances – Exchange forces – Meson theory.

Unit II Radioactive Decays

Alpha emission – Geiger-Nuttal law – Gamow theory – Neutrino hypothesis – Fermi theory of beta decay – Selection rules – Nonconservation of parity – Gamma emission – Selection rules -- Nuclear isomerism -- Gamma ray spectroscopy – Mossbauer effect -- Interaction of charged particles and X-rays with matter – Types and basic principles of particle detectors.

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Unit III Nuclear Reactions and Nuclear Models

Reciprocity theorem – Breit-Wigner formula – Resonance theory – Liquid drop model – Shell model -- Evidences for shell model -- Magic numbers -- Harmonic oscillator – Square-well potential -- Spin-orbit interaction – Collective model of a nucleus.

Unit IV Fission and Fusion Reactors

Characteristics of fission – Mass distribution of fragments – Radioactive decay processes – Fission cross-section – Energy in fission – Bohr-Wheeler's theory of nuclear fission – Fission reactors – Thermal reactors – Homogeneous reactors – Heterogeneous reactors – Basic fusion processes -- Characteristics of fusion – Solar fusion – Controlled fusion reactors.

Unit V Particle Physics

Nucleons, leptons, mesons, baryons, hyperons, hadrons, strange particles - Classification of fundamental forces and elementary particles – Basic conservation laws – Additional conservation laws: Baryonic, leptonic, strangeness and isospin charges/quantum numbers – Gell-mann--Nishijima formula - Invariance under charge conjugation (C), parity (P) and time reversal (T) – CPT theorem -- Parity nonconservation in weak interactions – CP violation – Eight-fold way and supermultiplets – SU(3) symmetry and quark model.

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CO

1. To understand Various aspect of nucleus properties.
2. Learn about the process of Radioactive Decays.
3. Learn the basic aspects of nuclear reaction.
4. To study the Fission and Fusion Reactors.
5. To Learn about Particle Physics.

Year: II **Semester: IV**

Subject Code: P16PY41

CORE COURSE IX - NUCLEAR AND PARTICLE PHYSICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY41.1	3	3	2	-	3	3	2	3	3	3
P16PY41.2	-	3	2	3	3	3	2	3	3	3
P16PY41.3	3	3	2	3	3	3	-	3	3	3
P16PY41.4	3	3	2	3	3	3	2	3	3	3
P16PY41.5	3	3	-	3	3	3	2	3	3	-
Average	3	3	2	3	3	3	2	3	3	3

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Year: II Semester: IV
Subject Code: P16PY42

CORE COURSE X

ADVANCED PHYSICS

Objective;-

To learn the basics and the advanced applications of physics in the fields of astrophysics, space physics, biomedical science and wireless communication.

Unit I Astrophysics and Radio Astronomy \Astrophysics:

Physical properties of stars - Life cycle of a star - End products of stellar evolution – Structure of milky way - Expanding universe - Future prospects.

Radio Astronomy (RA): Radio telescopes - Synchrotron radiation - Spectral lines in RA - Major discoveries in RA - RA in India - Hot big bang cosmology.

Unit II India's Space Programme

Overview - Methodological issues in cost beneficial analysis of space programme - The INSAT system - Broadcasting - Telecommunication - Meteorology - Indian remote sensing programme – Geoinformatics (basic idea only) - The launching programme

Unit III Biomedical Instruments

Ear and hearing Aids: Basic measurements of ear function - Air and bone conduction - Masking - Middle ear impedance audiometry - Oto-acoustic emission - Types of hearing aids and Cochlear implants -

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Sensory substitution aids - Electrophysiology: Source of biological potentials - Signal size and electrodes - Functions - Features of ECG, EEG and EMG. Cardiac and blood related devices: Pacemakers - Electromagnetic compatibility – Defibrillators - Artificial heart valves - Cardiopulmonary bypass - Haemodialysis.

Unit IV Wireless Communication Technology-I

Cellular Radio: IMTS, AMPS control system - Security and privacy - Cellular telephone specifications and operations - Cell site equipments - Fax and data communication using cellular phones and CDPD - Digital cellular systems. Personal Communication Systems (PCS): Differences between CS and PCS, IS-1 36 TDMA PCS, GSM, IS-95 CDMA PCS - Comparison of modulation schemes - Data communication with PCS.

Unit V Wireless Communication Technology – II

Satellite orbits – Satellites for communication - Satellites and transponders - Signal and noise calculations - InMARST, MSAT system using low - and medium-earth orbit stations. Paging (one-way and two-ways) and messaging system - Voice paging - LAN topologies - Ethernet bridges - Wireless LANs - Radio LANs - Bluetooth - Wireless bridges - Connections using infrared wireless modems - Wireless packet data services.

CO

1. Acquired knowledge in Astrophysics and Radio Astronomy.
2. To Study the Overview of ISRO.
3. To Understand Biomedical Instruments
4. To Learn Wireless communication technology such as GSM,CDMA.
5. To Understand Satellite Communication and LAN Topologies .

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Year: II **Semester: IV**

Subject Code: P16PY42 **CORE COURSE X**

ADVANCED PHYSICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY42.1	-	3	3	3	3	3	2	3	3	3
P16PY42.2	3	3	3	3	3	3	2	3	3	3
P16PY42.3	3	-	3	3	3	-	2	3	3	3
P16PY42.4	3	3	3	3	3	3	2	3	3	3
P16PY42.5	3	3	3	3	3	3	2	-	3	3
Average	3	3	3	3	3	3	2	3	3	-

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Year: II **Semester: IV**

Subject Code: P16PY43P

CORE PRACTICAL IV

PHYSICS PRACTICAL IV

(ELECTRONICS)

OBJECTIVE

Verification of characteristics and applications of electronic components anddevices.

Any **FIFTEEN** experiments

1. Characteristics of LVDT
2. Characteristics of LDR
3. Characteristics of strain guage
4. Characteristics of load cell
5. Characteristics of torque transducer
6. Calibration of thermistor
7. Digital to analog converter -- R-2R and weighted method
8. Study of frequency multiplexer using PLL
9. Digital comparator using XOR and NAND gates
10. Study of Hall effect
11. Four bit binary up and down counter using IC 7473
12. BCD to 7 segment display
13. Study of RAM
14. Study of A/D converter -- Counter ramp type method

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15. Study of Arithmetic Logic Unit (ALU) -- IC 74181
16. Construction and study of characteristics of Chua's diode
17. Study of nonlinear dynamics of Chua's circuit
18. Construction of memristor
19. Pulse code modulation and demodulation
20. Voltage controlled oscillator using IC 555
21. Microwave IC – Filter Characteristics
22. Characteristics of a voltage dependent resistor (VDR)
23. Transmission characteristics of optical fiber link
24. Design of AC/DC voltage regulator using SCR
25. Characteristics of Gunn diode oscillator

CO

1. To verify the charecteristics and applications of electronic components and devices such as D/A convertor.

2. To study digital comparator.

3. Comprehend the principle of Hall effect.

4. To Gain knowledge in ALU.

5. To study UP/DOWN counter.

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Year: II **Semester: IV**

Subject Code: P16PY43P

CORE PRACTICAL IV

PHYSICS PRACTICAL IV

(ELECTRONICS)

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

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PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PY43P.1	-	3	3	2	3	3	3	3	2	3
P16PY43P.1	3	3	3	2	3	3	3	3	-	3
P16PY43P.1	3	3	3	2	3	3	3	3	2	3
P16PY43P.1	3	3	3	2	3	3	3	3	2	3
P16PY43P.1	-	3	3	2	3	3	3	3	-	3
Average	3	3	3	2	3	3	3	3	2	3

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Department of Physics

Year: II **Semester: IV**

Subject Code: P16PYE5

ELECTIVE COURSE V

NANOPHYSICS

Objectives ;-

• To learn the structures, properties, characterization and applications of nanomaterials.

Unit I Introduction to Nano and Types of Nanomaterials

Need and origin of nano -- Nano and energetic – Top-down and bottom-up approaches – Introductory ideas of 1D, 2D and 3D nanostructured materials -- Quantum dots -- Quantum wire – Quantum well -- Exciton confinement in quantum dots.

Unit II Carbon Nanostructures

Carbon molecules and carbon bond -- C_{60}: Discovery and structure of C_{60} and its crystal -- Superconductivity in C_{60} -- Carbon nanotubes: Fabrication – Structure – Electrical properties – Vibrational properties – Mechanical properties -- Applications (fuel cells, chemical sensors, catalysts).

Unit III Fabrication of Nanomaterials

Synthesis of oxide nanoparticles by sol-gel method -- Electrochemical deposition method – Electrospinning method – Lithography -- Atomic layer deposition -- Langmuir--Blodgett films -- Zeolite cages -- Core shell structures – Organic and inorganic hybrids.

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Unit IV Characterization of Nanomaterials

Principles, experimental set-up, procedure and utility of scanning electron microscopy (SEM), transmission electron microscopy (TEM), scanning tunneling microscope (STM) and scanning probe microscopy (SPM).

Unit V Applications

Molecular electronics and nanoelectronics – Nanorobots -- Biological applications of nanoparticles -- Catalysis by gold nanoparticles – Band-gap engineered quantum devices -- Nanomechanics -- CNT emitters – Photoelectrochemical cells -- Photonic crystals – Plasmon waveguides.

CO

1. To learn Nano and types of Nano material.
2. To understand Carbon Nanostructure.
3. To study the Fabrication of nano materials.
4. To learn the Charecterization of nanomaterial.
5. To understand the Application of nano material such as nanorobot.

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Year: II **Semester: IV**

Subject Code: P16PYE5

ELECTIVE COURSE V - NANOPHYSICS

MAPPING

CO - PO – PSO matrices of course

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

M.Sc. Physics

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
P16PYE5.1	3	3	3	2	3	3	3	3	2	3
P16PYE5.2	-	3	3	2	-	3	3	3	2	3
P16PYE5.3	3	3	3	2	3	3	3	3	-	3
P16PYE5.4	3	-	3	2	3	3	3	3	2	3
P16PYE5.5	3	3	3	2	3	3	3	-	2	3
Average	3	3	3	2	3	3	3	3	2	3

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