Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 101 Title : Core I: Properties of Matter		Semester: I
Hrs/Week:	3	Credit:3
Objectives	➢ To understand the basic concepts of gravitation. ➢ To get exposure to the properties of liquids & solids	

Unit	Content	Hrs
I	**GRAVITATION** Kepler's laws - Newton's law of gravitation - Gravitational constant : Boy's Method - Gravitational field and Gravitational potential - Potential energy - Escape velocity - Equipotential surface - Earthquakes - Seismic waves - Determination of the Epicenter and the focus - Applications of Seismology	8
II	**ELASTICITY** Stress and Strain - Hooke's law - Types of Elasticity - Relation connecting the Elastic constants - Poisson' s ratio - Torsional pendulum - Determination of Moment of Inertia : The Inertia Table - Bending of beams - Bending moment – Depression of a beam Supported at the ends	8
III	**VISCOSITY** Viscosity - Coefficient of viscosity - Poiseuille's equation for the flow of liquid through a horizontal capillary tube – Experimental determination of coefficient of viscosity for a liquid - Motion in a viscous medium: Stoke's law - Determination of coefficient of viscosity of highly viscous liquid - Stoke's method - Rotation viscometer	8
IV	**SURFACE TENSION** Surface tension - Surface energy - Excess pressure inside a liquid drop and soap bubble - Determination of surface tension of a bubble - Capillary rise - Energy required to raise a liquid in a capillary tube - Experimental study of variation of surface tension with temperature	8
V	**DIFFUSION AND OSMOSIS** Diffusion - Fick's law - Graham's law of diffusion of gases - Osmosis and osmotic pressure - Laws of osmotic pressure - Experimental determination of osmotic pressure	7

Text Books

- Mathur D.S. (2003). *Elements Of Properties Of Matter*. Shyam Lal Charitable Trust, New Delhi, (Units I - V).

Reference Books

- Brijlal & Subramaniam, (2000). *Properties Of Matter*. Vikas Publications house, New Delhi.
- Murugesan R. (1995). *Properties Of Matter*. S.Chand & Company Ltd, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 102 Title : Core II: Mechanics & Sound		Semester: I
Hrs/Week:	3	Credit:3
Objectives	➢ Understand principles of rigid body dynamics and Projectile motions, ➢ Understand statics, hydrostatics and hydrodynamics	

Unit	Content	Hrs
I	**Rigid body dynamics** Rigid body–rotational and vibrational motion –Torque– moment of inertia – radius of gyration –kinetic energy of rotation– M.I. of a fly wheel– experimental determination– precession–M.I. of a diatomic molecule–its rotational energy states.	8
II	**Projectiles** Projectiles – Range – Expression for the range of projectile on the inclined plane – path of a projectile – Impulse – Direct and oblique impact – Expression for velocity after direct impact – Loss of energy during direct and oblique impact.	7
III	**Statics** Force of friction –Limiting friction – Laws of friction –Angle of friction and resultant reaction **Hydrostatics** Definition and determination of centre of pressure – Expression for centre of pressure of a rectangular lamina with one side on the surface of the liquid – Laws of floatation– Definition for metacentre and metacentric height. **Hydrodynamics** Steady or streamline flow – Lines and tubes flow – Equation of continuity of flow–Bernoulli's theorem.	8
IV	**Sound** Classification of Sound - Musical sound and Noise – Speech – Human voice – Human Ear – Characteristic of Musical Sound – Intensity of Sound – Measurement of Intensity of Sound – Decibel – Phon(Definitions only) – Velocity of Transverse waves along a stretched string – Laws of transverse vibration of strings – Melde's experiment – Resonance.	8
V	**Acoustics and Ultrasonics** Introduction – Reverberation – Sabine's Reverberation formula – Determination of Absorption coefficient – Factors affecting Acoustics of buildings – Sound distribution in an Auditorium – Requisites for good acoustics – Ultrasonics – Production of Ultrasonics – Magnetostriction Oscillator – Piezoelectric oscillator – Detection of Ultrasonic waves – Acoustic grating – Applications.	8

Text Books

- Mathur D.S. (1996). *Mechanics*. S.Chand & Company Ltd, New Delhi, (Units I & III).
- Venkataraman M.K. (2014). *Dynamics*. Agasthiar Publications, Trichy, (Unit II).
- Mathur D.S. (2003). *Elements Of Properties Of Matter*. Shyam Lal Charitable Trust, New Delhi, (Unit III).
- Brijlal. N. Subramaniam. (2002). *Text Book of Sound*. Vikas Publications house Pvt Ltd, NewDelhi, (Unit IV & V).

Reference Books

- Chakraborthy. B. K. *(2001.)Mechanics and General properties of matter*, (2001). Books & Allied (P) Ltd, .
- Rajendran. V,Marikani. A.(1997) *Applied Physics for Engineers.* Tata Mc-Graw Hill, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 203 Title : Core III: Heat & Thermodynamics		Semester: II
Hrs/Week:	5	Credit: 5
Objectives	➢ To understand the basic nature of heat. ➢ To apply the laws of thermodynamics to simple thermodynamical problems	

Unit	Content	Hrs
I	**THERMOMETRY AND SPECIFIC HEATS** Concept of heat and temperature - Thermoelectric thermometer - Absolute zero and Ice point - Low temperature measurement - High temperature measurement - Specific heat of a gas – C_p & C_v- Determination of C_v by Joule's differential steam calorimeter - Determination of C_p by continuous flow electrical method - Dulong and Petit's law - Variation of Specific heat and Atomic heat with temperature - Einstein's theory of specific heat - Debye's theory of specific heat	13
II	**KINETIC THEORY OF GASES** Kinetic theory of gases - Postulates - Derivation of gas equation - Maxwell's law of distribution of velocities - Experimental verification - Mean free path - Application of mean free path in determination of viscosity and thermal conductivity - Degrees of freedom and Maxwell's law of equipartition of energy – Vander waal's equation of state - Critical constants - Corresponding states of matter	13
III	**TRANSMISSION OF HEAT** Thermal conductivity - Forbe's method - Radial and cylindrical flow of heat - Thermal conductivity of rubber - Stefan's law and experimental verification - Determination of Stefan's constant - Blackbody - Properties of thermal radiation - Distribution of energy in the spectrum of a black body - Planck's law of black body radiation and significance	13
IV	**LOW TEMPERATURE PHYSICS** Porous Plug experiment and theory - Cascade process - Liquefaction of Oxygen - Air (Linde's process) - Hydrogen (Cascade process) - Liquefaction of Helium - K.Onnes method - Helium I and Helium II - Production of low temperature - Adiabatic demagnetization - Conversion of magnetic temperature to Kelvin temperature - Helium vapour pressure thermometer - Electrolux refrigerator	13
V	**THERMODYNAMICS** Zeroth law of thermodynamics - Thermal equilibrium - Comparison of heat and work - First law of thermodynamics - Isothermal and Adiabatic process - Work done during Isothermal and Adiabatic process - Reversible and Irreversible process - Carnot's reversible engine - Carnot's	13

	theorem - Second law of thermodynamics - Entropy : Reversible and Irreversible process - Third law of thermodynamics - Temperature - Entropy diagram - Maxwell's thermodynamic relations	

Text Books

- Brijlal and Subrahmanyam. (2000). *Thermodynamics and Statistical Mechanics.* Sultan & Chand & Co Ltd, NewDelhi, (Units I –V).

Reference Books

- Kakani S.L. (2001). *Thermodynamics And Statistical Mechanics*. Raj Publications, Jaipur.
- Singhal S.S. (2013) *Heat, Thermodynamics & Statistical Physics*. Pragathi Pragason, Meerut, 1st edition.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 204 Title : Core IV: Physics Lab I		Semester: I & II
Hrs/Week:	3	Credit: 3
Objectives	➢ To stimulate the student's desire to apply their knowledge of theory to experiments. ➢ To test how far the students have grasped and imbibed the basic principles taught.	

Cycle	Content	Hrs
I	1. Acceleration due to Gravity and Moment of Inertia - Compound pendulum 2. Young's Modulus - Non uniform Bending - Pin and Microscope 3. Rigidity Modulus - Static Torsion 4. Surface Tension and Interfacial Tension - Drop weight method 5. Coefficient of Viscosity - Stoke's method 6. Verification of Laws of Transverse Vibrations and Frequency of a Fork - Sonometer	24
II	1. Young's Modulus - Non uniform Bending - Koenig's method 2. Young's Modulus - Cantilever - Pin and Microscope 3. Viscosity of a Liquid - Capillary Flow - Variable Pressure head 4. Thermal Conductivity of a Bad Conductor - Lee's Disc 5. Specific Heat Capacity of a Liquid - Newton's Law of cooling 6. Frequency of a Tuning Fork and Density of Solid and Liquid - Melde's String	24
III	1. Young's Modulus - Uniform Bending - Scale and Telescope 2. Rigidity Modulus and Moment of Inertia - Torsional Pendulum 3. Coefficient of Viscosity - Searle's Viscometer 4. Specific Heat Capacity of a Liquid - Joule's Calorimeter 5. Comparison of Viscosities of Liquids and Radii of Capillary tubes 6. Refractive Index of a Prism - Spectrometer	24

Text Books

- Arora C.L. (2007). *Practical Physics*. S.Chand & Co, 19th Edition.
- Srinivasan M. L. Balasubramanian S. Ranganathan R. (2007). *A Text book of Practical Physics*. Sultan Chand. New Delhi.

Reference Books

- Govindarajan S.R. Sundarajan S. (1959). *Practical Physics.* Roc house & sons Pvt Ltd.
- Dhanalakshmi A. Somasundaram S. *Practical Physics.* Apsara Publishers.
- Gupta S.L. Kumar V. (1999). *Practical Physics.* Pragati Prakashan, Meerut, 20th Edition.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 305 Title : Core V: Electricity & Magnetism		Semester: III
Hrs/Week:	5	Credit: 5
Objectives	➢ To understand the concepts of Electric field. ➢ To understand the phenomenon of Electromagnetic induction. ➢ To study the oscillations in LCR circuits. ➢ To realize the significance of Maxwell's equations	

Unit	Content	Hrs
I	**ELECTRIC FIELD AND POTENTIAL** Concept of charge - Electric Field (E) - Potential difference (V) - Relation between E and V - Equipotential surfaces - Poisson's and Laplace equations - Potential and field due to an electric dipole - Potential and field due to a quadrupole - Potential and field due to uniformly charged disc - Potential due to two concentric spherical shells of charge - Potential energy due to charge distribution - Electrical images - A point charge near a conducting plane and conducting sphere.	13
II	**CAPACITORS AND DIELECTRICS** Capacitors - Parallel plate capacitor - Cylindrical capacitor - Spherical capacitor - Guard ring capacitor - Energy stored in a capacitor - Force of attraction between capacitor plates - Dielectric constant - Polar and nonpolar molecules - Polarisation of dielectric - Capacity of a parallel plate capacitor partially and completely filled with dielectric - Electric polarization vector P - Electric displacement vector D - Relation between D**,** E and P - Dielectric susceptibility and permitivity - Physical meaning of polarization - Mechanism of polarisation - Types of condensers - Dielectric strength	13
III	**MAGNETOSTATICS AND MAGNETIC FIELD** Magnetic effect of current - Lorentz force - Force on a current carrying wire - Magnetic flux - Gauss law in magnetostatics - Torque on a current carrying coil in uniform magnetic field - Potential energy of a current loop - Ballistic galvanometer - Deadbeat condition - Comparison of emfs and capacitances - Biot Savart law- field due to steady current in a long straight wire - Interaction between two long parallel wire carrying currents - Magnetic field along the axis of a circular coil - Helmholtz galvanometer - Field along the axis of a solenoid - Magnetic dipole - Ampere's law - Application to a current carrying conductor and solenoid	13
IV	**ELECTROMAGNETIC INDUCTION** Faraday's laws of Electromagnetic induction - Deduction of Faraday's laws from Lorentz's force - Self inductance - Calculation of self inductance for a solenoid - Energy stored in magnetic field - Mutual inductance - Energy stored in two interacting circuits - DC circuits : Simple RL circuit - Growth	13

	and decay of current - RC circuit - Charging and discharging of a condenser - Ideal LC circuit - Series LCR circuit - Discharge of a condenser through inductance and resistance	
V	**MAXWELL'S EQUATIONS AND ELECTROMAGNETIC THEORY** Basic equations - Types of current - Vacuum displacement current - Maxwell's equations (No derivations) - Maxwell's equations in free space - Electromagnetic waves in free space - Electromagnetic waves in isotropic non - conducting media - Refractive index - Impedence of dielectric media - Energy density of electromagnetic wave - Poynting theorem - Energy per unit volume - Retarded potentials	13

Text Books

- Tewari K.K. (2002). *Electricity And Magnetism*. Sultan chand and co Ltd, New Delhi, (Units I - V).

Reference Books

- Tayal T.C. (2001). *Electricity And Magnetism*. Himalaya publication house, Mumbai.
- Murugesan R. (1998). *Electricity And Magnetism.* S.Chand & Company Ltd, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 3N1 Title : Non-Major Elective I: Principles of Physics – I		Semester: III
Hrs/Week	1	Credit: 2
Objectives	➢ To spread the spirit of scientific interest ➢ To develop the curiosity in Science ➢ To embark on pursuing scientific enquiries as a hobby	

Unit	Content	Hrs
I	**ATMOSPHERE** Cosmic Rays - Ozone Layer - CFCs role in depletion - Solar Wind and Earth – Lightning (conducting medium to Earth) - Fragmentary Rainbows - Measurement of Rain - Rain colour of clouds-Reason for continous stream-Cloud bursts-Artificial Rain - Rainbows (Size, doubleness)	3
II	**GEOLOGY** Age of Fossil - Measurement of depth of ocean - Lava from Volcano - Monsoons – Seebergs - Radiation from Granites and Marbles - Earth's Magnetic properties	2
III	**HYDROLOGY** Coolness of mud pot water - Colour of Waterfall - Measurement of Quality of water in dams - Purity of Rain water - Purity of mineral water in the Market	2
IV	**SPACE** Saturn rings - Measurement of temperature of planets and stars - Asteroids - Rotation of Earth - Shooting stars and comet s- Atmosphere of stellar bodies - Flat plane orbits of Planets	3
V	**HOME APPLIANCES** Microwave ovens - Pressure cooker - Richter scale - Humming sound in Tension wires - Curved Fan wings - Sodium vapour lamp in streets - Tube Lights: Role of chokes of Starter, Reason for no sharp shadows – Photocopier - Thermostat	3

Text Book

- The Editor, (2006).*The Hindu Speaks on Scientific Facts*. Kasturi and Sons Ltd. Chennai, (Units I – V).

Reference Books

- Richard P. Feynman, Robert B. Leighton, Matthew Sands, (2008). *The Feynman Lecture on Physics.* Narosa Publishing House, New Delhi.
- David Halliday, Robert Resnick, Jearl Walker, (2000). *Fundamentals of Physics.* John Wiley Publications. 6th Edition.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 3N2 Title : Non-Major Elective I: Renewable Energy Sources Paper – I		Semester: III
Hrs/Week;	1	Credit: 2
Objectives	➢ To gain knowledge about conventional and non-conventional energy sources and their utilization.	

Unit	Content	Hrs
I	**INTRODUCTION TO ENERGY SOURCES** Conventional energy sources: Coal – Gas – Water – Agriculture and organic waste – Non conventional sources: Solar energy – Renewable energy resources	3
II	**SOLAR RADIATION AND ITS MEASUREMENTS** Solar Constant - Solar Radiation at the earth's surface: Beam and diffuse solar radiation – Air mass – Attenuation of beam radiation – Solar radiation geometry: Latitude of location – Declination – Hour angle – Angstrom compensation Pyrheliometer	3
III	**SOLAR ENERGY COLLECTORS** Physical principles of the conversion of solar radiation into heat - Flat plate liquid collector - Solar concentrators and receiver geometries (Basic types) - Advantages and disadvantages of concentrating collectors over flat – plate type collectors	3
IV	**SOLAR ENERGY STORAGE** Types of energy storage – Thermal storage - High temperature latent heat storage - Electrical storage - Storage in the form of fuel – Storage in the form of potential hydrogen energy	2
V	**APPLICATIONS OF SOLAR ENERGY** Introduction - Solar water heating- Space heating: Passive heating systems - Thermal storage wall – Roof storage - Solar cell principle – Solar cell modules - Applications of solar photovoltaic system	2

Text Book

- Rai G. D. (2002). *Non Conventional Sources of Energy*. Khanna Publishers, NewDelhi, (Units I – V).

Reference Books

- Rai G. D. *Solar Energy Utilization*. Khanna Publishers, NewDelhi.
- Garg H.P. Prakash J. *Solar Energy Fundamentals And Applications*. Tata McGraw Hill Publications, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 4N3 Title : Non-Major Elective II: Principles of Physics –II		Semester: IV
Hrs/Week:	1	Credit: 2
Objectives	➢ To spread the spirit of scientific interest ➢ To develop the curiosity in Science ➢ To embark on pursuing scientific enquiries as a hobby	

Unit	Content	Hrs
I	Electric train – Leek proof battery –Hot air balloons – Remote control in TV –Superconductivity – Nuclear reactors	3
II	Photochromic glasses – Exhaust silencer – Optical fibers – Radar and Sonar – Fluorescent Lamps – Holograms – Touch screens	2
III	Earthquake measurement – Splitting of white light – GPS – Origin of Gravity – Use of Infrared spectroscopy – Static electricity – Three pin electric plugs – Electric line tester	2
IV	Refrigerants and their use in refrigerators - Frost formation - Air Cooler & Conditioner - Black box in Planes - Speech synthesizers - Lie detector - Pencil eraser - Bullet proof glass - Dry cleaning - Aeroplane not affected by lightning - Mosquito mats - Unleaded Petrol and two wheelers - Oil with Petrol for two wheelers	3
V	TFM on soap - Cell phones - Cordless phones - Tubeless tyres - Radial & Ordinary tyres- Non linear editing - Tear gas - Smell of Dust bin - Biological Weapon -Super Plasticizers in concrete - Super Computers - Computers Simulation -Artificial teeth – Aqualung - Purity of Honey - Breath analyzers	3

Text Book

- The Editor, (2006). *The Hindu Speaks on Scientific Facts*. Kasturi and Sons Ltd. Chennai, (Units I – V).

Reference Books

- Richard P. Feynman, Robert B. Leighton, Matthew Sands, (2008). *The Feynman Lecture on Physics.* Narosa Publishing House, New Delhi.
- David Halliday, Robert Resnick, Jearl Walker, (2000). *Fundamentals of Physics.* 6th Edition, John Wiley Publications.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 4N4 Title : Non-Major Elective II : Renewable Energy Sources Paper – II		Semester: IV
Hrs/Week	1	Credit: 2
Objectives	➢ To gain knowledge about inexhaustible sources of energies.	

Unit	Content	Hrs
I	**WIND ENERGY** Introduction- Nature of the wind – The power in the wind- Basic components of wind energy conversion system- Classification of WEC systems- Direct heat applications.	3
II	**ENERGY FROM BIOMASS** Introduction- Biomass conversion technologies- Wet processes – Dry processes - Photosynthesis – Classification of biogas plants.	3
III	**GEOTHERMAL ENERGY** Introduction- Estimates of geothermal power – Geothermal sources – Hydrothermal resources – Applications of geothermal energy.	2
IV	**ENERGY FROM OCEANS** Introduction- Ocean thermal electric conversion by open and closed cycles- Energy from tides- Basic principle of tidal power- Advantages and limitations of small scale hydroelectric.	3
V	**HYDROGEN ENERGY** Introduction – Properties of hydrogen – Electrolysis or the electrolytic production of hydrogen – Hydrogen storage – Utilization of hydrogen gas.	2

Text Book

- Rai,G.D. (2002). *Nonconventional Sources of Energy*, Khanna Publishers. New Delhi, (Units I – V).

Reference Books

- Rai G.D. *Solar Energy Utilization*, Khanna Publishers. New Delhi.
- Sulchatme S.P. *Principles of Thermal Collection and Storage*, Tata McGraw Hill Publication, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 406 Title : Core VI: Optics & Spectroscopy		Semester: IV
Hrs/Week:	5	Credit: 5
Objectives	➢ To understand the mechanism of energy transfer in the form of waves and to impart knowledge in light ➢ To familiarize the concepts of molecular, atomic and nuclear spectra.	

Unit	Content	Hrs
I	**WAVE MOTION** Characteristics of wave motion - Transverse and longitudinal wave motion - Wavelength, Frequency, Amplitude, Time period, Vibration and Phase (Definitions only) - Relation between frequency and wavelength - Properties of longitudinal progressive waves - Equation of simple harmonic wave - Particle velocity and Wave velocity **INTERFERENCE** Theory of interference - Fresnel's biprism experiment - Determination of wavelength - Interference due to reflected light - Colours of thin films - Air wedge - Testing the planeness of surfaces - Newton's rings - Determination of wavelength and refractive index of a liquid	13
II	**DIFFRACTION** Fresnel's explanation of rectilinear propagation of light - Zone plate - Zone plate as converging lens - Fresnel's diffraction at a circular aperture - Fraunhofer diffraction at a single slit - Theory of the plane transmission grating - Determination of wavelength **POLARISATION** Polarisation of transverse waves - Plane of polarization - Brewster's law and Brewster's window - Polarization by refraction - Double refraction - Principal section and principal plane - Nicol prism - Nicol prism as an analyser - Theory of circularly and elliptically polarised light - Optical activity - Fresnel's explanation of rotation - Specific rotation - Laurent's half shade Polarimeter	13
III	**LASER OPTICS** Laser Characteristics - Einstein's coefficients -Population inversion - Pumping methods - Essential elements and Action of laser system - Ruby Laser- He-Ne Laser – Applications : Holography and Lasers in medicine **FIBER OPTICS** Construction and types of optical fiber - Critical angle - Acceptance angle, Acceptance cone and Numerical aperture - Propagation of light through optical fiber - Optical fiber configurations - Fiber optic communication system	13

IV	**MOLECULAR SPECTRA** Rotation of molecules - Rotational spectra of rigid diatomic molecule - Techniques and Instrumentation of Microwave Spectroscopy - Energy of a Vibrating diatomic molecule - Simple harmonic oscillator - Techniques and Instrumentation of Infrared Spectroscopy - Applications of Microwave & Infrared Spectroscopy (Basic ideas) - Raman effect and characteristics - Experimental study - Quantum theory of Raman effect	13
V	**ATOMIC & NUCLEAR SPECTRA** Normal and Anomalous Zeeman effects - Experimental study of normal Zeeman effect - Lorentz Classical interpretation and Expression for the Zeeman shift - Quantum mechanical theory of Normal Zeeman effect - Paschen Back effect - Stark effect – NMR: Splitting of nuclear level in a magnetic field – Block diagram of NQR spectrometer – ESR: Interaction with magnetic field - Block diagram of ESR spectrometer	13

Text Books

- Subramanyam N. Brijlal, *Waves And Oscillations*. S.Chand & Co, New Delhi, (Unit - I).
- Subrahmanyam. N. Brijlal, Avathanulu M.N. (2008). *A Textbook Of Optics*. S.Chand and Co Ltd., New Delhi, (Units I - III).
- Colin N .Banwell, Elaine M. Mc Cash, (2004). *Fundamentals Of Molecular Spectroscopy*. Tata McGraw-Hill, New Delhi, (Unit - IV).
- Gupta S.L. Kumar V. Sharma R.C. (2001). *Elements Of Spectroscopy*. 16th edition, Pragati Prakashan, Meerut, (Unit - V).

Reference Books

- Halliday, Resnick, (1994). *Physics Part I & II.* 4th Edition, Wiley Eastern Ltd, New Delhi.
- Jenkins, White, (1981). *Fundamentals of Optics*. 4th Edition, Mc Graw-Hill., New York.
- Manas Chanda, (1982). *Atomic Structure And Chemical Bond.* 2nd edition, Tata McGraw Hill, New Delhi.
- Gurdeep Chatwal, Sham Anand, (1987). *Spectroscopy*. 3rd edition, Himalaya Publishers, Mumbai.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 407 Title : Core VII: Physics Lab II		Semester: III & IV
Hrs/Week:	3	Credit: 3
Objectives	➢ To understand the theory with hands-on experience.	

Cycle	Content	Hrs
I	1.Refractive Index of a Liquid - Spectrometer - Hollow Prism 2.Refractive Index of a Prism - Spectrometer - **i-d** curve 3.Radius of curvature and Refractive index of a lens - Newton's Rings 4.Calibration of Voltmeter (Low & High Range) - Potentiometer 5.Determination of **M** - Field along the axis of a Circular coil carrying current 6.Figure of merit - Current & Voltage Sensitivity - Ballistic Galvanometer	24
II	1.Refractive Index of a Prism - Spectrometer - **i-i'** curve 2.Wavelength of different colours of Mercury spectrum and Dispersive power of a Grating - Normal Incidence-Spectrometer 3.Thickness of a Wire - Air wedge 4.Temperature Coefficient & Resistance of a coil of wire - Potentiometer 5.Determination of **H** - Circular Coil carrying current -Vibration Magnetometer 6.Comparison of Resistances - Specific Resistance - Ballistic Galvanometer	24
III	1.Refractive Index - Spectrometer - Small Angle Prism 2.Cauchy's Constants and Dispersive Power of a Prism - Spectrometer 3.Calibration of Ammeter(High Range) and Reduction Factor of T.G - Potentiometer 4.E.M.F of a Thermocouple - Potentiometer 5.Absolute capacity of a Condenser - Ballistic Galvanometer 6.Mutual Inductance of a Coil & Comparison of Mutual Inductances – Ballistic Galvanometer	24

Text Book

- Govindarajan S.R. Sundarajan S. (1959). *Practical Physics*. Roc house & sons Pvt Ltd.

Reference Book

- Dhanalakshmi A. Somasundaram S. *Practical Physics*. Apsara Publishers, Book II.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 508 Title : Core VIII: Classical Dynamics		Semester: V
Hrs/Week:	5	Credit: 5
Objectives	➢ To understand the basic concepts in mechanics of a particle and system of particles. ➢ To familiarize the classical equation of motions by Lagrangian, Hamiltonian and Hamilton-Jacobi formulations	

Unit	Content	Hrs
I	**MECHANICS OF A PARTICLE** Linear momentum - Angular momentum-Work- Power- Kinetic energy Conservative forces- Potential energy- Conservation theorem for linear momentum Conservation theorem for angular momentum - Conservation theorem for energy - Motion of a particle under time dependent applied force –Motion of a free electron in oscillating field - Motion of a particle under damping forces - Motion of a particle under central force – Application to Projectile and simple harmonic vibrations	13
II	**MECHANICS OF SYSTEM OF PARTICLES** Conservation theorem for a system of particle; Conservation theorem for linear momentum, angular momentum and energy - Constrained motion - Types of constraints with examples - Forces of constraints - Degrees of freedom - Generalized coordinates - Generalized notation for Displacement, Velocity, Acceleration, Momentum, Force and Potential - Limitations of Newton's Law	13
III	**LAGRANGIAN FORMULATION** Delta-Variation process - Hamilton's principle - Deduction of Lagrange's equations of motion from Hamilton's principle - Principle of virtual work - D'Alembert's principle - Deduction of Lagrange's equations by D'Alembert's principle for both conservative system and non-conservative system - Deduction of Hamilton's principle from D'Alembert's principle - Deduction of Newton's second law of motion from Hamilton's principle - Applications of Lagrange's equation: Linear harmonic oscillator, Simple pendulum, Compound pendulum.	13
IV	**HAMILTONIAN FORMULATION OF MECHANICS** View points of the new development - Phase space and the motion of systems - Hamiltonian - Hamilton's canonical equations of motion - Cyclic coordinates - Physical significance of H - Advantages of Hamiltonian approach - Deduction of canonical equations from variational principle - Applications of Hamilton's equations of motion; Simple Pendulum, Compound pendulum, Linear harmonic oscillator.	13

(CONTD….2)

V	**HAMILTON - JACOBI FORMULATION** Canonical or contact Transformations: Point Transformation, Canonical Transformation, Generating Function (Four forms) - Advantage of Canonical Transformations - Simple Harmonic Oscillator - Hamilton Jacobi method - Harmonic Oscillator problem by Hamilton Jacobi method - Particle falling freely - Hamilton Jacobi equation for Hamilton's Characteristic function - Kepler's Problem.	13

Text Books

- Gupta S.N. (1970). *Classical Mechanics*. Meenakshi Prakashan Publications, Meerut, (Unit I).
- Gupta, Kumar, Sharma, (2006). *Classical Mechanics*. 21st Edition, Pragati prakasan, Meerut, (Units II – V).

Reference Books

- Herbert Goldstein, (1985). *Classical Mechanics.* 2nd Edition, Narosa publishing House, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 509 Title : Core IX: Relativity & Quantum Mechanics		Semester: V
Hrs/Week:	5	Credit: 5
Objectives	➢ To understand the concepts and the consequences of special and general theory of relativity. ➢ To understand the basic concepts of Quantum theory and the wave properties of particles. ➢ To understand the different types of quantum numbers and to apply the wave equation to solve simple problems	

Unit	Content	Hrs
I	**RELATIVITY** Galilean transformations and their limitations - Search for an absolute frame of reference: Michelson Morley experiment - Einstein's postulates and Lorentz transformations - Length contraction, Time dilation and Simultaneity – Variation of Mass with velocity	13
II	Mass-energy equivalence with experimental evidence - Relation between total energy, particle momentum and rest energy - Relativistic Doppler effect - Cerenkov radiation - World point and world line in Minkowski space - Inertial and gravitational mass - Principle of equivalence - Qualitative discussion of bending of light - Precession of perihelion of mercury and gravitational red shift	13
III	**QUANTUM MECHANICS** **WAVE PROPERTIES OF PARTICLES** The deBroglie hypothesis – The deBroglie wavelength – Expression for group velocity – Experimental study of matter waves : Davisson and Germer's experiment - G.P.Thomson's experiment - Heisenberg's Uncertainty principle and its illustrations: Gamma ray microscope & Diffraction of a beam of electrons by a slit - Postulates of quantum mechanics - Properties of wave function	13
IV	**SCHRÖDINGERS EQUATION AND ITS APPLICATIONS** Time dependent and Time independent forms - Particle in a box: Infinite square well potential - Potential step - The barrier penetration problem - Linear Harmonic oscillator - The rigid rotator	13

(CONTD….2)

V	**QUANTUM THEORY OF HYDROGEN ATOM** Schrödinger's equation for the Hydrogen atom - Separation of variables-Normalized wave functions - Expression for the energy of the electron in the ground state – Significance of Quantum numbers : Principal Quantum number , Orbital Quantum number & Magnetic Quantum number - Electron probability density - Radiative transitions - Selection rules	13

Text Books

- Murugesan R. (2003). *Modern Physics*. 11th Edition, S.Chand, NewDelhi, (Units I - IV).
- Arthur Beiser, (1997). *Concepts of Modern Physics*. 5th Edition, Tata McGraw Hill, NewDelhi, (Unit V).

Reference Books

- Atam P.Arya, (1974). *Elementary Modern Physics*. 1st Edition, Addison Wesley.
- Mathews, Venkatesan, (2002). *A Text Book of Quantum Mechanics*, Tata McGraw Hill Company Ltd, New Delhi.
- Chatwal G.R. Anand S.K. (2006). *Quantum Mechanics*, Himalaya Publishing Company, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 510 Title : Major Elective I: Basic Electronics & Circuit Systems		Semester: V
Hrs/Week:	5	Credit: 5
Objectives	➢ To know the basics of AC&DC circuits. ➢ To understand the action of semiconductor devices and their applications. ➢ To know the principle and working of optoelectronic devices.	

Unit	Content	Hrs
I	**DC CIRCUITS AND ALTERNATING CURRENTS** DC Circuits: Current, Voltage, Resistance, Ohm's Law, Joule's Law, Resistors and Batteries - Series and Parallel Circuits - Networks - Kirchoff Rules - Thevenin's Theorem - Norton's Theorem - Maximum power transfer theorem – Proportional Voltage and Current formula - D'Arsonval Meter, Ammeter, Voltmeter, Ohmmeter and Multimeter (Basic ideas) - Alternating currents: Frequency, Amplitude and Phase - RMS value and Power - Capacitance and Inductance - Transformer - Oscilloscope	13
II	**SEMICONDUCTOR DEVICES AND CIRCUITS** Semiconductor and Energy bands - Doped Semiconductor - PN Junction diode and Zener diode - Characteristics - Half wave, Full wave and Bridge rectifiers – Capacitance filter-Two pin regulated power supply - Voltage doublers - Clippers and Clampers - Transistor and action - Common base and Common emitter Configurations - Relations between **α** and **β** - Load line and Operating point - Stability - Voltage divider Self bias - JFET and its characteristics	13
III	**AMPLIFIERS & OSCILLATORS** Principle of amplification - Classification of amplifiers - Common emitter single stage amplifier and frequency response - Multistage amplifiers (Basic ideas) - Concept of feedback and Effect of negative feed back (qualitative) - Barkhausen criterion - Basic Oscillatory circuit and Classification of oscillators - Hartley, Colpitts and Phase shift Oscillators (Circuit operations) – Multivibrators : Astable, Monostable and Bistable	13
IV	**OPERATIONAL AMPLIFIER** Typical stages of an Op Amp - Ideal Op Amp and characteristics - Input offset voltage, Offset current, Bias current and Slew rate (Definitions) - Inverting Op Amp - Noninverting Op Amp - Differential Op Amp - Scale and Phase changers - Adder and Averager – Subtractor, Differentiator and Integrator - Solving differential equation	13

(CONTD….2)

V	**OPTOELECTRONIC DEVICES** Optical radiation - Flux and illumination - Structure, variation of resistance & speed response of a Photo detector - Photovoltaic cells - Photodiodes - Phototransistors - Light beam detector - Electronic slave flash control - Window detector - LED: Bar graph display, drivers and LED arrays - Optically coupled isolator (Basic ideas)	13

Text Books

- James J.Brophy, (1990). *Basic Electronics for Scientists*. 5th Edition, McGraw Hill Publishing Company, New York, (Unit I).
- Sadasiva Biswal, (2001). *Basic Electronics (Vol.I).* Atlantic Publishers and Distributors, (Units II &III).
- Swaminathan Mathu, (1985). *Electronics: Circuits and Systems*. 1stEdition, Howard W.Sams & Co., Inc, New York, (Units IV&V).

Reference Books

- Narayana Rao B.V., (1994). *Principles of Electronics (Vol. I & II).* Wiley Eastern Limited & New Age International Limited, New York.
- Norman Lurch, *Fundamentals of Electronics*. 3rd Edition, John Wiley & Sons.
- Ramakant A.Gayakwad, (1997) *Op-Amps & Linear Integrated Circuits*. 3rd Edition, Prentice- Hall of India, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 511 Title : Major Elective II: Digital Circuit Systems		Semester: V
Hrs/Week:	5	Credit: 5
Objectives	➢ To study the number system, Logic circuits and its application. ➢ To understand the concept of Memories and IC technology.	

Unit	Content	Hrs
I	**NUMBER SYSTEMS AND CODES** Binary numbers - 1's and 2's complement - Addition - Subtraction - Multiplication - Division - Binary to Decimal conversion and vice versa - Octal numbers - Octal to Binary conversion and vice versa - Hexadecimal numbers - Hexadecimal to Binary conversion and vice versa - BCD - ASCII - Excess 3 code - Gray code **LOGIC GATES** OR, AND and NOT gates - NAND and NOR gates - Universal building blocks - XOR and XNOR gates	13
II	**THEOREMS OF BOOLEAN ALGEBRA** Demorgan's theorems - Laws and theorems of Boolean algebra - Simplification of Boolean expressions - Karnaugh map - Pairs, quads and octets - Sum of product method and simplifications - Don't care conditions - Product of sum method and simplifications **ARITHMETIC PROCESSING CIRCUITS** Half and full adders - Half and full subtractors - Parallel binary adder and subtractor	13
III	**DATA PROCESSING CIRCUITS** Multiplexers - Demultiplexers - 1 - of - 16 decoder - BCD to decimal decoder - Seven segment decoders - Encoders **FLIP FLOPS AND SHIFT REGISTERS** RS Flip Flop - D Flip Flop - Edge triggering - JK and Master slave Flip Flop - Serial in serial out - Serial in parallel out - Parallel in serial out - Parallel in parallel out shift register	13
IV	**COUNTERS** Asynchronous Mod 8 up and down counters - Decoding gates - Synchronous Mod 8 up and down counters - Mod 3, Mod 5, and Mod 10 counters - Presettable counter - Digital clock **D/A and A/D CONVERSIONS** Variable resistor network - Binary ladder - D/A Converter - A/D converter	13

(CONTD….2)

V	**SEMICONDUCTOR MEMORIES** Memory addressing - ROM's, PROM's and EPROM's - Expansion of ROM capacity - Static and Dynamic RAM's **IC TECHNOLOGY** Integrated circuits - Resistors, Diodes and BJT'S in IC's - Design rules for monolithic circuit - Fabrication of monolithic IC's	13

Text Books

- Malvino A.P, Leach D.P. (2000). *Digital Principles and Applications.* 4th Edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, (Units I - V).
- Swaminathan Madhu, (1985). *Electronic Circuits and Systems*. 1st Edition, Howard W. Sams & Co., Inc-A publishing subsidary of ITT, (Unit - V).

Reference Books

- Jacob Millman, Halkias C. (1985). *Integrated Electronics*. 1st Edition, Mc Graw Hill Publishing Company.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 612 Title : Core X: Mathematical Physics		Semester: VI
Hrs/Week:	5	Credit: 5
Objectives	➢ To study and apply various mathematical concepts to solve physical problems.	

Unit	Content	Hrs
I	**VECTORS** Gradient of a scalar field – Line, Surface and Volume integrals – Divergence of a vector function – Curl of a vector function and its physical significance – Important vector identities – Gauss divergence theorem – Stokes theorem – Curvilinear co-ordinates – Cylinderical co-ordinates (r,θ) - Spherical polar co-ordinates (r,θ,Φ) – Grad, Divergence and curl in terms of curvilinear, cylindrical and spherical polar co- ordinates	13
II	**MATRICES AND LINEAR SYSTEM OF EQUATIONS** Eigen values, Eigen vectors; Characteristic equation of a matrix - Finding inverse of a matrix using Cayley Hamilton Theorem - Some important theorems of eigen values and eigen vectors – Matrices in Physics : Rotation matrix – Pauli spin matrix – Dirac matrix	13
III	**LAPLACE TRANSFORM** Laplace transform – Properties of Laplace transforms – Problems – Inverse Laplace transform : Properties of Inverse Laplace transform – Convolution theorem – Evaluation of Inverse Laplace transforms by convolution theorem - Problems	13
IV	**GROUP THEORY** Concept of a group - Abelian group - Generators of finite group - Cyclic group - Group multiplication table (Qualitative analysis) - Group of symmetry of a square - The Rearrangement theorem - Subgroups - Lagrange's theorem for a finite group - Cosets- Conjucate elements and classes - Product of classes - Complexes - Conjugate subgroups, Normal subgroups and factor groups - Isomorphism and Homomorphism - Permutation Groups	13
V	**NUMERICAL METHODS** Solution of algebraic and transcendental equations: The Bisection method -The iterative method - Method of false position - Newton-Raphson method - Solution of ODE: Taylor's series method - Euler's method - Runge Kutta II order method - Trapezoidal Rule - Simple problems	13

Text Books

- Sathyaprakash, (2005). *Mathematical Physics.* Sultan Chand & Sons, New Delhi, (Units I - IV).
- Sastry S.S. (2003). *Introductory Methods of Numerical Analysis.* 3rd Edition, Prentice Hall Of India, (Unit - V).

Reference Books

- Gupta B.D. (1989). *Mathematical Physics.* 3rd Edition, Vikas Publication House, Noida.
- Louis A.Pipes, Lawrence R.Harvill, (1970). *Applied Mathematics For Engineers And Physicists* - Mc Graw Hill Kogakusha Ltd, New Delhi.
- Chattopadhyay P.K. (1990). *Mathematical Physics.* Wiley Eastern Limited, New Delhi.
- Venkataram M.K. *Numerical Methods in Science and Engineering*. The National Publishing Company, New Delhi.
- Raman K.V. *Group Theory.* Tata McGraw - Hill publishing company Ltd, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 613 Title : Core XI: Atomic & Nuclear Physics		Semester: VI
Hrs/Week:	5	Credit: 5
Objectives	➢ To understand the concept of electron ,and the structure of the atom ➢ To explore the origin of X-rays and its applications. ➢ To understand the properties of the nucleus and nuclear models. ➢ To know the concept of radioactive phenomena and nuclear reactions. ➢ To acquire knowledge about particle detectors, accelerators and elementary particles.	

Unit	Content	Hrs
I	**CONCEPT OF ELECTRON** Charge of electron by Millikan's oil drop method - J.J Thomson's method to determine e/m - Positive rays - Isotopic constitution of elements - Photoelectric effect - Experimental investigations - Einstein's equation - Millikan's experiment. **STRUCTURE OF THE ATOM** Bohr's theory of Hydrogen atom - Excitation & Ionisation potentials - Experimental verification of discrete atomic energy levels - Correspondence principle - Sommerfeld model & Relativistic effects - Hyperfine structure - Vector atom model - Quantum numbers - Coupling schemes - Pauli exclusion principle - Electronic configuration of an atom .	13
II	**X -RAYS** Origin of X rays - Production & detection - Properties - Diffraction of X rays (Laue spots) - Bragg's Law - Bragg's X ray Spectrometer - Determination of crystal structure by Powder crystal method - Continuous and Characteristic X ray spectrum - Mosley's Law and significance - Theory of Compton Scattering - Experimental verification - Applications of X rays (Basic ideas)	13
III	**NUCLEAR MODELS** Properties of nucleus - Binding energy of the nucleus and packing fraction - Nuclear stability - Nuclear models: Liquid drop model and Semi empirical mass formula - Shell model (Qualitative ideas). **RADIOACTIVITY** The law of radioactive decay and decay rate - Half life and Mean life - Alpha decay: spontaneous decay - General characteristics - Beta decay: Condition for spontaneous decay - Characteristics of beta ray spectra - Gamma decay: Gamma ray emission - Internal conversion.	13

IV	**NUCLEAR REACTIONS, DETECTORS AND ACCELERATORS** Nuclear reaction energy - Reaction cross section - Nuclear fission - Energy released in fission of U^{235} - Chain reaction - Fission reactor - Nuclear fusion - Fusion reaction - Advantages and problems of fusion. Ionization chamber: Simple Ionization chamber - Proportional counter - GM counter - Scintillation counter - Linear accelerator – Cyclotron.	13
V	**ELEMENTARY PARTICLES AND COSMIC RAYS** Fundamental forces in nature - Classification of elementary particles based on interactions - Conservation laws - Strange particle and Strangeness - Quarks - Quark model - Cosmic rays - Primary and Secondary cosmic rays - Cosmic ray showers - Positron - Pair production - Annihilation of matter - Mesons - Origin of cosmic rays.	13

Text Books

- Rajam J.B. Prof.Louis De Broglie, (2000). *Atomic Physics,* Sultan Chand & Sons, New Delhi, (Units I & II).
- Raymond A. Serwey, Clement J. Moses & Curt Moyer, *Modern Physics.* 2nd edition, Saunders College Publishers, (Units III & IV).
- Atam P.Arya, *Elementary Modern Physics.* Addition – Wesley publishing Company, (Unit IV)
- Murugeshan R, (2009) *Modern Physics*, S. Chand and Company Ltd, 14th edition, New Delhi, (Unit V).

Reference Books

- Atam P.Arya, (1974). *Elementary Modern Physics.* 1st edition, Addision Wesley.
- Sehgal Chopra, (2004) *Modern Physics*. 9th edition Sultan Chand & Sons, New Delhi.
- Pandya M.L. Yadev R.P.S, *Elements of Nuclear Physics*. 5th editions, KedarNath RamNath Publications.
- Tayal D. C. (1987). *Nuclear Physics* - 4th edition, Himalaya Publishing House Publishers, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 614 Title : Core XII: Condensed Matter Physics & Statistical Mechanics		Semester: VI
Hrs/Week:	5	Credit: 5
Objectives	➢ To understand the concepts of bonding in solids and various physical parameters to characterize crystals. ➢ To understand the electrical and magnetic properties of solids. ➢ To understand the occurrence of superconductivity and its applications. ➢ To understand the concepts of phase space, ensemble and their usage in various statistical distribution methods	

Unit	Content	Hrs
I	**BONDING IN SOLIDS** Bonding in solids - Ionic bonding - Covalent bond - Metallic bond - Intermolecular bonds - Dispersion bonds - Dipole bonds - Hydrogen bonds (Formation and properties) **CRYSTAL PHYSICS** Lattice points and space lattice - Unit cells and lattice parameters - Crystal systems - Symmetry elements in crystals - The Bravais lattices - Metallic crystal structures - Relation between the density of crystal material and lattice constant in a cubic lattice - Other cubic structures - Miller Indices - Reciprocal lattice (Construction only)	13
II	**ELECTRICAL PROPERTIES OF SOLIDS** Classical free electron theory of metals and its draw backs - Quantum theory of free electrons - Joule's law - Hall effect - Experimental determination of Hall coefficient - Band theory of solids - Electron in a periodic field of a crystal (the Kronig - Penney model) - Brillouin zones **MAGNETIC PROPERTIES OF SOLIDS** Different types of magnetic materials - Langevin's Classical theory of diamagnetism - Langevin's and Weiss theory of paramagnetism - Weiss molecular field theory of ferromagnetism - Domain theory of ferromagnetism - Antiferromagnetism -Ferrimagnetism	13
III	**SUPERCONDUCTIVITY** Properties of superconductors - Effects of magnetic field - Persistent current - Critical current - The Meissner effect - Isotope effect - Penetration depth - Type I and Type II superconductors - Electronic specific heat - Energy gap measurements - BCS theory - Josephson tunneling (simple ideas only) - High temperature superconductors - Applications of superconductivity (simple ideas only)	13

IV	**CLASSICAL STATISTICAL MECHANICS** Phase space of a microscopic particle - Density of quantum states of energy of a particle - Volume occupied by a quantum state - Isolated system - Statistical equilibrium - Statistical postulates - Distribution function, entropy and probability - Maxwell - Boltzmann statistics and its application - Total internal energy - Specific heat at constant volume - Speed distribution - Most probable speed, average, root mean square speeds – Doppler broadening of spectral lines	13
V	**QUANTUM STATISTICAL MECHANICS** Bose-Einstein energy distribution - Basic postulates - B-E energy distribution function - B-E energy distribution law for continuous variation of energy - Planck's law of radiation - Fermi - Dirac energy distribution - Basic postulates - Energy distribution function - Fermi energy - Energy distribution curve - Expression for the Fermi Energy for electrons in a metal - Fermi temperature and Fermi velocity - Thermionic emission - Richardson Dushman equation – Comparison of M-B, B-E and F-D statistics	13

Text Books

- Pillai S.O. (2005). *Solid State Physics*. 6th Edition, New age international (P) Ltd, New Delhi, (Units I - III).
- Serway R. Moses C. Moyer C.A. (1997). *Modern Physics*. 2nd edition, Saunders college publishers, (Unit III).
- Kamal Singh, Singh S. P. (1985). *Elements Of Statistical Mechanics*. 1st Edition, S.Chand & Company Ltd, NewDelhi, (Units IV &V).

Reference Books

- Agarwal B.K. Melvin Eicher, (1975). *Statistical Mechanics*. Wiley Eastern Ltd, Bangalore.
- Gupta S.L. Kumar V. (1987). *Solid State Physics*. 6th Edition, K.Nath & Co., Meerut.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 615 Title : Major Elective III: Microprocessor Mechanisms & Programming in C		Semester: VI
Hrs/Week:	5	Credit: 5
Objectives	➢ To know the architecture & instruction set of Intel 8085 Microprocessor. ➢ To familiarize different schemes of data transfer & learn a few applications of 8085. ➢ To become familiar with C programming language. ➢ To realize the efficiency & power of C language.	

Unit	Content	Hrs
I	**MICROPROCESSOR ARCHITECTURE AND PROGRAMMING** Organization of a Microcomputer system – Architecture of the 8085 - Microprocessor instruction set and computer languages - Overview of the 8085 instruction set: Data transfer, Arithmetical, Logical, Branch, Stack, I/O & Machine control groups - Addressing modes - Programming the 8085: The programming process - The stack and subroutines - Simple programming examples	13
II	**INTERFACING MEMORY AND I/O DEVICES** Address space partitioning - Data transfer schemes - Programmed data transfer**:** Synchronous transfer - Asynchronous transfer - Interrupt driven data transfer - Multiple interrupts - Enabling, disabling and masking of interrupts - Direct Memory Access data transfer **APPLICATIONS OF MICROPROCESSOR** Temperature monitoring system (Brief description) - Closed loop process control: The process of growing synthetic Quartz (Qualitative ideas only)	13
III	**INTRODUCTION TO C** Basic Structure of C Programs - Character set - Key words and Identifiers - Constants - Variables - Data types – Declaration of variables – Assigning values to variables – Defining symbolic constants - Arithmetic operators - Relational operators - Logical operators - Assignment operators - Increment and decrement operators - conditional operators - Precedence of operators - Formatted input & output statements	13

IV	**CONTROL STRUCTURES, ARRAYS & STRINGS** Simple if - if…else - Nesting of if...else - else if ladder - Switch - while - do…while - for statements - Declaration and initialization of one & two dimensional arrays - Declaring and initializing string variables - String handling functions	13
V	**FUNCTIONS, STRUCTURES AND POINTERS** Definition of functions - Return values and their types - Category of functions**:** No arguments and no return values - Arguments but no return values - Arguments with return values - Recursion - Defining a structure - Declaring structure variables - Accessing structure members - Structure initialization - Declaring and initializing pointers - Pointers as function arguments - Pointers and structures	13

Text Books

- Aditya P.Mathur, (1997). *Introduction To Microprocessor*. 3rd Edition,Tata McGrawHill, New Delhi,(Units I & II).
- E.Balagurusamy, (2004). *Programming In Ansi C*. Tata McGraw Hill Publishing Company, New Delhi, (Units III - V).

Reference Books

- Ramesh S.Gaonkar, (1997). *Microprocessor Architecture, Programming And Applications With The 8085*. 3rd Edition, Penram International Publishing, India.
- Ravichandran.D, (1998). *Programming In C*. New Age International (P) Limited Publishers.
- Yashvant Kanetkar, (1995). *Let Us C*. 2nd Revised Edition, BPB Publications, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 6S3 Title : Skill based Elective II: Environmental Instrumentation		Semester: VI
Hrs/Week:	1	Credit: 2
Objectives	➢ To provide good foundation and inspire interest to gain knowledge in Thermal measurements. ➢ To understand the operational features, limitations and difficulties inherent in the instruments.	

Unit	Content	Hrs
I	**TEMPERATURE MEASUREMENTS** Temperature scales - The ideal gas - Thermometer - Temperature measurement by mechanical effects - Temperature measurements by electrical effects : Electrical resistance thermometer - Thermistors - Thermoelectric effects - Quartz-crystal thermometer - Liquid crystal thermography	3
II	**RADIATION MEASUREMENTS** Radiation pyrometers – Blackbody conditions – Radiation reactive elements – Total radiation pyrometers – Infrared pyrometers – Optical pyrometers	3
III	**THERMAL MEASUREMENTS** Detection of thermal radiation – Measurement of emissivity – Reflectivity and Transmissivity measurements – Solar radiation measurements	2
IV	**NUCLEAR RADIATION MEASUREMENTS** Detection of Nuclear radiation – Geiger Muller Counter – Ionisation chambers – The Scintillation counter – Neutron detection.	2
V	**AIR POLLUTION SAMPLING AND MEASUREMENTS** Units of pollution measurements – General air sampling train-gas sampling techniques – Sulfur dioxide measurements – Combustion products measurements – Opacity measurements	3

Text Book

- Sawhney A. K. Puneet Sawhney, (2004), *A Course in Mechanical Measurements and Instrumentation*, Dhanpat Rai & Co Pvt Ltd, (Units I & II).
- Jack P. Holman, (2000), *Experimental Methods for Engineers*, Tata McGrawHill, New Delhi, (Units III - V).

Reference Book

- Rangan C. S. Sharma G. R. Mani V.S.V. (1983), *Instrumentation Devices and Systems*, Tata McGrawHill, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : Title :	16 UPS 6S4 Skill based Elective II: Fundamentals of Astrophysics	Semester: VI
Hrs/Week:	1	Credit: 2
Objectives	➢ To get acquainted with the latest aspects of Astrophysics which have come out so far in the transition period.	

Unit	Content	Hrs
I	**OUR PLACE IN THE UNIVERSE** A tour of the Universe – Scale and Contents: Planets, Stars, Galaxies, Light years and the Interstellar medium	2
II	**OBSERVATIONAL ASTRONOMY** The Electromagnetic spectrum - Geometrical Optics: Ray Diagrams, Focal length, Magnification – Diffraction: Resolving Power, Airy Disc, Diffraction Limit – Telescopes: Reflecting, Refracting, Multiwavelength.	3
III	**STARS** Properties of stars – Stellar structure and Evolution – Introduction to supernovae – Stellar remnants – White dwarfs – Neutron stars – Black holes	2
IV	**QUASARS** Constituents of Galaxies - General structure – Mass of the Galaxy – Cosmic Rays - External Galaxies: Classification and Spectra of Galaxy – Active Galaxies and Quasars.	3
V	**COSMOLOGY** Red shift and Expansion of the Universe – Hubble's Law – The Age of the Universe – The Big Bang – Introductory to Cosmology: The Cosmological Principle, Homogeneity and Isotropy, Olber's Paradox – Introductory to Cosmological Models: Critical Density, Geometry of Space, The fate of the Universe – Dark energy and the Accelerating Universe.	3

Text Book

- Baidyanath Basu,Tanuka Chattopadhyay, Sudhindra Nath, (2010) *An Introduction to Astrophysics*. PHI Learning Private Limited. New Delhi, (Units I – V).

Reference Book

- Abhyankar,K.D. (1999). *Astrophysics of The Solar System,*University Press Limited. Hyderabad.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 616 Title : Core XIII: Electronics Lab		Semester: V & VI
Hrs/Week:	3	Credit: 3
Objectives	➢ To provide a basic grounding in the field of Electronics and to serve as a hint for the student to the more advance techniques.	

Cycle	Content	Hrs
I	1.Rectifier diode and Zener diode characteristics 2.Rectifiers and Filters 3.CRO Familiarization	12
II	1.Verification of Thevenin's theorem 2.Two pin regulated power supply 3.Transistor characteristics - Common Base mode	12
III	1.Verification of Norton's theorem 2.Measurement of Band gap energy of Semiconductors 3.Transistor characteristics - Common Emitter mode	12
IV	1.Verification of Maximum power transfer theorem 2.Voltage doubler 3.Transistor voltage amplifier - Single stage	12
V	1. Astable Multivibrator 2.JFET - characteristics 3.Inverting and Non-inverting Operational amplifiers	12
VI	1.Hartley Oscillator 2.Adder and Subtractor using Operational amplifier 3.Colpitts Oscillator	12

Text Books

- Paul B.Zbar, Malvino, Miller, (1983). *Electronics: A Text-Lab Manual*. Mc.Graw Hill, New Delhi.
- Subramaniyan S.V. (1983). *Experiments In Electronics.* Macmillan India,Ltd, New Delhi.

Reference Books

- Paul B.Zbar, Joseph Sloop, (1997). *Electricity & Electronics Fundamentals : A Text-LabManual*. Mc.Graw Hill, New Delhi.
- Woollard G. (1984). *Practical Electronics*. 2nd Edition,Mc.Graw Hill, New Delhi.
- Bhargowa N.N. (1984). *Basic Electronics And Linear Circuits.* Tata Hill Publishing Co.Ltd.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 617 Title : Core XIV: Digital & Microprocessor Lab		Semester: V & VI
Hrs/Week:	3	Credit: 3
Objectives	➢ To be acquainted with the basics and working of Electronic Digital circuits and Microprocessor.	

Cycle	Content	Hrs
I	1. Study of Various logic gates using ICs and basic logic gates using discrete components 2. Study of NAND and NOR as Universal building blocks 3. Microprocessor - Addition and Subtraction	12
II	1. Construction and Study of Half and Full adders 2. Verification of Demorgan's theorems and problem solving through logic circuits 3. Microprocessor - 1's and 2's complement	12
III	1. Construction and Study of Half and Full Subtractors 2. Construction and Study of RS, D and JK flip-flops 3. Microprocessor - Multiplication	12
IV	1. Construction and Study of Parallel binary adder 2. Construction and Study of Multiplexers and Demultiplexers 3. Microprocessor - Ascending and Descending orders	12
V	1. Construction and Study of Parallel binary Subtractor 2. Construction and Study of Shift registers 3. Microprocessor - Addition of an array of numbers and comparison of two numbers	12
VI	1. Construction and Study of MOD 3 and MOD 5 up counters 2. Construction and Study of BCD to decimal decoder 3. Microprocessor - Division	12

Text Books

- Albert Paul Malvino, Donald P. Leech, (1987). *Digital Principle And Applications.* 3rd Edition, Mc.Graw Hill.
- Paul B.Zbar, Malvino, Miller, (1983). *Electronics: A Text- Lab Manual.* Mc.Graw Hill, New York.

Reference Books

- Leech, (1986). *Experiments In Digital Principles*. 3rd Edition, Mc.Graw Hill, New York.
- Paul B.Zbar, Malvino, Sloop, (1997). *Electricity & Electronics Fundamentals: A Text-Lab Manual.* Mc.Graw Hill.
- Woollard G. (1984). *Practical Electronics.* 2nd Edition,Mc.Graw Hill.
- Subramaniyan S.V. (1983). *Experiments In Electronics.* Macmillan India Ltd, New Delhi.
- Bhargowa N.N. (1984). *Basic Electronics And Linear Circuits*. Tata Hill Publishing Co Ltd, New Delhi.

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UPS 618 Title : Core XV: Computer Lab in C		Semester: VI
Hrs/Week:	2	Credit: 2
Objectives	➢ To become familiar with C programming language.	

Content	Hrs
1. Temperature Conversion 2. Largest /Smallest of three numbers 3. Quadratic equation 4. Fibonacci number 5. Armstrong number 6. Electric Power Consumption 7. Ascending/Descending order 8. Matrix Addition/ Subtraction 9. Matrix multiplication 10. Sorting of names 11. Multiplication Table 12. Function with arguments and with return values 13. Recursion function 14. Pointer to Structure 15. Pointer as function arguments	36

Text Book

- Balagurusamy E. (2004). *Programming In Ansi C.* Tata McGraw Hill Publishing Company, New Delhi.

Reference Books

- Ravichandran D. (1998). *Programming In C.* New Age International (P) Limited Publishers.
- Yashvant Kanetkar, (1995).*Let Us C.* 2nd Revised Edition, BPB Publications, New Delhi.

Department	Physics	
Course	B.Sc. Mathematics & Chemistry	Effective from the year : 2016
Subject Code : 16 UMS 3A3 / 16 UCY 3A3 Title : Physics For Mathematics & Chemistry- I		Semester: III
Hrs/Week:	5	Credit: 4
Objectives	➢ To understand the concepts & phenomena of Electric field.& Electromagnetic induction ➢ To understand the mechanism of energy transfer in the form of waves ➢ To provide the basic knowledge in semiconductor theory and digital electronics	

Unit	Content	Hrs
I	**ELECTRICITY AND MAGNETISM** Electric field, Intensity & Potential - Potential due to a charged conducting sphere - Capacitance - Parallel plate capacitor - Energy stored in a charged capacitor - Kirchoff's law - Wheatstone's bridge - Potentiometer - Measurement of Resistance & EMF - Calibration of Ammeter & Voltmeter - Biot Savart law - Field along the axis of a circular coil - Determination of M & H - Electromagnetic induction - Self and Mutual induction - Induction coil, Transformer & Choke (Basic ideas)	13
II	**WAVE OPTICS** Young's double slit experiment - Coherent sources - Theory of interference fringes - Interference due to reflected light (Thin films) - Colours of thin films - Newton's rings - Determination of λ and μ - Theory of plane transmission grating - Determination of λ of Mercury light - Plane polarized light - Nicol prism as Analyzer and Polariser - Optical activity - Laurent's half shade Polarimeter	13
III	**SEMICONDUCTOR PHYSICS** Semiconductor - Intrinsic and Extrinsic semiconductors - Junction diode and Zener diode characteristics - Half & Full wave Rectifiers - Regulated power supply - Transistor and its action - Common base and common emitter configurations - Relations between α and β - Load line and Operating point - Stability	13

(CONTD……2)

IV	**NUMBER SYSTEMS, LOGIC GATES AND ARITHMETIC CIRCUITS** Binary number - Addition, Subtraction, Multiplication & Division - Octal & Hexadecimal numbers - Interconversions - BCD numbers - ASCII codes - OR, AND & NOT gates using Discrete components and ICs - NOR & NAND gates - Universal building blocks - Demorgan's theorems - XOR & XNOR gates - Laws and theorems of Boolean algebra - Simplification of Boolean expression - Half & full adders - Half & full subtractors	13
V	**FLIP FLOPS** RS - D - JK - Master/Slave **COUNTERS** Mod 8 Ripple counter (up and down) - Mod 10 counter **MEMORIES** (Basic ideas) Memory addressing - ROM, PROM and EPROM - RAM	13

Text Books

- Murugeshan R, (2008). *Electricity and Magnetism*, S.Chand & Company Ltd, New Delhi, (Unit - I).
- Brijlal and Subramaniam, (1999). *A Text Books Of Optics*. S.Chand & Company Ltd, New Delhi, (Unit - II).
- Theraja B.L, (1998). *Basic Electronics Solid state*. S.Chand & Company Ltd, New Delhi, (Unit - III).
- Malvino and Leech, (1986). *Digital Principles and Applications*. Tata Mc Graw Hill Publishing Company, New Delhi (Units IV & V).

Reference Books

- Brijlal and Subramaniam, (1987). *Electricity and Magnetism*, S.Chand & Company Ltd, New Delhi.
- Sadasiva Biswal, (2001). *Basic Electronics*. Atlantic Publishers and Distributors.
- Narayana Rao B.V. (1994). *Principles of Electronics*. Wiley Eatern Limited New Age International Limited.

Department	Physics	
Course	B.Sc. Mathematics & Chemistry	Effective from the year: 2016
Subject Code : 16 UMS 4A4 / 16 UCY 4A4 Title : Physics For Mathematics & Chemistry- II		Semester: IV
Hrs/Week:	5	Credit: 4
Objectives	➢ To understand the properties of atom and the nucleus ➢ To provide basic concepts and methodology of quantum mechanics. ➢ To study the basic concepts of special theory of relativity and the emergence of Einstein's Mass energy equivalence ➢ To acquire basic knowledge in the Field of Laser and Fiber optic technology	

Unit	Content	Hrs
I	**ATOMIC PHYSICS** Discharge of electricity through rarified gases - Cathode rays - Properties - Determination of charge of electron by Millikan's oil drop method -Positive rays - Thomson parabola method - Rutherford atom model - Bohr atom model - Hydrogen spectral series - Critical potentials - Sommerfield atom model - Vector atom model (qualitative) - Pauli's exclusion principle	13
II	**NUCLEAR PHYSICS** Basic properties of nucleus - Binding energy, Mass defect and Nuclear force - Liquid drop model - Law of radioactivity - Half life and Mean life - Radioactive dating - α, β and γ decay process (Basic ideas) - Nuclear fission - Chain reaction & Atom bomb - Nuclear reactors - Nuclear fusion & Sources of stellar energy - Thermonuclear reactions & Hydrogen bomb	13
III	**QUANTUM PHYSICS** Black body radiation and Planck's hypothesis - Photoelectric phenomena and Experimental investigations - Einstein's equation and Millikan's experiment - De Broglie's concept of Matter waves and De Broglie wavelength – G.P.Thomson Experiment - Uncertainty Principle - Postulates of wave mechanics - Wave function and significance - Schrodinger equation (one dimensional) - Eigen values and Eigen functions	13

(CONTD……2)

IV	**SPECIAL THEORY OF RELATIVITY** Frames of reference - Newtonian Relativity - Michelson Morley experiment and explanation for negative results - Postulates of special theory of relativity - Lorentz transformation - Time dilation - Length contraction - Addition of velocities - Variation of mass with velocity - Equivalence of mass and energy	13
V	**LASER OPTICS** Concept of energy levels - Einstein's coefficients (qualitative) -Population inversion - Pumping methods - Essential elements and Action of laser system - Characteristics - Holography and Lasers in medicine (Basic ideas) **FIBER OPTICS** Construction and types of optical fiber - Critical angle - Propagation of light through optical fiber - Optical fiber configurations - Acceptance angle, Acceptance cone and Numerical aperture - Fiber optic communication system	13

Text Books

- Murugesan R. (2001). *Modern Physics.* S.Chand & Company Ltd, New Delhi, (Units I - III).
- Pedrotti L. & Pedrotti S. (2008). *Introduction To Optics*. Prentice Hall international Edition, New Delhi, (Unit - IV).
- Wayne Tomasi and Vincent F.Alisouskas. (1988). *Telecommunications.* Prentice Hall International, New Delhi,(Unit -V).

Reference Books

- Arthur Beiser, (2003). Concepts of *Modern Physics*. Addison Wesley Pvt Ltd.
- Raymond.A.Serway, (2007). *Physics For Scientists And Engineers*. Saunders College Publishing (Harcourt Brace College Publishers).

Department	Physics	
Course	BSc Physics	Effective from the year: 2016
Subject Code : 16 UMS 4A5 / 16 UCY 4A5 Title : Physics Lab For Mathematics & Chemistry		Semester: III & IV
Hrs/Week:	3	Credit: 4
Objectives	➢ To make the students understand the theoretical background by performing experiments.	

Cycle	Content	Hrs
I	1. Refractive index of a Prism - Spectrometer 2. Refractive index of a Lens - Newton's Rings 3. Specific resistance of a Wire - Potentiometer 4. Horizontal Component of Earth's Magnetic Field (H) - Field along the axis of a Circular coil carrying current 5. Characteristics of PN Junction Diode 6. Basic Logic Gates - Discrete Components & ICs 7. Demorgan's Theorems and Problem solving in Boolean Algebra through Logic Circuits 8. Half & Full Adder 9. NAND as Universal building block	24
II	1. Refractive index of a Prism – i d Curve - Spectrometer 2. Wavelength of Mercury source – Grating - Normal incidence – Spectrometer 3. Calibration of Low range Voltmeter and Ammeter - Potentiometer 4. Magnetic Moment (M) - Field along the axis of a Circular coil carrying current 5. Characteristics of Zener Diode 6. Rectifiers & Filters 7. Two pin Regulated Power supply 8. Half & Full Subtractors 9. NOR as Universal building block.	24

Text Book

- Govindarajan S.R. Sundarajan S. (1959). *Practical Physics*. Roc house & sons Pvt Ltd.

Reference Book

- Paul B.Zbar, Malvino, Miller, (1983). *Electronics: A Text- Lab Manual*. Mc.Graw Hill, New Delhi.