

Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code : 13 UPS 01 Title : Properties Of Matter & Sound	Semester: I	
Hrs/Week:	6	Credit:5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the basic concepts of gravitation.</li> <li>➤ To get exposure to the properties of liquids, solids &amp; sound</li> </ul>	

Unit	Content	Hrs
I	<p><b>GRAVITATION</b></p> <p>Kepler's laws - Newton's law of gravitation - Gravitational constant - Boy's method - Gravitational field and Gravitational potential - Potential energy - Escape velocity - Equipotential surface - Potential at a point outside and inside a spherical shell - Inertial and gravitational mass - Earthquakes - Seismic waves and Seismographs - Determination of the Epicenter and the focus - Application of Seismology</p>	14
II	<p><b>ELASTICITY</b></p> <p>Stress and Strain - Hooke's law - Types of Elasticity - Relation between three types of Elasticity - Poisson's ratio - Twisting couple on a cylinder - Strain energy in twisted cylinder - Torsional pendulum - Determination of coefficient of rigidity of a wire - Bending of beams - Bending moment - Cantilever - Determination of Y of a cantilever - Depression of a beam supported at the ends - Uniform and nonuniform bending - Strain energy in a bent beam - Searle's method to determine the rigidity modulus</p>	15
III	<p><b>VISCOSITY</b></p> <p>Bernoulli's theorem and Applications - Viscosity - Coefficient of viscosity - Poiseuille's equation for the flow of liquid through a tube - Determination of coefficient of viscosity - Motion in a viscous medium - Determination of coefficient of viscosity of highly viscous liquid - Stoke's method - Rotation viscometer - Determination of viscosity of a gas by Rankine's method</p>	14
IV	<p><b>SURFACE TENSION, DIFFUSION AND OSMOSIS</b></p> <p>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 - Diffusion - Fick's law - Graham's law of diffusion of gases - Osmosis and osmotic pressure - Laws of osmotic pressure - Experimental determination of osmotic pressure</p>	14

V	<p><b>SOUND</b></p> <p>Velocity of transverse waves along a stretched string (I method) - Laws of transverse vibration of strings - Verification of the Laws of transverse vibration of strings - Melde's experiment - Resonance - Musical sound and noise - Speech - Human voice - Human Ear - Characteristic of Musical Sound - Intensity of Sound - Measurement of Intensity of Sound - Decibel - BEL - Phon (Definitions only)- Acoustics - 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 - Piezo electric oscillator - Detection of Ultrasonics - Acoustic grating-Application</p>	15
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**Text Books**

- Mathur D.S. (2003). *Elements Of Properties Of Matter*. Shyam Lal Charitable Trust, NewDelhi, (Units I - IV).
- Brijlal. N. Subramaniam. (2002). *Text Book of Sound*. Vikas Publications house Pvt Ltd, NewDelhi, (Unit V).

**Reference Books**

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code : 13 UPS 03 Title : Heat & Thermodynamics		Semester: II
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the basic nature of heat.</li> <li>➤ To apply the laws of thermodynamics to simple thermodynamical problems</li> </ul>	

Unit	Content	Hrs
I	<p><b>THERMOMETRY AND SPECIFIC HEATS</b></p> <p>Concept of heat and temperature - Thermoelectric thermometer - Absolute zero and Ice point - Low temperature measurement - High temperature measurement - Specific heat of a gas – <math>C_p</math> &amp; <math>C_v</math>- Determination of <math>C_v</math> by Joule's differential steam calorimeter - Determination of <math>C_p</math> 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</p>	12
II	<p><b>KINETIC THEORY OF GASES</b></p> <p>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</p>	12
III	<p><b>TRANSMISSION OF HEAT</b></p> <p>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</p>	12
IV	<p><b>LOW TEMPERATURE PHYSICS</b></p> <p>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</p>	12

	vapour pressure thermometer - Electrolux refrigerator	
V	<b>THERMODYNAMICS</b> 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 - Irreversible and Reversible process - Second law of thermodynamics - Carnot's reversible engine - Carnot's theorem - Entropy - Reversible and Irreversible process - Third law of thermodynamics (statements and its tests) - Temperature entropy diagram - Maxwell's thermodynamic relation	12

Text Books

- Brijlal and Subramaniam. (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. *Heat, Thermodynamics & Statistical Physics*. Pragathi Pragason, Meerut, 1<sup>st</sup> edition.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 04	Semester: I & II
Title :	Physics Lab I	
Hrs/Week:	3	Credit: 3
Objectives	<ul style="list-style-type: none"> <li>➤ To stimulate the student's desire to apply their knowledge of theory to experiments.</li> <li>➤ To test how far the students have grasped and imbibed the basic principles taught.</li> </ul>	

Cycle	Content	Hrs
I	<ol style="list-style-type: none"> <li>1. Acceleration due to Gravity and Moment of Inertia - Compound pendulum</li> <li>2. Young's Modulus - Non uniform Bending - Pin and Microscope</li> <li>3. Rigidity Modulus - Static Torsion</li> <li>4. Surface Tension and Interfacial Tension - Drop weight method</li> <li>5. Coefficient of Viscosity - Stoke's method</li> <li>6. Verification of Laws of Transverse Vibrations and Frequency of a Fork - Sonometer</li> </ol>	24
II	<ol style="list-style-type: none"> <li>1. Young's Modulus - Non uniform Bending - Koenig's method</li> <li>2. Young's Modulus - Cantilever - Pin and Microscope</li> <li>3. Viscosity of a Liquid - Capillary Flow - Variable Pressure head</li> <li>4. Thermal Conductivity of a Bad Conductor - Lee's Disc</li> <li>5. Specific Heat Capacity of a Liquid - Newton's Law of cooling</li> <li>6. Frequency of a Tuning Fork and Density of Solid and Liquid - Melde's String</li> </ol>	24
III	<ol style="list-style-type: none"> <li>1. Young's Modulus - Uniform Bending - Scale and Telescope</li> <li>2. Rigidity Modulus and Moment of Inertia - Torsional Pendulum</li> <li>3. Coefficient of Viscosity - Searle's Viscometer</li> <li>4. Specific Heat Capacity of a Liquid - Joule's Calorimeter</li> <li>5. Comparison of Viscosities of Liquids and Radii of Capillary tubes</li> <li>6. Refractive Index of a Prism - Spectrometer</li> </ol>	24

### Text Books

- Arora C.L. (2007). *Practical Physics*. S.Chand & Co, 19<sup>th</sup> 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, 20<sup>th</sup> Edition.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 06 / 10 UPS 06	Semester: III
Title	: Electricity & Magnetism	
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the concepts of Electric field.</li> <li>➤ To understand the phenomenon of Electromagnetic induction.</li> <li>➤ To study the oscillations in LCR circuits.</li> <li>➤ To realize the significance of Maxwell's equations</li> </ul>	

Unit	Content	Hrs
I	<p><b>ELECTRIC FIELD AND POTENTIAL</b></p> <p>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.</p>	12
II	<p><b>CAPACITORS AND DIELECTRICS</b></p> <p>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 permittivity - Physical meaning of polarization - Mechanism of polarisation - Types of condensers - Dielectric strength</p>	12
III	<p><b>MAGNETOSTATICS AND MAGNETIC FIELD</b></p> <p>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</p>	12

IV	<b>ELECTROMAGNETIC INDUCTION</b> Faraday's laws of Electromagnetic induction - Deduction of Faraday's laws from Lorentz's force - Generation of induced emf by moving a conductor in magnetic field - Self inductance - Calculation of self inductance for a solenoid - Toroidal coil - Energy stored in magnetic field - Mutual inductance - Energy stored in two interacting circuits - Simple RL circuit : Growth 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	12
V	<b>MAXWELL'S EQUATIONS AND ELECTROMAGNETIC THEORY</b> 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	12

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.

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Department	Physics	
Course	B.Sc Physics	Effective from the year: 2013
Subject Code :	13 UPS SA1 / 12 UPS SA1	Semester: III
Title	: Mechanical Measurements	
Hrs/Week:	1	Credit: 2
Objectives	<ul style="list-style-type: none"> <li>➤ To provide good foundation and inspire interest for the knowledge in Mechanical measurements.</li> <li>➤ To understand the operational features, limitations and difficulties inherent in the instruments.</li> </ul>	

Unit	Content	Hrs
I	<b>INSTRUMENT CHARACTERISTICS</b> <b>STATIC TERMS AND CHARACTERISTICS:</b> Range and span - Accuracy, error and correction – Calibration - Hysteresis - Dead zone – Drift – Sensitivity – Stability - Linearity - Back lash – Stiction <b>DYNAMIC TERMS AND CHARACTERISTICS:</b> Speed of response and measuring lag - Fidelity and dynamic error – Overshoot – Dead time and Dead zone - Frequency response	3
II	<b>TRANSDUCER</b> Transducer description - Variable resistance transducer - Capacitance transducer - Photoelectric transducer - Piezo electric transducer	3
III	<b>PRESSURE MEASUREMENT</b> Terms - Piezometer - U tube double column monometer – Bourdon gauge - McLeod gauge - CRO for varying pressure measurement	2
IV	<b>FLOW MEASUREMENT</b> Nature of flow - Cup and Vane anemometers - Hotwire anemometer -Ultrasonic flow meter - Thermal flow meter – Shadograph	2
V	<b>MEASUREMENT OF DENSITY AND HUMIDITY</b> Hydrometer – Density measurement using LVDT – Electrical Hygrometers – Sling Psychrometer	2

Text Books

- Kumar, D. S. (1997). *Mechanical Measurements And Control*. Metropolitan, Third Edition, (Units I – IV).
- Sawhney A. K. Puneet Sawhney, (2004). *A Course In Mechanical Measurements And Instrumentation*. Dhanpat Rai & Co, 12<sup>th</sup> Edition, (Unit – V).

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code : 13 UPS SB1 Title : Fundamentals of Biophysics	Semester: III	
Hrs/Week:	1	Credit: 2
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the underlying physical principles of the biological phenomena.</li> <li>➤ To understand the separation and physico-chemical techniques used to study biological structure.</li> </ul>	

Unit	Content	Hrs
I	<b>LAWS OF PHYSICS AND CHEMISTRY</b> Quantum Mechanics – Electronic structure of Atom – Molecular orbitals and Covalent bonds – Molecular Interactions – Strong and Weak interaction – Thermodynamics – Entropy and Enthalpy – Free energy of a system	3
II	<b>MOLECULAR ALPHABETS OF LIFE</b> Introduction to the molecular structure and function of Proteins, Nucleic acids, Carbohydrates and Lipids.	2
III	<b>BIOMOLECULAR SEPARATION TECHNIQUES</b> Chromatography: Column, Thin Layer, Ion exchange, Molecular exclusion and Affinity Chromatography – Electrophoresis – Gel Electrophoresis.	2
IV	<b>PHYSIOCHEMICAL TECHNIQUES</b> Ultra centrifugation – Viscosity – Light scattering measurements – Different types of Light microscopy – Basics of TEM, SEM – Introduction to X-ray crystallography and NMR.	2
V	<b>BIOMECHANICS AND NEURO-BIOPHYSICS</b> Mechanical properties of muscles – Biomechanics of cardiovascular system – The nervous system – Physics of membrane potentials – Sensory mechanisms – The Eye – Physical aspects of hearing.	3

Text Book

- Vasantha Pattabhi, Gautham N. (2002). *Biophysics* Narosa Publishing House. New Delhi, (Units I-V).

Reference Book

- Rodney Cotterill, *Biophysics An Introduction*. John Wiley & Sons Ltd, England.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS SB1/ 12 UPS SB1	Semester: III
Title :	Fundamentals of Biophysics	
Hrs/Week:	1	Credit: 2
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the underlying physical principles of the biological phenomena.</li> <li>➤ To understand the separation and physico-chemical techniques used to study biological structure.</li> </ul>	

Unit	Content	Hrs
I	<b>LAWS OF PHYSICS AND CHEMISTRY</b> Quantum Mechanics – Electronic structure of Atom – Molecular orbitals and Covalent bonds – Molecular Interactions – Strong and Weak interaction – Thermodynamics – Entropy and Enthalpy – Free energy of a system	3
II	<b>MOLECULAR ALPHABETS OF LIFE</b> Introduction to the molecular structure and function of Proteins, Nucleic acids, Carbohydrates and Lipids.	2
III	<b>BIOMOLECULAR SEPARATION TECHNIQUES</b> Chromatography: Column, Thin Layer, Ion exchange, Molecular exclusion and Affinity Chromatography – Electrophoresis – Gel Electrophoresis.	2
IV	<b>PHYSIOCHEMICAL TECHNIQUES</b> Ultra centrifugation – Viscosity – Light scattering measurements – Different types of Light microscopy – Basics of TEM, SEM – Introduction to X-ray crystallography and NMR.	2
V	<b>BIOMECHANICS AND NEURO-BIOPHYSICS</b> Mechanical properties of muscles – Biomechanics of cardiovascular system – The nervous system – Physics of membrane potentials – Sensory mechanisms – The Eye – Physical aspects of hearing.	3

Text Book

- Vasantha Pattabhi, Gautham N. (2002). *Biophysics* Narosa Publishing House. New Delhi, (Units I - V).

Reference Book

- Rodney Cotterill, *Biophysics An Introduction*. John Wiley & Sons Ltd, England.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 08 / 13 UPS 08	
Title :	Optics And Spectroscopy	
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the mechanism of energy transfer in the form of waves and to impart knowledge in light</li> <li>➤ To familiarize the concepts of molecular, atomic and nuclear spectra.</li> </ul>	

Unit	Content	Hrs
I	<p><b>WAVE MOTION</b>            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</p> <p><b>INTERFERENCE</b>            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</p>	12
II	<p><b>DIFFRACTION</b>            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</p> <p><b>POLARISATION</b>            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</p>	12
III	<p><b>LASER OPTICS</b>            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</p>	12

	<b>FIBER OPTICS</b> 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	
IV	<b>MOLECULAR SPECTRA</b> 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	12
V	<b>ATOMIC &amp; NUCLEAR SPECTRA</b> 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	12

Text Books

- Subramanyam N. Brijlal, *Waves And Oscillations*. S.Chand & Co(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, (Unit - IV).
- Gupta S.L. Kumar V. Sharma R.C. (2001). *Elements Of Spectroscopy*. 16<sup>th</sup> edition, Pragati Prakashan, (Unit - V).

Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code : 13 UPS SA2 Title : Environmental Instrumentation	Semester: IV	
Hrs/Week:	1	Credit: 2
Objectives	<ul style="list-style-type: none"> <li>➤ To provide good foundation and inspire interest to gain knowledge in Thermal measurements.</li> <li>➤ To understand the operational features, limitations and difficulties inherent in the instruments.</li> </ul>	

Unit	Content	Hrs
I	<b>TEMPERATURE MEASUREMENTS</b> 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	<b>RADIATION MEASUREMENTS</b> Radiation pyrometers – Blackbody conditions – Radiation reactive elements – Total radiation pyrometers – Infrared pyrometers – Optical pyrometers	3
III	<b>THERMAL MEASUREMENTS</b> Detection of thermal radiation – Measurement of emissivity – Reflectivity and Transmissivity measurements – Solar radiation measurements	2
IV	<b>NUCLEAR RADIATION MEASUREMENTS</b> Detection of Nuclear radiation – Geiger Muller Counter – Ionisation chambers – The Scintillation counter – Neutron detection.	2
V	<b>AIR POLLUTION SAMPLING AND MEASUREMENTS</b> Units of pollution measurements – General air sampling train-gas sampling techniques – Sulfur dioxide measurements – Combustion products measurements – Opacity measurements	2

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.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS SB2 / 12 UPS SB2	Semester: IV
Title	: Fundamentals of Astrophysics	
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	<b>OUR PLACE IN THE UNIVERSE</b> A tour of the Universe – Scale and Contents: Planets, Stars, Galaxies, Light years and the Interstellar medium	2
II	<b>OBSERVATIONAL ASTRONOMY</b> The Electromagnetic spectrum - Geometrical Optics: Ray Diagrams, Focal length, Magnification – Diffraction: Resolving Power, Airy Disc, Diffraction Limit – Telescopes: Reflecting, Refracting, Multiwavelength.	3
III	<b>STARS</b> Properties of stars – Stellar structure and Evolution – Introduction to supernovae – Stellar remnants – White dwarfs – Neutron stars – Black holes	2
IV	<b>QUASARS</b> Constituents of Galaxies - General structure – Mass of the Galaxy – Cosmic Rays - External Galaxies: Classification and Spectra of Galaxy – Active Galaxies and Quasars.	2
V	<b>COSMOLOGY</b> 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.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 09 / 12 UPS 09	Semester: III & IV
Title :	Physics Lab II	
Hrs/Week:	3	Credit: 4
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 - <b>i-d</b> 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 <b>M</b> - 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 - <b>i-i'</b> 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 <b>H</b> - 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.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 12 / 12 UPS 12	Semester: V
Title :	Classical Dynamics	
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the basic concepts in mechanics of a particle and system of particles.</li> <li>➤ To familiarize the classical equation of motions by Lagrangian, Hamiltonian and Hamilton-Jacobi formulations</li> </ul>	

Unit	Content	Hrs
I	<p><b>MECHANICS OF A PARTICLE</b></p> <p>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</p>	12
II	<p><b>MECHANICS OF SYSTEM OF PARTICLES</b></p> <p>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</p>	12
III	<p><b>LAGRANGIAN FORMULATION</b></p> <p>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.</p>	12

IV	<p><b>HAMILTONIAN FORMULATION OF MECHANICS</b></p> <p>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.</p>	12
V	<p><b>HAMILTON - JACOBI FORMULATION</b></p> <p>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.</p>	12

Text Books

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

Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code : 13 UPS 13 / 12 UPS 13 Title : Relativity & Quantum Mechanics	Semester: V	
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the concepts and the consequences of special and general theory of relativity.</li> <li>➤ To understand the basic concepts of Quantum theory and the wave properties of particles.</li> <li>➤ To understand the different types of quantum numbers and to apply the wave equation to solve simple problems</li> </ul>	

Unit	Content	Hrs
I	<b>RELATIVITY</b> 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	12
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	12
III	<b>QUANTUM MECHANICS</b> <b>WAVE PROPERTIES OF PARTICLES</b> 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	12
IV	<b>SCHRÖDINGERS EQUATION AND ITS APPLICATIONS</b> 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	12

V	<p><b>QUANTUM THEORY OF HYDROGEN ATOM</b></p> <p>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 &amp; Magnetic Quantum number - Electron probability density - Radiative transitions - Selection rules</p>	12
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Text Books

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

Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 14 / 12 UPS 14	Semester: V
Title	: Basic Electronics & Circuit Systems	
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To know the basics of AC&amp;DC circuits.</li> <li>➤ To understand the action of semiconductor devices and their applications.</li> <li>➤ To know the principle and working of optoelectronic devices.</li> </ul>	

Unit	Content	Hrs
I	<p><b>DC CIRCUITS AND ALTERNATING CURRENTS</b>  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 - 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</p>	12
II	<p><b>SEMICONDUCTOR DEVICES AND CIRCUITS</b>  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 <math>\alpha</math> and <math>\beta</math> - Load line and Operating point - Stability - Voltage divider Self bias - JFET and its characteristics</p>	12
III	<p><b>AMPLIFIERS &amp; OSCILLATORS</b>  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</p>	12

IV	<b>OPERATIONAL AMPLIFIER</b> 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	12
V	<b>OPTOELECTRONIC DEVICES</b> 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)	12

#### Text Books

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

#### Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 15 / 12 UPS 15	Semester: V
Title :	Digital Circuit Systems	
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To study the number system, Logic circuits and its application.</li> <li>➤ To understand the concept of Memories and IC technology.</li> </ul>	

Unit	Content	Hrs
I	<p><b>NUMBER SYSTEMS AND CODES</b>            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</p> <p><b>LOGIC GATES</b>            OR, AND and NOT gates - NAND and NOR gates - Universal building blocks - XOR and XNOR gates</p>	12
II	<p><b>THEOREMS OF BOOLEAN ALGEBRA</b>            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</p> <p><b>ARITHMETIC PROCESSING CIRCUITS</b>            Half and full adders - Half and full subtractors - Parallel binary adder and subtractor</p>	12
III	<p><b>DATA PROCESSING CIRCUITS</b>            Multiplexers - Demultiplexers - 1 - of - 16 decoder - BCD to decimal decoder - Seven segment decoders - Encoders</p> <p><b>FLIP FLOPS AND SHIFT REGISTERS</b>            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</p>	12
IV	<p><b>COUNTERS</b>            Asynchronous Mod 8 up and down counters - Decoding gates - Synchronous Mod 8 up and down counters - Mod 3, Mod 5, and Mod 10 counters - Presetable counter - Digital clock</p> <p><b>D/A and A/D CONVERSIONS</b>            Variable resistor network - Binary ladder - D/A Converter - A/D converter</p>	12

V	<p><b>SEMICONDUCTOR MEMORIES</b>  Memory addressing - ROM's, PROM's and EPROM's -  Expansion of ROM capacity - Static and Dynamic RAM's</p> <p><b>IC TECHNOLOGY</b>  Integrated circuits - Resistors, Diodes and BJT'S in IC's -  Design rules for monolithic circuit - Fabrication of monolithic IC's</p>	12
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Text Books

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

Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS NA1 / 11 UPS NA1	Semester: V
Title :	Principles of Physics – I (Non-Major)	
Hrs/Week	1	Credit: 2
Objectives	<ul style="list-style-type: none"> <li>➤ To spread the spirit of scientific interest</li> <li>➤ To develop the curiosity in Science</li> <li>➤ To embark on pursuing scientific enquiries as a hobby</li> </ul>	

Unit	Content	Hrs
I	<b>ATMOSPHERE</b> 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	<b>GEOLOGY</b> Age of Fossil-Measurement of depth of ocean-Lava from Volcano-Monsoons –Seebergs-Radiation from Granites and Marbles-Earth’s Magnetic properties	2
III	<b>HYDROLOGY</b> 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	<b>SPACE</b> Saturn rings-Measurement of temperature of planets and stars-Asteroids-Rotation of Earth-Shooting stars and comets-Atmosphere of stellar bodies-Flat plane orbits of Planets	2
V	<b>HOME APPLIANCES</b> 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. 6<sup>th</sup> Edition.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS NB1 / 11 UPS NB1	Semester: V
Title	: Renewable Energy Sources Paper - I	
Hrs/Week;	1	Credit: 2
Objectives	➤ To gain knowledge about conventional and non-conventional energy sources and their utilization.	

Unit	Content	Hrs
I	<b>INTRODUCTION TO ENERGY SOURCES</b> Conventional energy sources: Coal – Gas – Water – Agriculture and organic waste – Non conventional sources: Solar energy – Renewable energy resources	2
II	<b>SOLAR RADIATION AND ITS MEASUREMENTS</b> 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	<b>SOLAR ENERGY COLLECTORS</b> 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	<b>SOLAR ENERGY STORAGE</b> 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	<b>APPLICATIONS OF SOLAR ENERGY</b> 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.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code : 13 UPS 16 / 12 UPS 16 Title : 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	<b>VECTORS</b> 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 – Cylindrical 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	12
II	<b>MATRICES AND LINEAR SYSTEM OF EQUATIONS</b> 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	12
III	<b>LAPLACE TRANSFORM</b> 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	12
IV	<b>GROUP THEORY</b> 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- Conjugate elements and classes - Product of classes - Complexes - Conjugate subgroups, Normal subgroups and factor groups - Isomorphism and Homomorphism - Permutation Groups	12
V	<b>NUMERICAL METHODS</b> 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	12

Text Books

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

Reference Books

- Gupta B.D. (1989). *Mathematical Physics*. 3<sup>rd</sup> Edition, Vikas Publication House.
- 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.
- Venkataram M.K. *Numerical Methods in Science and Engineering*. The National Publishing Company.
- Raman K.V. *Group Theory*. Tata McGraw - Hill publishing company Ltd.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 17 / 10 UPS 17	Semester: VI
Title :	Atomic & Nuclear Physics	
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the concept of electron ,and the structure of the atom</li> <li>➤ To explore the origin of X-rays and its applications.</li> <li>➤ To understand the properties of the nucleus and nuclear models.</li> <li>➤ To know the concept of radioactive phenomena and nuclear reactions.</li> <li>➤ To acquire knowledge about particle detectors, accelerators and elementary particles.</li> </ul>	

Unit	Content	Hrs
I	<p><b>CONCEPT OF ELECTRON</b>            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.</p> <p><b>STRUCTURE OF THE ATOM</b>            Bohr's theory of Hydrogen atom - Excitation &amp; Ionisation potentials - Experimental verification of discrete atomic energy levels - Correspondence principle - Sommerfeld model &amp; Relativistic effects - Hyperfine structure - Vector atom model - Quantum numbers - Coupling schemes - Pauli exclusion principle - Electronic configuration of an atom .</p>	12
II	<p><b>X -RAYS</b>            Origin of X rays - Production &amp; 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)</p>	12
III	<p><b>NUCLEAR MODELS</b>            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).</p> <p><b>RADIOACTIVITY</b>            The law of radioactive decay and decay rate - Half life and</p>	12

	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.	
IV	<b>NUCLEAR REACTIONS, DETECTORS AND ACCELERATORS</b> 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.	12
V	<b>ELEMENTARY PARTICLES AND COSMIC RAYS</b> 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.	12

#### Text Books

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

#### Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 18 / 12 UPS 18	
Title	Condensed Matter Physics And Statistical Mechanics	Semester: VI
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To understand the concepts of bonding in solids and various physical parameters to characterize crystals.</li> <li>➤ To understand the electrical and magnetic properties of solids.</li> <li>➤ To understand the occurrence of superconductivity and its applications.</li> <li>➤ To understand the concepts of phase space, ensemble and their usage in various statistical distribution methods</li> </ul>	

Unit	Content	Hrs
I	<p><b>BONDING IN SOLIDS</b>            Bonding in solids - Ionic bonding - Covalent bond - Metallic bond - Intermolecular bonds - Dispersion bonds - Dipole bonds - Hydrogen bonds (Formation and properties)</p> <p><b>CRYSTAL PHYSICS</b>            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)</p>	12
II	<p><b>ELECTRICAL PROPERTIES OF SOLIDS</b>            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</p> <p><b>MAGNETIC PROPERTIES OF SOLIDS</b>            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</p>	12
III	<p><b>SUPERCONDUCTIVITY</b>            Properties of superconductors - Effects of magnetic field - Persistent current - Critical current - The Meissner effect - Isotope effect - Penetration depth - Type I and Type II</p>	12

	superconductors - Electronic specific heat - Energy gap measurements - BCS theory - Josephson tunneling (simple ideas only) - High temperature superconductors - Applications of superconductivity (simple ideas only)	
IV	<b>CLASSICAL STATISTICAL MECHANICS</b> 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	12
V	<b>QUANTUM STATISTICAL MECHANICS</b> 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	12

#### Text Books

- Pillai S.O. (2005). *Solid State Physics*. 6<sup>th</sup> Edition, New age international (P) Ltd, New Delhi, (Units I - III).
- Serway R. Moses C. Moyer C.A. (1997). *Modern Physics*. 2<sup>nd</sup> edition, Saunders college publishers, (Unit III).
- Kamal Singh, Singh S. P. (1985). *Elements Of Statistical Mechanics*. 1<sup>st</sup> 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*. 6<sup>th</sup> Edition, K.Nath & Co., Meerut.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 19 / 10 UPS 19	
Title	: Microprocessor Mechanisms And Programming In C	Semester: VI
Hrs/Week:	5	Credit: 5
Objectives	<ul style="list-style-type: none"> <li>➤ To know the architecture &amp; instruction set of Intel 8085 Microprocessor.</li> <li>➤ To familiarize different schemes of data transfer &amp; learn a few applications of 8085.</li> <li>➤ To become familiar with C programming language.</li> <li>➤ To realize the efficiency &amp; power of C language.</li> </ul>	

Unit	Content	Hrs
I	<p><b>MICROPROCESSOR ARCHITECTURE AND PROGRAMMING</b></p> <p>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 &amp; Machine control groups - Addressing modes - Programming the 8085: The programming process - The stack and subroutines - Simple programming examples</p>	12
II	<p><b>INTERFACING MEMORY AND I/O DEVICES</b></p> <p>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</p> <p><b>APPLICATIONS OF MICROPROCESSOR</b></p> <p>Temperature monitoring system (Brief description) - Closed loop process control: The process of growing synthetic Quartz (Qualitative ideas only)</p>	12
III	<p><b>INTRODUCTION TO C</b></p> <p>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 -</p>	12

	Precedence of operators - Formatted input & output statements	
IV	<b>CONTROL STRUCTURES, ARRAYS &amp; STRINGS</b> 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	12
V	<b>FUNCTIONS, STRUCTURES AND POINTERS</b> 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	12

#### Text Books

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

#### Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS NA2 / 11 UPS NA2	Semester: VI
Title	: Principles of Physics –II (Non-Major)	
Hrs/Week:	1	Credit: 2
Objectives	<ul style="list-style-type: none"> <li>➤ To spread the spirit of scientific interest</li> <li>➤ To develop the curiosity in Science</li> <li>➤ To embark on pursuing scientific enquiries as a hobby</li> </ul>	

Unit	Content	Hrs
I	Electric train – Leek proof battery –Hot air balloons – Remote control in TV –Superconductivity – Nuclear reactors	2
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*. 6<sup>th</sup> Edition, John Wiley Publications.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS NB2 / 11 UPS NB2	Semester: VI
Title	: Renewable Energy Sources Paper - II	
Hrs/Week	1	Credit: 2
Objectives	➤ To gain knowledge about inexhaustible sources of energies.	

Unit	Content	Hrs
I	<b>WIND ENERGY</b> 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	<b>ENERGY FROM BIOMASS</b> Introduction- Biomass conversion technologies- Wet processes – Dry processes - Photosynthesis – Classification of biogas plants.	2
III	<b>GEOHERMAL ENERGY</b> Introduction- Estimates of geothermal power – Geothermal sources – Hydrothermal resources – Applications of geothermal energy.	2
IV	<b>ENERGY FROM OCEANS</b> 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	<b>HYDROGEN ENERGY</b> 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.

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code	: 13 UPS 20 / 12 UPS 20	Semester: V & VI
Title	: Electronics Lab	
Hrs/Week:	3	Credit: 3
Objectives	<p>➤ To provide a basic grounding in the field of Electronics and to serve as a hint for the student to the more advance techniques.</p>	

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.
- Subramaniyan S.V. (1983). *Experiments In Electronics*. Macmillan India,Ltd.

#### Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 21 / 12 UPS 21	Semester: V & VI
Title	: Digital and Microprocessor Lab	
Hrs/Week:	3	Credit: 3
Objectives	<p>➤ To be acquainted with the basics and working of Electronic Digital circuits and Microprocessor</p>	

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*. 3<sup>rd</sup> Edition, Mc.Graw Hill.
- Paul B.Zbar, Malvino, Miller, (1983). *Electronics: A Text- Lab Manual*. Mc.Graw Hill.



## Reference Books

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

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Department	Physics	
Course	BSc Physics	Effective from the year: 2013
Subject Code :	13 UPS 22 / 12 UPS 22	
Title :	Computer Lab in C	
Hrs/Week:	2	Credit: 2
Objectives	➤ To become familiar with C programming language.	

Content	Hrs
1. Temperature Conversion	36
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	

#### Text Book

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

#### Reference Books

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

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