

OBJECTIVES: To enable the students to –

1. To compare and analyze the wave motion in different fluids.
2. To make the student learn about acoustics of buildings and auditoria.
3. To enable the students learn about audio and video system.

UNIT – I : Fundamentals of Vibration – simple oscillator – energy of SHO – Frequency of vibration of a loaded spring – superposition of waves – phenomenon of beats – superposition of two mutually perpendicular waves – Fourier's theorem – Analysis of square wave; rectangular wave, saw tooth wave and triangular wave.

UNIT – II: Damped harmonic oscillator – energy and power dissipation – forced oscillator – amplitude and velocity resonance – power absorption – quality factor and sharpness of resonance – electrical analogy of forced oscillator – coupled oscillators – theory of two coupled and N-coupled oscillators-normal modes and frequencies.

UNIT – III: Waves in air – wave equation – velocity of sound – energy density – acoustic intensity – intensity level – specific acoustic impedance – reflection and transmission of acoustic waves – shock waves. Earth quakes – waves produced in earth quakes – Rayleigh and love waves – waves in water – velocity of water waves – gravity waves and ripples – group and phase velocity – wave power.

UNIT – IV: Wave motion on strings – general wave equation and its solution – velocity of transverse wave in a stretched string – frequency of vibration – harmonics and over tones – energy density – energy transport – characteristic impedance – reflection and transmission of transverse waves – standing waves – theory of a plucked string – energy of vibration of string – center plucked string.

UNIT – V: Ultrasonics: properties of ultrasonic waves, -production of ultrasonic's by piezoelectric and magnetostriction methods, -detection of ultrasonic's- determination of wavelength of ultrasonic waves-. Velocity of ultrasonic's in liquid by sear's method-. Applications of ultrasonic's waves.

REFERENCES:

1. Unified Physics Vol.(SL Gupta & Sanjeev Gupta) Jaiprakashnath & Co, Meerut (2008)
2. A text book of Physics B.Sc. I year A A Rama Krishna & B. Raghavendra Rao (Vikram book links, Vijayawada (2001).
3. A text book on Waves and Acoustics (Chakravarthi and Chowdhury) PICC & SBC Publisher Calcutta (1994).
4. A Text book of Sound (Khanna and Bedi) Atma Ram & Sons, Delhi (1985)
5. Undergraduate physics vol I by AB Bhattacharya & R.Bharracharya, New Central Book Agency, Calcutta (2007)
6. Unified physics part I by K.N.Sharma & Sameer Kalia, Kalyani publishers, New Delhi (2006)
7. Oscillations and waves by K.Rama Reddy & SB Badami, university press, Hyderabad (1994)
8. Waves Vibrations & Sound by C.L.Arora, S.Chand & Co., Delhi (1999)
9. A Text Books of Sound by Brijlal & Subhrahmanyam Vikas Publishing House, New Delhi (1993)
10. Waves & Oscillations by S.R.Shankar Narayana, Sultan Chand & Sons, Delhi (1981)

OBJECTIVES:

1. To make the students understand better in applying mathematical methods in the analysis of physical aspects.
2. To know the importance of minimizing methods in the measurement of errors so as to maintain accuracy in practical observations.
3. To make the students understand the effect of gravitation on rigid Rotatory bodies and to learn Relativistic variation of time and length under different frames of reference.

COURSE CONTENT

1. Torsion pendulum
2. Volume resonator
3. Meldis experiment – Determination of frequency
4. Fly wheel – Moment of inertia
5. Y by sear's apparatus
6. Non-Uniform Bending – Det of Y
7. Surface tension – method of drops
8. Cantilever oscillations – determination of Young's Modulus.
9. Lissajou's figures [Demonstration]

SUGGESTED REFERENCES:

1. B.Sc Practical Physics – K.Hanumantha Rao, D.P.Sivaramiah & D.V.Krishnamurthy.
Maruthi Book Depot, Guntur. (2000)
2. B.Sc Practical Physics – N.N.Ghosh, Bharathi Bhavan, Thakur Bai Road, Kadamkaun,
Patna. (1996)

OBJECTIVES: To enable the students to –

1. Understand of various phenomena occurring in nature by applying the basic laws in Physics.
2. Become aware of the basics in the latest transmission techniques involved communications.
3. apply the concepts while appearing for competitive exams leading to Post graduation and others.

UNIT – I: INTERFERENCE OF LIGHT:

- a) **Division of wave-front** : principle of superposition-Young's experiment – intensity at a point – energy distribution – coherent sources – conditions for spatial and temporal coherence – theory of interference fringes – conditions for interference of light – Fresnel's biprism – determination of thickness of a thin sheet of transparent material – change of phase on reflection – Lloyd's mirror – determination of wavelength – distinction between biprism and Lloyd's mirror fringes – problems.
- b) **Division of amplitude:** Interference by a plane parallel film illuminated by a plane wave – oblique incidence of a plane wave on a thin film – colours of thin films – non reflecting films – interference by a plane parallel film illuminated by a point source – wedge shaped film – determination of diameter of a wire – theory of Newton's rings – determination of wavelength and refractive index of a liquid – Michelson interferometer – types of fringes – uses – problems.

UNIT – II: DIFFRACTION OF LIGHT:

- a) **Fraunhofer Class:** theory of diffraction due to a single slit (normal incidence) – theory of diffraction at a circular aperture – theory of diffraction by a double slit (normal incidence) – theory of diffraction with N slits (normal incidence) - determination of wavelength – dispersive power of grating – resolving power of grating – problems.
- b) **Fresnel's Class:** Half period zones – resultant amplitude – zone plate and its action – phase reversal zone plates – comparison between zone plate and convex lens – theory of diffraction due to a straight edge (not rigorous approach) – determination of wavelength by straight edge – distinction between interference and diffraction – problems.

UNIT – III: POLARISATION OF LIGHT:

Polarised light and unpolarised light – polarization by reflection, refraction and double refraction – Malus law – geometry of calcite crystal – double refraction – principle, construction and working of Nicol's prism – Use as polarizer and analyzer – Huygen's theory of double refraction – quarter and half wave plates – production of circularly and elliptically polarized light – conversion of latter into former – analysis of polarized light of different kinds – optical activity – Fresnel's theory of optical rotation – Laurents half – shade polarimeter – determination of specific rotation – problems

UNIT – IV: LASERS:

Introduction – Spontaneous and stimulated emission – Einstein's coefficients – their relation – population inversion – Laser principle – Construction and working of Ruby laser and Helium Neon laser – Applications of lasers– problems.

UNIT – V: FIBRE OPTICS

Introduction – principle of optical fibre – Structure of optical fibre – single mode fibre (SMF) and multi mode fibre (MMF) – step index and graded index optical fibre – acceptance angle and numerical aperture – fibre materials – fibre optic communication system – advantages of communication with optical fibre – problems.

REFERENCE BOOKS:

1. Unified Physics Vol – II (SL Gupta and Sanjeev Gupta) Jai Prakash nath & co, Meerut (2009)
2. A Text book of Optics Vol – I (Subrahmanyam and Brijlal) S Chand publisher, Delhi (1990)
3. Fundamentals of Optics Vol-IV (Francis A. Jennis) Mc Graw Hill publisher, Kogakusha (1976)
4. Fibre optic communication Vol – II (DC Agarwal) Wheeler Publisher, Delhi (1995)
5. Lasers theory and application Vol – I (K.Thyagarajan and A.K.Ghatak) SG Wasani, Newyork (1981)
6. Laser fundamental Vol – I (William T Silfvast) Cambridge University Press, Florida (1998)
7. An Introduction to Modern Optics Vol – I (Ajoy K.Ghatak) Tata Mc Graw Hill publisher, Bombay (1991)
8. University Physics Vol – VI (Francis Jenmarksy) Narora publishing house, Delhi (1982)
9. Introduction to Optics and Optical Imaging Vol – I, Schand publisher, New Delhi (1998)
10. Electronic Communications Vol – IV (Dennis Roddy) Prentice – Hall, USA (1995)

OBJECTIVE: To enable the students to

Understand the important concepts of Heat and Optics and

Measure experimentally the physical constants like $\omega, \lambda, \theta, k, s$ and verify with the standard value.

COURSE:

1. Dispersive power of prism – spectrometer
2. Resolving power of telescope
3. Newton's Rings
4. normal incidence – grating
5. Thermal conductivity of rubber
6. Newton's law of cooling
7. Forbe's Method – Determination of conductivity of iron
8. Resolving Power of grating
9. Biprism [Demonstration experiment]

SUGGESTED REFERENCES:

1. B.Sc Practical Physics - K. Hanumantha Rao, D.P. Sivaramaiah & D.V. Krishnamurthy, Maruthi Book Depot, Guntur(2000).
2. B.Sc Practical physics – N.N. Ghosh, Bharathi Bhavan, Thakur Bai Road, Kadamkaun, Patna (1996)

OBJECTIVES: To enable the student to

- gain insight into the nucleus of the atom and various concepts principles, and measurements regarding radioactive radiations.
- Acquire wider knowledge of nuclear structure, nuclear detectors, accelerators and gives a practical outlook regarding nuclear reactors, nuclear power plants and accelerators.
- Progress to higher studies in nuclear physics.
- Gain insight into classical and quantum aspects in the behavior of particles and dualistic nature of matter and light.
- Develop an awareness of spectra of different elements and their fine structures and an analytical study of different spectroscopic observation

UNIT – I: Atomic and molecular physics:

Introduction – Drawbacks of Bohr's atomic model- Sommerfeld's elliptical orbits-relativistic correction (no derivation). Vector atom model and Stern-Gerlach experiment - quantum numbers associated with it. L-S and j-j coupling schemes. Zeeman effect and its experimental arrangement.

Raman effect, hypothesis, Stokes and Anti Stokes lines. Quantum theory of Raman effect. Experimental arrangement – Applications of Raman effect.

UNIT – II: Matter waves & Uncertainty Principle:

Matter waves, de Broglie's hypothesis - wavelength of matter waves, Properties of matter waves - Davisson and Germer experiment – Phase and group velocities. Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t). Experimental verification - Complementarity principle of Bohr.

UNIT – III: Quantum (wave) mechanics:

Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.

UNIT – IV: General Properties of Nuclei:

Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy, angular momentum, parity, magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) - Magic numbers.

Radioactivity decay:

Alpha decay: basics of α -decay processes. Theory of α -decay, Gamow's theory, Geiger Nuttal law. β -decay, Energy kinematics for β -decay, positron emission, electron capture, neutrino hypothesis.

UNIT – V: DETECTORS AND ACCELERATORS : Ionization chamber - GM counter – proportional

counter – cloud chamber – Bubble chamber - scintillation counter – solid state detector – need for accelerators – Linear accelerators – Van de Graff generator -The Lawrence cyclotron – synchro cyclotron – synchrotron - Betatron– problems.

REFERENCES:

1. Nuclear Physics and introduction by S.B.Patel (Wiley Eastern Ltd., Delhi)1992
2. Nuclear Physics by D.C.Tayal (Himalaya Pub. House, Bombay)1993
3. Concepts of Nuclear Physics by Bernard L Cohen (Tata McGraw Hill, Delhi)1988
4. Modern Physics by R. Murugesan (S.Chand & Co., Delhi)1998
5. Unified Physics-Vol 4- S.L.Gupta and Sanjeev Gupt (Jai Prakash Nath & Co., Meerut) 1992 (Prescribed)
6. Quantum Mechanics by Gupta, Kumar and Sharma (Jai Prakash Nath & Co, Meerut) 1985
7. Introduction to Quantum Mechanics Agrwal and Jain (Pragati Prakashan Pub, Delhi) 1998
8. Atomic Physics by J.B. Rajam (S. Chanda & Co. Delhi) 1980

OBJECTIVES: To enable the students to

- ❖ Develop the skills of connecting different types of electrical circuits
- ❖ Measure the values of resistance, potential difference and currents in various types of circuits.
- ❖ Understand the basic principles and working of electronic devices.

COURSE CONTENT:

Minimum of twelve experiments to be done and recorded.

1. field along the axis of a circular coil-SG Galvanometer.
2. LCR series and parallel resonance.
3. Half wave and full wave rectifier
4. Bridge rectifier and Choke input filter
5. Transistor characteristics in CB/CE configurations.
6. Zener diode-I and V characteristics.
7. Band gap of a diode
8. Thermistor characteristics.
9. Figure of merit/Constant of BG
10. Potentiometer-determination of resistance
11. Carey-Foster's bridge-temp.coeff.of resistance
12. FET Characteristics
13. Specific charge of an electron – Thomson's method
14. Photocell-Verification of Einstein's equation
15. Verification of logic gates and DeMorgan's theorems.
16. Time constant of a CR circuit.

Suggested References:

1. B.Sc Practical Physics – K. Hanumantha Rao, D.P.Sivaramiah & D.V.Krishnamurthy. Maruthi Book Depot, Guntur.(2000)
2. B.Sc Practical Physics – N.N.Ghosh, Bharathi Bhavan, THakur Bai Road, Kadamkaun, Patna (1996)

OBJECTIVES: To enable the students to –

1. understand various physical processes involved in nature.
2. analyse a physical phenomenon based on physical laws.
3. apply the concepts and principles to face competitive examinations leading to higher studies and others.

UNIT – I: THERMODYNAMICS:

Introduction – isothermal and adiabatic changes – work done in isothermal and adiabatic processes – indicator diagram – reversible and irreversible processes – Carnot's engine – its efficiency – Carnot's theorem – Second law of thermodynamics (Clausius and Kelvin's statements) – Kelvin scale of temperature – Entropy – Physical significance – entropy measurement – change in entropy in a reversible and irreversible cycles – entropy and second law of thermodynamics – entropy and disorder – entropy of universe – temperature entropy diagram – uses – change of entropy of a perfect gas – change of entropy when ice changes into steam – problems.

UNIT – II: THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS:

Thermodynamic potentials – Maxwell's relations – Gibb's Helmholtz equation – importance – Clausius Claperyon equation and its applications – Stefan Boltzman's law – ratio of specific heats – difference of two specific heats – for a perfect gas and van der wall's gas – Joule Kelvin effect – Expression for cooling produced – inversion temperature – Joule Kelvin effect for perfect gas and van der wall's gas – problems.

UNIT – III: LOW TEMPERATURE PHYSICS:

Introduction – Joule Thomson effect – principle of regenerative cooling – Distinction between Joule's expansion, adiabatic expansion and Joule Kelvin expansion – liquefaction of air by Linde's and Claude's methods – Liquefaction of hydrogen – Liquefaction of helium by Kamerlingh Onnes and Kapitza's methods – adiabatic demagnetization with necessary theory – refrigeration – working of vapour compression machine (Frigidaire) and vapour absorption machine – problems.

UNIT – IV: QUANTUM THEORY OF RADIATION:

Black body and its radiation – Fery's and Wien's black bodies – energy distribution in black body radiation – Rayleigh Jean's formula for energy distribution – derivation of Wien's displacement law – Planck's hypothesis – energy of an oscillator – Planck's formula – Deduction of Wien's law, Rayleigh Jean's formula and Stefan's law from Planck's formula – problems.

UNIT – V: STATISTICAL MECHANICS:

Introduction – Maxwell Boltzmann distribution law – Application to an ideal gas – MB distribution law of molecular speeds – mean speed, rms speed and most probable speed of a molecule – relation between them – quantum statistics – Bose Einstein distribution law – energy distribution of photon gas – Fermi Dirac distribution law – Fermi energy of electron gas – comparison between MB, BE and FD statistics – problems.

REFERENCE BOOKS:

1. Unified Physics Vol – II (Sanjeev Gupta & SL Gupta) Jai Prakash nath & co, Meerut (2009)
2. Heat and Thermodynamics (Brijlal, N.Subrahmanyam) S Chand & co, Delhi (1979)
3. Heat and Thermodynamics Vol – VI (Mark W. Zemansky) Mc Graw Hill Publisher, Singapore (1981)
4. A Textbook of Heat and Thermodynamics Vol – X (B Rajam & L. Arora) SChand, Delhi (1984)
5. A Textbook of Thermal Physics Vol – I (OP Verma) published by RChand, Delhi (1987)
6. Thermodynamics Vol – I by MS Yadav, Anmol publisher, New Delhi (1987)
7. An Introduction to Thermodynamics Vol – I (Y.V.C Rao) Wiley Eastern limited publisher, Delhi (1993)
8. Kinetic theory of gases Vol – I, Mc Graw hill publisher, New york (1962)
9. University physics Vol – VI (Francis W Sears) Narosa publishing house, Delhi (1982)
10. Concepts of Physics Vol – II (HC Verma) Bharati bhavan publisher, Delhi (1993)

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OBJECTIVES: To enable the students to understand the important concepts of Heat & Optics and measure experimentally the physical constants like $\omega, \lambda, \theta, k, s$ and verify with standard value.

COURSE CONTENT:

1. Dispersive power of grating.
2. Determination of wave length of light – Wedge method.
3. I – D Curve – Spectrometer.
4. Determination of refractive index – Holloprism.
5. Determination of co-efficient of thermal conductivity – Lec’x method of bad conductor
6. Polarimeter
7. Determination of specific heat of solid applying Barton’s radiation correction
8. Electric kettle – Determination of efficiency (Demonstration)
9. Wavelength – Grating of Minimum deviation

SUGGESTED REFERENCES:

1. B.Sc. Practical Physics – K. Hanumantha Rao, D.p. Sivaramiah & D.V. Krishnamurthy, Maruthi book Depot, Guntur (2009)
2. B.Sc. Practical Physics N.N. Ghosh, Bharathi Bhavan, Thakur Bai Road, Kadamkaun, Patna (1996).

OBJECTIVES: To enable the students to

1. understand the basic concepts in physics in relation to the effect of charges at rest and motion and combination of electric and magnetic fields.
2. understand the working principle of electric devices and analyze electric circuits.

UNIT – I: ELECTROSTATICS AND DIELECTRICS - electric intensity E-Gauss law and its proof- electric field intensity due to a uniformly charged sphere-electric field intensity due to a charged cylinder-electric field due to an infinite sheet of charge-electric potential V-potential due to a charged spherical shell-potential due to a charged circular disc-potential due to a dipole and hence intensity-electric displacement D-electric polarization P-relation between D,E and P vectors-boundary conditions between two dielectrics-problems.

UNIT – II: MAGNETOSTATICS - Biot and Savarts law-magnetic induction due to a infinite straight conductor, circular loop and solenoid-magnetic shell and its strength-equivalence between a magnetic shell and a current circuit-potential and intensity due to a magnetic shell-Ampere's law-applications to solenoid and toroid-electromagnetic induction-Faraday's experiments-Faraday's law-integral and differential form-Lenz's law-self induction-L due to a solenoid and toroid-self induction of two coaxial cylindrical conductors-energy density in magnetic field-mutual induction-mutual inductance of two given coils-coefficient of coupling-problems

UNIT – III: ALTERNATING CURRENTS AND MAXWELL'S EQUATIONS-LCR series AC circuit-series resonance-Q factor-band width-power consumption in AC circuits-power factor-LCR parallel circuit-parallel resonance-series versus parallel resonance-displacement current-Maxwell's equations in integral and differential forms-em wave equation and its velocity-transverse nature of em waves-poynting theorem-production of em waves by Hertz experiment-problems

UNIT – IV: RECTIFIERS AND FILTERS - Diode as half wave, full wave and bridge rectifier with their analysis and wave forms-filter devices-series inductor, shunt capacitive, choke input and pi filters with full wave rectifier-expressions for their ripple factors-problems

UNIT - V: TRANSISTORS - working of pnp and npn transistors-CB, CE and CC configurations of a transistors-relation between alpha, beta and gamma-characteristics(input and output) of CB and CE transistors-hybrid parameters-hybrid equivalent circuits of CB, CE and CC configurations-transistor as an amplifier-problems

REFERENCES:

1. Unified Physics-Vol 3-by S.L.Gupta and Sanjeev Gupts (Jai Prakash Nath & Co., Meerut) 2005 (Prescribed)
2. Electricity and Magnetism by Prantosh Chakraborty (New Age Int. Pub., Delhi) 1998
3. Electricity and Magnetism by D.N.Vasudeva (S.Chand & Co, Delhi) 1987
4. Electricity and Magnetism by D.C.Tayal (Himalaya Pub.House, Delhi) 1988
5. Unified Physics – Vol III – Electricity and Electronics (Jai Prakash Nath & Co.,Meerut)1991
6. Principles of Electronics by V.K.Mehta (S. Chand & Co. Ltd., New Delhi) 1989
7. Electricity and Electronics by D.C. Tayal (Himalaya Pub. House, Delhi) 1988
8. Electricity and Magnetism with Electronics by K.K. Tewari (S.Chand & Co., Delhi) 1992

UNIT – I: 1. INTRODUCTION TO ENERGY: Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth. Origin and time scale of fossil fuels, Conventional energy sources, Role of energy in economic development and social transformation.

2. ENVIRONMENTAL EFFECTS: Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation. Effect of pollution due to thermal power station, nuclear power generation, hydroelectric power stations on ecology and environment.

UNIT – II: 3. GLOBAL ENERGY SCENARIO: Energy consumption in various sectors, projected energy consumption for the next century, exponential increase in energy consumption, energy resources, coal, oil, natural gas, nuclear and hydroelectric power, impact of exponential rise in energy usage on global economy.

4. INDIAN ENERGY SCENE: Energy resources available in India, urban and rural energy consumption, energy consumption pattern and its variation as a function of time, nuclear energy - promise and future, energy as a factor limiting growth, need for use of new and renewable energy sources.

UNIT – III: 5. SOLAR ENERGY: Solar energy, Spectral distribution of radiation, Flat plate collector, solar water heating system, Applications, Solar cooker. Solar cell, Types of solar cells, Solar module and array, Components of PV system, Applications of solar PV systems.

6. WIND ENERGY: Introduction, Principle of wind energy conversion, Components of wind turbines, Operation and characteristics of a wind turbine, Advantages and disadvantages of wind mills, Applications of wind energy.

UNIT – IV: 7. OCEAN ENERGY: Introduction, Principle of ocean thermal energy conversion, Tidal power generation, Tidal energy technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and disadvantages.

8. HYDROGEN ENERGY: History of hydrogen energy - Hydrogen production methods - Electrolysis of water, Hydrogen storage options – Compressed and liquefied gas tanks, Metal hydrides; Hydrogen safety - Problems of hydrogen transport and distribution - Uses of hydrogen as fuel.

UNIT- V: 9. BIO - ENERGY: Energy from biomass – Sources of biomass – Different species – Conversion of biomass into fuels – Energy through fermentation – Pyrolysis, gasification and combustion – Aerobic and anaerobic bio-conversion – Properties of biomass – Biogas plants – Types of plants – Design and operation – Properties and characteristics of biogas.

REFERENCES:

1. Solar Energy Principles, Thermal Collection & Storage, S.P. Sukhatme: Tata McGraw Hill Pub., New Delhi.
2. Non-Conventional Energy Sources, G.D. Rai, New Delhi.
3. Renewable Energy, power for a sustainable future, Godfrey Boyle, 2004,
4. The Generation of electricity by wind, E.W. Golding.
5. Hydrogen and Fuel Cells: A comprehensive guide, Rebecca Busby, Pennwell corporation (2005)
6. Hydrogen and Fuel Cells: Emerging Technologies and Applications, B. Sorensen, Academic Press (2012).
7. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub., 2009.
8. Fundamentals of Renewable Energy Resources by G.N. Tiwari, M.K. Ghosal, Narosa Pub., 2007.

1. Study of performance of a solar cooker / solar energy.
2. Conversion of electrical energy to heat energy by Joule's Calorimeter.
3. Study of power characteristics of an electric bulb
4. Conversion of electrical energy to chemical energy by Copper Voltmeter.
5. Study of charging and discharging behaviour of a capacitor.
6. Conversion of light energy to electrical energy by photo cell.

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OBJECTIVES: To enable the students to –

- Apply mathematical methods in the analysis physical aspects.
- Know the importance of minimizing methods in the measurement of errors so as to maintain accuracy in practical observations.
- Understand the effect of gravitation on rigid bodies.

UNIT – I : Vector Analysis: Scalars and Vectors – dot and cross products – scalar and vector triple products – scalar and vector fields – gradient of a scalar field – divergence and curl of a vector field-line. Surface and volume integrals – Stoke's . Gauss's and Green's theorems – standard results.

UNIT – II: Collisions & Theory Of Scattering: Law of conservation of energy and Momentum – elastic, inelastic and semi elastic collisions – coefficient of Restitution – elastic collision & inelastic collision in one dimension - elastic Collision in two dimensions (direct and oblique)–impact parameter–scattering Cross section – Rutherford's theory of scattering.

UNIT – III: Gravitation–gravitational potential and attraction–potential due to thin spherical shell, thick spherical shell, solid spherical and circular disc-gravitational PE Motion under a central force-conservative nature of central force-conservation of angular Momentum-equation of motion under central force-Kelper's laws and their Deduction –Motion of satellites – satellites – geocentric satellites.

UNIT – IV: Rigid Body Motion

Inertial and non inertial frames – rotating frames of reference-Coriolis force and Centrifugal force effect of Coriolis force on a freely falling body-effect of centrifugal force on acceleration due to gravity – angular momentum and products of inertia-Euler's equations-applications to conservation of energy, conservation of angular momentum and symmetrical top.

UNIT – V: Theory of Relativity: Frames of references-Galilean transformations-Galilean invariance of Newton's law and conservation of momentum-search for an absolute frame of reference (Michelson Morley experiment)-Explanation of negative result-Postulates of STR-Lorentz transformations-length contraction-time dilation-velocity addition theorem-variation of mass with velocity- mass and energy equivalence-relativistic KE of a body-momentum and energy relation.

REFERENCES:

1. Unified Physics – Vol.I by SL.Gupta & Sanjeev Gupta (1992) Jai Prakashnath &Co. Meerut.
2. B.S.c. Physics – Vol.I by CMM Sastry, KS. Rao & P.Babu Rao (1991) S.Chanda & Co. New Delhi.
3. Introduction to Special Relativity by Robert Resnick (1968) Wiley Eastern Ltd. New Delhi.
4. A Text Book of Physics by A.A Rama Krishna & B.Raghvendra Rao. Vikram Book Links, Vijyawada(2001)
5. Undergraduate Physics Vol.I by A.B.Bhattacharya & R Bhattacharya New Central Book Agency, Calcutta (2007)
6. Unified Physics Part – I by K.N. Sharma & Sameer Kalia, Kalyani Publishers, New Delhi (2006)
7. Teach Yourself Physics by N.N.Ghosh. Bharathi Bhavan, Patna (1996)
8. Elements of mechanics by Gupta, Prakash and Agarwal, Satish Publishers,Meerut (1985)
9. Mechanics by D.S.Mathur, S.Chanda & Co., New Delhi.
10. A Text Book of Mechanics by Bhargava & Sharma, Ratna Prakash Mandir, Agra (1989).

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1. To make the students understand better in applying mathematical methods in the analysis of physical aspects.
2. To know the importance of minimizing methods in the measurement of errors so as to maintain accuracy in practical observations.
3. To make the students understand the effect of gravitation on rigid Rotary bodies and to learn Relativistic variation of time and length under different frames of references.

COURSE CONTENT

1. Compound pendulum – Determination of "g"
2. Somometer – Determination of frequency/Verification of laws
3. uniform bending– Determination of Young's Modules
4. Spiral spring– Determination of y, n ,
5. Determination of A.C.frequency
6. Spherometer-Det.of curvature/thickness
7. Viscosity – Poiseuille's method
8. Bifilar pendulum – Moment of Inertia
- *9. Viscosity – Senle's /Oswald's viscometer [Demonstration]

SUGGESTED REFERENCES:

1. B.S.c Practical Physics – K. Hanumantha Rao, D.P.Sivaramiah & D.V.Krishnamurthy. Maruthi Book Depot, Guntur.(2000)
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1. To compare and analyze the wave motion in different fluids.
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UNIT – II: Damped harmonic oscillator – energy and power dissipation – forced oscillator – amplitude and velocity resonance – power absorption – quality factor and sharpness of resonance – electrical analogy of forced oscillator – coupled oscillators – theory of two coupled and N-coupled oscillators-normal modes and frequencies.

UNIT – III: Waves in air – wave equation – velocity of sound – energy density – acoustic intensity – intensity level – specific acoustic impedance – reflection and transmission of acoustic waves – shock waves. Earth quakes – waves produced in earth quakes – Rayleigh and love waves – waves in water – velocity of water waves – gravity waves and ripples – group and phase velocity – wave power.

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UNIT – V: Ultrasonics: properties of ultrasonic waves, -production of ultrasonic's by piezoelectric and magnetostriction methods, -detection of ultrasonic's- determination of wavelength of ultrasonic waves-. Velocity of ultrasonic's in liquid by sear's method-. Applications of ultrasonic's waves.

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2. A text book of Physics B.Sc. I year A A Rama Krishna & B. Raghavendra Rao (Vikram book links, Vijayawada (2001).
3. A text book on Waves and Acoustics (Chakravarthi and Chowdhury) PICC & SBC Publisher Calcutta (1994).
4. A Text book of Sound (Khanna and Bedi) Atma Ram & Sons, Delhi (1985)
5. Undergraduate physics vol I by AB Bhattacharya & R.Bharracharya, New Central Book Agency, Calcutta (2007)
6. Unified physics part I by K.N.Sharma & Sameer Kalia, Kalyani publishers, New Delhi (2006)
7. Oscillations and waves by K.Rama Reddy & SB Badami, university press, Hyderabad (1994)
8. Waves Vibrations & Sound by C.L.Arora, S.Chand & Co., Delhi (1999)
9. A Text Books of Sound by Brijlal & Subhrahmanyam Vikas Publishing House, New Delhi (1993)
10. Waves & Oscillations by S.R.Shankar Narayana, Sultan Chand & Sons, Delhi (1981)

OBJECTIVES :

1. To make the students understand better in applying mathematical methods in the analysis of physical aspects.
2. To know the importance of minimizing methods in the measurement of errors so as to maintain accuracy in practical observations.
3. To make the students understand the effect of gravitation on rigid Rotatory bodies and to learn Relativistic variation of time and length under different frames of reference.

COURSE CONTENT

1. Torsion pendulum
2. Volume resonator
3. Meldis experiment – Determination of frequency
4. Fly wheel – Moment of inertia
5. γ by sear's apparatus
6. Non-Uniform Bending – Det of Y
7. Surface tension – method of drops
8. Cantilever oscillations – determination of Young's Modulus.
9. Lissajou's figures [Demonstration]

SUGGESTED REFERENCES:

1. B.Sc Practical Physics – K.Hanumantha Rao, D.P.Sivaramiah & D.V.Krishnamurthy. Maruthi Book Depot, Guntur. (2000)
2. B.Sc Practical Physics – N.N.Ghosh, Bharathi Bhavan, Thakur Bai Road, Kadamkaun, Patna. (1996)

OBJECTIVES: To enable the students to –

1. Understand of various phenomena occurring in nature by applying the basic laws in Physics.
2. Become aware of the basics in the latest transmission techniques involved communications.
3. apply the concepts while appearing for competitive exams leading to Post graduation and others.

UNIT – I: INTERFERENCE OF LIGHT:

- a) **Division of wave-front** : principle of superposition-Young's experiment – intensity at a point – energy distribution – coherent sources – conditions for spatial and temporal coherence – theory of interference fringes – conditions for interference of light – Fresnel's biprism – determination of thickness of a thin sheet of transparent material – change of phase on reflection – Lloyd's mirror – determination of wavelength – distinction between biprism and Lloyd's mirror fringes – problems.
- b) **Division of amplitude:** Interference by a plane parallel film illuminated by a plane wave – oblique incidence of a plane wave on a thin film – colours of thin films – non reflecting films – interference by a plane parallel film illuminated by a point source – wedge shaped film – determination of diameter of a wire – theory of Newton's rings – determination of wavelength and refractive index of a liquid – Michelson interferometer – types of fringes – uses – problems.

UNIT – II: DIFFRACTION OF LIGHT:

- a) **Fraunhofer Class:** theory of diffraction due to a single slit (normal incidence) – theory of diffraction at a circular aperture – theory of diffraction by a double slit (normal incidence) – theory of diffraction with N slits (normal incidence) - determination of wavelength – dispersive power of grating – resolving power of grating – problems.
- b) **Fresnel's Class:** Half period zones – resultant amplitude – zone plate and its action – phase reversal zone plates – comparison between zone plate and convex lens – theory of diffraction due to a straight edge (not rigorous approach) – determination of wavelength by straight edge – distinction between interference and diffraction – problems.

UNIT – III: POLARISATION OF LIGHT:

Polarised light and unpolarised light – polarization by reflection, refraction and double refraction – Malus law – geometry of calcite crystal – double refraction – principle, construction and working of Nicol's prism – Use as polarizer and analyzer – Huygen's theory of double refraction – quarter and half wave plates – production of circularly and elliptically polarized light – conversion of latter into former – analysis of polarized light of different kinds – optical activity – Fresnel's theory of optical rotation – Laurent's half – shade polarimeter – determination of specific rotation – problems

UNIT – IV: LASERS:

Introduction – Spontaneous and stimulated emission – Einstein's coefficients – their relation – population inversion – Laser principle – Construction and working of Ruby laser and Helium Neon laser – Applications of lasers– problems.

UNIT – V: FIBRE OPTICS

Introduction – principle of optical fibre – Structure of optical fibre – single mode fibre (SMF) and multi mode fibre (MMF) – step index and graded index optical fibre – acceptance angle and numerical aperture – fibre materials – fibre optic communication system – advantages of communication with optical fibre – problems.

REFERENCE BOOKS:

1. Unified Physics Vol – II (SL Gupta and Sanjeev Gupta) Jai Prakash nath & co, Meerut (2009)
2. A Text book of Optics Vol – I (Subrahmanyam and Brijlal) S Chand publisher, Delhi (1990)
3. Fundamentals of Optics Vol-IV (Francis A. Jennis) Mc Graw Hill publisher, Kogakusha (1976)
4. Fibre optic communication Vol – II (DC Agarwal) Wheeler Publisher, Delhi (1995)
5. Lasers theory and application Vol – I (K.Thyagarajan and A.K.Ghatak) SG Wasani, Newyork (1981)
6. Laser fundamental Vol – I (William T Silfvast) Cambridge University Press, Florida (1998)
7. An Introduction to Modern Optics Vol – I (Ajoy K.Ghatak) Tata Mc Graw Hill publisher, Bombay (1991)
8. University Physics Vol – VI (Francis Jenmarksy) Narora publishing house, Delhi (1982)
9. Introduction to Optics and Optical Imaging Vol – I, Schand publisher, New Delhi (1998)
10. Electronic Communications Vol – IV (Dennis Roddy) Prentice – Hall, USA (1995)

OBJECTIVE: To enable the students to

Understand the important concepts of Heat and Optics and

Measure experimentally the physical constants like $\omega, \lambda, \theta, k, s$ and verify with the standard value.

COURSE:

1. Dispersive power of prism – spectrometer
2. Resolving power of telescope
3. Newton's Rings
4. normal incidence – grating
5. Thermal conductivity of rubber
6. Newton's law of cooling
7. Forbe's Method – Determination of conductivity of iron
8. Resolving Power of grating
9. Biprism [Demonstration experiment]

SUGGESTED REFERENCES:

1. B.Sc Practical Physics - K. Hanumantha Rao, D.P. Sivaramaiah & D.V. Krishnamurthy, Maruthi Book Depot, Guntur(2000).
2. B.Sc Practical physics – N.N. Ghosh, Bharathi Bhavan, Thakur Bai Road, Kadamkaun, Patna (1996)

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OBJECTIVES: To enable the students to –

1. understand various physical processes involved in nature.
2. analyse a physical phenomenon based on physical laws.
3. apply the concepts and principles to face competitive examinations leading to higher studies and others.

UNIT – I: THERMODYNAMICS:

Introduction – isothermal and adiabatic changes – work done in isothermal and adiabatic processes – indicator diagram–reversible and irreversible processes–Carnot's engine– its efficiency – Carnot's theorem – Second law of thermodynamics (Clausius and Kelvin's statements) – Kelvin scale of temperature – Entropy – Physical significance – entropy measurement – change in entropy in a reversible and irreversible cycles – entropy and second law of thermodynamics – entropy and disorder–entropy of universe – temperature entropy diagram – uses – change of entropy of a perfect gas – change of entropy when ice changes into steam – problems.

UNIT – II: THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS:

Thermodynamic potentials – Maxwell's relations– Gibb's Helmholtz equation– importance – Clausius Claperyon equation and its applications – Stefan Boltzman's law – ratio of specific heats – difference of two specific heats – for a perfect gas and van der wall's gas – Joule Kelvin effect – Expression for cooling produced – inversion temperature – Joule Kelvin effect for perfect gas and van der wall's gas – problems.

UNIT – III: LOW TEMPERATURE PHYSICS:

Introduction – Joule Thomson effect – principle of regenerative cooling–Distinction between Joule's expansion, adiabatic expansion and Joule Kelvin expansion– liquefaction of air by Linde's and Claude's methods – Liquefaction of hydrogen – Liquefaction of helium by Kamerlingh Onnes and Kapitza's methods – adiabatic demagnetization with necessary theory – refrigeration – working of vapour compression machine (Frigidaire) and vapour absorption machine – problems.

UNIT – IV: QUANTUM THEORY OF RADIATION:

Black body and its radiation – Fery's and Wien's black bodies – energy distribution in black body radiation – Rayleigh Jean's formula for energy distribution – derivation of Wien's displacement law – Planck's hypothesis – energy of an oscillator – Planck's formula – Deduction of Wien's law, Rayleigh Jean's formula and Stefan's law from Planck's formula – problems.

UNIT – V: STATISTICAL MECHANICS:

Introduction – Maxwell Boltzmann distribution law – Application to an ideal gas – MB distribution law of molecular speeds – mean speed, rms speed and most probable speed of a molecule – relation between them – quantum statistics – Bose Einstein distribution law – energy distribution of photon gas – Fermi Dirac distribution law – Fermi energy of electron gas – comparison between MB, BE and FD statistics – problems.

REFERENCE BOOKS:

1. Unified Physics Vol – II (Sanjeev Gupta & SL Gupta) Jai Prakash nath & co, Meerut (2009)
2. Heat and Thermodynamics (Brijlal, N.Subrahmanyam) S Chand & co, Delhi (1979)
3. Heat and Thermodynamics Vol – VI (Mark W. Zemansky) Mc Graw Hill Publisher, Singapore (1981)
4. A Textbook of Heat and Thermodynamics Vol – X (B Rajam & L. Arora) SChand, Delhi (1984)
5. A Textbook of Thermal Physics Vol – I (OP Verma) published by RChand, Delhi (1987)
6. Thermodynamics Vol – I by MS Yadav, Anmol publisher, New Delhi (1987)
7. An Introduction to Thermodynamics Vol – I (Y.V.C Rao) Wiley Eastern limited publisher, Delhi (1993)
8. Kinetic theory of gases Vol – I, Mc Graw hill publisher, New york (1962)
9. University physics Vol – VI (Francis W Sears) Narosa publishing house, Delhi (1982)
10. Concepts of Physics Vol – II (HC Verma) Bharati bhavan publisher, Delhi (1993)

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OBJECTIVES: To enable the students to understand the important concepts of Heat & Optics and measure experimentally the physical constants like $\omega, \lambda, \theta, k, s$ and verify with standard value.

COURSE CONTENT:

1. Dispersive power of grating.
2. Determination of wave length of light – Wedge method.
3. I – D Curve – Spectrometer.
4. Determination of refractive index – Holloprism.
5. Determination of co-efficient of thermal conductivity – Lec’x method of bad conductor
6. Polarimeter
7. Determination of specific heat of solid applying Barton’s radiation correction
8. Electric kettle – Determination of efficiency (Demonstration)
9. Wavelength – Grating of Minimum deviation

SUGGESTED REFERENCES:

1. B.Sc. Practical Physics – K. Hanumantha Rao, D.p. Sivaramiah & D.V. Krishnamurthy, Maruthi book Depot, Guntur (2009)
2. B.Sc. Practical Physics N.N. Ghosh, Bharathi Bhavan, Thakur Bai Road, Kadamkaun, Patna (1996).

OBJECTIVES: To enable the students to

1. understand the basic concepts in physics in relation to the effect of charges at rest and motion and combination of electric and magnetic fields.
2. understand the working principle of electric devices and analyze electric circuits.

UNIT – I: ELECTROSTATICS AND DIELECTRICS - electric intensity E-Gauss law and its proof- electric field intensity due to a uniformly charged sphere-electric field intensity due to a charged cylinder-electric field due to an infinite sheet of charge-electric potential V-potential due to a charged spherical shell-potential due to a charged circular disc-potential due to a dipole and hence intensity-electric displacement D-electric polarization P-relation between D,E and P vectors-boundary conditions between two dielectrics-problems.

UNIT – II: MAGNETOSTATICS - Biot and Savarts law-magnetic induction due to a infinite straight conductor, circular loop and solenoid-magnetic shell and its strength-equivalence between a magnetic shell and a current circuit-potential and intensity due to a magnetic shell-Ampere's law-applications to solenoid and toroid-electromagnetic induction-Faraday's experiments-Faraday's law-integral and differential form-Lenz's law-self induction-L due to a solenoid and toroid-self induction of two coaxial cylindrical conductors-energy density in magnetic field-mutual induction-mutual inductance of two given coils-coefficient of coupling-problems

UNIT – III: ALTERNATING CURRENTS AND MAXWELL'S EQUATIONS-LCR series AC circuit-series resonance-Q factor-band width-power consumption in AC circuits-power factor-LCR parallel circuit-parallel resonance-series versus parallel resonance-displacement current-Maxwell's equations in integral and differential forms-em wave equation and its velocity-transverse nature of em waves-poynting theorem-production of em waves by Hertz experiment-problems

UNIT – IV: RECTIFIERS AND FILTERS - Diode as half wave, full wave and bridge rectifier with their analysis and wave forms-filter devices-series inductor, shunt capacitive, choke input and pi filters with full wave rectifier-expressions for their ripple factors-problems

UNIT - V: TRANSISTORS - working of pnp and npn transistors-CB, CE and CC configurations of a transistors-relation between alpha, beta and gamma-characteristics(input and output) of CB and CE transistors-hybrid parameters-hybrid equivalent circuits of CB, CE and CC configurations-transistor as an amplifier-problems

REFERENCES:

1. Unified Physics-Vol 3-by S.L.Gupta and Sanjeev Gupts (Jai Prakash Nath & Co., Meerut) 2005 (Prescribed)
2. Electricity and Magnetism by Prantosh Chakraborty (New Age Int. Pub., Delhi) 1998
3. Electricity and Magnetism by D.N.Vasudeva (S.Chand & Co, Delhi) 1987
4. Electricity and Magnetism by D.C.Tayal (Himalaya Pub.House, Delhi) 1988
5. Unified Physics – Vol III – Electricity and Electronics (Jai Prakash Nath & Co.,Meerut)1991
6. Principles of Electronics by V.K.Mehta (S. Chand & Co. Ltd., New Delhi) 1989
7. Electricity and Electronics by D.C. Tayal (Himalaya Pub. House, Delhi) 1988
8. Electricity and Magnetism with Electronics by K.K. Tewari (S.Chand & Co., Delhi) 1992

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OBJECTIVES: To enable the student to

- gain insight into the nucleus of the atom and various concepts principles, and measurements regarding radioactive radiations.
- Acquire wider knowledge of nuclear structure, nuclear detectors, accelerators and gives a practical outlook regarding nuclear reactors, nuclear power plants and accelerators.
- Progress to higher studies in nuclear physics.
- Gain insight into classical and quantum aspects in the behavior of particles and dualistic nature of matter and light.
- Develop an awareness of spectra of different elements and their fine structures and an analytical study of different spectroscopic observation

UNIT – I: Atomic and molecular physics:

Introduction –Drawbacks of Bohr’s atomic model- Sommerfeld’s elliptical orbits-relativistic correction (no derivation).Vector atom model and Stern-Gerlach experiment - quantum numbers associated with it. L-S and j-j coupling schemes.Zeeman effect and its experimental arrangement.

Raman effect, hypothesis, Stokes and Anti Stokes lines. Quantum theory of Raman effect. Experimental arrangement – Applications of Raman effect.

UNIT – II: Matter waves & Uncertainty Principle:

Matter waves, de Broglie’s hypothesis - wavelength of matter waves, Properties of matter waves - Davisson and Germer experiment – Phase and group velocities. Heisenberg’s uncertainty principle for position and momentum (x and p), & energy and time (E and t). Experimental verification - Complementarity principle of Bohr.

UNIT – III: Quantum (wave) mechanics:

Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.

UNIT – IV: General Properties of Nuclei:

Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy, angular momentum, parity, magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) - Magic numbers.

Radioactivity decay:

Alpha decay: basics of α -decay processes. Theory of α -decay, Gamow’s theory, Geiger Nuttal law. β -decay, Energy kinematics for β -decay, positron emission, electron capture, neutrino hypothesis.

UNIT – V: DETECTORS AND ACCELERATORS : Ionization chamber - GM counter – proportional counter – cloud chamber – Bubble chamber - scintillation counter – solid state detector – need for accelerators – Linear accelerators – Van de Graff generator -The Lawrence cyclotron – synchro cyclotron – synchrotron - Betatron– problems.

REFERENCES:

1. Nuclear Physics and introduction by S.B.Patel (Wiley Eastern Ltd., Delhi)1992
2. Nuclear Physics by D.C.Tayal (Himalaya Pub. House, Bombay)1993
3. Concepts of Nuclear Physics by Bernard L Cohen (Tata McGraw Hill, Delhi)1988
4. Modern Physics by R. Murugesan (S.Chand & Co., Delhi)1998
5. Unified Physics-Vol 4- S.L.Gupta and Sanjeev Gupt (Jai Prakash Nath & Co., Meerut) 1992 (Prescribed)
6. Quantum Mechanics by Gupta, Kumar and Sharma (Jai Prakash Nath & Co, Meerut) 1985
7. Introduction to Quantum Mechanics Agrwal and Jain (Pragati Prakashan Pub, Delhi) 1998
8. Atomic Physics by J.B. Rajam (S. Chanda & Co. Delhi) 1980

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OBJECTIVES: To enable the students to

- ❖ Develop the skills of connecting different types of electrical circuits
- ❖ Measure the values of resistance, potential difference and currents in various types of circuits.
- ❖ Understand the basic principles and working of electronic devices.

COURSE CONTENT:

Minimum of twelve experiments to be done and recorded.

1. field along the axis of a circular coil-SG Galvanometer.
2. LCR series and parallel resonance.
3. Half wave and full wave rectifier
4. Bridge rectifier and Choke input filter
5. Transistor characteristics in CB/CE configurations.
6. Zener diode-I and V characteristics.
7. Band gap of a diode
8. Thermistor characteristics.
9. Figure of merit/Constant of BG
10. Potentiometer-determination of resistance
11. Carey-Foster’s bridge-temp.coeff.of resistance
12. FET Characteristics
13. Specific charge of an electron – Thomson’s method
14. Photocell-Verification of Einstein’s equation
15. Verification of logic gates and DeMorgan’s theorems.
16. Time constant of a CR circuit.

Suggested References:

1. B.Sc Practical Physics – K. Hanumantha Rao, D.P.Sivaramiah & D.V.Krishnamurthy.
Maruthi Book Depot, Guntur.(2000)
2. B.Sc Practical Physics – N.N.Ghosh, Bharathi Bhavan, THakur Bai Road, Kadamkaun,
Patna (1996)

UNIT-I

1. Introduction to Energy: Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth. Origin and time scale of fossil fuels, Conventional energy sources, Role of energy in economic development and social transformation.

2. Environmental Effects: Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation. Effect of pollution due to thermal power station, nuclear power generation, hydroelectric power stations on ecology and environment.

UNIT-II

3. Global Energy Scenario: Energy consumption in various sectors, projected energy consumption for the next century, exponential increase in energy consumption, energy resources, coal, oil, natural gas, nuclear and hydroelectric power, impact of exponential rise in energy usage on global economy.

4. Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, energy consumption pattern and its variation as a function of time, nuclear energy - promise and future, energy as a factor limiting growth, need for use of new and renewable energy sources.

UNIT-III

5. Solar energy: Solar energy, Spectral distribution of radiation, Flat plate collector, solar water heating system, Applications, Solar cooker. Solar cell, Types of solar cells, Solar module and array, Components of PV system, Applications of solar PV systems.

6. Wind Energy: Introduction, Principle of wind energy conversion, Components of wind turbines, Operation and characteristics of a wind turbine, Advantages and disadvantages of wind mills, Applications of wind energy.

UNIT-IV

7. Ocean Energy: Introduction, Principle of ocean thermal energy conversion, Tidal power generation, Tidal energy technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and disadvantages.

8. Hydrogen Energy: History of hydrogen energy - Hydrogen production methods - Electrolysis of water, Hydrogen storage options – Compressed and liquefied gas tanks, Metal hydrides; Hydrogen safety - Problems of hydrogen transport and distribution - Uses of hydrogen as fuel.

UNIT-V**9. Bio-Energy**

Energy from biomass – Sources of biomass – Different species – Conversion of biomass into fuels – Energy through fermentation – Pyrolysis, gasification and combustion – Aerobic and anaerobic bio-conversion – Properties of biomass – Biogas plants – Types of plants – Design and operation – Properties and characteristics of biogas.

References:

1. Solar Energy Principles, Thermal Collection & Storage, S.P.Sukhatme: Tata McGraw Hill Pub., New Delhi.
2. Non-Conventional Energy Sources, G.D.Rai, New Delhi.
3. Renewable Energy, power for a sustainable future, Godfrey Boyle, 2004,
4. The Generation of electricity by wind, E.W. Golding.
5. Hydrogen and Fuel Cells: A comprehensive guide, Rebecca Busby, Pennwell corporation (2005)
6. Hydrogen and Fuel Cells: Emerging Technologies and Applications, B.Sorensen, Academic Press (2012).
7. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub., 2009.
8. Fundamentals of Renewable Energy Resources by G.N.Tiwari, M.K.Ghosal, Narosa Pub., 2007.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH

Practical: VII A

Max. Marks:

1. Preparation of copper oxide selective surface by chemical conversion method.
2. Performance testing of solar cooker.
3. Determination of solar constant using pyrheliometer.
4. Measurement of I-V characteristics of solar cell.
5. Study the effect of input light intensity on the performance of solar cell.
6. Study the characteristics of wind.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI-SEMESTER

PHYSICS

TIME: Hrs/week

PH Cluster **Elective Paper –VIII-A-1: Solar Thermal and Photovoltaic Aspects** Max Marks:

UNIT-I

1. Basics of Solar Radiation: Structure of Sun, Spectral distribution of extra terrestrial radiation, Solar constant, Concept of Zenith angle and air mass, Definition of declination, hour angle, solar and surface azimuth angles; Direct, diffuse and total solar radiation, Solar intensity measurement – Thermoelectric pyranometer and pyr heliometer.

2. Radiative Properties and Characteristics of Materials: Reflection, absorption and transmission of solar radiation through single and multi covers; Kirchoff's law – Relation between absorptance, emittance and reflectance; Selective Surfaces - preparation and characterization, Types and applications; Anti-reflective coating.

UNIT-II

3. Flat Plate Collectors (FPC) : Description of flat plate collector, Liquid heating type FPC, Energy balance equation, Efficiency, Temperature distribution in FPC, Definitions of fin efficiency and collector efficiency, Evacuated tubular collectors.

4. Concentrating Collectors: Classification, design and performance parameters; Definitions of aperture, rim-angle, concentration ratio and acceptance angle; Tracking systems; Parabolic trough concentrators; Concentrators with point focus.

Unit-III

5. Solar photovoltaic (PV) cell: Physics of solar cell –Type of interfaces, homo, hetero and schottky interfaces, Photovoltaic Effect, Equivalent circuit of solar cell, Solar cell output parameters, Series and shunt resistances and its effect on cell efficiency; Variation of efficiency with band-gap and temperature.

6. Solar cell fabrication: Production of single crystal Silicon: Czochralski (CZ) and Float Zone (FZ) methods, Silicon wafer fabrication, Wafer to cell formation, Thin film solar cells, Advantages, CdTe/CdS cell formation, Multi-junction solar cell; Basic concept of Dye-sensitized solar cell, Quantum dot solar cell.

UNIT-IV

Solar PV systems: Solar cell module assembly – Steps involved in the fabrication of solar module, Module performance, I-V characteristics, Modules in series and parallel, Module protection – use of Bypass and Blocking diodes, Solar PV system and its components, PV array, inverter, battery and load.

UNIT-V

Solar thermal applications: Solar hot water system (SHWS), Types of SHWS, Standard method of testing the efficiency of SHWS; Passive space heating and cooling concepts, Solar desalinator and drier, Solar thermal power generation.

Solar PV applications: SPV systems; Stand alone, hybrid and grid connected systems, System installation, operation and maintenances; Field experience; PV market analysis and economics of SPV systems.

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modeling and applications, G.N. Tiwari, Narosa Pub., 2005.
3. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata Mc-Graw Hill Publishers, 1999.
4. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
5. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH

Practical : VIII A 1

Max. Marks:

Minimum of 6 experiments to be done and recorded

1. Measurement of direct solar radiation using pyr heliometer.
2. Measurement of global and diffuse solar radiation using pyranometer.
3. Measurement of emissivity, reflectivity and transsivity.
4. Measurement of efficiency of solar flat plate collector.
5. Performance testing of solar air dryer unit.
6. Effect of tilt angle on the efficiency of solar photovoltaic panel.
7. Study on solar photovoltaic panel in series and parallel combination.

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI-SEMESTER

PHYSICS

TIME: Hrs/week

PH Cluster Elective Paper –VIII-A-2 :Wind, Hydro and Ocean Energies Max Marks:

UNIT-I

1. Introduction: Wind generation, meteorology of wind, world distribution of wind, wind speed variation with height, wind speed statistics, Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics.

2. Wind Measurements: Eolian features, biological indicators, rotational anemometers, other anemometers, wind measurements with balloons.

UNIT-II

3. Wind Energy Conversion System: Aerodynamic design principles; Aerodynamic theories; Axial momentum, blade element and combine theory; Rotor characteristics; Maximum power coefficient; Prandtl's tip loss correction.

4. Design of Wind Turbine: Wind turbine design considerations; Methodology; Theoretical simulation of wind turbine characteristics; Test methods.

UNIT-III

5. Wind Energy Application: Wind pumps: Performance analysis, design concept and testing; Principle of wind energy generation; Standalone, grid connected and hybrid applications of wind energy conversion systems, Economics of wind energy utilization; Wind energy in India; Environmental Impacts of Wind farms.

UNIT-IV

6. Small Hydropower Systems: Overview of micro, mini and small hydro systems; Hydrology; Elements of pumps and turbine; Selection and design criteria of pumps and turbines; Site selection; Speed and voltage regulation; Investment issues load management and tariff collection; potential of small hydro power in India. Wind and hydro based stand-alone hybrid power systems.

UNIT-V

7. Ocean Thermal, Tidal and Wave Energy Systems: Ocean Thermal - Introduction, Technology process, Working principle, Resource and site requirements, Location of OCET system, Electricity generation methods from OCET, Advantages and disadvantages, Applications of OTEC,

8. Tidal Energy - Introduction, Origin and nature of tidal energy, Merits and limitations, Tidal energy technology, Tidal range power, Basic modes of operation of tidal systems. Wave Energy – Introduction, Basics of wave motion, Power in waves, Wave energy conversion devices, Advantages and disadvantages, Applications of wave energy.

Reference Books:

1. Dan Charis, Mick Sagrillo, Lan Woofenden, "Power from the Wind", New Society Pub., 2009.
2. Erich Hau, "Wind Turbines-Fundamentals, Technologies, Applications, Economics", 2nd Edition, Springer Verlag, Berlin Heidelberg, NY, 2006.

3. Joshue Earnest, Tore Wizelius, Wind Power and Project Developmen”, PHI Pub., 2011.
4. T. Burton, D. Sharpe, N. Jenkins, E. Bossanyi, Wind Energy Handbook, John Wiley Pub., 2001.
5. Paul Gipe, “Wind Energy Basics”, Chelsea Green Publications, 1999.
6. Khan, B.H., “Non-Conventional Energy Resources”, TMH, 2nd Edition, New Delhi, 2009.
7. Tiwari, G.N., and Ghosal, M.K, Renewable Energy Resources – Basic Principles and applications, Narosa Publishing House,2007.

ST.JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER	PHYSICS	TIME: Hrs/week
PH	Practical: VIII A 2	Max. Marks:

1. Estimation of wind speed using anemometer.
2. Determination of characteristics of a wind generator
3. Study the effect of number and size of blades of a wind turbine on electric power output.
4. Performance evaluation of vertical and horizontal axes wind turbine rotors.
5. Study the effect of density of water on the output power of hydroelectric generator.
6. Study the effect of wave amplitude and frequency on the wave energy generated.

ST.JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER	PHYSICS	TIME: Hrs/week
PH	Cluster Elective Paper –VIII-A-3 :Energy Storage Devices	Max. Marks:

UNIT-I

1. Energy Storage:Need of energy storage; Different modes of energy storage, Flywheel storage, Electrical and magnetic energy storage: Capacitors,electromagnets; Chemical Energy storage: Thermo-chemical, photo-chemical, bio-chemical,electro-chemical, fossil fuels and synthetic fuels. Hydrogen for energy storage.

UNIT-II

2. Electrochemical Energy Storage Systems:Batteries: Primary, Secondary, Lithium, Solid-state and molten solvent batteries; Leadacid batteries; Nickel Cadmium Batteries; Advanced Batteries. Role of carbon nano-tubes inelectrodes.

UNIT-III

3. Magnetic and Electric Energy Storage Systems: Superconducting Magnet Energy Storage(SMES) systems; Capacitor and battery: Comparison and application; Super capacitor: Electrochemical Double Layer Capacitor(EDLC), principle of working, structure, performance and application.

UNIT-IV

4. Fuel Cell: Fuel cell definition, difference between batteries and fuel cells, fuel cell components, principle and working of fuel cell, performance characteristics, efficiency, fuel cell stack, fuel cell power plant: fuel processor, fuel cell power section, power conditioner, Advantages and disadvantages.

UNIT-V

5. Types of Fuel Cells: Alkaline fuel cell, polymer electrolyte fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell; solid oxide fuel cell, proton exchange membrane fuel cell, problems with fuel cells, applications of fuel cells.

REFERENCE BOOKS

1. J. Jensen and B. Squirensen, Fundamentals of Energy Storage, John Wiley, NY, 1984.
2. M. Barak, Electrochemical Power Sources: Primary and Secondary Batteries by, P. Peregrinus, IEE, 1980.
3. P.D. Dunn, Renewable Energies, Peter Peregrinus Ltd, London, 1986.
4. B. Viswanathan and M. A. Scibioh, Fuel Cells-Principles and Applications, University Press, 2006.
5. Hart, A.B and G.J. Womack, Fuel Cells: Theory and Application, Prentice Hall, New York, 1989.

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH

Practical VIII A 3

Max. Marks:

1. Study of charge and discharge characteristics of storage battery.
2. Study of charging and discharging behavior of a capacitor.
3. Determination of efficiency of DC-AC inverter and DC-DC converters
4. Study of charging characteristics of a Ni-Cd battery using solar photovoltaic panel.
5. Performance estimation of a fuel cell.
6. Study of effect of temperature on the performance of fuel cell.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH

Elective VII-B (Materials Science)

Max. Marks:

UNIT-I

1. Materials and Crystal Bonding: Materials, Classification, Crystalline, Amorphous, Glasses; Metals, Alloys, Semiconductors, Polymers, Ceramics, Plastics, Bio-materials, Composites, Bulk and nanomaterials. Review of atomic structure – Interatomic forces – Different types of chemical bonds – Ionic-covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Binding energy of a crystal.

UNIT-II

2. Defects and Diffusion in Materials: Introduction – Types of defects - Point defects- Line defects- Surface defects- Volume defects- Production and removal of defects- Deformation- irradiation- quenching- annealing- recovery - recrystallization and grain growth. Diffusion in solids- Fick's laws of diffusion.

UNIT-III

3. Mechanical Behavior of Materials: Different mechanical properties of engineering materials – Creep – Fracture – Technological properties – Factors affecting mechanical properties of a material – Heat treatment - Cold and hot working – Types of mechanical tests – Metal forming process – Powder – Misaligning – Deformation of metals.

UNIT-IV

4. Magnetic Materials: Dia-, Para-, Ferri- and Ferromagnetic materials, Classical Langevin theory of diamagnetism, Quantum mechanical treatment of paramagnetism. Curie's law, Weiss's theory of ferromagnetism, Ferromagnetic domains. Discussion of B-H Curve. Hysteresis and energy Loss.

UNIT-V

5. Dielectric Materials: Dielectric constant, dielectric strength and dielectric loss, polarizability, mechanism of polarization, factors affecting polarization, polarization curve and hysteresis loop, types of dielectric materials, applications; ferroelectric, piezoelectric and pyroelectric materials, Clausius-Mosotti equation.

Reference books

1. Materials Science by M.Arumugam, Anuradha Publishers. 1990, Kumbakonam.
2. Materials Science and Engineering V.Raghavan, Printice Hall India Ed. V 2004. New Delhi.
3. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
4. Solid State Physics, M.A. Wahab, 2011, Narosa Publications

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH

Practical: VII B

Max. Marks:

Minimum of 6 experiments to be done and recorded

1. Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method)
2. Measurement of magnetic susceptibility of solids.
3. Determination of coupling coefficient of a piezoelectric crystal.
4. Measurement of the dielectric constant of a dielectric Materials
5. Study the complex dielectric constant and plasma frequency of metal using surface plasmon resonance (SPR)
7. Study the hysteresis loop of a Ferroelectric Crystal.
8. Study the B-H curve of 'Fe' using solenoid and determine energy loss from hysteresis.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH **Cluster Elective Paper VIII-B-1 :Fundamentals of Nanoscience**

Max. Marks

:

UNIT-I

1. Background and history: Emergence of Nanoscience with special reference to Feynman and Drexler; Role of particle size; Spatial and temporal scale; Concept of confinement, strong and weak confinement with suitable example; Development of quantum structures, Basic concept of quantum well, quantum wire and quantum dot.

Finite size Zero, One and Two Dimensional Nanostructures, Concept of Surface and Interfacial Energies. Physics of the solid state – size dependence of properties, crystal structures, Lattice vibrations, Energy bands:- Insulators Semiconductors and conductors.

UNIT-II

2. Classification of Nanomaterials: Inorganic nanomaterials: carbon nanotubes and cones, Organic nanomaterials: dendrimers, micelles, liposomes, block copolymers; Bionanomaterials: Biomimetic, bioceramic and nanotherapeutics; Nanomaterials for molecular electronics and optoelectronics.

UNITS-III

3. Macromolecules: Classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization. Molecular weight of polymers-number average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry, Osmometry and light scattering methods.Kinetics of free radical polymerization, derivation of rate law.Preparation and application of polyethylene, PVC, Teflon.

UNIT-IV

4. Molecular & Nanoelectronics:Semiconductors, Transition from crystal technology to nanotechnology. Tiny motors, Gyroscopes and accelerometers. Nano particle embedded wrinkle resistant cloth, Transparent Zinc Oxide sun screens.Bio-systems, Nanoscale processes in environment. Nanoscale structures, Novel phenomena and Quantum control and quantum computing. Single electron transistors, Quantum dots, Quantum wires.

UNIT-V

5. Biomaterials: Implant materials: Stainless steels and its alloys, Ti and Ti based alloys, Ceramic implant materials; Hydroxyapatite glass ceramics, Carbon Implant materials, Polymeric Implant materials, Soft tissue replacement implants, Sutures, Surgical tapes and adhesives, heart valve implants, Artificial organs, Hard Tissue replacement Implants, Internal Fracture Fixation Devices, Wires, Pins, and Screws, Fracture Plates.

Reference Books

1. T. Pradeep: Textbook of Nanoscience and Nanotechnology Chapter (McGraw-Hill Professional, 2012), Access Engineering.
2. C. N. R. Rao, A. Müller, A. K. Cheetham, "The Chemistry of Nanomaterials :Synthesis, Properties and Applications", Wiley-VCH, 2006.
3. C. Breachignac P. Houdy M. Lahmani, "Nanomaterials and Nanochemistry", Springer, 2006.
4. Guozhong Cao, "Nanostructures and Nanomaterials: Synthesis, Properties, and Applications", World Scientific Publishing Private, Ltd., 2011.
5. Zhong Lin Wang, "Characterization of Nanophase Materials", Wiley-VCH, 2004.
6. Carl C. Koch, "Nanostructured Materials: Processing, Properties and Potential Applications", William Andrew Publishing Norwich, 2006.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER	PHYSICS	TIME: Hrs/week
PH	Practical VIII B 1	Max. Marks

Minimum of 6 experiments to be done and recorded

1. Determination of the Band Gap of Semiconductor Nanoparticles.
2. Surface Enhanced Raman Scattering Activity of Silver Nanoparticles
3. [Conversion of Gold Nanorods into Gold Nanoparticles](#)
4. [Bimetallic Nanoparticles](#)
5. Processing and Development of Nanoparticle gas sensor
6. Magnetic separation/identification studies of nanoparticles
7. Harvesting light using nano-solar cells
8. Nano-Forensic analysis to identify, individualize and evaluate evidence using nanophase materials
9. Comparison of the performance of nanoparticles based conductive adhesives and conventional non conductive adhesives.
10. Electrodeposition and corrosion behavior of nanostructured composite film
11. Photocatalytic activity of nanomaterials

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER	PHYSICS	TIME: Hrs/week
PH	Cluster Elective Paper –VIII-B-2: Synthesis and Characterization of Nanomaterials	Max. Marks:

UNIT-I

1. Nanomaterials synthesis: Synthesis and nanofabrication, Bottom-Up and Top-Down approach with examples. Chemical precipitation methods, sol-gel method, chemical reduction, hydrothermal, process. Physical Methods- ball milling, Physical Vapour deposition (PVD), Sputtering, Chemical Vapor deposition (CVD), spray pyrolysis, Biological methods- Synthesis using micro organisms and bacteria, Synthesis using plant extract, use of proteins and DNA templates.

UNIT-II

2. Classification of materials: Types of materials, Metals, Ceramics (Sand glasses) polymers, composites, semiconductors. Metals and alloys- Phase diagrams of single component, binary and ternary systems, diffusion, nucleation and growth. Diffusional and diffusionless transformations. Mechanical properties. Metallic glasses. Preparation, structure and properties like electrical, magnetic, thermal and mechanical, applications.

UNIT-III

3. Glasses: The glass transition - theories for the glass transition, Factors that determine the glass-transition temperature. Glass forming systems and ease of glass formation, preparation of glass materials. Applications of Glasses: Introduction: Electronic applications, Electrochemical applications, optical applications, Magnetic applications.

UNIT-IV

4. Liquid Crystals: Mesomorphism of anisotropic systems, Different liquid crystalline phase and phase transitions, Thermal and electrical properties of liquid crystals, Types Liquid Crystals displays, few applications of liquid crystals.

UNIT-V

5. Characterization Methods: XRD, SEM, TEM, AFM, XPS and PL characterization techniques for nano materials. Electrical and mechanical properties, Optical properties by IR and Raman Spectroscopy.

References books

1. Encyclopedia of Nanotechnology by M. Balakrishna Rao and K. Krishna Reddy, Vol. I to X, Campus books.
2. Nano: The Essentials- Understanding Nanoscience & Nanotechnology by T. Pradeep; Tata Mc. Graw Hill
3. Nanotechnology in Microelectronics & Optoelectronics, J.M Martine Duarte, R.J Martin Palma, F. Agullo Rueda, Elsevier
4. Nanoelectronic Circuit Design, N.K Jha, D Chen, Springer
5. Handbook of Nanophysics- Nanoelectronics & Nanophotonics, K.D Sattler, CRC Press
6. Organic Electronics-Sensors & Biotechnology- R. Shinar & J. Shinar, McGraw-Hill

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH

Practical: VIII B 2

Max. Marks:

Minimum of 6 experiments to be done and recorded

1. Synthesis of nanocrystalline films of II-VI compounds doped with rare earths by chemical process.

3. K.K. Chattopadhyay and A.N. Banerjee, Introduction to Nanoscience & Technology (PHI Learning Private Limited).
4. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER	PHYSICS	TIME: Hrs/week
PH	Practical: VIII B 3	Max. Marks:

Minimum of 6 experiments to be done and recorded

1. Synthesis of metal nanoparticles by chemical route.
2. Synthesis of semiconductor nanoparticles.
3. Surface Plasmon study of metal nanoparticles by UV-Visible spectrophotometer.
4. XRD pattern of nanomaterials and estimation of particle size.
5. To study the effect of size on color of nanomaterials.
6. Prepare a disc of ceramic of a compound using ball milling, pressing and sintering, and study its XRD.
7. Fabricate a thin film of nanoparticles by spin coating (or chemical route) and study transmittance spectra in UV-Visible region.
8. Fabricate a pn-diode by diffusing Al over the surface of n-type Si and study its I-V characteristics.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI-SEMESTER	PHYSICS	TIME: Hrs/week
PH	Elective–VII-C (Analog and Digital Electronics)	Max. Marks:

Unit-I

1. FET-Construction, Working, characteristics and uses; MOSFET-enhancement MOSFET, depletion MOSFET, construction and working , drain characteristics of MOSFET, applications of MOSFET
2. Photo electric devices: Structure and operation, characteristics, spectral response and application of LDR, LED and LCD

Unit-II

3. Operational Amplifiers: Characteristics of ideal and practical Op-Amp (IC 741), Basic differential amplifiers, Op-Amp supply voltage, IC identification, Internal blocks of Op-Amp, its parameter off set voltages and currents, CMRR, slew rate, concept of virtualground.

Unit-III

4. Applications of Op-Amp: Op-Amp as voltage amplifier, Inverting amplifier, Non-inverting amplifier, voltage follower, summing amplifier, difference amplifier, comparator, integrator, differentiator.

Unit-IV

5. Data processing circuits: Multiplexers, De-multiplexers, encoders, decoders, Characteristics for Digital ICs -RTL, DTL, TTL, ECL CMOS (NAND & NOR Gates).
6. IC 555 Timer -Its pin diagram,internal architecture, Application as astablemultivibrator and mono stable multivibrator.

Unit-V

7. Sequential digital circuits:Flip-flops, RS, Clocked SR, JK, D, T, Master-Slave, Flip- flop, Conversion of Flip flops.
8. Code Converters: Design of code converter, BCD to 7 segment, binary/BCD to gray, gray to binary/BCD ,design of counters using state machine.

Reference Books

1. Digital Electronics by G.K.Kharate Oxford University Press
2. Unified Electronics by Agarwal and Agarwal.
3. Op- Amp and Linear ICs by Ramakanth A Gayekwad, 4th edition PHI
4. Digital Principles and Applications by Malvino and Leach, TMH, 1996, 4th edition.
5. Digital Circuit design by Morris Mano,PHI
6. Switching Theory and Logic design by A.AnandKumar ,PHI
7. operations amplifier by SV Subramanyam.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH

Practical: VII C

Max. Marks:

Minimum of 6 experiments to be done and recorded

- 1) Characteristics of FET
- 2) Characteristics of MOSFET
- 3) Characteristics of LDR
- 4) Characteristics of Op-amp.(IC741)
- 5)Op-Amp as amplifier/inverting amplifier
- 6) Op-Amp as integrator/differentiator
- 7) Op-Amp as summing amplifier/difference amplifier
- 8) IC 555 as astable multivibrator
- 9) IC 555 as monostable amplifier
- 10) Master slave flip-flop
- 11) JK flip-flop

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH **Cluster elective Paper – VIII-C-1: Introduction to Microprocessors And Microcontrollers** Max. Marks

Unit – I

1. Introduction to microcontrollers:General purpose of computer systems,architecture of embedded system, classification, applications and purposes, challenges and designs, operational and non operational quality attributes, elemental description of embedded processors and micro controllers

Unit –II

2. Microprocessors:Organisation of microprocessorbased system, 8085 microprocessor,its pin diagram and architecture, concept of data bus, and address bus, 8085 programming, instruction classification, stacks and its implementation, hardware and software interrupts.

Unit– III

3. 8051 microcontroller:Introduction , block diagram, assembly language programming, programme counter, ROM memory, data types and directives, flag bits PSW register, jump, loop and call constructions

4. 8051 I/O Programming: Introduction to I/O port programming, pin out diagram, I/O port pin programming, bit manipulation, addressing modes, accessing memory, arithmetic and logic instructions.

Unit – IV

5. Timers:Programming of 8051 timers, counter programming, interrupts, externalhardware interrupts, serial communication interrupts, interrupt priority.

6. Embedded system programming:Structure of programming, infinite loop, compiling, linking locating, down loading and debugging.

Unit –V

7. Embedded system design and development:Embedded system development environment, file type generated after cross compilation, disassembler, decompiler, simulator, emulator and debugging.

8. Embedded product life cycle:Embedded product development life cycle, trends in embedded industry.

Reference Books

- 1)Embedded Systems.. Architecture,programming and design, R Kamal, 2008, TMH
- 2) The 8051 micro controller and embedded systems using Assembly and C, M.A.Mazidi, J.G.Mazidi and R.D.McKinlay, second Ed., 2007 pearson Education India
- 3) Introduction to embedded systems K.V. Shibu, 1st edition, 2009 McGraw Hill
- 4) Micro Controllers in practice, I Susnea and Mitescu,2005,springer

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH **Practical: VIII C 1** Max. Marks:

Minimum of 6 experiments to be done and recorded

1. To find that the given numbers is prime or not.
2. To find the factorial of a number.
3. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
4. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's.

5. Program to glow first four LED then next four using TIMER application.
6. Program to rotate the contents of the accumulator first right and then left.
7. Program to run a countdown from 9-0 in the seven segment LED display.
8. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.
9. To toggle '1234' as '1324' in the seven segment LED.
10. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
11. Application of embedded systems: Temperature measurement, some information on LCD display, interfacing a keyboard.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER

PHYSICS

TIME: Hrs/week

PH **Cluster Elective Paper VIII-C-2: Computational Methods and Max. Marks Programming**

UNIT-I

1. Fundamentals of C language: C character set-Identifiers and Keywords-Constants -Variables-Data types-Declarations of variables-Declaration of storage class-Defining symbolic constants- Assignment statement.
2. Operators: Arithmetic operators-Relational operators-Logic operators-Assignment operators-Increment and decrement operators-Conditional operators.

UNIT-II

3. Expressions and I/O Statements: Arithmetic expressions-Precedence of arithmetic operators-Type converters in expressions-Mathematical (Library) functions - Data input and output-The getchar and putchar functions-Scanf-Printf simple programs.
4. Control statements:If -Else statements -Switch statements - The operators - GO TO - While, Do - While, FOR statements - BREAK and CONTINUE statements.

UNIT-III

5. Arrays: One dimensional and two dimensional arrays - Initialization - Type declaration - Inputting and outputting of data for arrays - Programs of matrices addition, subtraction and multiplication
6. User defined functions: The form of C functions - Return values and their types - Calling a function - Category of functions. Nesting of functions.Recursion.ANSI C functions- Function declaration. Scope and life time of variables in functions.

UNIT-IV

7. Linear and Non - Linear equations: Solution of Algebra and transcendental equations-Bisection, Falsi position and Newton-Rhapson methods-Basic principles-Formulae-algorithms
8. Simultaneous equations: Solutions of simultaneous linear equations-Guass elimination and Gauss Seidel iterative methods-Basic principles-Formulae – Algorithms.

UNIT-V

9. Interpolations: Concept of linear interpolation-Finite differences-Newton's and Lagrange's interpolation formulae-principles and Algorithms
10. Numerical differentiation and integration: Numerical differentiation-algorithm for evaluation of first order derivatives using formulae based on Taylor's series-Numerical integration-Trapezoidal and Simpson's 1/3 rule- Formulae-Algorithms.

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Reference books:

1. Introductory methods of Numerical Analysis: Sastry
2. Numerical Methods: Balaguruswamy
3. Programming in ANSI C (TMH) : Balaguruswamy
4. Programming with 'C'- Byron Gottafried, Tata Mc Graw Hill

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI- SEMESTER	PHYSICS	TIME: Hrs/week
PH	Practical: VIII C 2	Max. Marks

Minimum of 6 experiments to be done and recorded

1. Write a program that reads an alphabet from keyboard and display in the reverse order.
2. Write a program to read and display multiplication of tables.
3. Write a program for converting centigrade to Fahrenheit temperature and Fahrenheit temperature centigrade.
4. Write a program to find the largest element in an array.
5. Write a program based on percentage calculation, the grade by entering the subject marks. (If percentage > 60 I class, if percentage between 50&60 II class, if percentage between 35&50 III class, if percentage below 35 fail).
6. Write a program for generation of even and odd numbers up to 100 using while, do-while and for loop.
7. Write a program to solve the quadratic equation using Bisection method.
8. Write a program for integration of function using Trapezoidal rule.
9. Write a program for solving the differential equation using Simpson's 1/3rd rule.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

Unit – I

1. Basic of measurements: Instruments accuracy , precision , sensitivity , resolution range, errors in measurement, Multimeter , principles of measurement of dc voltage and dc currents, ac current and resistance, specifications of multimeter and their significance.

Unit -11

2. Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity, principles of voltage measurement (block diagram only), specification of an electronic voltmeter/multimeter and their significance.

Unit– III

3. CRO :Block diagram of basic CRO, construction of CRT, electron gun, electrostatic focusing and acceleration(only explanation) , time base operation, synchronization, front panel controls, specifications of CRO and their significance.

Applications CRO: Measurement of voltage ,dc and ac frequency , time period, special features of dual trace, digital storage oscilloscope, block diagram and principle of working.

Unit – IV

4. Digital Multimeter:Block diagram,working, frequency and period measurement using universal counter, frequency counter ,accuracy and resolution.

5. Digital instruments:Principle and working of digital instruments, characteristics of a digital meter, working principle of digital voltmeter.

Unit – V

6. Signal generators:Block diagram explanation, specifications of low frequency signal generators, pulse generator, function generator-working, Brief idea for testing, specifications. Distortion factor meter, wave analysis.

7. Bridges:Block diagram, working of basic LCR bridge – specifications – block diagram and working.

Reference Books

1. A text book in electrical technology by B.L.Thereja (S.Chand&Co)
2. Digital circuits and systems by Venugopal 2011 (Tata Mcgraw Hill)
3. Digital Electronics by SubrathaGhoshal 2012 (Cengage Learning)

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Minimum of 6 experiments to be done and recorded

1. Study the loading effect of a multimeter by measuring voltage across low and high resistance.
2. Study the limitations of a multimeter for measuring high frequency voltage and currents.
3. Measurement of voltage, frequency, time period and phase angle using CRO.
4. Measurement of time period and frequency using universal counter/frequency counter.
5. Measurement of rise, fall and delay times using a CRO.
6. Measurement of distortion of a RF signal generator using distortion factor meter.
7. Measurement of R, L and C using a LCR bridge/ universal bridge.

