Unit 1. ELASTICITY: - Modulus of elasticity- Poisson’s ratio- Relation between elastic constants and Poisson’s ratio-Energy stored- Twisting couple on a cylinder- Torsional pendulum (with and without weights)- Bending of beams- Bending moment- Cantilever loading- Transverse vibrations of cantilever-Non-uniform and uniform bending of a beam-Koenig’s method – Determination of Y and n for the material of the spring.


Unit 3. SURFACE TENSION: - Molecular interpretation- surface energy- Pressure difference across a curved surface- Excess pressure in liquid drops and air bubbles-Molecular forces- Shape of liquid meniscus in capillary tube-Angle of contact- Capillary rise and energy consideration- Jaeger’s method- Quincke’s drop-Vapour pressure over flat and curved surfaces.


Unit 5. ULTRASONICS AND ACOUSTICS: - Ultrasonic- Piezo-electric effect-Piezo-electric generator-Magnetostriction effect- Magnetostriction oscillator-Detection and application of ultrasonic-Acoustics-Reverberation time and its measurement- Sabine’s formula-Absorption coefficient and its determination- Condition for good acoustical design of an auditorium- Noise and its measurement- Noise reduction-sound insulation

TEXT BOOKS:
1. D.S MATHUR- ELEMENTS OF PROPERTIES OF MATTER: S.CHAND AND CO

BOOKS FOR REFERENCE:
PH1504 - PHYSICS PRACTICAL - I

Category : MC
Semesters : I
Credits : 3
No. of hrs/wk : 3

Objectives:
1. The course aims at exposing the under graduate students to the technique of handling simple measuring instruments.
2. Provide the students the required training to determine some of the mechanical and thermal properties of matter.

1) Cantilever loading-Pin and Microscope- Transverse vibrations – Young’s Modulus
2) Torsional Pendulum ( Without weights) – Rigidity Modulus
3) Graduated burette- Viscosity of liquid
4) Joly’s Bulb- Pressure Coefficient of Air
5) Sonometer- Verification of Laws of Transverse vibration in a stretched string
6) Convex lens- Focal length
7) Spectrometer- Solid Prism- A , D and μ.
8) Logic Gates- OR, AND and NOT
9) Potentiometer- Calibration of Ammeter

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
**PH2505 - MECHANICS AND STATISTICAL PHYSICS**

**Unit 1: RIGID BODY AND FLUID DYNAMICS:**
Compound pendulum - Centers of oscillation and suspension - determination of g and k - Bifilar pendulum - Parallel and non parallel threads – Centre of mass - Conservation of linear and angular momentum - Variable mass-Rocket propulsion.
Equation of continuity-Bernoulli’s theorem and its applications - Toricelli’s theorem - Velocity of efflux – Venturimeter - Pitot’s tube-Diffusion - Fick’s law - Relation between the time of diffusion and length of column -Graham’s law for diffusion of gases

**Unit 2: LAGRANGIAN AND HAMILTONIAN MECHANICS:**
Mechanics of system of particles - Constraints of motion- Generalized coordinates and the transformation equation-simple illustration for the transformation equation
Configuration space - principle of virtual work - D’Alembert’s principle - Lagrange’s equations – Applications: Atwood’s machine – Bead sliding on a uniformly rotating wire
Phase space- Hamilton’s equations of motion- Physical significance of the Hamiltonian function- Applications: Motion of a particle in a central force field- Motion of a charged particle in an electromagnetic field

**Unit 3: TRANSPORT PHENOMENA**

**Unit 4: THERMODYNAMIC RELATIONS:**
Extensive and intensive variables- Thermodynamic potentials and Maxwell’s relations- Applications of Maxwell’s relations: Specific heat equation and Joule- Thomson cooling- T-ds equations- Clapeyron’s latent heat equations – Internal energy of ideal and real gases- Clausius inequality- Entropy and second law of thermodynamics – First and second order phase transitions- Gibbs- Helmholtz equation of a reversible cell

**Unit 5: MAXWELL- BOLTZMANN STATISTICS:**
Macro and microstates-Thermodynamic probability-Equilibrium state-Momentum and phase space-Entropy and probability- Maxwell-Boltzmann energy and momentum distribution law- Application of M-B distribution law :Total internal energy and specific heat at constant volume of an ideal gas-M-B distribution of speed-Mean, rms and most probable speeds- Doppler broadening of spectral lines- Limitations of M-B statistics.

**TEXT BOOKS:**
1) M.Narayanamurti and Nagarajan, Dynamics, National Publishing Company, 8th Edition, 2002.( For Chapter 1 (partly) and Chapter 2)
3) Brij Lal, N.Subrahmanyam and P.S Hemne- Heat Thermodynamics and Statistical Mechanics, S.Chand and C Ltd- Revised Edition 2007 ( For Chapter 3,4 and 5)

**REFERENCE BOOKS**
PH2505 - PHYSICS PRACTICAL - II

Category: MC
Semesters: II
Credits: 3
No. of hrs/wk: 3

Objectives:
1. The course aims at exposing the undergraduate students to the technique of handling simple measuring instruments.
2. Provide the students the required training to determine some of the mechanical and thermal properties of matter.

1) Compound bar pendulum- g and k
2) Capillary Rise- Surface Tension of liquid
4) Deflection magnetometer- Tan C position- Moment of a bar Magnet
5) Spectrometer- Grating-Normal incidence
6) Carey-Foster Bridge- Specific Resistance
7) Table Galvanometer- Figure of Merit
8) Transistor Characteristics (Static)
9) Unregulated and Zener regulated power supply.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH2105 - PHYSICS FOR CHEMISTRY – I

Category : AR  Credits : 3
Semester : II  No. of hrs/wk : 4

Objective: This paper is offered to the students of chemistry as allied required. While the chemical properties are learnt in the major, the study of physical properties will compliment their studies.

Unit – 1: Classical mechanics
a) Particle dynamics: Displacement, velocity and acceleration - distance –time graph-velocity – time graph – projectile motion – uniform circular motion – tangential acceleration in circular motion – relative velocity and acceleration
b) Lagrangian formulation: Generalised coordinates – holonomic and non-holonomic constraints – Lagrange’s equations – simple applications- Atwood’s machine – simple pendulum

Unit 2: Gravitation

Unit – 3: Properties of matter

Unit – 4: Optics

Unit – 5: Crystal Physics

TEXT BOOKS:-
2. M.Narayanamurthy and N.Nagarathnam Dynamics – (The national publishers)
3. D.S.Mathur, properties of matter, S.Chand and Co., New Delhi

BOOKS FOR REFERENCE:-
LIST OF EXPERIMENTS
1. Young’s modulus by stretching - vernier microscope
2. Rigidity modulus - torsional pendulum
3. Surface tension and interfacial tension - method of drops
4. Surface tension - capillary rise
5. Viscosity - capillary flow
7. Specific heat of liquid - electrical heating
8. Sonometer - verification of laws
9. Compound bar pendulum - determination of ’g’ and radius of gyration

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:

PH1101 - PHYSICS FOR MATHEMATICS – I

Objective:
This paper is offered to the students of mathematics as allied required. Most of the mathematics learnt by the students has immediate application to many physical problems. The logical reasoning behind the description of the physics problem and obtaining the solution to such problems are taught in this paper.

Unit – 1: Classical mechanics
a) Particle dynamics: Displacement, velocity and acceleration- distance –time graph-velocity – time graph – projectile motion – uniform circular motion – tangential acceleration in circular motion – relative velocity and acceleration
b) Lagrangian formulation: Generalised coordinates – holonomic and non-holonomic constraints – Lagrange’s equations – simple applications- Atwood’s machine – simple pendulum

Unit 2: Gravitation

Unit –3: Properties of matter

**Unit – 4: Electronics**


b) Digital circuits: J-K-Flip-Flop – combinational circuits – application of Karnaugh map- Full and half binary adders - counters

**Unit – 5: Special theory of relativity**


**TEXT BOOKS:**

2. M.Narayananmurthy and N.Nagarathnam Dynamics – (The national publishers)
3. D.S.Mathur, properties of matter, S.Chand and Co., New Delhi

**BOOKS FOR REFERENCE:**


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**PH1102 - PHYSICS FOR MATHEMATICS - PRACTICALS – I**

<table>
<thead>
<tr>
<th>Category : AR</th>
<th>Credits : 1</th>
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<tr>
<td>Semester : I</td>
<td>No. of hrs/wk : 2</td>
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**LIST OF EXPERIMENTS**

1. Young’s modulus by stretching -vernier microscope
2. Rigidity modulus -torsional pendulum
3. Surface tension and interfacial tension - method of drops
4. Viscosity - capillary flow
5. Specific heat of liquid - electrical heating
6. Sonometer -verification of laws
7. Compound bar pendulum - determination of g’and radius of gyration
8. Basic Gates – AND, OR, NOT, NAND, NOR
9. NAND, NOR as Universal Building Blocks

**BOOKS FOR STUDY:**


**BOOKS FOR REFERENCE:**
PH2107 - MICROPROCESSOR

Objective: This paper aims at providing the students with an in-depth exposure to the sixteen bit microprocessor Intel 8086.

UNIT - 1: Intel 8086 Architecture and Instruction set
CPU architecture-addressing modes-instruction formats-instruction set-execution timing.

UNIT - 2: Introduction to Macro Assembler (MASM)
Assembler directives-assembler operators-assembly process-translation of assembler instructions-simple programs.

UNIT - 3: Modular Programming and Multiprogramming
Linking and relocation-access to external identifiers-procedures-interrupts and their routines-macros-process management and IRMX86-semaphore operations-common procedure sharing.

UNIT - 4: I/O consideration and System bus structure
Programmed I/O-Interrupt I/O-block transfer and DMA-basic 8086 bus configuration-minimum and maximum modes-system bus timings.

UNIT - 5: Interrupt system
Software Interrupts – hardware interrupts – vectored and non-vectored interrupts – hardware Interrupt priority management Daisy chain - single and multiple interrupt controllers 8259

BOOKS FOR STUDY:

BOOKS FOR REFERENCES:

PH2108 - MICROPROCESSOR PRACTICAL

Category : AR Credits : 1
Semester : II No. of hrs/wk : 2
Objective: This paper aims at providing the students with hands on experience of developing assembly language programs for the 16 bit microprocessor 8086.

1. Microprocessor 8086 - Introduction I (arithmetic - immediate mode)
2. Microprocessor 8086 - Introduction II (arithmetic and logical - all modes)
3. Microprocessor 8086 - Code conversions and arrays manipulation
4. Microprocessor 8086 - Solving equations
5. Microprocessor 8086 - Subroutines
6. Microprocessor 8086 - Interface I (LEDs & switches)
7. Microprocessor 8086 - Interface II (Freq. generation)
8. Microprocessor 8086 - Interface III (Waveform generation)
9. Microprocessor 8086 - Interface IV (Traffic lights simulation)

BOOKS FOR STUDY:

BOOKS FOR REFERENCES:
PH3506 - MATHEMATICAL PHYSICS

Category : MC
Semester : III

Credits : 6
No. of hrs/wk : 6

Objectives:
1. To help the student to understand the applications of Complex analysis to electrical circuits or mechanical vibrating system, Vector calculus in electromagnetism, Fourier Analysis for periodic functions in Physics such as sound waves etc.
2. To provide an insight to the use of Numerical methods for solving real time physics problems and an exposure to Matrices to grasp the fundamental principles of quantum mechanics

Unit 1 - COMPLEX ANALYSIS:

Unit 2 - VECTOR CALCULUS:

Unit 3 - FOURIER ANALYSIS:
Periodic functions- Trigonometric series- Fourier series: Rectangular wave- Orthogonality of trigonometric system- Functions of any period: Periodic square wave and Half-wave rectifier-Even and odd functions: Rectangular pulse and sawtooth wave-Half range expansions- Fourier integrals- Square wave-Fourier cosine and sine integrals: Laplace integral

Unit 4 - MATRIX THEORY:

Unit 5 - NUMERICAL METHODS:

BOOKS FOR STUDY:
2) A.W. Joshi, Matrices and Tensors in Physics, New Age International Publishers, 3rd Ed., 1995 (Unit-IV)

BOOKS FOR REFERENCE:
1) Tulsi Dass and Satish K.Sharma, Mathematical Methods in Classical and Quantum Physics, Universities Press- 1998 (Units I, II & IV)
7) H.K. Dass, Mathematical Physics, S. Chand & Co. Ltd.- 2010 (for unit V)
10) Riley & Hobson - Foundation Mathematics for Physical Sciences - Cambridge University Press - 2011
11) Introductory methods of Numerical Analysis - 3rd Ed - S S Sastry - PHI - 2004
Objectives: The course aims at exposing the undergraduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical and thermal properties of matter.

1) Non-uniform and uniform bending - Pin and microscope - Young’s modulus.
2) Torsional Pendulum (With weights) - Rigidity modulus.
3) Thermal conductivity of bad conductor - Lee’s disc.
4) Deflection and Vibration magnetometers - M and Bh.
5) Air wedge - Thickness of insulation.
6) Spectrometer - Hollow prism - Refractive index of liquid.
7) Newton’s law of cooling - Specific heat of liquid.
8) Ballistic galvanometer - Figure of merit.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH4506 - ELECTRONICS – I

Category : MC
Semester : IV

Credits : 6
No. of hrs/wk : 6

Objectives:
1. To expose the undergraduate students to the fundamentals of analog and digital electronics.
2. The various topics augment the electronics experiment they will be doing in their practical sessions.

Unit 1 - Circuit Analysis:

Unit 2 - Amplifiers and Oscillators:

Unit 3 - Operational amplifier and special devices:
Ideal operational amplifier parameters - inverting and non inverting - common mode rejection ratio - summing and difference amplifiers - Solving simultaneous equations - FET, MOSFET, UJT, SCR – Structure and working and I-V characteristics. Application - SCR as half and full wave rectifiers.

Unit 4 - Digital Electronics:
Counters - Binary ripple counter - modulus counter - decade counter - up counter – down counter - Registers - Shift registers - Shift counter circuits and their working - An introduction to memory devices - ROM, RAM.

Unit 5 - Integrated Circuit technology:
Scale of integration - VLSI - monolithic, thick, thin film and hybrid integrated circuits – bipolar and MOS technology comparison - fabrication of monolithic I.C. - fabrication of integrated components like resistors, capacitors, transistors and diodes - linear and nonlinear I.C’s.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH4507 - PHYSICS PRACTICAL - IV

Category : MC  
Credits : 3
Semester : IV  
No. of hrs/wk : 3

Objectives: The course aims at exposing the undergraduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical and thermal properties of matter.

1) Searle’s viscometer- Viscosity of highly viscous liquid.
2) Focal length – concave lens and convex mirror.
3) Saturated vapour pressure- Jolly’s bulb
4) Liquid lens- Refractive index of glass and liquid.
5) Spectrometer - grating - minimum deviation.
6) Carey-Foster bridge- Temperature coefficient of resistance.
7) Transistor- RC coupled amplifier.
8) IC regulated dual power supply.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH5510 - QUANTUM MECHANICS AND RELATIVITY

Category : MC
Semester : V
Credits : 6
No. of hrs/wk : 6

Objective:
1. To understand the basic concepts of quantum mechanics and apply it to various simple problems.
2. Also to understand the laws of special and general theory of relativity.

UNIT 1 - Introduction to quantum mechanics:

UNIT 2 - Formulation of Quantum mechanics:

UNIT 3 - Exactly solvable eigenvalue problems:
Time independent Schrodinger equation- particle in a square potential well – square potential barrier- alpha decay – simple harmonic oscillator(1D): Schrodinger equation and energy eigenvalues- energy eigen functions (qualitative) – properties of stationary states- - Angular momentum operators L² and L_z – eigenvalues and eigenfunctions (qualitative) for L² and L_z – Quantum approach to central potential – hydrogen atom – separation of variables – solution of radial equation (qualitative) eigenvalues and properties of stationary states- selection rules for allowed and forbidden transitions.(qualitative)

Unit 4 - Relativistic Kinematics

Unit 5 - Relativistic Dynamics

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:

Web sites:
PH5511 - OPTICS

Objectives: To expose the students to the fundamentals of optics and to provide the student with knowledge of the applications of optics.

Unit 1 - Geometrical Optics
Matrix method in ray optics - Effect of translation and refraction - Thick and thin lens formulae - Unit planes - Nodal planes - System of two thin lenses.
Dispersive power of a prism – Cauchy’s formula – Combination of prisms to produce – dispersion without deviation – deviation without dispersion - Direct vision spectroscope.

Unit 2 - Interference
Fresnel’s biprism – determination of wavelength of light and thickness of thin sheet of transparent material - Fresnel’s mirrors and Lloyd’s single mirror experiments - Achromatic fringes -Interference in thin films due to reflected and transmitted light -Fringes in wedge shaped films-Reflective and antireflective coatings - Michelson’s interferometer - determination of wavelength of light and thickness of thin transparent sheet.

Unit 3 -Diffraction
Rectilinear propagation of light - Zone plate - Fresnel diffraction - Diffraction at circular aperture, circular disc and a straight edge - Fraunhoffer diffraction - Diffraction at a single and double slit - Missing orders in double slit - Theory of diffraction grating - Determination of wavelength - Dispersive power - Rayleigh’s criterion for resolution and resolving power of a telescope ,microscope, prism and grating.

Unit 4 - Polarization
Plane of polarization - Polarization by reflection - Brewster’s law - Pile of plates- Polarization by refraction - Malu’s law -Double refraction - Nicol prism - Huygen’s explanation of double refraction in uniaxial crystals - Elliptically and circularly polarized light - Quarter and half wave plates -Production and determination of plane, elliptically and circularly polarized light - Optical activity - Fresnel’s theory - Specific rotation - Laurent’s half shade polarimeter.

Unit 5 - Applied Optics
Lasers- spontaneous and stimulated emission - Einstein’s coefficients - carbon dioxide and, Nd-YAG lasers.

BOOKS FOR STUDY:
1. Ajoy Ghatak, Optics, Tata McGraw Hill Co. 3rd edition- 2005 (For Matrix methods)

BOOKS FOR REFERENCE:
6. Introduction to Optics 3rd Ed - Pedrotti and Pedrotti - Addison - Wesley -2006
PH5512 - ELECTRICITY AND MAGNETISM

Category : MC
Semester : V
Credits : 6
No. of hrs/wk : 6

Objectives:
1. To make the students understand the basic concepts of Electricity and Magnetism.
2. To expose the students to the applications of Electricity and Magnetism.

Unit 1 - ELECTROSTATICS: Gauss’s Law and its applications – Gauss Divergence Theorem and differential form of Gauss’s Law – Poisson’s and Laplace’s equations. Electric potential – Potential as line integral of the Electric field – Relation between electric field and electric potential. Potential and field due to a dipole – quadrapole – Potential energy of a dipole in an electric field.

DIELECTRICS: An atomic view of dielectrics – Polarization and charge density – Gauss Law for dielectric medium – Relation between D, E & P. Dielectric constant, Susceptibility and relation between them – Clausius – Mossotti equation - Boundary conditions at the dielectric surface.


Unit 3 - MAGNETIC EFFECT OF AN ELECTRIC CURRENT: Biot–Savart’s rule – application to straight conductor, circular coil – Helmholtz Galvanometer. Amperes cuiralu law and its applications.


Unit 4 - TRANSIENT CURRENT: Rise and decay of current in LR and CR circuits, decay constants – Determination of high resistance by leakage – Transients in LCR circuits.


BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH5406 - FUNDAMENTALS OF NANOSCIENCE

Category : ES
Semester : V
Credits : 2
No. of hrs/wk : 3

Objectives:
1. To make the students understand the importance, relevance and potentialities of this emerging field
2. To make them recognize the rules and applications of nano science from the Physics perspectives.

Unit 1 - Introduction to Nanotechnology
Scientific revolution, Historical milestones, Emergence of Nanotechnology, Definition of nanotechnology, Bohr radius, Quantum confinement, Nanosized effects, Challenges in Nanotechnology

Unit 2 - Synthesis of Nanomaterials
Physical method: Ball Milling, Sputter deposition, electric arc deposition, Ion beam technique. Chemical method: Wet chemical synthesis – sol-gel processing, co-precipitation, hydrothermal, chemical vapor condensation, chemical bath deposition

Unit 3 - Types of Nanostructures
Definition of a Nano system - Types of Nanocrystals-One Dimensional (1D)-Two Dimensional (2D) -Three Dimensional (3D) nanostructured materials - Quantum dots - Quantum wire - Core/Shell structures

Unit 4 - Functional Nanomaterials
Carbon (CNT, graphene), Noble Metals (Au, Ag), Metal oxides (TiO₂, SnO₂, ZnO), Semiconductors (CdS, CdSe, CdTe), Magnetic nanoparticles, Semiconductor Nanocomposites

Unit 5 - Applications of nanomaterials
Applications in Physics: Nanoelectronics, Quantum dot and Dye sensitized solar cells, Photovoltaics, Hydrogen Production, Quantum electronic devices, CNT based transistor and Field Emission Display, Other applications: Nanosensors, Nanomedicine, Nanorobotics.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH5407 - ELECTRONICS – II

Category : ES
Semester : V
Credits : 2
No. of hrs/wk : 3

Objectives:
1. To expose the students to the principles and design of non-linear circuits and A/D & D/A convertors.
2. To provide the students with a thorough understanding of the functioning of the microprocessor 8085.
3. To introduce the students to the applications of 555 timer and Phase Locked Loops.

Unit 1 - Operational amplifiers (non-linear circuits)
Integrator - Differentiator - solving differential equations - logarithmic amplifiers- II order high pass and low pass filters - astable and monostable multivibrators - instrumentation amplifiers.

Unit 2 - Digital to analog and analog to digital conversion:
Weighted resistor D/A converter - R-2R ladder D/A converter - parallel A/D converter - A/D conversion by counter method - A/D conversion using voltage to frequency converter.

Unit 3 - Architecture of µP 8085:
Architecture of 8085 - the instruction set - data addressing modes – Introduction to I/O devices and interfacing
Simple assembly language programs - addition, subtraction, multiplication, division

Unit 4 - Assembly language programming - µP 8085
Assembly language programs: square, square root, picking largest/smallest of an array Subroutines - Hand assembling programs.

Unit 5 - Timer & Phase Locked Loop

BOOKS FOR STUDY:
1. S. L. Gupta, V. Kumar, A Handbook of Electronics, Pragati Prakashan 2008

BOOKS FOR REFERENCE:
8. Krishnamurthy Ten days with 8085 microprocessor PHI LEARNING PVT. LTD-NEW DELHI 2010
Objectives:
1. To introduce the concepts of materials science and motivate the students to a research career in it.
2. To focus on the relationship of structure of materials with its properties and
3. To throw light into the latest developments in the field.

Unit 1 - Engineering materials and chemical bonding

Unit 2 - Mechanical behavior of materials

Unit 3 - Magnetic materials and dielectric materials
Terminology and classification – magnetic moment due to electron spin – ferromagnetism and the domain structure – soft and hard magnetic materials.

Unit 4 - Smart Materials
Definition of smart materials - Types- Piezoelectric materials-Materials for MEMS and NEMS- Ferrofluid-Magnetic shape-memory alloys (MSMAs)- Shape memory alloy (SMA)- One way and Two way memory effect- Dielectric elastomers (DEs)- Light sensitive materials- Smart catalysts

Unit 5 - Non-destructive testing
Equipments used for NDT – metallurgical microscope - electron microscope – scanning electron microscope (SEM)

BOOKS FOR STUDY:
1. Raghavan V – Materials Science and engineering – a first course, IIIEd, PHI 1990

BOOKS FOR REFERENCE:
PH5409 - ENERGY PHYSICS

Category : ES  Credits : 2
Semester : V  No. of hrs/wk : 3

Objective:
1. The paper aims at providing to students the perspectives of energy sources, their availability and demand.
2. To expose the students to the basic principles of energy conversions, conservation and alternate energy resources.

Unit 1 - Introduction to Energy Sources
World Energy Reserves and Future —Various forms of energy - Conventional energy Sources – Fossil fuels - Coal, Oil and Natural Gas - impact of conventional energy sources on environment - global warming – climate change – non-conventional energy sources – Prospects in the energy sector.

Unit 2 - Solar Energy

Unit 3 - Wind Energy and Biomass Energy

Unit 4 - Emerging Sources of Renewable Energy

Unit 5 - Energy Consumption, Conservation and Options
Patterns of energy consumption in domestic, industrial, transportation and agricultural sectors - Principles of Energy Conservation and Energy Audit – energy crisis and possible solutions - energy options for the developing countries

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
8. Renewable energy resources - C S Solanki - PHI - 2008
PH5410 - GEOPHYSICS

Category : ES  
Semester : V  
Credits : 2  
No. of hrs/wk : 3

Objectives: To provide a qualitative idea on the fundamentals of seismology and theoretical understanding of various physical properties of earth.

Unit 1 - seismology
Introduction-Seismology- P- waves-S waves, their velocities- the location of epicenters-Effect of Boundaries-Major discontinuities-Seismic energy sources-Detectors-Interpretation of time and distance curves.-Derivation of properties from the velocities.

Unit 2 - internal structure of earth
Introduction-Seismic waves-Rayleigh waves and love waves-Study of earth by seismic waves-Earthquake seismology-Horizontal and vertical seismograph-Seismograph equation-Internal structure of earth.

Unit 3 - Earthquakes and gravity
Earthquakes: Focus, Magnitude, Frequency –Detection and prediction –Gravity –Absolute and relative measurements of gravity-Worden gravimeter-Application of gravity methods

Unit 4 - Geomagnetism

Unit 5 - Geochronology and Geothermal Physics
Geochronology-Radioactivity of the earth-Radioactive dating of rocks and minerals-Geological time scale

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH5513 - PHYSICS PRACTICAL – V

Category : MC
Semester : V
Credits : 3
No. of hrs/wk : 3

Objectives: It is aimed at exposing the under graduate students of the Physics department to the techniques of handling equipments, making error free measurements and error analysis.

1. Spectrometer- i-d curve-Refractive index.
3. EMF of a thermocouple- Potentiometer.
4. Field along the axis of a circular coil- Determination of $B_H$.
5. Field along the axis of a circular coil- Moment of a bar magnet.
7. Potentiometer- Calibration of low range Voltmeter.
8. Absolute determination of capacitance- BG.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:

PH5514 - PHYSICS PRACTICAL – VI

Category : MC
Semester : V
Credits : 3
No. of hrs/wk : 3

Objective : It is aimed at exposing the under graduate students of the Physics department to the techniques of handling equipments, making error free measurements and error analysis.

1. Inverting and Non-inverting amplifier – Op-amp.
2. Summing and Difference amplifier – Op-amp
4. Low and High pass filters (2nd order) – Op-amp
5. Astable multivibrator – Op-amp
6. Light to frequency converter – 555 timer
7. Mod n counter using 7493
8. ASM programs – Add & subtract (all modes of addressing) - µP 8085

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
**PH6611 - ATOMIC AND NUCLEAR PHYSICS**

**Category : MS**

**Semester : VI**

**Credits : 8**

**No. of hrs/wk : 6**

**Objectives:**

1. To enable the students understand the laws that govern the structure and properties of the atom, molecules and the nucleus.
2. Also to provide an introduction to the elementary particles.

### UNIT 1 - Ions, electrons and atomic structure

Detection of charged particles in electric and magnetic fields- Dunnigton's method for e/m- positive ray analysis: Thomson's parabola method - Bohr's atom model - Sommerfeld's relativistic atom model- the Vector atom model and the quantum numbers- comparison with quantum model.

Coupling schemes: L-S coupling and j-j coupling – Pauli’s exclusion principle - Magnetic moment due to (i) orbital motion of the electron (ii) due to spin- Stern and Gerlach experiment

### UNIT 2 - Atomic and molecular spectra

Spin-orbit interaction in atomic spectra - fine structure and sodium doublet - Zeeman effect: experiment - classical result - Quantum mechanical explanation- anomalous Zeeman effect - Paschen Back effect- Stark effect (qualitative)

Origin of a pure rotational spectra of a rigid linear molecule- vibrating diatomic molecule as a quantum harmonic oscillator- pure vibrational spectra- Spectroscopy (Schematic) : Ultraviolet - Infrared-absorption-Raman

### UNIT 3 - Properties of nuclei and Radioactivity

Isobars, isotopes, mirror nuclei -Nuclear mass and binding energy -Parity-Nuclear spin –Mass defect and packing fraction-Stable nuclei –Nuclear size, Nuclear magnetic moment-Electric quadrupole moment-Nuclear energy levels.


### UNIT 4 - Nuclear models, Fission and Fusion


### UNIT 5 - Elementary particle physics


**BOOKS FOR STUDY:**

1. R.Murugesan and Kiruthiga Sivaprasath, Modern Physics 14th Ed, S.Chand and Company Ltd, 2009 (Units 1, 2 & 5)

**BOOKS FOR REFERENCE:**

1. K.Gopla Krishnan, Atomic and Nuclear Physics, 3rd Ed. ,MacMillan India Ltd. 1994
PH6612 - SOLID STATE PHYSICS

Objectives:
1. To give the students a firm understanding of the basics of Solid State Physics.
2. To introduce the students to the applications of Solid State Physics and the physical properties of solids.

Unit 1 - Crystal Structure: Periodic array of atoms – Crystal lattice – Unit cell _ Basis – Symmetry considerations – Classification of crystals – Bravais lattices in three dimensions – Crystal Planes and Miller indices – crystal imperfections: zero and one dimensions – Burger’s vector


Unit 5 - Superconductivity: Introduction – Meissner effect – Levitation – Type I and Type II superconductivity – Vortex states – BCS theory (qualitative treatment only) – Josephson’s effect – Cooper pair tunneling.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH6613 - PHYSICS PRACTICAL – VII

Category : MS  
Semester : VI  
Credits : 4  
No. of hrs/wk : 3

Objectives: It is aimed at exposing the undergraduate students of the Physics department to the techniques of handling equipments, making error free measurements and error analysis.

1. Spectrometer- i-i’ curve- Refractive index.
2. Spectrometer- Dispersive power of a grating-normal incidence.
3. EMF of a thermocouple- Moving Coil galvanometer.
4. Field along the axis of a circular coil- Searle’s Vibration magnetometer- B_H.
5. Searle’s vibration magnetometer- Magnetic moment.
6. Mutual Inductance- BG.
7. High resistance by leakage- BG.
8. Potentiometer- Calibration of High range voltmeter.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:

PH6614 - PHYSICS PRACTICAL – VIII

Category : MS  
Semester : VI  
Credits : 4  
No. of hrs/wk : 3

Objectives: It is aimed at exposing the undergraduate students of the Physics department to the techniques of handling equipments, making error free measurements and error analysis.

1. Wein’s bridge oscillator – Op-amp
2. R-2R D/A converter – Op-amp
3. Temperature to voltage converter – Op-amp
4. Colpit’s oscillator – transistor
5. Double digit seconds counter – 7 segment
6. Flasher using relay – 555 timer
7. ASM programs – multiply & divide (all modes of addressing) - μP 8085
8. ASM programs – factorial & square root (all modes of addressing) - μP 8085

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:

PH6654 - ELECTRICAL AND ELECTRONICS SCIENCE & APPLIANCES

Category : SK  
Credits : 15
Semester : VI

No. of hrs/wk : 15

Objectives:
1. This course has been designed to provide an introduction to electrical machines and electronic instruments.
2. To enable students acquire knowledge on the basic working principles and troubleshooting of everyday household appliances.

ELECTRICAL AND ELECTRONICS SCIENCE

Unit 1 - Electrical Machines
D.C. Machines - constructional details - D.C. Generators- principle of working-types - emf equation D.C. motor
- induction motors-principle of working of 3 phase induction motor (Simple problems)

Unit 2 - Power Supplies and Regulators
Half-wave, full-wave and bridge rectifiers-efficiency and ripple factor for the above circuits- filters capacitors, inductors, L-section and Pi-section and RC filters - Voltage multipliers – Half-wave – Full-wave doublers - triplers and quadruplers - Voltage regulators- zener regulator - Emitter follower regulators - Series regulators – Switched mode power supply(SMPS) - Uninterrupted power supply (UPS) (Block diagrams only) - Transformerless power supplies

Unit 3 - Instrumentation

ELECTRICAL & ELECTRONIC APPLIANCES

Unit 4 - Electromechanical Components used in Electronic Equipment
Switches – Types - Mechanical, Electromechanical & Electronic Switches, characteristics and performance – connectors and relays - types and applications - panel components


Basics of Trouble Shooting
Tools used for repairing of electronic equipments – Soldering/de-soldering techniques – Basic Troubleshooting techniques - General safety considerations in Trouble Shooting – Practical troubleshooting problems

Unit 5 - House Wiring and Home Appliance Accessories

Home appliances

PRACTICALS
For units 1 to 3 (Any Eight to be selected by the course teacher)
1. Shift Registers - shift left, right and parallel load using JK flip-flop.
2. Counters- to design mod counters (of any sequence) using JK flip-flop.
3. Astable Multivibrator - using 555 timer, to study the Frequency response for different values of resistances and capacitances and to find the unknown resistance and capacitance.
4. Solving Boolean Expressions using K-map and implementing the logic circuit.
5. Switching mode power supply – design and testing.
6. Transformer - to find the efficiency of a single-phase transformer by conducting o.c. and s.c. tests.
7. Induction motor - to find the power input to a 3-phase induction motor using two watt meter method at no load and any other load.
8. DC motors-speed control.
9. Microcontroller Intel 8051 - Software programs – I
10. Micro controller Intel 8051-Software programs – II
11. Microcontroller Intel 8051- Interfacing – I
12. Microcontroller Intel 8051-Interfacing-II

For units 4 and 5 (Any Four to be selected by the course teacher)
1. Digital Multimeter – Basics and Troubleshooting
2. CRO – Calibration, Measurements and Troubleshooting
3. Function Generator – Basic tuning, measuring and troubleshooting techniques.
4. Introduction to Soldering /De-soldering
5. Stabilizers – Working and Troubleshooting soldering techniques
6. House Wiring – single phase
7. House Wiring – three phase
8. Inverters – Circuit design and Troubleshooting.
9. Fluorescent lamps and Decorative Serial lamps – Basics and maintenance techniques
10. Home appliances servicing – I (Electric iron/Electric kettle/ mixer grinder)
11. Home appliances servicing – II (Ceiling Fan/table fan)

BOOKS FOR STUDY:
FOR UNITS 1 to 3
2. Paul P. John, Electronic Devices and Circuits, New Age Intl., 2003
4. 8051 Manual and Student Work Book

FOR UNITS 4 and 5

BOOKS FOR REFERENCE:
PH6655 - ELECTRICAL AND ELECTRONIC SCIENCE & MACHINE SHOP TECHNOLOGY

Category : SK             Credits : 15
Semester : VI             No. of hrs/wk : 15

Objectives: This course has been designed to provide an introduction to electrical machines and the basics of machine shop technology as well as devices for production technology.

ELECTRICAL AND ELECTRONIC SCIENCE

Unit 1 - Electrical Machines

Unit 2 - Power Supplies and Regulators
Half-wave, full-wave and bridge rectifiers-efficiency and ripple factor for the above circuits- filters capacitors, inductors, L-section and Pi-section and RC filters - Voltage multipliers – Half-wave – Full-wave doublers - triplers and quadruplers - Voltage regulators- zener regulator - Emitter follower regulators - Series regulators – Switched mode power supply (SMPS) - Uninterrupted power supply (UPS) (Block diagrams only) - Transformerless power supplies

Unit 3 - Instrumentation

MACHINE SHOP TECHNOLOGY

Unit 4 - Planer, Shaper, Drilling Machines
Types of planers (Description only)-specifications-Principles of operation-Drives-Quick return mechanism-feed mechanism-Types, work holding devices and special fixtures-Types of tools -various operations.

Shaper
Types of shapers-specifications-standard plain-universal-draw cut -principles of operation- drives quick return mechanism-crank and slotted ink-feed mechanism work holding devices- tools and fixtures.

Drilling Machines
Drills -Flat drills- Twist drills- Nomenclature-Types of Drilling Machines-Bench type- Floor type-Radial Type-Gang Drill-Multi spindle type-Principle of operation in drilling-speeds and feeds for various materials -drilling holes-methods of holding drill bit-drill chucks- Reregrinding of Drill bits and Drill jigs.

Unit 5 - Milling, Grinding and Broaching Machines

Grinding: Types and classification-specifications –Rough Grinders-Floor mounted band grinders- portable grinders
Broaching: Types of broaching machine-Horizontal, vertical and continuous broaching –principles of operation.

PRACTICALS
For units 1 to 3 (Any eight to be selected by the course teacher)
1. Shift Registers-to shift left, right and parallel load using JK flip-flop.
2. Counters- to design modern counters (of any -sequence) using JK flip-flop.
3. Astable multivibrators-using 555 timer, to study the Frequency response for different values of resistances and capacitances and to find the unknown resistance and capacitance.
4. Solving Boolean Expressions using K-map and implementing the logic circuit.
5. Switching mode power supply – design and testing.
6. Transformer-to find the efficiency of a single-phase transformer by conducing o.c. and s.c. tests.
7. Induction motor-to find the power input to a 3-phase induction motor using two watt meter method at no load and any other load.
8. DC motors-speed control.
9. Microcontroller Intel 8051-Software programs -I
10. Microcontroller Intel 8051-Software programs-II
11. Microcontroller Intel 8051-Interfacing-I
12. Microcontroller Intel 8051-Interfacing-II

**For units 4 and 5 (Any Four to be selected by the course teacher)**
1. Shaping to the planned dimensions.
2. Cutting and bending.
3. Using drilling machines for various requirements.
4. Different types of welding.
5. Boxes of different sizes.
6. Wood work.
7. Experiments using lathe.

**BOOKS FOR STUDY:**

**FOR UNITS 1 to 3**
8. 8051 Manual and Student Work Book

**FOR UNITS 4 and 5**

**BOOKS FOR REFERENCE:**
PH3206 - PHYSICS FOR BIOLOGY

Category : AO
Credits : 3
Semester : III
No. of hrs/wk : 4
To Whom : PB & Bio Tech / Adv. Zoo

Objective: To expose the students of biology to some fundamental physics required for study of the measurements of physical properties related to biological systems.

Unit 1 Properties of matter

Unit 2 Laser Physics

Unit 3 Microscopes

Unit 4 Radiation Biology

Unit 5 Biological transducers

BOOKS FOR STUDY:
2. S. Armugam, Biomedical instrumentation, Anuratha Agencies, 2\textsuperscript{nd} Ed., 2006.
3. J. Kumar, S. Moorthy Babu, S. Vasudevan, Engineering Physics, Vijay Nicole Imprints Pvt. Ltd, 2006

BOOKS FOR REFERENCE:
3. D.S.Mathur, Properties of matter, S.Chand Publishing, 11\textsuperscript{th} Ed. 2005
4. P. Narayanan, Essentials of Biophysics, New Age International, 2\textsuperscript{nd} Ed. 2007
PH3207 - PHYSICS PRACTICAL FOR BIOLOGY

Category : AO
Semester : III
To Whom : PB & Bio Tech / Adv. Zoo

Credits : 1
No. of hrs/wk : 2

Objective: To expose the students of biology to some measurements of physical properties.

EXPERIMENTS:
1. Surface tension - capillary rise
2. Surface tension by method of drops
3. Viscosity by graduated burette
4. Focal length of a convex and concave lens
5. Melde’s string – longitudinal and transverse vibrations.
6. Temperature transducer.
7. Light Transducer.

BOOKS FOR REFERENCE:
PH3208 - MICROPROCESSOR 8085

Category : AO
Semester : III
To Whom : CS / CA

Credits : 3
No. of hrs/wk : 4

Objectives:
1. This paper aims at providing an in depth knowledge of the eight bit microprocessor 8085.
2. The students will also get the opportunity to practically work out the assembly language programs during the lab sessions.

Unit 1 - Architecture

Unit 2 - Instructions in 8085
Instruction set – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – immediate, direct, register indirect, register and implied

Unit 3 - ASM programs

Unit 4 - Interfacing I/O devices
Types of interfacing devices – address decoding for I/O – input/output ports – Programmable peripheral interface 8255 – Features of 8255 – programming 8255

Unit 5 - Interrupts
Interrupts in 8085 – hardware and software interrupts – RIM, SIM instructions – Simple polled and interrupt controlled data transfer.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
**PH3209 - MICROPROCESSOR 8085 PRACTICAL**

**Category : AO**
**Semester : III**
**To Whom : CS / CA**

**Credits : 1**
**No. of hrs/wk : 2**

**Objectives:**
1. This paper aims at providing an in depth knowledge of the eight bit microprocessor 8085.
2. The students will also get the opportunity to practically work out the assembly language programs during the lab sessions.

**EXPERIMENTS:**
1. ASM programs – Add & subtract (all modes of addressing) – microprocessor 8085
2. ASM programs – multiplication & division (all modes of addressing) – microprocessor 8085
3. ASM programs – factorial & square root (all modes of addressing) – microprocessor 8085
4. ASM programs – sorting & determining largest and smallest in an array – microprocessor 8085
5. ASM programs – code conversion - microprocessor 8085
6. Microprocessor 8085 – Interface I (LEDs & switches)
7. Microprocessor 8085 – Interface II (waveform generation)
8. Microprocessor 8085 – Interface III (frequency generation)
9. Microprocessor 8085 – Interface IV (Traffic light simulator)

**BOOKS FOR REFERENCE:**
Objective:
1. This paper provides an in depth knowledge to the students about semiconductor devices & integrated circuits and their functioning.
2. The students will also experimentally implement the theory they study through in practical sessions.

Unit 1 - Semiconductor Devices

Unit 2 - Optoelectronic Devices

Unit 3 - Operational amplifiers

Unit 4 - A/D and D/A convertors

Unit 5 - Timer and applications:
555 timer – Internal block diagram and working – Applications of 555 timer – Schmitt trigger – Astable and monostable operations

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH4209 - APPLIED PHYSICS PRACTICAL

Category : AO                         Credits : 1
Semester : IV                          No. of hrs/wk : 2
To Whom : CH / MT / CS / CA

Objective:
1. This paper provides an in depth knowledge to the students about semiconductor devices & integrated circuits and their functioning.
2. The students will also experimentally implement the theory they study through in practical sessions.

EXPERIMENTS:
1. Zener diode – Forward and Reverse Bias
2. Zener diode – regulated and unregulated power supply
3. Transistor Characteristics – CE mode
4. Inverting and non inverting amplifier – OPAMP
5. Summing and Difference amplifier – OPAMP
6. Solving simultaneous equations – OPAMP
7. R-2R D/A converter – OPAMP
8. Astable multivibrator – 555 timer
9. Light to frequency converter – 555 timer

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
PH3302 - WORKSHOP PRACTICE

Category : EG
Semester : III
No. of hrs/wk : 3
To Whom : Other Than Physics Students

Credits : 1

Objectives:
1. This course has been designed to provide an introduction to machines
2. The students will acquire knowledge on the basic working principles and manufacturing technology.


Unit 2: Properties, testing and inspection of metals – stress and strain- mechanical properties- destructive testing – comprehensive test- hardness test


Unit 4: Lathe- types of lathe-centering- turning- tapers and taper turning- grooving- filing-spinning-reaming-boring

Unit 5: Drilling – types of drilling machines- portable drilling- radial drilling- spindle drilling – machine time in drilling – boring – grinding

EXPERIMENTS:
Any eight to be selected by the course teacher
1. Marking out and filling plane surfaces. Use of surface plates, Angle plate, marking block, Height gauge, marking the centre of a round bar.
2. Hack sawing, chiselling.
3. Marking for drilling holes.
5. Filing right angles and open fitting, Use of vernier callipers.
9. Soldering, Sheet metal work.
10. Welding- fabrication.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
1. Myron L. Begeman , 1964, Asia publishing house, Bombay
2. Rajinder Singh, Introduction to basic manufacturing technology, 2010, New age publishers’ internationals publishers pvt. Ltd’
PH4304 - ELECTRICAL AND ELECTRONIC APPLIANCES

Category : EG  
Semester : IV  
Credits : 1  
No. of hrs/wk : 3  
To Whom : Other Than Physics Students

Objectives:
1. This paper is designed to make the students aware of the latest type of appliances and gadgets available and to know how they work.
2. The paper also aims at helping them to know how to make the best use of these appliances.
3. The students will further be exposed to essential maintenance and how to avoid potential health hazards if any

Unit 1 - Test and Measurement:

Unit 2 - Home appliances:

Unit 3 - Communication:

Unit 4 - Robotics:

Unit 5 - Computers:
Basic components – Motherboards – Memory – I/O devices – assembling – operating systems.

BOOKS FOR STUDY:

REFERENCES:
1. howstuffworks.com
2. wikepedia.com
3. Study material to be provided by the department.