GOVERNMENT COLLEGE FOR WOMEN (A)

GUNTUR

COURSE
INFORMATION BOOKLET

DEPARTMENT OF PHYSICS & ELECTRONICS

2023-2024

CONTENTS

Vision and Mission of the Department

Vision

Our vision is to develop scientific skills, Scientific reasoning among students that will Empower women to successfully move into the society with confidence and build their Abilities and skills in creation of developed Nation

Mission

- Provide high quality education in Physics within an environment committed to excellence in teaching.
- Provide intellectual challenging environment for the overall development of the students.
- Introduce wide range of innovative teaching and learning methods.
- Develop independent thinking, skill and the ability to solve the problems in physics.
- Develop analytical reasoning and critical thinking through creative assignments.
- Provide advanced knowledge in Physics to gain excellence in future projects.

Objectives for a B.Sc. Physics programme:

- To understand the concepts and significance of the various physical phenomena.
- To carry out experiments to understand the laws and concepts of Physics.
- To apply the theories learnt and the skills acquired to solve real time problems.
- To acquire a wide range of problem solving skills, both analytical and computational and to apply them.

Program Specific outcomes of B.Sc. Physics

PSO	Upon the successful completion of B.Sc., degree with Physics as one of the subject, the students will be able to
PSO1	Demonstrate in-depth knowledge of key concepts in Physics, Mathematics, Computer Science and Chemistry concepts in pursuing higher studies in Physics and its allied area like Electronics, Computer Science, Mathematics ,Chemistry etc.,
PSO2	Develop various basic skills, thinking skills and problem solving skills to solve wide range of real life problems and to get employment
PSO3	Develop various basic skills, thinking skills and problem solving skills to solve wide range of real life problems and to get employment
PSO4	Advanced learning techniques for students aiming to be a part of various research institutes of Physics, Chemistry and Mathematics and contribute to community development through goal oriented and Project-based interaction with the Community.

List of Programmes offered by the Department

S.No.	Title of the Programme
1	B.Sc. Honours (Physics) Major
2	B.Sc. Mathematics, Physics, Chemistry
3	B.Sc. Mathematics, Physics, Computer Science
4	B.Sc. Mathematics, Physics, Electronics
5	B.Sc. Mathematics, Electronics, Computer Science

B.Sc. Physics course structure (Three Major system)

Year	Semester	Course & Code	Title of the Course
I	I	Mechanics, Waves and Oscillations	(PHY302-1)
		Mechanics, Waves and Oscillations Practical Course	
	II	Wave Optics	(PHY302-2)
		Wave Optics Practical Course	
Community Service Project			
II	III	Thermodynamics & Radiation Physics	(PHY302-3)
		Thermodynamics & Radiation Physics Lab –III	
	IV	Electricity, Magnetism and Electronics	(PHY302-4)
		Electricity, Magnetism and Electronics Lab-IV	
	IV	Modern Physics	(PHY302-5)
		Modern Physics Lab-V	
Short term internship			
III	V	Optical Instruments and Optometry	(PHY302-6A)
		Optical Instruments and Optometry Lab – VI	
	V	Optical Imaging and Photography	(PHY302-7A)
		Optical Imaging and Photography Lab – VII	
	V	Low temperature Physics & Refrigeration	(PHY302-6B)
		Low temperature Physics & Refrigeration Lab – VI	
	V	Solar Energy and its applications	(PHY302-7B)
		Solar Energy and its applications Lab –VII	
	V	Applications of Electricity & Electronics	(PHY302-6C)
		Applications of Electricity & Electronics Lab -VII	
	V	Electronic Instrumentation	(PHY302-7C)
		Electronic Instrumentation Lab –VII	
	VI	**Semester end internship**	

Electronics Three Major System course structure

Year	Semester	Title of the course	Course code
I	I	Basic Theory & Electronic Devices	ELE 309-1
		Basic Theory & Electronic Devices Lab	
	II	Digital Electronics	ELE 309-2
		Digital Electronics Lab	
Community Service Project			
II	III	Analog Circuits and Communication	ELE 309-3
		Analog Circuits and Communication Lab	
	IV	Microprocessor Systems	ELE 309-4
		Microprocessor Systems Lab	
		Micro Controllers and Interfacing	ELE 309-5
		Micro Controllers and Interfacing Lab	
Short term internship			
III	V	Industrial Electronics	ELE 309-6A
		Industrial Electronics Lab	
		Electronic Instrumentation	ELE 309-7A
		Electronic Instrumentation Lab	
		Embedded systems design	ELE 309-6B
		Embedded systems design Lab	
		Consumer Electronics	ELE 309-7B
		Consumer Electronics Lab	
		VLSI Design	ELE 309-6C
		VLSI Design Lab	
		Data Communication and Networking	ELE 309-7C
		Data Communication and Networking Lab	
	VI	**Semester end internship**	

B.Sc. Physics course structure (Single Major System)

Year	Semester	Course	Title of the Course	Course code
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	1PS-CM-01
		2	Advances in Mathematical, Physical and Chemical Sciences	1PS-CM-02
	II	3	Mechanics and Properties of Matter	2PHY - 03
			Mechanics and Properties of Matter Practical Course	
		4	Waves and Oscillations	2PHY - 04
			Waves and Oscillations Practical Course	
Community Service Project				
II	III	5	Optics	2PHY - 05
			Optics Practical Course	2PHY – 05P
		6	Heat and Thermodynamics	2PHY - 06
			Heat and Thermodynamics Practical Course	2PHY – 06P
		7	Electronic Devices and Circuits	2PHY - 07
			Electronic Devices and Circuits Practical Course	2PHY – 07P
		8	Analog and Digital Electronics	2PHY - 08
			Analog and Digital Electronics Practical course	2PHY – 08P
	IV	9	Electricity and Magnetism	2PHY - 09
			Electricity and Magnetism Practical Course	2PHY – 09P
		10	Modern Physics	2PHY - 10
			Modern Physics Practical Course	2PHY – 10P
		11	Introduction to Nuclear and Particle Physics	2PHY - 11
			Introduction to Nuclear and Particle Physics Practical Course	2PHY – 11P
Short term internship				
		12	Applications of Electricity & Electronics	2PHY - 12
			Applications of Electricity & Electronics Practical Course	2PHY – 12P

III	V	13	Electronic Instrumentation	2PHY - 13
			Electronic Instrumentation Practical Course	2PHY – 13P
		14 A	Optical Instruments and Optometry	2PHY – 14A
			Optical Instruments and Optometry Practical Course	2PHY – 14AP
		OR		
		14 B	Optical Imaging and Photography	2PHY - 14 B
			Optical Imaging and Photography Practical Course	2PHY – 14BP
		15 A	Low Temperature Physics & Refrigeration	2PHY -15 A
			Low Temperature Physics & Refrigeration Practical Course	
		OR		
		15 B	Solar Energy and Applications	2PHY - 15 B
			Solar Energy and Applications Practical Course	2PHY – 15BP
	VI	Semester end internship		

List of Minors offered by the Department

Year	Semester	Minor Subject	Title of the Course	Course Code
I	II	Physics	Industrial Mechanics	MNR2INDPHY-01
		Electronics	Fundamentals of Electricity and Electronics	MNR2ELE-01

List of MDCs offered by the Department

Year	Semester	Title of the Course	Course Code
I	I	Principles of physical sciences	1MD-PHY

Physics Course wise Syllabus with Outcomes

SEMESTER – I
PAPER– I

Course Title: Essentials and Applications of Mathematical, Physical and Chemical Sciences
Course code: 1PS-CM-01

SYLLABUS

CO 2: To explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of Physics to Everyday situations

CO 4: Understand the interplay and connections between mathematics, physics and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

UNIT II: ESSENTIALS OF PHYSICS:

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behavior of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY:
Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Recommended books:

1. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
2. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
3. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett Jr.
4. Physics for Technology and Engineering" by John Bird

SEMESTER – I
PAPER– II
Course title: Advances in Mathematical, Physical and Chemical Sciences
Course code: 1PS-CM-02
SYLLABUS

CO 2: To explain the basic principles and concepts underlying a broad range of fundamental of physics and to connect their knowledge of physics to everyday situations.

CO 5: Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

UNIT II: ADVANCES IN PHYSICS

Renewable energy: Generation, energy storage, and energy-efficient materials and devices.

Recent advances in the field of nanotechnology: Quantum dots, Quantum Communication

Recent advances in the Bio-Physics

Recent advances in the Medical-Physics - Shape Memory Materials.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

Mathematical Modeling applications in Physics and Chemistry

Application of Renewable energy: Grid Integration and Smart Grids,

Application of nanotechnology: Nano-medicine,

Application of Bio-Physics: Biophysical Imaging, Biomechanics, Neurophysics,

Application of Medical physics: Radiation Therapy, Nuclear medicine, Solid waste management, Environmental remediation- Green Technology, Water treatment

Recommended books:

1. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
2. "Energy Storage: A Nontechnical Guide" by Richard Baxter
3. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara
4. "Biophysics: An Introduction" by Rodney Cotterill
5. "Medical Physics: Imaging" by James G. Webster
6. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas

SEMESTER – II
PAPER– III
Course title: Mechanics and Properties of Matter
Course code: 2PHY-03

Course Outcomes:

1. Able to define , memorize, understand and explore the principles of Mechanics and Properties of Matter
2. Able to apply, demonstrate , analyze and differentiate the concepts of the Mechanics and Properties of Matter
3. Able to evaluate, create and formulate about the Mechanics and Properties of Matter

UNIT-I: VECTOR ANALYSIS

Scalar and vector fields, gradient of a scalar field and its physical significance- Divergence and curl of a vector field with derivations and physical interpretation- Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems

UNIT-II: MECHANICS OF PARTICLES

Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scatteringcross-section, Rutherford scattering-derivation

UNIT-III: MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA

Definition of rigid body-rotational kinematic relations-equation of motion for a rotating body- Precession of a top-Gyroscope- Precession of the equinoxes- Elastic constants of isotropic solids and their relations- Poisson's ratio and expression for Poisson's ratio -Types of bending, point load, distributed load.

UNIT-IV CENTRAL FORCES

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion of a particle under central force - Derivation of Kepler’s laws. Motion of satellites-Basic idea of Global Positioning System (GPS), weightlessness, Physiological effects of astronauts

UNIT-V SPECIAL THEORY OF RELATIVITY

Introduction to relativity, Frames of reference, Galilean relativity-Absolute frames. Michelson-Morley experiment - the negative result - Postulates of special theory of relativity-Lorentz transformation, time dilation, length contraction, Variation of mass with velocity, mass-energy relation

REFERENCE BOOKS:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi

3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S.Chand & Co, New Delhi ,11th Edn., 2000
5. Physics Vol. I - Resnick-Halliday-Krane ,Wiley, 2001
6. Properties of Matter – Brijlal & Subrmanyam, S. Chand &Co. 1982
7. Dynamics of Particles and Rigid bodies– Anil Rao, Cambridge Univ Press, 2006
8. Mechanics-EM Purcell, Mc Graw Hill

COURSE 3: MECHANICS AND PROPERTIES OF MATTER PRACTICAL

List of experiments to be done and recorded

1. Viscosity of liquid by the flow method (Poiseuille's method)
2. Young's modulus of the material of a bar (scale) by uniform bending
3. Young's modulus of the material a bar (scale) by non- uniform bending
4. Surface tension of a liquid by capillary rise method
5. Determination of radius of capillary tube by Hg thread method
6. Viscosity of liquid by Searle's viscometer method
7. Bifilar suspension –moment of inertia of a regular rectangular body.
8. Determination of moment of inertia using Fly-wheel
9. Determination of the height of a building using a sextant.
10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)

SEMESTER – II
PAPER– IV
Course title: Waves and Oscillations
Course code: 2PHY-04

Course outcomes:

1. Able to understand, acquire knowledge and hard skills based on the concepts of waves and Oscillations

2. Able to develop critical and creative thinking skills, problem solving skills to empower themselves by learning the concepts of simple, damped, forced oscillations, complex vibrations, vibrating strings and bars, ultrasonics of waves and oscillations.

3. Able to create, formulate, interpret and evaluate the obtained results in practical, project based and environmental applications of waves and oscillations

UNIT-I: SIMPLE HARMONIC OSCILLATIONS

Simple harmonic oscillator and solution of the differential equation-Physical characteristics of SHM, torsion pendulum-measurements of rigidity modulus, compound pendulum-measurement of 'g', Principle of superposition, Doppler effect, beats, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies. Lissajous figures.

UNIT-II: DAMPED AND FORCED OSCILLATIONS

Damped harmonic oscillator, solution of the differential equation of damped oscillator-Energy considerations, comparison with un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance and velocity resonance

UNIT-III: COMPLEX VIBRATIONS

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, simple problems on evolution of Fourier coefficients

UNIT-IV: VIBRATING STRINGS AND BARS

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance- Longitudinal vibrations in bars-wave equation and its general solution- Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint (iii) bar fixed at one end- Tuning fork.

UNIT-V: ULTRASONICS

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magneto strictive methods, detection of ultrasonics, determination of wavelength of ultrasonic waves in liquids- Applications and uses of ultrasonic waves

REFERENCE BOOKS

1. BSc Physics Vol.1, Telugu Academy, Hyderabad.
2. Fundamentals of Physics. Halliday/Resnick/Walker ,Wiley India Edition 2007.
3. Waves & Oscillations. S.Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
4. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
5. Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004
6. Introduction to Physics for Scientists and Engineers. F.J. Buche. McGraw Hill.

Practical Course 3 PHY302-3P

Experiments List

1. Volume resonator experiment
2. Determination of 'g' by compound/bar pendulum
3. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean bystatistical analysis
4. Determination of the force constant of a spring by static and dynamic method.
5. Determination of the elastic constants of the material of a flat spiral spring.
6. Coupled oscillators
7. Verification of laws of vibrations of stretched string –sonometer
8. Determination of frequency of a bar –Melde's experiment.
9. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant anddamping correction of the amplitude.
10. Formation of Lissajous figures using CRO.

SEMESTER – III
PAPER– III
Course title: Thermodynamics & Radiation Physics
Course code: PHY302-3

Course outcomes:

1. Able to memorize, understand and explore the basic properties and laws of Thermodynamics & Radiation Physics

2. Able to develop, empower critical and reflective thinking with the theories and properties studied in Thermodynamics& Radiation Physics and to apply them to learn and differentiate the concepts of Thermodynamics, Entropy, Thermodynamic potentials, Maxwell's equations, low temperature physics, quantum theory of radiation.

3. Able to create, formulate, interpret and evaluate the obtained results in practical, project based and environmental applications of Thermodynamics & Radiation Physics

UNIT-I

1. KINETIC THEORY OF GASES (8 HRS)
Introduction, Maxwell's law of distribution of molecular velocities (qualitative treatment only) and its experimental verification, Mean free path, Degrees of freedom, Principle of equi-partition of energy (Qualitative ideas only)

2. TRANSPORT PHENOMENON IN IDEAL GASES (4 HRS)
Viscosity, Thermal conductivity and diffusion of gases

UNIT-II

3. THERMODYNAMICS (7 HRS)
Introduction- Isothermal and Adiabatic processes, Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Thermodynamic scale of Temperature and its identity with perfect gas scale, Second law of thermodynamics: Kelvin's and Clausius statements, Principle of refrigeration

4. ENTROPY (5 HRS)
Entropy, Physical significance, Change in entropy in reversible and irreversible processes; Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses, change of entropy when ice changes into steam.

UNIT-III

5. THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS (12HRS)

Thermodynamic potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Applications to (i) Clausius-Clayperon's equation (ii) Value of $C_P - C_V$ (iii) Value of C_P/C_V (iv) Joule-Kelvin coefficient for ideal and VanderWaals'gases

UNIT-IV

6. LOW TEMPERATURE PHYSICS (6 HRS)

Methods for producing very low temperatures, Joule Kelvin effect, Porous plug experiment, Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling

7. LIQUEFACTION METHODS (6 HRS)

Liquefaction of air by Linde's method, Production of low temperatures by adiabatic demagnetization (qualitative), Practical applications of substances at low temperature, Ozone layer, effect of uv radiation on ozone layer, chlorofluro carbons -their effect on ozone layer

UNIT-V

8. QUANTUM THEORY OF RADIATION (5 HRS)

Blackbody, Fery's and Weins black body, spectral energy distribution of black body radiation, Kirchoff's law, Wein's displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations)

9. PLANCK'S LAW (7 HRS)

Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh-Jean's law from Planck's law, Measurement of Radiation, Types of pyrometers, Disappearing filament optical Pyrometer, experimental determination, Solar constant and its determination using Angstrom pyroheliometer, Estimation of surface temperature of Sun

REFERENCE BOOKS

1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad
2. Thermodynamics, R.C.Srivastava, S.K.Saha& AbhayK.Jain, Eastern Economy Edition.
3. Unified Physics Vol.2, Optics & Thermodynamics, Jai rakashNath&Co.Ltd.,Meerut
4. Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition2007
5. Heat and Thermodynamics -N BrijLal, P Subrahmanyam, S.Chand&Co.,2012
6. Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd,2000
7. Physics, HD Young, MW Zemansky,FW Sears, Narosa Publishers, New Delhi

Practical Course 3 PHY302-3P

1. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction
2. Thermal conductivity of bad conductor-Lee's method
3. Thermal conductivity of rubber.
4. Measurement of Stefan's constant.
5. Specific heat of a liquid by applying Newton's law of cooling correction.
6. Heating efficiency of electrical kettle with varying voltages.
7. Thermo emf- thermo couple -Potentiometer
8. Thermal behavior of an electric bulb (filament/torch light bulb)
9. Measurement of Stefan's constant- emissive method
10. Study of variation of resistance with temperature -Thermistor.

SEMESTER – IV
PAPER– IV
Course title: Electricity, Magnetism & Electronics
Course code: PHY302-4

Course outcomes:

1. Explain Gauss law and biot savarts law and its applications in Electricity and magnetism. Deduce (L5) the Gauss law and its application to obtain electric field in different cases. Develop (L6) the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant. Summarize (L2) Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.

2. Illustrate the applications of electromagnetic induction. Distinguish (L4) between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances. Develop (L6) an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves. Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the Compare (L5) of series and parallel resonant circuits.

3. Describe and analyze basic and digital electronics also construct required logic circuits. Describe(L2) the operation of p-n junction diodes, zener diodes, light emitting diodes and transistors • Analyse (L4) the operation of basic logic gates and universal gates and their truth tables. Choose(L3) the proper logic gates to construct required circuit

1. Electrostatics (6hrs)

Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere and (ii) an infinite conducting sheet of charge, Deduction of Coulomb's law from Gauss law, Electrical potential–Equi-potential surfaces, Potential due to a (i) dipole (ii)uniformly charged sphere.

2. Dielectrics (6hrs)

Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics, Dielectric strength, Capacitance of a parallel plate condenser with dielectric slab between the plates, Electric displacement D, electric polarization P, Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II

3. Magneto statics (6 hrs)

Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Divergence and Curl of Magnetic field, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.

4. Electromagnetic Induction (6 hrs)

Faraday's laws of electromagnetic induction, Lenz's law, Self induction and Mutual Induction, Self-inductance of a long solenoid, Mutual inductance of two coils, Energy Stored in magnetic field, Eddy currents and Electromagnetic damping

UNIT-III

5. Alternating currents (6 hrs)

Alternating current - Relation between current and voltage in LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Power factor.

6. Electromagnetic waves-Maxwell's equations (6 hrs)

Idea of displacement current, Maxwell's equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement and proof).**Basics in vector analysis**

UNIT-IV

7. Basic Electronic devices (12hrs)

PN junction diode, Zener diode and Light Emitting Diode (LED) and their I-V Characteristics, Zener diode as a regulator-Transistors and its operation, CB, CE and CC Configurations, Input and output characteristics of a transistor in CE mode, Relation Between alpha, beta and gamma; Hybrid parameters, Determination of hybrid parameters from transistor characteristics; Transistor as an amplifier.

UNIT-V

8. Digital Electronics (12hrs)

Number systems, Conversion of binary to decimal system &vice versa, Binary addition & Binary subtraction (1's &2's complement methods), Laws of Boolean algebra, De-Morgan's laws-Statements & Proof, Basic logic gates, NAND & NOR as universal gates, Exclusive-OR gate, Half& Full adders.

REFERENCE BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand &Co.
3. Electricity and Magnetism, B.D.Duggal and C.L.Chhabra. Shobanlal&Co.
4. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand&Co.,
5. Electricity and Magnetism, R.Murugeshan, S. Chand &Co.
6. Principles of Electronics, V.K. Mehta, S.Chand&Co.,
7. Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHill Edition.

SEMESTER – IV
PAPER– V
Course title: Modern Physics
Course code: PHY302-5

Course outcomes:

1. Able to define , memorize, understand and explore the principles of the Elements of Modern Physics
2. Able to apply, demonstrate , analyze and differentiate the concepts of the elements of Modern Physics
3. Able to evaluate, create and formulate about the Elements of Modern Physics.

UNIT-I

1. Atomic and Molecular Physics (8hrs)

Blackbody radiation, photoelectric effect, Compton Effect, Bohr's atomic model,
Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, Spectral terms and spectral notations, Selection rules, Intensity rules, Fine structure of Sodium D-lines Zeeman Effect, Experimental arrangement to study Zeeman Effect

2. Raman Effect (4 Hrs)
Raman Effect, Characteristics of Raman effect, Experimental arrangement to study Raman Effect, Quantum theory of Raman Effect, Applications of Raman effect

UNIT-II

3. Matter waves (6 hrs)
Matter waves, de Broglie's hypothesis, Wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities,

4. Uncertainty Principle (6 hrs)
Heisenberg's uncertainty principle for position and momentum& energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit)and photons(Gamma ray microscope),Bohr's principle of complementarily.

UNIT-III

5. Quantum (Wave) Mechanics (8 hrs)
Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations-Derivations, Physical interpretation of wave function, Eigen functions, Eigen values,

6. Applications (4 Hrs)
Application of Schrodinger wave equation to (i) one dimensional potential box of infinite height (Infinite Potential Well) and (ii) one dimensional harmonic oscillator

UNIT-IV

7. Nuclear Structure (6 Hrs)

General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces- Yukawa's meson theory; Nuclear Models: Liquid drop model, The Shell model, Magic numbers

8. Nuclear Radiation detectors (6 Hrs)

G.M. Counter, Cloud chamber, Solid State detector; Elementary Particles: Elementary Particles and their classification

UNIT-V

9. Nanomaterials (7hrs)

Nanomaterials – Introduction, Electron confinement, Size effect, Surface to volume ratio, Classification of nano materials– (0D, 1D, 2D); Quantum dots, Nano wires, Fullerene, CNT, Graphene (structures and properties),Distinct properties of nano materials (mechanical, optical, electrical, and magnetic properties); applications of nano materials**:(Fuel cells, Phosphors for HD TV, Next Generation Computer chips, elimination of pollutants, sensors).**

10. Super conductivity (5 Hrs)

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect , Isotope effect, Josephson's effect Type I and Type II superconductors, BCS theory (elementary ideas only),Applications of superconductors.

REFERENCE BOOKS

1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad
2. Atomic Physics by J.B. Rajam; S.Chand&Co.,
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-HillEdition.
5. Nuclear Physics, D.C.Tayal, Himalaya PublishingHouse.

SEMESTER – V
PAPER– VI
Course title: Low temperature physics & refrigeration
Course code: PHY302-6B

Course outcomes:

CO1: Develop the concepts of producing low temperature and its measurement of thermometers. Develop(L6) low temperatures in the Laboratory. Explain (L5) the concepts of producing low temperature. Classify (L4) various types of thermometers using to measure low temperature and its advantages.

CO2: Understand the concepts of refrigeration and their components &using various refrigerants. Demonstrate (L2) skills of Refrigerators through hands on experience,& using various refrigerants. Analyze (L4) different refrigeration components and their accessories working.

CO3: Conclude the applications of Low Temperature Physics and refrigeration. List (L1) the applications of low temperature. Explain (L2) the application of low temperature in different fields

UNIT-I

1. Production of Low Temperature (10hrs)

Production of low temperatures - Introduction, Freezing mixtures, Joule-Thomson effect, Regenerative cooling - Different methods of liquefaction of gases- HAMPSON and LINDE's liquefaction of air. Production of liquid hydrogen and nitrogen, Adiabatic demagnetization, Properties of materials at low temperatures, Superconductivity

UNIT-II

2. Measurement of Low Temperature (10hrs)

Gas thermometer and its correction and calibration, Secondary thermometers, resistance thermometers, thermocouples, Vapour pressure thermometers, Magnetic thermometers, Advantages and drawbacks of each type of thermometer

UNIT-III

3. Principles of Refrigeration (10hrs)

Introduction to Refrigeration- Natural and artificial refrigeration, Stages of refrigeration, Types of refrigeration - Vapor compression and vapor absorption refrigeration systems, Refrigeration cycle and explanation with a block diagram, Introductory ideas on air-conditioning. Differentiate between vapour compression and vapour absorption systems.

Refrigerants-Introduction, Ideal refrigerant, Properties of refrigerant, Classification of refrigerants, commonly used refrigerants, Eco-friendly refrigerants

UNIT-IV

4. Components of Refrigerator (10hrs)

Refrigerator and its working, Block diagram, Coefficient of Performance (COP), Tons of refrigeration (TR) and Energy Efficiency Ratio (EER), Refrigerator components: Types of compressors, evaporators and condensers and their functional aspects, defrosting in a refrigerator, Refrigerant leakage and detection

UNIT-V

5. Applications of Low Temperature & Refrigeration (10hrs)

Applications of Low temperatures: Preservation of biological material, Food freezing, liquid nitrogen and liquid hydrogen in medical field, Superconducting magnets in MRI-Tissue ablation (cryosurgery)-Cryogenic rocket propulsion system-importance of liquid nitrogen

Applications of refrigeration: Domestic refrigerators, Water coolers, Cold storages, Ice plants, Food preservation methods, Chemical and Process industries, Cold treatment of metals, Construction field, Desalination of water, Data centers

SEMESTER – V
PAPER– VII
Course title: Solar Energy and its applications
Course code: PHY302-7B

Course outcomes:

- Able to demonstrate the direct and diffuse radiation and sketch the corresponding diagrams and can compare the pyroheliometer and pyranometer Can list types of thermal collectors and describe their working and can calculate their efficiency and can distinguish the different types of solar cookers
- Able to differentiate types of semiconductors interface and can discuss the output parameters and sketch I-V characteristics. Also can discriminate their series &shunt resistance
- Able to differentiate the type of solar cells discuss the structure of different solar cells and choose the correct cell required purpose and can analyze the fabrication steps

UNIT-I

1. Basic Concepts of Solar Energy (10hrs)

Energy- Sources -Spectral distribution of solar radiation, Solar constant , zenith angle and Air-Mass, standard time, local apparent time, equation of time, direct, diffuse and total radiations Pyrheliometer-working principle, direct radiation measurement, Pyrometer-working Principle, diffuse radiation measurement, Distinction between the two meters.

UNIT-II

2. Solar Thermal Collectors (10hrs)

Solar Thermal Collectors-Introduction, Types of Thermal collectors, Flat plate collector – liquid heating type, Evacuated tube collector, collector-solar water heating system, natural and forced circulation types Concentrating collectors, Solar cookers, Solar dryers, Solar desalinators,

UNIT–III

3. Fundamentals of Solar Cells (10hrs)

Semiconductor interface, Types, homo junction, hetero junction and Schottky barrier, advantages and drawbacks, Photovoltaic cell, equivalent circuit, output parameters, quantum efficiency, Measurement of I-V characteristics, series and shunt resistance, their effect on efficiency

UNIT-IV

4. Types of Solar cells And Modules (10hrs)

Types of solar cells, Crystalline silicon solar cells, I-V Characteristics, poly-Si cells, Amorphous silicon cells, Thin film solar cells-CdTe/CdS and CuInGaSe2/CdS cell configurations, structures, advantages and limitations, Multi junction cells – Double and triple junction cells. Module fabrication steps, Modules in series and parallel, Bypass and blocking diodes

Unit–V

5. Solar Photovoltaic Systems (10hrs)

Energy storage in PV systems, Energy storage modes, electrochemical storage, Batteries, Primary and secondary, Solid-state battery, Molten solvent battery, lead acid battery and dry batteries- **Gel electrolyte Battery**-Mechanical storage –Flywheel, Electrical storage –Super capacitor

References:

1. Solar Energy Utilization by G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modeling and applications by G.N. Tiwari, NarosaPublications,2005.
3. Solar Energy-Principles of thermal energy collection & storage by S.P. Sukhatme, Tata Mc-Graw Hill Publishers, 1999.
4. Science and Technology of Photovoltaics, P.Jayarama Reddy, CRC Press(Taylor &Francis Group), Leiden &BS Publications,Hyderabad,2009.
5. Solar Photovoltaics-Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt.Ltd.,
6. https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar_energy_v1.1.pdf

Electronics
Course wise Syllabus with Outcomes

SEMESTER – III
PAPER–III
Course Title :: Analog circuits & Communication
Code :: ELE309-3

Course Outcomes:

CO – 1: Students will be able to understand The working principle of Different electronic circuits and their applications in real life. Students are able to memorize the semiconductor devices and different operating conditions and their performance parameters

CO – 2: Able to recognize the proper semiconductor devices depending up on application considering economic and technology up gradation. Students are capable to analyze different practical issues modelling of semiconductor devices

CO – 3: Illustrate the basic different signal processing circuits and the use in industrial ,real life ,modern control system applications. Able to modelling simulations, parameters with standard equivalent circuit model to predict correctly the expected performance of various general electronic circuits

UNIT I

1. Operational amplifiers (12hrs)

Definition, Characteristics of Op-Amp, Block diagram of op-amp, inverting, no inverting, virtual ground, summing amplifier, subtractor, voltage follower, op-amp parameters, voltage to current convertor ,integrator, differentiator, differential amplifier, Logarithmic amplifier.

UNIT- II

2. OP-AMP Circuits(12hrs)

Voltage regulator, comparator, zero cross detecting circuit, instrumentation amplifier, Schmitt trigger. sine wave generator, square wave generator, triangular wave generator, Active filters (Basics)-low pass, high pass, band pass filters.IC-555 functional block diagram and mention its applications

UNIT III

3. Amplitude Modulation (12hrs)

Need for modulation, amplitude modulation-frequency spectrum of AM wave, representation of AM, power relations in the AM wave .Generation of AM-Transistor modulators .Detection of AM signals Diode detector.

UNIT-IV

4. Frequency Modulation (12hrs)

Theory of FM, Frequency deviation and carrier swing, modulation index, deviation ratio, percent modulation, Mathematical representation of FM, frequency spectrum and bandwidth of FM waves, Generation of FM signals Varactor diode modulator and

Reactance modulator. Detection of FM waves ñ FM demodulation with discriminator.

UNIT-V

5. Radio Broadcasting and Reception (12hrs)

Spectrum of electromagnetic waves, Radio broadcasting and reception, Transmitters, AM receivers- Straight forward receiver, super heterodyne receiver, FM receivers

TEXT BOOKS:

1. Op Amp and Linear Integrated Circuits By Ramakan tGaykwad
2. Linear Integrated Circuits By Roy Choudary
3. Unified Electronics Vol II ñ J.P. Agarwal and AmitAgarwal.
4. Electronic Communications – George Kennedy
5. Antennas and Wave Propagation ñ G.S.N.Raju ñPHI
6. Principles of communication system ñ Herbert Taub & D.L.Schilling

Experiment List:

1. Op-Amp as inverting and non-inverting
2. Op-Amp Voltage follower and current follower.
3. Op-Amp as integrator and differentiator
4. Op-Amp as adder & subtractor
5. Op-Amp as voltage to current converter
6. Op-Amp as square wave generator
7. Amplitude modulation and demodulation.
8. AM Transimitter and Receiver.
9. FM Transmitter and Receiver

SEMESTER – IV

PAPER–IV

Course Title :: Microprocessor Systems

Code :: ELE309-4

Course Outcomes:

CO – 1: Students will be able to understand The working principle of Different Processors circuits and their applications in real life. Students are able to memorize the Memory devices and different operating concepts and their performance using ICs

CO – 2: Able to recognize the Pin configurations depending up on application considering processors technology up gradation. Students are capable to analyze different practical issues modeling of ICs and structures

CO – 3: Illustrate the basic different logical operations in microprocessors, differences between micro controllers Able to modelling simulations,

UNIT -I

1. CPU Architecture (12 Hrs)

Introduction to Microprocessor, INTEL -8085(p) Architecture, CPU, ALU unit, Register organization, Address, data and control Buses Pin configuration of 8085. Addressing modes 8086 Microprocessor-Architecture, Pin description, Instruction format, Instruction Execution timing, addressing modes

UNIT -II

2.8085 Instruction Set (12 Hrs)

Data transfer Instruction**,** Logical Instructions**,** Arithmetic Instructions**,** Branch Instructions and Machine Controlling Structures

UNIT -III

3. Assembly Language Programming using 8085 (12 Hrs)

Programmes for Addition, Subtraction, Multiplication and Division, largest and smallest number in an array, BCD to ASCII and ASCII to BCD, Block of data transfer

UNIT -IV

4. Basic 8086 Configurations (12 Hrs)

Minimum mode and Maximum Mode, Interrupt Priority Management I/O Interfaces: Serial Communication interfaces, Parallel Communication, Programmable Timers, Keyboard and display, DMA controller

UNIT -V

5. ARM Processor (12 Hrs)

Introduction to 16/32 bit processors, Arm architecture & organization, Arm based MCUs, Programming model, Instruction set.

Text Books:

1. MicroprocessorArchitecture,ProgrammingandApplicationswiththe8085ñPenram

International Publishing, Mumbai.- Ramesh S.Gaonakar
2. MicrocomputerSystemsthe8086/8088familyñYU-ChengLiuandGlennSAGibson
3. Microcontrollers Architecture Programming, Interfacing and System Design RajKamal Chapter: 15.1, 15.2, 15.3,15.4.1
4. 8086 and 8088 Microprocessor by Tribel and Avatar Singh

LAB LIST: Programs using Intel 8085

1. Addition and Subtraction 8 bit
2. Addition and Subtraction 16 bit
3. Multiplication and Division (8-bit)
4, Multiplication and Division (16-bit)
5. Largest number in an array.
6. Smallest number in an array.
7. BCD to ASCII and ASCII to BCD

SEMESTER – IV
PAPER–V
Course Title :: Microcontroller and Interfacing
Code :: ELE309-5

Course Outcomes:

CO – 1: Describe the evolution of 8051controllers, differentiate processor and controller, understand the architecture, pin configuration

CO – 2: Explain different instructions, Discuss addressing modes of 8051, Develop program by using simulation tool 8051. Perform different types of programmes using 8051.

CO – 3: Familiarize with interfacing of various peripheral devices, Understand the complete operation and functioning of peripheral devices with 8051

UNIT-I (10Hrs)

1. Micro Controller

Introduction, comparison of Microprocessor and micro controller, Evolution of microcontrollers from 4-bit to 32bit, Development tools for microcontrollers, Assembler-Compiler-Simulator/Debugger

UNIT-II (10 Hrs)

2. Microcontroller Architecture

Overview and block diagram of 8051, Architecture of 8051, program counter and memory organization, Data types and directives, PSW register, Register banks and stack, pin diagram of 8051, Port organization, Interrupts and timers.

UNIT-III (10 Hrs)

3. Addressing modes, instruction set of 8051

Addressing modes and accessing memory using various addressing modes, instruction set: Arithmetic, Logical, Simple bit, jump, loop and call instructions and their usage. Time delay generation and calculation, Timer/Counter Programming

UNIT –IV (15 Hrs)

4. Assemble language programming Examples:

Addition, Multiplication, Subtraction, division, arranging a given set of numbers in largest/smallest order

UNIT-V (15 Hrs)

5. Interfacing and Application of Microcontroller

Interfacing of PPI 8255, DAC (0804), Temperature measurement (LM35), interfacing seven segment displays, displaying information on a LCD, control of a stepper Motor (Uni-Polar)

TEXT BOOKS:

1. The 8051 microcontroller and embedded systems using assembly and c-kennetj.Ayalam,

Dhananjay V. gadre, cengage publishers

2. The 8051 microcontrollers and Embedded systems-ByMuhammadAliMazidiandJanice Gillispie Mazidi Pearson Education Asia, 4th Reprint, 2002.

REFERENCE BOOKS:

1. Microcontrollers Architecture Programming, Interfacing and System Design **RajKamal.**

2. The 8051 Microcontroller Architecture, Programming and Application - **Kenneth J. Ajala ,**west publishing company (ST PAUL, NEW YORK, LOS ANGELES

3. Microcontroller theory and application-Ajay V.Deshmukh

LAB LIST:

1. Addition And Subtraction Of Two 8-Bit Numbers.
2. Multiplication And Division Of Two 8-Bit Numbers.
3. Largest number /smallest in an array.
4. Exchange Of Higher And Lower Nibbles In Accumulator.
5. Addition Of Two 8-Bit Numbers (Keil Software).
6. Addition Of Two 16-Bt Numbers (Keil Software)
7. Subtraction Of Two 8-Bit Numbers (Keil Software).
8. Subtraction Of Two 16-Bit Numbers (Keil Software).
9. Multiplication Of Two 8-Bit Numbers (Keil Software).
10. Program For Swapping And Compliment Of 8-Bit Numbers (Keil Software).
11. Program To Find The Largest Number In Given Array (Keil Software).
12. Program To Find The Smallest Number In Given Array (Keil Software

SEMESTER – V

PAPER–VIA

Course Title :: Industrial electronics

Code :: ELE309-6A

Course Outcomes:

CO – 1: Describe full, half wave rectifier working and calculate efficiency, Discuss regulated power supply block diagram, switch mode power supply, bridge rectifier .

CO – 2: Explain working of silicon controlled rectifier as full and half wave, understand about voltage multipliers, voltage doublers, triplers working and functioning, explain about the filter action, series and parallel inverters.

CO – 3: Familiarize with the principles of heating effects of inductance, dielectric materials, understand the experimental changes of resistive heatings.

UNIT-I

1. Rectifiers and filters (20 hours)

Rectifiers– Half wave, full-wave and bridge rectifiers- Efficiency- Ripple factor- Regulation – Harmonic components in rectified output – Types of filters- Choke input (inductor) filter- Shunt capacitor filter- L section and π section filters.

2. Voltage Regulators: Transistor Series voltage regulator - Transistor Shunt voltage regulator – Three terminal regulators (78XX and 79XX).

UNIT-II

3. Power Supplies (10 hours)

Block diagram of regulated power supply – A simple regulated transistorized power supply (circuit and working) – Principle and working of switch mode power supply (SMPS).

UNIT-III

4. Voltage Multipliers (10 hours)

Half wave voltage doubler, Full wave voltage doubler, Voltage Tripler circuit diagram and working mentioning of applications of voltage multipliers.

UNIT-IV

5. Controlled rectifiers (10 hours)

SCR Half wave rectifier circuit, working with wave forms, mathematical analysis for resistive load - SCR Full wave rectifier circuit, working with wave forms, mathematical analysis for resistive load – SCR as inverter parallel and series circuits

UNIT-V

6. Heat effects (10 hours)

Resistance, inductance and dielectric heating, Principle of operations and its applications

Reference Books:

1. Unified Electronics Volume II by J.P Agarwal and AmitAgarwal.
2. Industrial Electronics, S.B. Biswas, Dhanapur Rai &Sons.
3. Industrial Electronics, G.K. Mithal, KhannaPublishers.
4. Electronic Devices and Circuits – G.K.Mithal.
5. Electronic Devices and Circuits-Millman and Halkias- Tata Mc Graw Hill(TMH)

ELECTRONICS: LAB – 6A Industrial Electronics

Lab List

1. D.C Power supply and filters.
2. Transistor series regulator
3. Transistor as a shunt regulator
4. Voltage regulator using IC-7805and IC-7905.
5. Voltage doubler using diodes
6. Voltage Tripler using diodes
7. SCR VI characteristics.
8. SCR Series inverter SCR parallel inverter.

SEMESTER – V
PAPER–VIIA
Course Title :: Electronic Instrumentation
Code :: ELE309-7A

Course Outcomes:

CO – 1: Describe about Ac and Dc measurement, Understand about Multimeter ac, dc block diagram functions, display devices, function generator operation. Explain about CRO and CRT parts and functioning , Understand the functioning parts.

CO – 2: Explain different types of transducers, LVDT, resistive and capacitive transducers in touch phones , photo electric devices. Discuss about the functioning of LED and LCD Working to different systems.

CO – 3: Familiarize with Medical devices and understand the parts and function of thermometer, sphygmomanometer, ct scan, ophthalmoscope, MRI scan, Biomedical devices.

UNIT-I

1. Introduction to Instruments (10 hrs)

Measurements: Basic block diagram of measurement system, accuracy, and precision, resolution, sensitivity, linearity, Errors, Systematic and Random errors. Types of electronic Instruments –Analog instruments & Digital Instruments, DC Voltmeter and AC Voltmeter, Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach), Sensitivity, 3½display and 4½ display Digital multimeters, Basic ideas on Function generator.

UNIT-II

2. Oscilloscope (10 hrs)

Cathode Ray Oscilloscope-Introduction, Block diagram of basic CRO, Cathode ray tube, Electron gun assembly, Screen for CRT, Time base operation, Vertical deflection system, Horizontal deflection system, Use of CRO for the measurement of voltage (AC and DC), frequency, phase difference, Different types of oscilloscopes and uses.

UNIT-III

3. Transducers (10 hrs)

Classification of transducers, Selection of transducers, Resistive, capacitive & inductive transducers, Resistive and capacitive touch screen transducer used in mobiles, Displacement transducer-LVDT, Piezoelectric transducer, Photo transducer, Digital transducer, Fibre optic sensors

UNIT-IV

4. Display Instruments (10 hrs)

Introduction to Display devices, Seven Segment Displays, LED Displays, Construction and operation (Display of numbers), Types of SSDs (Common Anode & Common Cathode type), Limitations of SSDs, Liquid Crystal Displays, Applications of LCD modules.

UNIT-V

5. Biomedical Instruments (10 hrs)

Basic operating principles and uses of (i) Clinical thermometer (ii) Stethescope (iii) Sphygmomanometer (iv) ECG machine (v) Radiography (vi) Ophthalmoscope (vii) Ultrasound scanning (viii) Pulse oxymeter (ix) Glucometer, Basic ideas of CT scan and MRI scan.

Reference Books:

1. Electronic Instrumentation by H.S.Kalsi , TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs , McGrawHill
3. Introduction to Biomedical Instrumentation byMandeep Singh, PHILearning.
4. Biomedical Instrumentation and Measurements by Leslie Cromwell Prentice

Practical (Laboratory)

1. Familiarisation of digital multimeter and its usage in the measurements of (i) resistance, (ii) current, (iii) AC & DC voltages and for (i) continuity test (ii)diode test and (iii) transistor test.
2. Measure the AC and DC voltages, frequency using a CRO and compare the values Measured with other instruments like Digital Multimeter.
3. Formation of Sine, Square wave signals on the CRO using Function Generator and measure their frequencies. Compare the measured values with actual values
4. Display the numbers from 0 to 9 on a single Seven Segment Display module by Applying voltages.
5. Display the letters a to h on a single Seven Segment Display module by applying voltages.
6. Measurement of body temperature using a digital thermometer and list out the error and corrections.
7. Measurement of Blood Pressure of a person using a B.P. meter And record the values and analyze them.

MINOR PAPERS SYLLABUS
SEMESTER – II
PHYSICS MINOR PAPER
Course Title :: INDUSTRIAL MECHANICS
Code :: MNR2 INDPHY01

Learning outcomes:

After completion of the course student can able to

1. Demonstrate knowledge of safety practices in industrial environments and apply them in industrial settings.
2. Describe and apply fundamental principles of mechanics, including forces, motion, energy, power, Torque and angular momentum in industrial applications.
3. Identify, analyze, and explain the principles of simple machines and their applications.

Unit-I

Instrumentation and Measurement Techniques:
Introduction to measurement tools used in industrial physics-Error analysis in measurements-Calibration of instruments in industrial settings-Safety issues in industry-basic physics principles that govern industrial technology-industrial working conditions.

Unit-II

Simple Machines:
Understanding the principles of simple machines (levers, pulleys, gears)-Applications of simple machines in everyday life-Newton's laws of motion-Forces and their effects on objects-Linear and projectile motion

Unit-III

Kinematics and Dynamics
Introduction to motion analysis in industrial systems-Applications of Newton's laws to industrial scenarios-Force analysis in machinery and structures

Unit-IV

Energy and Work in Industrial Contexts:
Work and energy considerations in machines and industrial processes-Efficiency calculations in industrial systems-Potential and kinetic energy in the context of industrial equipment

Unit-IV

Rotational Motion in Industrial Systems:
Analysis of rotational motion in machinery-Torque and angular momentum in industrial applications-Rotational equilibrium in structures

Lab List

1. Viscosity of liquid by the flow method (Poiseuille's method)
2. Young's modulus of the material of a bar (scale) by uniform bending
3.Young's modulus of the material a bar (scale) by non- uniform bending
4. Surface tension of a liquid by capillary rise method
5. Determination of radius of capillary tube by Hg thread method
6. Viscosity of liquid by Searle's viscometer method
7. Bifilar suspension –moment of inertia of a regular rectangular body.
8. Determination of moment of inertia using Fly-wheel
9. Determination of the height of a building using a sextant.
10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)

SEMESTER – II
ELECTRONICS MINOR PAPER
Course Title :: FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS
Code :: MNR 2ELE 01

Course Outcomes:

CO-1 :Able to understand and acquire knowledge on the concepts of basics of electronics , Gauss theorem and its applications

CO2: Able to create and developed creative thinking by learning the concepts of capacitors, types of capacitors ,electrical measurements and magnetic effects of currents

CO3: Able to understand and acquire knowledge by learning the concepts of p-n junction diodes, rectifiers, filter circuits, the basics of transistor characteristics ,amplifiers and basic Logic Gates

UNIT-I

Electrostatics: Electric charges - Coulomb's law - Electric field - Electric intensity and electric potential - Relation between electric potential and intensity - Electric intensity and potential due to a uniform charged conducting sphere at a point outside, on, and inside the conductor. Electric dipole - Dipole moment - Intensity and potential due to a dipole - Statement and proof of Gauss law - Application of Gauss law to uniformly charged solid sphere.

UNIT-II

Capacitors: Definition and unit of capacity - Capacitance of a parallel plate capacitor - Effect of dielectric on capacity - Capacitors in series and parallel - Energy stored in a charged capacitors - Loss of energy on sharing of charges between two capacitors - Force of attraction between plates of charged parallel plate capacitor - Kelvin's attracted disc electrometer - Measurement of potential and dielectric constant. Type of capacitors - Mica capacitor, Electrolytic capacitors, and Variable air capacitor - Uses of capacitors

UNIT-III

Electrical Measurements: Carey-Foster bridge - Determination of specific resistance - Potentiometer - Calibration of low and high range voltmeters - Calibration of Low range ammeter. [Magnetic Effect of Current: Biot-Savart's law [Force on a conductor carrying current placed in a magnetic field - Principle, construction and theory of a moving coil ballistic galvanometer - Measurement of figure of merit of B.G. - Comparison of capacitors using B.G.

UNIT-IV

Diode circuits and power Supplies: Junction diode characteristics - Half and full wave rectifiers - Expression for efficiency and ripple factor - Construction of low range power peak using diodes - Bridge rectifier - Filter circuits - Zener Diode - Characteristics - Regulated power supply using Zener diode - Clipper and Clamper using diodes. Differentiator and integrator using resistor and capacitor

UNIT-V

Transistor circuits: Characteristics of a transistor in CB, CE modes - Relatively merits Graphical analysis in CE configuration - Transistor as a amplifier - RC coupled Single stage amplifier - Frequency response - Thevenin's and Norton's theorems - h parameters. Basis

logic gates AND, OR, and NOT - Construction of basic logic gates using diodesand transistors.

Text Books :

- Electricity and Magnetism - M. Narayanamoorthi and Others, National PublishingCo., Chennai.
- Electricity and Magnetism - R. Murugeshan, S. Chand & Co. Ltd., New Delhi,Revised Edition, 2006. Principles of Electronics - V.K. Mehta, S. Chand & Co., 4/e, 2001.
- Basic Electronics - B.L. Theraja, S. Chand & Co., 4/e, 2001.

Reference Books

- Electricity and Magnetism - Brijlal & Subrahmanyam, Ratan Prakashan Mandir,Agra. Fundamentals of Electricity and Magnetism - B.D. Duggal & C.L. Chhabra, ShobanLal Nagin Chand & Co., Jallundur. Physics, Vol. II - Resnick, Halliday & Krane, 5/e, John Wiley & Sons, Inc.,.
- Basic Electronics - B. Grob, McGraw - hill, 6/e, NY, 1989.
- Elements of Electronics - Bagde & Singh, S. Chand

Practical Lab List:

2. I-V Characteristics of PN junction diode

3. I-V Characteristics of Zener diode

4. CE Characteristics of Transistor

5. Logic Gates

6. Potentiometer- emf of a cell

7. Potentiometer-comparison of emfs of two cells

8. Carey foster bridge –specific resistance determination

9. Thevenińs Theorem-verification

10. Norton's Theorem-verification

Multi –Disciplinary Paper
SEMESTER – II
Course Title :: PRINCIPLES OF PHYSICAL SCIENCES
Code :: 1MD - PHY

Learning outcomes:

Upon completion of the course "Principles of Physical Sciences for Arts Students," students from arts backgrounds will be able to:

1. Understand the foundational principles of physical sciences: Students will develop a comprehensive understanding of the core principles and concepts in physical sciences.

2. Analyse and interpret scientific information: Students will acquire the ability to critically analyse scientific information and data related to physical sciences.

3. Apply physical science principles to real-world scenarios: Students will develop the skills to apply physical science principles to solve real-world problems and scenarios.

Unit 1: Introduction to Physics

Nature of Physics: Overview of physics as a discipline, its scope, and its relationship to other sciences. Scientific Method in Physics: Introduction to the scientific method and its application in the study of physics. Measurement and Units: Understanding the principles of measurement, SI units, and the importance of accurate and precise measurements. Scalars and Vectors: Differentiating between scalars and vectors, understanding vector addition and subtraction.

Unit 2: Mechanics for Arts Students

Motion and Forces: Introduction to the principles of motion, including velocity, acceleration, and the laws of motion. Energy and Work: Understanding the concept of energy, different forms of energy, and the relationship between work and energy. Circular Motion: Exploring the principles of circular motion, centripetal force, and applications in real-world scenarios. Gravity: Introduction to the concept of gravity, Newton's law of universal gravitation, and its implications.

Unit 3: Waves and Optics for Arts Students

Waves: Understanding the properties and characteristics of waves, including wave types, wave motion, and wave interference. Sound Waves: Exploring the nature of sound waves, including properties of sound, sound propagation, and the Doppler effect. Light and Optics: Introduction to the behavior of light, reflection, refraction, and the formation of images by mirrors and lenses. Wave Optics: Understanding the principles of interference, diffraction, and polarization of light waves.

Reference Books:

1."Principles of Physics" by David Halliday, Robert Resnick, and Jearl Walker: This textbook covers the fundamental principles of physics, including mechanics, electromagnetism, thermodynamics, and modern physics. It provides a comprehensive introduction to the subject and includes numerous examples and exercises for practice.

2. "University Physics" by Hugh D. Young and Roger A. Freedman: This textbook is widely used in university-level physics courses. It covers a wide range of topics in classical physics, modern physics, and thermodynamics. It is known for its clear explanations and problem-solving approach.

3. "Concepts of Modern Physics" by Arthur Beiser: This book provides an introduction to the principles and concepts of modern physics, including quantum mechanics, atomic and nuclear physics, and relativity. It is suitable for students with a basic background in physics and mathematics.

4. "The Feynman Lectures on Physics" by Richard P. Feynman, Robert B. Leighton, and Matthew Sands: This three-volume set is based on the famous lectures given by physicist Richard Feynman. It covers a wide range of topics in physics, including mechanics, electromagnetism, quantum mechanics, and statistical mechanics. The lectures are known for their engaging style and intuitive explanations.

5. "Physical Science" by Bill Tillery: This textbook provides a comprehensive introduction to the principles of physical science, covering topics such as motion, forces, energy, waves, electricity, and magnetism. It is designed for introductory-level courses and includes numerous examples, illustrations, and practice problems.

6. "Fundamentals of Physics" by Jearl Walker, David Halliday, and Robert Resnick: This textbook is widely used in physics courses and covers the fundamental principles of classical physics. It includes a strong emphasis on problem-solving and conceptual understanding.