CODE	COURSE TITLE
18PHUC101	**MECHANICS, PROPERTIES OF MATTER AND ACOUSTICS**

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	3

Preamble

To understand the concepts of Mechanics, to get exposure in Properties of matter and to understand the applications of Acoustics.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the basic concepts of Rigid body dynamics, Gravitation, Properties of Matter and Acoustics	K1
CO2	Understand the concept of Radius of Gyration, Moment of Inertia, Elasticity, Surface tension and Types of Vibration	K2
CO3	Understand the principles of Low Pressure Gauges and their measurements	K2
CO4	Understand the applications of Acoustics and Ultrasonics	K2
CO5	Apply the basic concepts in real world problems.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

UNIT I (9 hrs.)
Rigid Body Dynamics:

Rigid Body-Rotational and Vibrational Motion - Torque Moment of Inertia- Radius of Gyration-Kinetic Energy of Rotation - M.I of a Fly Wheel - Experimental determination – Precession - The Gyrostat - Gyrostatic Applications - M.I of a Diatomic Molecule - its Rotational Energy States.

UNIT II (9 hrs.)
Gravitational Field & Potential:

Nature of Motion Under Center Forces - Kepler's Laws - Newton's Law of Gravitation-Gravitational Potential and Field - Gravitational Potential and Field due to (i) Spherical Shell. (ii) Solid Sphere - Boy's Method of determining "G".

UNIT III (9 hrs.)
Elasticity:

Elastic Constants of an Isotropic Solids - Relations Connecting them - Poisson's Ratio - Bending of Beams - Bending Moment of a Bent Beam - Cantilever - Static and Dynamic Method - Uniform and Non - Uniform Bending - Torsion in a Wire - Rigidity Modulus - Determination By Static and Dynamic Methods.

UNIT IV (9 hrs.)
Surface Tension, Production and Measurement of Low Pressures:

Surface Tension and Surface Energy - Pressure on Curved Surface of a Liquid - Variation of Surface Tension with Temperature - Jaeger's Method - Laws of Diffusion - Diffusion Pump - Pirani and Knudsen Gauge.

UNIT V (9 hrs.)
Types of Vibration:

Simple Harmonic Motion - Types of Vibrations - Undamped Vibrations - Damped Vibrations - Vibrations - Resonance and Sharpness of Resonance.

Acoustics of Buildings:

Factors affecting the Acoustics of Buildings - Sabine's Reverberation Formula.

Ultrasonics:

Production by Piezo - Electric method - Applications.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugeshan R	Properties of Matter	S.Chand & Company	2016, 1st Edition
2	Brij Lal & Subrahmanyam	Properties of Matter	Eurasia Publishing House (Pvt) Ltd,	1989, 5th Edition
3	Brij Lal & Subrahmanyam	A Text book of Sound	Vikas Publishing House	2015, 2nd Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Mathur D.S	Mechanics	S.Chand & Company	2015, 1st Edition
2	Mathur D.S	Elements of Properties of Matter	Shyamlal Charitable Trust	2014, 11th Edition
3	Saihgal R.L	A Text books of sound	S.Chand & Co	1987, 1st Edition

Web Resources

1. https://www.khanacademy.org/science/physics/forces-newtons-laws
2. https://www.khanacademy.org/science/physics/fluids/fluid-dynamics/v/surface-tension-and-adhesion

Pedagogy

Lecture, PPT, Quiz, Assignment, Seminar, Demonstration

CODE	COURSE TITLE
18PHUC102	**HEAT, THERMODYNAMICS AND STATISTICAL MECHANICS**

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	3

Preamble

To understand the fundamental laws, principles of thermodynamics and Statistical thermodynamics and to learn appropriate concepts about the Production of Low Temperature and Liquefaction of Gases.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of Heat, Thermodynamics and Statistical Thermodynamics.	K1
CO2	Procure basic knowledge about real gas, specific heat and Entropy	K2
CO3	Get ideas about liquefaction of gases	K2
CO4	Understand the laws of thermal radiation.	K2
CO5	Acquire knowledge in classical and Quantum Statistics	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	M	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

UNIT I (9 hrs.)
Entropy:
Principles of Increase of Entropy - Temperature-Entropy Diagram - Entropy of a Perfect Gas Thermodynamic Potentials: Internal Energy (U), Helmholtz Function(F), Gibb's Function(G), and Enthalpy (H) - Maxwell's Thermodynamic Relations - (T-ds) Equations - Clausius Latent Heat Equation From Maxwell's Thermodynamic Relations.

UNIT II (9 hrs.)
Production of Low Temperature and Liquefaction of Gases:
Method of Production of Low Temperatures - Joule Thomson Effect - Porous Plug Experiment - Theory and Results - Joule Thomson Effect for Perfect and Real Gases – Super fluidity – Helium-I and Helium-II - Lamda Point -Adiabatic Demagnetization.

UNIT III (9 hrs.)
Thermal Radiation:
Quantum Theory of Radiation - Planck's Hypothesis - Average Energy of Planck's Oscillator - Planck's Radiation Law and its Experimental Verification - Wien's Law and Rayleigh- Jeans's Law in relation to Planck's Law - Stefan's Constant and Wien's Constant from Planck's Law.

UNIT IV (9 hrs.)
Equation of State of a Real Gas:
Van der Waal's Equation of State - Critical Constants.
Quantum Theory of Specific Heat:
 Dulong and Petit's Law and the deduction - Failure of Dulong and Petit's Law - Einstein Theory and its limitations - Debye's Theory - Specific Heat of Di-Atomic Gases.

UNIT V (9 hrs.)
Statistical Thermodynamics:
Statistical Equilibrium - Probability Theorems in Statistical Thermodynamics - Maxwell - Boltzman Distribution Law - Maxwell - Boltzman Distribution Law in terms of Temperature - Quantum Statistics - Fermi - Dirac Distribution Law - Bose - Einstein's Distribution Law (Qualitative Study Only) - Comparison of Three Statistics.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Brij Lal & Subrahmanyam	Heat and Thermodynamics	S.Chand & Company	2016, 1st Edition.
2	Murugeshan & Kiruthiga Sivaprasath	Thermal Physics	S.Chand & Company	2016, 3rd Edition
3	Singhal, Agarwal & Sathya Prakash	Heat Thermodynamics and Statistical Physics	Pragati Prakashan	1995, 1st Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Brij Lal, Subrahmanyam & P.S.Hemne	Heat Thermodynamics and Statistical Physics	S.Chand & Company	2007, Revised and Multicolour Edition
2	Mathur D.S	Heat and Thermodynamics	S. Chand & Company	2008, 5th Edition
3	Sharma J.K & Sarkar K.K	Thermodynamics and Statistical Physics	Himalaya Publishing House	1991, 3rd Edition

Web Resources

1. https://www.khanacademy.org/science/physics/thermodynamics
2. https://www.khanacademy.org/science/physics/thermodynamics/laws-of-thermodynamics/v/macrostates-and-microstates

Pedagogy

Lecture, PPT, Quiz, Assignment, Seminar

CODE	COURSE TITLE
18PHUC203	**ELECTRICITY AND MAGNETISM**

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	3

Preamble

To acquire basic knowledge in Electricity & Magnetism and to understand the electrical behavior of charges and magnetic properties of materials.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Know the basic concepts of Electricity and Magnetism	K1
CO2	Understand the various phenomenon in Electricity and Magnetism	K2
CO3	Understand Circuit analysis and network theorems	K2
CO4	Explain the Dynamics of Charged Particles	K2
CO5	Apply the acquired knowledge to solve the problems.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	M
CO3	S	S	M	S	S
CO4	S	S	M	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

UNIT I   (9 hrs.)
Electrostatistics:
Gauss Theorem - Application of Gauss Theorems: An Insulated Conductor- Electric Field due to Uniformly Charged Sphere- Electric Field due to an Isolated Uniformly Charged Conducting Sphere- Electric Field due to uniformly Infinite Cylindrical Charge - Coulomb's Law: Proof - Mechanical Force Experienced by unit area of a Charged Surface Energy Stored per unit Volume in an Electric Field.

Principle of Capacitors:
Parallel Plate Capacitor - Force of attraction between Plates of a Charged Parallel Plate Capacitor- Types of Capacitors: Guard Ring Capacitor - Electrolytic Capacitor - Variable Capacitor.

UNIT II   (9 hrs.)
Helmholtz Equations of Varying Current:
Growth and Decay of Current in an Inductive - Resistive Circuit - Charging and Discharging of a Capacitance through a Resistance - Charging and Discharging of a Capacitance through an Inductance and a Resistance - Discharge of a Capacitance through an Inductance - Oscillatory circuits - Force on a Current carrying Conductor - Theory of Ballistic Galvanometer.

UNIT III   (9 hrs.)
AC Circuit Analysis and Network Theorems:
LCR Series Resonance Circuit - LC Parallel and L, R and C Parallel Resonance Circuits - Power Consumed by the above Circuits - Q - Factor and Bandwidth of Response of a tuned Circuit - Sharpness of Resonance - Network Theorems: Thevenin and Norton theorems.

UNIT IV   (9 hrs.)
Dynamics of Charged Particles:
Charged Particles in a Uniform and Constant Electric Field - Charged Particle an Alternating Electric Field - Charged Particle in a Uniform and Constant Magnetic Field - Magnetic Focusing - Charged Particle in Combined Electric and Magnetic Field when the Fields are parallel and are in mutually perpendicular directions

UNIT V   (9 hrs.)
Magnetic Properties Of Materials:
Electron Theory of Magnetism - Langevin's Theory - Dia and Paramagnetism - Weiss Theory of Ferromagnetism - Magnetic Susceptibility and Magnetic Permeability - Hysteresis - Area of the Hysteresis Loop – Ferro Magnets – Determination of Susceptibility - Guoy's Method.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugeshan R	Electricity and Magnetism	S.Chand & Company	2011, 9th Edition
2	Brij Lal & Subrahmanyam N	Electricity and Magnetism	S.Chand & Company	1995, 9th Edition
3	Nagaratnam N & Lakshmi Narayanan N	Electricity and Magnetism	The National Publishing Company	1997, 3rd Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Tewari K.K	Electricity and Magnetism with Electronics	S.Chand & Company	2011, 1st Edition
2	Seghal, D.C., Chopra, K.L & Seghal, N.K	Electricity and Magnetism	S.Chand & Company	2009, 5th Edition

Web Resources
1. https://www.khanacademy.org/science/physics/discoveries/batteries/v/the-battery-electromagnetism
2. https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields/magnets-magnetic/v/introduction-to-magnetism

Pedagogy

Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUC204	**NUCLEAR AND PARTICLE PHYSICS**

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	3

Preamble

To acquire the knowledge of nuclear structure, nuclear models, nuclear reactors and elementary particles.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics concepts of atomic structure and general static properties of atomic nuclei	K1
CO2	Analyze different nuclear models knowing the properties of nuclei	K2
CO3	Analyze the various techniques of nuclear radiation detectors	K2
CO4	Apply the knowledge of radioactivity to realize the concept of artificial radioactivity	K3
CO5	Acquire knowledge on the kinematics of high energy collusion of nuclear elementary particles.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	M
CO3	S	S	M	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

UNIT I (9 hrs.)
General Properties of Atomic Nuclei:
Introduction - Nuclear Forces - Meson's Theory of Nuclear Forces - Theories of Nuclear Composition - Proton Electron Hypothesis - Models of Nuclear Structure - Liquid Drop Model - Shell Model. Particle Accelerators - Synchrocyclotron - Betatron - Electron and Proton Synchrotron.

UNIT II (9 hrs.)
Radio Activity:
Introduction - Geiger Nuttal Experiment - Geiger Nuttal Law - Alpha Particle Disintegration Energy - Origin of Line and Continuous Spectrum - Neutrino theory of Beta Decay - K. Electron Capture - Origin of Gamma Rays - Absorption of Gamma Rays - Natural Radio Active Series - Law of Successive Disintegration - Radioactive Equilibrium - Radioactive dating.

UNIT III (9 hrs.)
Artificial Transmutation of Elements:
Discovery of Artificial Transmutation - Rutherford's Experiment - Bohr's Theory of Nuclear Disintegration - Nuclear Reactions - Energy Balance in Nuclear Reactions and the Q - Value - Nuclear Transmutations - Transmutation by (i) Alpha Particle (ii) Protons (iii) Deuterons and Neutrons - The Scattering Cross Section and its determination – Production of Radioisotopes and their uses.
Detectors of Nuclear Radiations - Ionization Chamber - Geiger Muller Counter - Proportional Counter - Wilson's Cloud Chamber - Bubble Chamber - Basic Principles and Working.

UNIT IV (9 hrs.)
Nuclear Fission, Fusion and Reactors:
Nuclear Fission - Energy Released in Fission - Bohr Wheeler Theory of Nuclear Fission - Chain Reaction - Multiplication Factor - Natural Uranium and Chain Reaction - Design of Nuclear Reactor - Breeder Reactor - Nuclear Reactor Programmes in India - Nuclear Fusion - Sources of Stellar Energy - Thermo Nuclear Reactions -Transuranic Elements.

UNIT V (9 hrs.)
Elementary Particles:
Baryons - Leptons - Mesons - Particles and Antiparticles - Concept of Antimatter - Strong Interaction - Electro Magnetic Interaction - Gravitational Interaction - Elementary Particle Quantum Numbers - Conservation Laws and Symmetry - Charge Conjugation - Parity and Time Reversal – CPT - Quark Model.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugeshan R	Modern Physics	S.Chand & Company	2016, 18th Edition
2	Seghal, Chopra and Seghal	Modern Physics	S.Chand & Company	2013, 7th Edition
3	Goshal S.N	Nuclear Physics	S.Chand & Company	2016, 1st Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Sharma R.C	Nuclear Physics	K.Nath & Company	2005, 1st Edition
2	Kennath .S.Krane	Modern Physics	John Wiley & Sons	1998, 2nd Edition
3	Arthur Beiser	Concepts of Modern Physics	Tata McGraw Hill	2008, 6th Edition

Web Resources

1. https://www.khanacademy.org/science/chemistry/atomic-structure-and-properties/introduction-to-the-atom/v/atomic-number-mass-number-and-isotopes
2. https://www.khanacademy.org/science/cosmology-and-astronomy/universe-scale-topic/light-fundamental-forces/v/four-fundamental-forces

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUCP01	CORE PRACTICAL I

Category	CIA	ESE	L	T	P	Credit
Core	40	60	-	-	90	3

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Determine the various properties of materials	K4
CO2	Apply the knowledge of Physics fundamentals	K3
CO3	Find the errors and adjust it to get the nearer ideal readings using specific measurement techniques	K3
CO4	Quantify the measurement of the reflection or transmission properties of a material	K4
CO5	Determine the characteristics of the electronic devices	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	S	M	M	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

Any SIXTEEN of the following:

1. Young's Modulus - Non Uniform Bending - Pin and Microscope.
2. Young's Modulus - Uniform Bending - Optic Lever.
3. Young's Modulus - Cantilever - Static Method.
4. Young's Modulus - Cantilever - Dynamic Method.

5. Rigidity Modulus - Static Torsion.
6. Compound Pendulum - Acceleration due to gravity.
7. Surface Tension by Capillary Rise method
8. Coefficient of Thermal Conductivity - Lee's Disc.
9. Refractive Index of a Liquid - Hollow Prism - Spectrometer.
10. Refractive Index of the Material of a Solid Prism - Spectrometer.
11. Refractive Index of the Material of a Solid Prism - i-d Curve - Spectrometer.
12. Wavelength of Mercury Spectral Lines - Grating - Normal Incidence - Spectrometer.
13. Wavelength of Spectral Lines - Grating - Minimum Deviation - Spectrometer.
14. Calibration of Low Range Voltmeter - Potentiometer.
15. Calibration of Low Range Ammeter - Potentiometer.
16. Specific Resistance - Potentiometer.
17. Moment of a Magnet - Tan C position.
18. Characteristics of Junction Diode.
19. Sonometer - Frequency of A.C mains.
20. Temperature Coefficient of Resistance of a Thermistor - Post Office Box.

CODE	COURSE TITLE
18PHUA101	**ALLIED PHYSICS PAPER I - MECHANICS, HEAT, SOUND, SOLAR PHYSICS, ELECTRICIRY AND MAGNETISM**

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

Preamble

To procure the basic knowledge of physical laws and principles to the students of other branches of science.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts in mechanics, Solar energy, electricity and magnetism.	K1
CO2	Investigate the effects of gravity and elasticity	K2
CO3	Explore the concepts of heat and thermodynamics	K2
CO4	Provide the opportunity to integrate theory and the application of it in everyday experience	K3
CO5	Understand the Fundamental properties of electricity and magnetism	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	M	M	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	M	M	S

S- Strong; M-Medium; L-Low

UNIT I (9 hrs.)
Gravitation:
Newton's law of Gravitation - Definition of G - Determination of G by Boy's Method - Mass and Density of Earth - Acceleration due to Gravity - Determination of g by Compound Pendulum.
Elasticity:

Bending of Beams - Bending Moment - Depression of Cantilever - Determination of Y by Uniform and Non Uniform Bending Method - Torsion in a wire - Determination of Rigidity Modulus by Torsional Pendulum - I section of Girders

UNIT II (9 hrs.)
Heat and Thermodynamics:
Vander Waal's Equation of State - Critical Constants of a Gas - Derivation of Critical Constants in terms of Van der Waals Constant - Joule - Thomson Effect - Theory of J-K Effect - Liquefaction of Hydrogen and Helium - Properties of Liquid - He I and II
Sound:
Doppler Effect - Derivation and Applications - Frequency of A.C by Sonometer - Ultrasonics – Production, Properties and Applications

UNIT III (9 hrs.)
Solar Physics:
Measurement of Solar Radiations by Pyroheliometer and Pyrometer - Solar Constants - General Applications of Solar Energy - Flat Plate Collector - Box Type Cooker - Solar Water Heater - Solar Photovoltaic Cells- Applications of Solar Cells

UNIT IV (9 hrs.)
Electricity:
Conversion of Galvanometer into Ammeter and Voltmeter - Ballistic Galvanometer: Theory - Charge Sensitiveness - Measurement of Capacitance - Potentiometer - Theory - Measurement of Current, Voltage and Resistance - Electromagnetic Induction: Transformer and its Applications.

UNIT V (9 hrs.)
Magnetism:
Basic Concepts of Magnetic Materials - Magnetic Properties of Dia, Para and Ferro Magnetic Materials - Area of (B-H) Loop - Curie Temperature - Applications of Ferities in Computer Memory

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugeshan R	Properties of Matter	S.Chand & Company	2017, 5th Edition
2	Brij Lal & Subrahmanyam.N	Heat and Thermodynamics	S.Chand & Company	2016, 1st Edition
3	Subrahmanyam.N & Brij Lal	Sound	Vikas Publising House	2015, 2nd Edition
4	Sukhatme S P	Solar Energy Utilization	Tata Mc Graw Hill	1987, 2nd Edition
5	Murugeshan R	Electricity and Magnetism	S.Chand & Com	2016, 9th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Brij Lal & Subrahmanyam.N	Properties of Matter	Eurasia Publication House	1989, 5th Edition
2	JayaPrakash N	Allied Physics I	JP Publications	1993

Web Resources

1. https://www.khanacademy.org/science/physics/centripetal-force-and-gravitation/gravity-newtonian/v/introduction-to-gravity
2. https://www.khanacademy.org/science/physics/mechanical-waves-and-sound/doppler-effect/v/introduction-to-the-doppler-effect

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUA202	**ALLIED PHYSICS PAPER II –MODERN PHYSICS, ELECTRONICS AND DIGITAL ELECTRONICS**

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

Preamble

To perceive ideas about various fields in Physics and their applications in day to day life.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand new types of Lasers for commercial applications	K2
CO2	Understand the concepts in nuclear and particle Physics	K2
CO3	Procure knowledge in electronic devices and systems	K2
CO4	Understand the principles of modern communication systems	K2
CO5	Analyze and construct various digital circuits.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	M
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

UNIT I   **(9 hrs.)**
Structure of the Atom:
The Vector Atom Model - Pauli Exclusion Principle - Coupling Schemes.
Laser:
Induced Absorption, Spontaneous and Stimulated Emission - Principle of Laser - Population Inversion
- Ruby Laser - Helium and Neon Laser - Semiconductor Laser - Properties and Applications.

UNIT II   **(9 hrs.)**
Nuclear Physics:
Characteristics of Nuclear forces - Model of Nuclear Structure - Liquid Drop Model - Shell Model -
Synchrocyclotron - Betatron - Discovery of Artificial Transmutation - Transmutations by Alpha
Particles - Transmutation by Protons - Elementary Particles - Leptons - Mesons - Baryons.

UNIT III   **(9 hrs.)**
Electronics:
Construction and Characteristics of Zener Diode, Photo Diode, Light Emitting Diode (LED)-
Transistor Characteristics (CE) - Qualitative Analysis of a Common Emitter Amplifier - Phase
Reversal of the output Voltage - Advantages of Common Emitter Amplification Circuit.

UNIT IV   **(9 hrs.)**
Operational Amplifier:
Circuit Symbol, Polarity Conventions and Virtual Ground or Summing Point of an Operational
Amplifier- Characteristics of an Ideal Operational Amplifier- Amplifier as an Adder - Subtractor -
Differentiator and Intergrator
Communication Electronics:
Definition of Frequency Modulation - Modulation Index - Block Diagram of a Superheterodyne
Receiver - Principle of Picture Transmission and Reception - Block Diagram of a Monochrome TV
Receiver - Basic Principle and Applications of Radar.

UNIT V   **(9 hrs.)**
Digital Electronics:
Digital Computers - Organization of Digital Computers - Number System - Binary Octal -
Hexadecimal - ASCII and EBCDIC - Basic Logic Design using Digital Integrated Circuits, Truth
Tables, Boolean Algebra - Simple Arithmetic Circuits - Half Adder - Full Adder- Half Subtractor -
Full Subtractor. NAND and NOR as a Universal Building Block - De Morgan's Theorems and Proof-
Basic Ideas of Memory Elements.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugaeshan R	Modern Physics	S.Chand & Co	2016, 18th edition
2	Thereja B.L	Basic Electronics- Solid State	S.Chand & Co	2015, 1st Edition
3	Mehta V.K	Principles of Electronics	S.Chand & Co	2008, 11th Edition
4	Albert P.Malvino & Ronald P. Leach	Digital Principles and Applications	Tata McGraw Hills	2006, 6th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Jayaprakash N	Allied Physics- II	J.P.Publications	1993
2	William H.Gothmann	Digital Electronics	Prentice- Hall of India	2006, 2nd Edition

Web Resources

1. https://www.khanacademy.org/science/physics/circuits-topic/circuits-resistance/v/circuits-part-1
2. https://www.khanacademy.org/science/electrical-engineering/ee-amplifiers/ee-opamp/v/ee-opamp-intro

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUAP01	**ALLIED PHYSICS PRACTICALS**

Category	CIA	ESE	L	T	P	Credit
Allied	20	30	-	-	90	2

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Determine the various properties of materials	K4
CO2	Apply the knowledge of Physics fundamentals	K3
CO3	Find the errors and adjust it to get the nearer ideal readings using specific measurement techniques	K3
CO4	Quantify the measurement of the reflection or transmission properties of a materials	K4
CO5	Determine the characteristics of the electronic devices	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	S
CO3	S	S	S	S	S
CO4	S	M	S	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

Any SIXTEEN of the Following:

1. Young's Modulus - Non Uniform Bending - Pin and Microscope.
2. Young's Modulus - Uniform Bending - Optic Lever.
3. Rigidity Modulus - Static Torsion.
4. Acceleration Due to Gravity - Compound Pendulum
5. Moment of Inertia - Torsional Pendulum

6. Surface Tension by Capillary Rise Method
7. A.C Frequency - Sonometer
8. Refractive Index of a Liquid - Hollow Prism - Spectrometer.
9. Refractive Index of a Solid Prism - Spectrometer.
10. Refractive Index of the Material of a Solid Prism - i-d Curve - Spectrometer.
11. Wavelength of Spectral Lines - Grating - Minimum Deviation - Spectrometer.
12. Radius of the Curvature - Newton's Experiment
13. Calibration of Voltmeter - Low Range - Potentiometer.
14. Calibration of Ammeter - Low Range - Potentiometer.
15. Specific Resistance - Potentiometer.
16. Moment of a Magnet - Tan C position.
17. Characteristics of Junction Diode.
18. Characteristics of Zener Diode.
19. Verification of Truth Tables of the gates OR,AND, NOT, NOR, NAND and EX- OR
20. Verification of De Morgan's Theorems

Instructional Hrs.:75   **Sub. Code: 16PHUC507**

Max. Marks: CIA-25; ESE-75   **Credits: 5**

Objective: To enable the students to solve various mathematical problems and to understand how mathematics and physics are related.

UNIT - I   17Hrs.
Vector Analysis:
Meaning of dot products and vector products - Scalar valued function and vector valued function - Plotting scalar and vector fields - Examples from physics - Gradient of a scalar function - Directional derivative - Examples - Divergence of a vector function - Curl of a vector function - Physical meaning of gradient operation, divergence and curl.
Line integral - surface integral and volume integral - Stoke's theorem - Gauss's divergence theorem - Green's theorem.

Unit II
Matrices: 15 Hrs.
Matrices - Symmetric matrix, anti-symmetric matrix - Hermitian matrix, skew - Hermitian matrix - Orthogonal matrix - Unitary matrix. Eigen value and Eigenvector of matrices - Cayley-Hamilton's theorem - Proof - Inverse of a matrix - Rank of a matrix - elementary row or column transformation.

Unit- III
Ordinary Differential Equations: 20 Hrs.
First and second order ordinary differential equations with constant coefficients - Initial value problem - Method of finding solutions - Superposition principle - Wronskian-Second order differential equations with variable coefficients - Definition of ordinary and singular points - Power Series Solution - Solutions about ordinary point and singular point.

UNIT- IV   12 Hrs.
Probability and Statistics:
Probability: Basic definition - Classical probability and empirical probability - Properties of probability - Conditional probability - Joint probability - Addition law and multiplication law of probability.
Statistics: Measures of central tendency - Mean, median and mode - Skewness and kurtosis.
Probability distribution – Random variables - Binomial distribution, Poisson's distribution, Normal (Gaussian) distribution and Standard normal distribution. Expectation values - Moments and moment generating functions - variance and standard deviation.

UNITV   **11 Hrs.**
Beta, Gamma Functions:

Definition of Gamma function - Fundamental property of gamma function and values of Gamma function - Definition of beta function - Different forms of beta function - Relationship between beta and gamma functions - Delta function - Basic properties**.**

Text Books
   1. **Zill D. G. and Cullen M. R.,** "Advanced Engineering Mathematics", (Unit I, II & III) Narosa, 2006.
   2. **Kreyszig E.,** "Advanced Engineering Mathematics", (Unit I, II, III & IV) Wiley Eastern, 2015.
   3. **Dass H.K.,** "Mathematical Physics", (Unit IV &V), S.Chand & Company, New Delhi, 2010.
   4. **Satya Prakash,** "Mathematical Physics",(Unit IV), S.Chand & Company, New Delhi, 2014

Reference Books
   1. **Gupta B.D**., " Mathematical Physics" , S.Chand & Company, New Delhi, 4th Edition, 2009.
   2. **Arfken, Weber and Harris**, "Mathematical Methods for Physicists A Comprehensive Guide", Elsevier Publication, 7th Edition.

Core Paper X
CLASSICAL MECHANICS AND RELATIVITY

Instructional Hrs: 90   **Sub. Code: 16PHUC610**
Max. Marks: CIA-25; ESE-75   **Credits: 6**

UNIT I   **12 Hrs**
Newtonian Mechanics:
Newton's Law of Motion - First Law - Second Law - Third Law.
Applications: Simple Pendulum - Simple Pendulum as Linear Harmonic Oscillator - Physical Pendulum: Compound Pendulum
Cyclic coordinates and conservation laws - linear momentum, angular momentum and energy.

UNIT II   **20 Hrs**
Constraints
Holonomic and non-holonomic constraints - scleronomic and rheonomic constraints - degrees of freedom - generalized coordinate and generalized velocity - configuration space - virtual displacement - virtual work done D'Alembert's principle - Euler - Lagrangian equation of motion.
Applications of Lagrangian - simple pendulum, linear harmonic oscillator in one dimension, Atwood's machine, compound pendulum, double pendulum and a charged particle in an electromagnetic field.

UNIT III   **20 Hrs**
Variational technique:
Variational calculus - geodesics - Lagrangian equation of motion from Hamilton's principle - Newton's equation of motion from Hamilton's principle
Hamiltonian:
Phase space - Legendre transformation - Hamiltonian for simple pendulum, linear harmonic oscillator in one dimension and a charged particle in an electromagnetic field - Hamilton's equation of motion.

UNIT IV   **20 Hrs**
Central force:
Two body problem can be written as equivalent one body problem - central force properties - Kepler's second law - effective potential and classification of orbits - inverse square law problem.
Scattering theory - differential cross section and total cross section - Rutherford scattering (Qualitative Analysis).

UNIT V   **18 Hrs**
Relativity:
Frames of reference - Galilean transformation equations - Michelson - Morley experiment - postulates of special theory of relativity - Lorentz transformation equations - length contraction - time dilation - Illustration - meson decay - addition of velocities - Variation of Mass with Velocity - Mass - Energy Equivalence - Unified Mass Unit.

Text Books

1. **Verma H.C.**, "Concept of Physics", Bharati Bhawan Publishers & Distributors, 2nd Edition, 1996.
2. **Helbert Goldstein., John Safko, Charles P. Poole.**, "Classical Mechanics", Pearson, 3rd Edition, 2011
3. **Upadhyaya J. C.,** "Classical Mechanics", Himalaya Publishing House, 2009.
4. **Murugeshan R.,** "Modern Physics", S.Chand & Company., New Delhi, 18th Edition, 2016.

Reference Books

1. **Gupta, Kumar, Sharma.,** "Classical Mechanics", Pragati Prakashan, Meerut, 21st Edition, 2004.
2. **Takwale R.G. and Puranik P. S.**, "Introduction to Classical Mechanics", Tata McGraw-Hill, New Delhi, 2006.

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SEMESTER VI
Core Paper XI
QUANTUM MECHANICS

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Instructional Hrs. : 90   **Sub. Code: 16PHUC611**
Max. Marks: CIA-25; ESE-75   **Credits: 6**
Objective: To provide an insight into the behavior of particles at micro level.

UNIT I   **18 Hrs.**

Foundation of Quantum Mechanics:
Inadequacy of classical mechanics - dual nature of matter - expression for de-Broglie wavelength - G.P. Thomson's experiment - wave packet - phase velocity - group velocity - relation between phase velocity and group velocity.
Heisenberg's Uncertainty Principle:
Statement and its physical significance - gamma ray microscope - diffraction of electron through a slit - application of uncertainty principle - size of the Hydrogen atom and energy in the ground state.

UNIT II   **18 Hrs.**
Foundation of Quantum Mechanics:
Postulates of quantum mechanics - Max Born's statistical interpretation of wave functions - Probability density - Schrodinger time dependent wave equation and time independent wave equation. Orthogonal and normalization conditions for wave functions.
The operator formalism in Quantum Mechanics:
Dynamical variables as operators - operators for position, momentum, kinetic energy in position representation and momentum representations - Hermitian operators and its properties - parity operator - expectation values of dynamical quantities.

UNIT III 16 Hrs.

Stationary states:

Probability current density and probability density - Ehrenfest's Theorem - Proof.

Commutation Algebra:

Canonical commutation relation between position, momentum, Hamiltonian operators - orbital angular momentum commutation - commutation relation of L^2 with components of angular momentum operators L_x, L_y and L_z - Ladder operators L_+ and L_-.

UNIT IV 20 Hrs.

Applications of Schrödinger's Equation and bound state problems :

Infinite square well potential - A particle inside an one dimensional box (0 , L) and (- L , L) - two dimensional box (0 , L) and three dimension (0, L) - concept of degeneracy; finite square well potential - potential step – rectangular potential barrier - application of barrier penetration - tunneling effect - Scanning Tunneling Microscope - theory of alpha decay in nuclear physics.

UNIT V 18 Hrs.

Linear harmonic oscillator in one dimension – analytical method and algebraic method - zero point energy - plotting of ground state, first excited state and second excited state wave functions using any software (C, C++, Matlab, Mathematica, etc.).

Schrodinger wave equation in spherical polar coordinates - Hydrogen atom - solution by variables separable method– azimuthal solution - spherical harmonics - radial differential equation and its solutions - energy eigen value - plot of ground state, first excited state and second excited wave function using any software (C,C++, Matlab, Mathematica, etc.).

Text Books

1. **Murugeshan R.,** "Modern Physics", S.Chand & Company., New Delhi, 18th Edition, 2016.
2. **Satya Prakash, Singh C K.,** "Quantum Mechanics", Kedar Nath Ram Nath Publications , Merrut , 10th Edition, 1997.
3. **Singh S.P., Bagde M K., Kamal Singh.,** "Quantum Mechanics", S.Chand & Company., New Delhi, 2nd Edition, 1996.
4. **Nouredine Zettili.,** "Quantum Mechanics - concepts and applications", A John Wiley and Sons, Ltd., Publication, 2nd Edition, 2009.

Refernce Books

1. **Mathews P M., Venkatesan K.,** "A Text Book of Quantum Mechanics", Tata Mc Hill New Delhi, 1997.
2. **Ghatak A K., Loganathan S.,** "Quantum Mechanics", Tata Mc Hill New Delhi, 1977.
3. **Rajput B S.,** "Advanced Quantum Mechanics", Pragati Prakashen Publishers,Merrut ,5th Edition, 2001.

Instructional Hrs.: 60   **Sub. Code: 16PHUE602**

Max. Marks: CIA-25; ESE-75   **Credits: 4**

Objective: The purpose is to understand the basics of 8085 Microprocessor and to provide an in-depth knowledge in programming.

UNIT I   **12 Hrs.**
Introduction to Microprocessors and Architecture of 8085 Microprocessor:

Evolution of Microprocessors - Microprocessor Based System (Micro computer) - 8085 Microprocessor - Pin functions of 8085 Microprocessor - Architecture of 8085Microprocessor - ALU - Registers - Accumulator - Flag register - program counter - Stack pointer - Bus: Address Bus Data bus – Control bus.

UNIT II   **12 Hrs.**
Instruction set of 8085:

Computer languages - Machine language - Assembly language - High level language - Instruction format – Op code - Operand - Classification of instruction based on length - Classification of instruction based on function: Data transfer instructions - Arithmetic instructions - Logic instructions - Branch instructions - Machine control instructions - Stack - Subroutines - Addressing Modes.

UNIT III   **12 Hrs.**
Microprocessor Timings:
Timing and Control Unit - Instruction Cycle - Machine Cycle - T-State - Fetch operation - Execute Cycle - Instruction and Data Flow - Timings of Intel 8085 - OP Code Fetch Cycle - Memory And I/O Read Cycle - Memory And I/O - Write Cycles.
Address Space Partitioning - Memory mapped I/O scheme - I/O Mapped I/O scheme.

UNIT IV   **12 Hrs.**

Assembly language programs:
8 bit addition - 8 bit subtraction - 8 bit multiplication - 8 bit division - Square and Square root of a number - Sum of N numbers - Generating Fibonacci series - Transferring a block of data
UNIT V   **12 Hrs.**
Assembly language programs:
Finding greatest and smallest number in an array(Bubble sort method) - Arranging numbers in

ascending and descending order - Code Conversion: BCD to Binary - Binary to BCD - A temperature monitoring system (Block Diagram) - Microcontroller 8051(Block Diagram)

Text Books

1. **Ramesh Gaonkar., "**Microprocessor, Architecture, Programming and Applications with the 8085", Penram Interrnational Publishing (India)Private Limited, Mumbai, 5th Edition.
2. **Vijayendran V..,** **"**Fundamentals Of Microprocessor-8085",Viswanathan Publication, Chennai, First Edition 2002.
3. **Ram B.,** "Fundamentals of Microprocessors and Microcomputers" , Dhanpat Rai Publications (Pvt) Ltd.,New Delhi, 6th Edition, 2005**.**

Reference Books

1. **Anokh Singh, Chhabra A.K**., **"**Fundamentals of Microprocessor and its Applications**"** S.Chand & Company Ltd., New Delhi, First Edition, 2005**.**
2. **Aditya P Mathur**., "Introduction To Microprocessors", Tata McGraw – Hill Publishing Company Ltd., New Delhi, 3rd Edition.

SEMESTER VI

Elective Paper III

COMMUNICATION ELECTRONICS

Instructional Hrs: 60   **Sub. Code: 16PHUE603**
Max. Marks: CIA-25; ESE-75   **Credits: 4**

Objectives: The syllabus envisages in providing the necessary theory and analog and digital communication principles and applications. Communication techniques hold the key for development.

UNIT I   **12Hrs.**
Modulation
Modulation - Definition - Types of Modulation AM, FM, PM - Amplitude Modulated Voltage - Wave Form of Amplitude Modulated Wave - Balanced Modulator - SSB Generation - Suppression of Carrier - Frequency Modulation - Definition and Expression - Phase Modulation - Definition - Comparison of AM, FM And PM.

UNIT II   **10 Hrs.**
Demodulation:
Definition - Diode Detection of AM Signals - FM Detection - Foster Seely Discriminator - Radio Receivers: Straight Receivers - TRF Receivers - Super Heterodyne Receivers - Block Diagram-Explanation of Each Stage - FM Receivers - Block Diagram.

UNIT III   **14 Hrs.**
Digital Communication:
Introduction to Digital Communication System - Pulse Code Modulation - Amplitude Shift Keying

(ASK) - Band Width and Frequency Spectrum of ASK - Binary ASK Modulator - Coherent ASK Detector- Non Coherent ASK Detector - Frequency Shift Keying (FSK)

Bandwidth of Binary FSK - Detection Of FSK Using PLL- Phase Shift Keying (PSK) - Generation of binary PSK-DPSK- Generator and Demodulator- Advantages and Disadvantages of Digital Modulation.

UNIT IV   **12 Hrs.**

Broad Band Communication:

TDM, FDM, Integrated Digital Network: ISDN - Broadband ISDN - Basic Concepts of LAN: BUS Topology - Star Topology - Ring Topology - Hybrid Topology - Private Branch Exchange (PVBX) - Modems Classification.

UNIT V   **12 Hrs.**

Fiber Optics and Satellite Communication:

Optical Communication - Basic Fiber Optic System; Advantages - Optical Fiber Construction   Modes of propagation - Numerical Aperture - Losses in Optical Fiber - Optical Communication System.

Introduction to Satellite Communication System - Basic Components - Telemetry Tracking and Command System (Block Diagram) - Satellite Links.

Text Books

1. **Anokh Singh & Chabra A.K.,** "Principles Of Communication Engineering", S.Chand
    & Company, New Delhi 2006.

2**. Deshponde N.D, Deshponde D.A & Rangole.,** "Communication Electronics" , TMG,

   New Delhi, 2002.

3. **Gupta & Kumar**, "Hand book of Electronics", Pragati Prakhasan, Meerut (2012)

4**. Theraja B.L.,** "Basic Electronics", S.Chand & Company, New Delhi, 5th Edition , 2009.

Reference Books

1**. George Kennedy**., "Electronic Communication System", Tata McGraw Hill, New
    Delhi, 4th Edition, 2004.

2. **Kennedy and Davis** , "Electronics Communication Systems", TMH, 6th Edition

3. **Robert M., Gagliarasi** ., "Satellite Communication", CBS, New Delhi,1994.