

B.Sc. Physics

PROGRAMME OUTCOMES OF B.SC.

- Apply the broaden and in-depth knowledge of science and computing to analyse, think creatively and generate solutions to face the global challenges.
- Foster intellectual curiosity, critical thinking and logical reasoning.
- Adapt to different roles and responsibilities and develop leadership qualities in multicultural working environment by relating to diversity and ethical practices.
- Update the techniques and acquire skills to develop systems and methods to solve current problems.

PROGRAMME SPECIFIC OUTCOME-B.SC

No	Upon completion of the programme the Students will be able to	PSO NO
1	Understand the core theories and principles of physics which include mechanics, thermodynamics, electronics and material science.	PSO-1
2	Develop clear and extensive comprehensive of fundamental physics and wide experience of diverse applications related to physical phenomena.	PSO-2
3	Apply the knowledge of physical concepts and phenomenon.	PSO-3
4	Apply the critical reasoning and computing skills to analyze and solve problems in physics.	PSO-4
5	Analyze the observed experimental data and relate the results with theoretical expectations.	PSO-5
6	Understand the impact of physics on the society and the world around.	PSO-6
7	Communicate the scientific information in oral and written formats. So that they can think critically and work independently in the present scenario.	PSO-7

Semester I

Major Core I

Name of the Course

: MECHANICS AND PROPERTIES OF MATTER

Subject code

: PC1711

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objective: To impart knowledge on basic aspects of dynamics, conservation laws, kinematics, collisions and elasticity.

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Understand the fundamentals of dynamics	PSO1	U
CO-2	Explain the conservation laws	PSO2	U

CO-3	Apply the concept of moment of inertia to objects of different shapes	PSO4	A
CO-4	Distinguish elastic and inelastic collisions and discuss about the centre of pressure and Bernoulli's theorem	PSO2	An
CO-5	Explain the different moduli of elasticity	PSO1	U
CO-6	Analyze the various properties of liquids	PSO4	An

Teaching Plan

Credits: 4

Total contact hours: 60 (Including assignments and tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
I	Fundamentals of Dynamics					
	1	Reference frame – Inertial frames – Newton's laws of motion and its limitations	2	To understand the concept of frames of references.	Lecture Discussion with PPT illustration	Evaluation through short test
	2	Galilean transformations, Law of conservation of momentum and energy	2	To be able to derive the transformation equations of position, length, velocity and acceleration. To analyze that energy and momentum are conserved.	Lecture discussion with illustration	Multiple choice questions Formative assessment I
	3	Time period and orbital speed of a satellite, Impulse of force. Projectile on inclined plane and down to inclined plane, Range and time of flight	3	To know the principles of impulse and projectile.	Lecture discussion	
	4	Two body problem and reduced mass; Bifilar pendulum. Stable, unstable and neutral equilibrium. Equilibrium of bodies suspended and supported.	2	To distinguish between stable, unstable and neutral equilibrium with suitable illustration. To acquire knowledge to do practical experiment on bifilar pendulum.	Lecture discussion	
II	Conservation Laws and Kinematics					
	1	Conservation laws in general– Concept of work power and energy Conservative forces Energy: Work energy principle	3	To identify the principle of work-energy and power.	Lecture Illustration	Short test Quiz Assignment
	2	Conservative force as negative gradient of potential energy	3	To analyze that force is conservative.	Lecture discussion	Formative assessment I

		Curl $F=0$ Law of conservation of mechanical energy				
	3	Moment of Inertia Moment of Inertia of a Circular Disc Moment of inertia of a diatomic molecule Moment of Inertia of a rectangular block	3	To categorize moment of inertia of different objects.	Lecture Illustration	
III	Collisions and Hydrostatics					
	1	Elastic and inelastic Collision, Fundamental principles of impact Direct impact of two smooth spheres and its loss of kinetic energy Oblique impact of two smooth spheres and its loss of kinetic energy	5	To recall the concept of collision and to recognize the impact of smooth spheres.	Lecture with PPT Illustration	Formative assessment II
	2	Pressure and thrust, Thrust on a plane immersed in a liquid Center of pressure, Center of pressure on a rectangular lamina Center of pressure on a triangular lamina Laws of flotation, meta centric height Equation of continuity Euler's equation Bernoulli's theorem	4	To understand the concept of pressure and thrust.	Question-answer session Lecture	
IV	Elasticity					
	1	Moduli of Elasticity Work done in a strain – Torsion of a body Torsional oscillations of a body	3	To acquire knowledge on elasticity.	Lecture Discussion	Formative assessment II
	2	Bending of beams- Definitions Expression for the bending moment Depression of the loaded end of a cantilever. Measurement of Young's Modulus Uniform and non-uniform	6	To acquire skills to do experiments on bending of beams.	Lecture Discussion	

		bending of a beam				
V	Viscosity and Surface tension					
	1	Streamline flow and Turbulent Flow Poiseuille's formula for the flow of a liquid through a capillary tube Poiseuille's method for determining coefficient of viscosity of a liquid	3	To have practical knowledge on determining the coefficient of viscosity of a liquid.	Lecture with PPT	Short test Formative assessment III
	2	Terminal Velocity and Stokes' Formula Stokes' method for the coefficient of viscosity of a viscous liquid Explanation of surface tension on Kinetic theory	3	To evaluate Stoke's formula and apply it in experiment to understand the viscous force of a liquid.	Brain storming session. Lecture Illustration	
	3	Drop weight method of determining the surface tension of a liquid Experiment to determine the interfacial tension between water and kerosene	3	To evaluate the principle of surface tension in liquids and understand it by practical experiments.	Lecture with PPT Illustration	

Course Instructor: Dr. M. Mary Freeda

Head of the Department:

Dr.S.Mary Delphine

Semester: I/ III

Name of the Course: Allied Physics Paper –I

Subject Code: AP1711/AP1731

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objectives

1. To understand the behavior of waves, oscillations, properties of matter and optics.
2. To study the physical concepts behind natural phenomena.

Course Outcomes

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	Describe the behaviour of waves and oscillations	PSO1	U
CO-2	Demonstrate the bending moment diagrams (Distinguish different type of bending)	PSO1	U
CO-3	Explain the properties and behavior of fluids under various conditions	PSO2	Ev
CO-4	Distinguish between the characteristics and features of various phenomena of light (Interference, diffraction, polarization, double	PSO6	An

	refraction, specific rotation)		
CO-5	Analyze and study the applications of dispersion and refraction through a prism	PSO5	An
CO-6	Understand the elastic nature of materials	PSO1	U

Teaching Plan

Total contact hours: 60 (Including lectures, assignments and Tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	Waves and Oscillations					
	1	Simple harmonic motion (Definition, Example)- Transverse vibrations of a stretched string- Velocity- Frequency	3	Describe the behavior of waves and Oscillations	Lecture discussion	Multiple Choice Questions Quiz, Formative Assessment I Assignment
	2	Laws- Verification using Sonometer	1	Able to verify the Laws of vibrations of the string	Lecture demonstration	
	3	Melde's experiment- A.c frequency using sonometer	2	Able to determine the frequency of AC	Lecture demonstration	
	4	Ultrasonics- Piezoelectric effect- Production of ultrasonic & Piezo electric – Reverberation.	3	Able to understand the Ultrasonic waves & its production	Lecture discussion	
II	Elasticity and Bending moment					
	1	Elasticity-Different moduli-Poisson's Ratio	3	Understand the elastic nature of materials	Lecture discussion	Short Test, Formative Assessment I, II
	2	Bending of Beam- Expression for the bending moment- Young's modulus by non-uniform bending	4	Distinguish the different types of bending	Lecture demonstration	
	3	Torsional pendulum- Determination of rigidity modulus.	2	Evaluate the Rigidity modulus of the material by conducting experiments	Lecture demonstration	
III	Viscosity and surface tension					
	1	Streamline flow & turbulent flow	1	Explain the motion and behaviour of the fluids	Lecture discussion	Multiple choice

	2	Coefficient of Viscosity- Definition- Determination- Poiseuill's formula - Terminal Velocity-	3	Discuss the theories of Viscosity	Lecture discussion & Demonstration	questions Formative Assessment II
	3	Stoke's law- Determination of Viscosity of highly viscous liquid-	2	Evaluate the Viscosity of highly viscous liquid	Lecture demonstration	
	4	Surface Tension: Excess of pressure inside a drop and bubble- Jaegar's Method.	3	To determine the physical parameters by conducting experiments	Lecture, Illustration, Group discussion	Short Test
IV	Physical optics					
	1	Interference- Interference in thin film- Production of colours of thin films-	1	To explain the basic principles & phenomena of Interference	Lecture discussion	Short Test, Formative Assessment II, III
	2	Airwedge- Test of Optical flatness-	1	To test the optical flatness of glass plate	Lecture Illustration	
	3	Diffraction- Plane transmission diffraction grating- Determination of wavelength of light using transmission grating-Polarization: Polarization by reflection	3	Discuss the phenomena of diffraction & Polarization	Lecture discussion Lecture demonstration	
	4	Double refraction- Nicol Prism- Optical Activity- Specific rotatory power	4	Determine the various optical parameters by using optical components	Lecture discussion	
V	Geometrical Optics					
	1	Refraction of light- Refraction through prism- Refraction through thin prism	3	Discuss the theories of refraction	Lecture discussion	Multiple Choice Questions Quiz,
	2	Dispersion through a prism- Expression for dispersive power-	2	Discuss the theories of dispersion	Lecture discussion	Formative

	3	Combination of two prisms to produce dispersion without deviation and deviation without dispersion- Direct vision spectroscopy.	4	Analyze and study the applications of dispersion and refraction through a prism	Group discussion	Assessment III
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Course Instructor: Dr. R.Krishna Priya **Head of the Department:**Dr.S.Mary Delphine

Semester I

Non Major Elective Course

Name of the Course : Physics Every day – I

Subject code : PNM171

No of hours per week	No of credits	Total no of hours	Marks
4	3	60	100

Objective:

1. To introduce the basic concepts in physics and their applications in everyday life.
2. To Know how physics is applied in day to day life situations.

Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	Understand their knowledge of basic scientific principles and fundamental concepts in physics.	PSO-2	U
CO- 2	Recall various laws in physics (Newton, Archimedes, conservation, gravitation) applied in day today life situation.	PSO-1	R
CO- 3	Identify basic physics principles of instruments(veena, violin, guitar, drum, flute) and devices(thermometer, refrigerator).	PSO-3	Ap
CO -4	Explain safety measure for using electricity.	PSO-6	E
CO- 5	Elaborate the properties and application of light.	PSO-1	C

Teaching Plan

Total contact hours:60 (Including lectures, assignments and tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	Force and acceleration					
	1	Speed, velocity Acceleration Unbalanced forces causes acceleration Forces on stationary objects	3	To understand the fundamental concepts in physics	Lecture, PPT	Quiz test, Formative assessment (I)
	2	Friction –the law of universal gravitation Acceleration due to gravity Mass and weight	3	To know the law of universal gravitation	Lecture, Demonstration	
	3	Newton’s laws of motion Momentum- conservation of momentum-	3	To understand the fundamental concepts in physics	Lecture	
4	Why do boats float and silverware sink? Surface tension and its effects in everyday life.	3	To apply Surface tension effects in day today lie situation.	Lecture, Demonstration		
II	Work, Energy and Heat					
	1	Force, Work and Power	3	To understand the fundamental concepts in physics	Lecture, Demonstration	Quiz test, Formative assessment (I)
	2	Levers Inclined Planes Compound Machines	3	Able to differentiate simple and compound machines	Lecture, Demonstration	
	3	Energy Swings , Work Energy Theorem Running Speed Of Animals	3	To understand the fundamental concepts in physics	Lecture	
4	Temperature And Heat Movement Of Heat Thermometer Refrigerators.	3	Identify basic physics principles of instruments	Lecture, PPT		
III	Waves and vibrations					
	1	Waves and wavelike motion Waves of Energy Sound Waves	3	To understand the fundamental concepts in waves	Lecture	Quiz test, Formative assessment (II)
2	Physics Of Sound Interference Standing Waves	3	To understand the fundamental concepts in sound	Lecture, PPT		

	3	Human Ear Human Voice The Doppler Effect Acoustics	3	To understand the fundamental concepts	Lecture, Group discussion	
	4	Musical Sounds Vibrations In Musical Instruments-The Violin The Nagaswaram The Mirthangam ,Flute.	3	Identify basic physics principles of instruments	Lecture, Demonstration	
IV	Light waves in motion					
	1	How Light Travels The Brightness Of Light Properties Of Light	3	To know the fundamental concepts in light	Lecture, PPT	Quiz test, Formative assessment (II & III)
	2	Total Internal Reflection Bending Of Light Rays Sources Of Light	3	To know about the laws of light	Lecture, PPT	
	3	Human Eye Light And Color Visualization Of Color	3	To know about the Visualization Of Color	Lecture, Demonstration	
	4	Camera Kaleidoscope Prism Binoculars.	3	Understand basic physics principles of instruments	Lecture, Demonstration	
V	Electricity and magnetism					
	1	Electrical charge - producing electric current Electric energy and potential Making an electric circuit	3	To understand about Electrical charge	Lecture, PPT	Formative assessment (II & III) Assignment, Quiz test,
	2	Current and resistance Ohm's law High voltage transmission	3	To know about Ohm's laws.	Lecture, PPT	
	3.	Ac vs dc current Lightning-formation Lightning safety tips Lightning protector.	3	To recall Lightning effects	Lecture, Group discussion	
	4.	Magnets - magnetic earth the fields around magnets Electricity makes magnetism-magnetic force Magnetism makes electricity Appliances and motors House hold circuits.	3	Explain safety measure for using electricity	Lecture, Group discussion	

Course Instructor: M. Abila Jeba Queen **Head of the Department :**Dr.S.Mary Delphine

Semester :III
Name of the Course :ELECTRICITY AND MAGNETISM
Subject code : PC1731

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives: 1. To provide knowledge on the basic concept of electric and magnetic fields.

2. To understand the laws and theorems in electromagnetism and their application.

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	Explain the concept and features of the electrostatic force (Coulomb force), magnetic field, flux, force, the electric force field, Gauss's Law and its application (charged sphere, cylinder, plane sheet)	PSO-1	U
CO- 2	Analyse the presence of electric potential and potential difference, within a framework of distributed symmetric charge distributions	PSO-2	An
CO- 3	Solve problems associated with the effect of uniform magnetic fields on moving charges and current-carrying wires, loops and the magnetic dipole.	PSO-3	C
CO -4	Understand the laws of electromagnetic induction as applied to self and mutual induction.	PSO-3	U
CO- 5	Analyse AC circuit behavior (LR, CR and LCR)	PSO-5	An
CO -6	Apply kirchoff's laws and network theorems to electrical circuits .	PSO-2	A
CO-7	Determine magnetic dipole moment using magnetometers and AC bridges, and Ballistic galvanometer to do electrical measurements	PSO-5	E

Teaching Plan

Credit:4

Total Hours: 60 (Incl. Seminar & Test)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	Electric Field					
	1	Electric dipole , Force and Torque, Potential energy of a dipole in a uniform electric field	3	To understand the basic concepts and features related to electric field	Illustration and lecture	Evaluation through: quiz, short questions
	2	Lines of force – Flux of the electric field, Gauss law	2	To derive Gauss law in terms of electric field	PPT Illustration Theoretical	Multiple choice, questions ,
	3	Electric field due to a uniformly charged sphere , infinite cylindrical charge, infinite plane sheet of charge	3	To apply Gauss's Law for different configurations	Illustration Theoretical derivation	Deriving theoretical Formulas Assignment
II	Electrostatic Potential					
	1	Conservative nature of electrostatic field, Potential difference, Electric potential as line integral of electric	2	To understand the origin of electrostatic field and relate	PPT Illustration, Theoretical	Evaluation through: quiz,

		field		between potential, its line integral and potential difference	formulation	short test
	2	Potential at a point due to a point charge, uniformly charged conducting sphere, Electric potential energy	3	To extend the idea of potential to calculate potential of different configurations	Lecture , Illustration, Theoretical formulation	Assignment on applications.
	3	Electrical Images - Capacity of a condenser, spherical condenser and Parallel plate condenser	3	To understand the concept of electrical images and evaluate the capacitance of various condensers	Lecture , Illustration, Theoretical formulation	Formative assessment(I &II)
III	Magnetic field and Electromagnetic induction					
	1	Magnetic field and Definition of \vec{B} , Magnetic force on a particle and Magnetic field lines, Magnetic force on a current carrying wire, Torque on a current loop	3	To understand the basic concepts and features related to Magnetic field, the force and torque due to \vec{B}	Lecture , Illustration, Theoretical formulation	Evaluation through: quiz, short questions
	2	Faradays law of electromagnetic induction, Lenz law and Explanation of Faradays law	2	To apply laws of electromagnetic induction and be able to calculate self- and mutual inductance.	Lecture , Illustration,	Multiple choice, questions ,
	3	Coupling of two coils with flux linkage and Magnetic energy stored in the inductance	3	To evaluate the effect of coupling two inductances and the magnetic energy stored	Illustration, Theoretical formulation	Deriving theoretical formulas Formative assessment(II)
IV	Electrical Circuits and Network theorems					
	1	Kirchoff's laws, Series circuit – AC through an L-R circuit, C-R circuit	3	To apply Kirchoff's laws to ac circuit theory including L-R circuit and C-R circuit	Lecture , Demonstration , theoretical formulation	Evaluation through: quiz, short questions
	2	LCR in series resonance circuit- Vector diagram method, The series circuit at resonance, The parallel resonance circuit	3	To analyse the behaviour of series and parallel resonance circuit and arrive at the condition for resonance	Lecture , Demonstration , theoretical formulation	Multiple choice, questions , Deriving theoretical formulae
	3	Network theorems, Ideal constants, Thevenins theorem, Norton's theorem - Maximum power transfer theorem	3	Understand the theorems which decide the distribution of currents and potentials in complex networks	Lecture , Demonstration , theoretical formulation	Formative assessment (II&III)
V	Electrical Measurements					

1	AC bridges, The Desauty bridge , Anderson's L-C bridge, Owen's L-C bridge	4	To understand the distribution of currents in C-R and L-C , AC bridges	Illustration, Theoretical formulation	Evaluation through: quiz,
2	Moving coil galvanometer, Correction for damping in Ballistic galvanometers, Measurement of charge sensitivity of a ballistic galvanometer, Determination of the absolute capacity of a condenser	4	To understand the theory, working and application of Moving coil galvanometer for various measurements	Lecture , Demonstration , theoretical formulation	Deriving theoretical formulas Formative assessment (III)

Course instructor: Dr. Fernando Loretta

Head of the Department:Dr.S.Mary Delphine

Semester: III

Name of the Course: Non -Conventional energy sources

Subject Code: PC1732

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives

1. To provide knowledge on various alternative sources of energy.
2. To create awareness about the non-conventional energy sources which will solve the energy crisis.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	Utilize the solar energy for generating the electric power	PSO-6	Ap
CO-2	Apply the solar energy in various sectors (industry, agriculture and domestic purposes)	PSO-4	Ap
CO-3	Explain the basic principles of wind energy conversion, its components and its classification	PSO-1	U
CO-4	Explain the various Biomass conversion Processes	PSO-1	U
CO-5	Elaborate the geothermal energy resources and chemical energy resources (fuel cells)	PSO-2	C
CO-6	Outline the extraction of useful energy from Earth, Ocean, Wind and Sun.	PSO-2	U
CO-7	Design the various pollution-free energy resources(solar heater, solar cooker, Wind mill etc)	PSO-6	C
CO-8	Solve the present and future energy crisis	PSO-7	C

Teaching Plan

Total contact hours: 60 (Including lectures, assignments and Tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment /Evaluation
I	Solar Energy					
	1	Introduction- Solar water heating - Solar electric power generation- Solar photo voltaics	3	Able to utilize the solar energy for generating power	Lecture discussion	Quiz, Formative Assessment I Multiple Choice Questions
	2	Agriculture and industrial process heat	2	Apply the solar energy in various sectors	Lecture discussion	
	3	Solar distillation – Solar cooker - Solar green houses	3	Design the various Pollution free energy resources	Lecture with ppt, Group Discussion	
	4	Solar production of hydrogen	1	Apply the solar energy for the production of Hydrogen	Lecture discussion	
II	Wind energy					
	1	Basic principles of wind energy conversion - Nature of the wind- Power in the wind- Site selection considerations -	4	Understand the fundamental of wind resource	Lecture , Group discussion	Short Test, Formative Assessment II
	2	Basic components of WECS - Classification of WEC systems - Advantages and disadvantages of WECS -	3	Explain the wind energy, its components and its classification	Lecture discussion	
	3	Wind energy collectors - Horizontal axial machines	2	Outline the extraction of wind energy from the wind	Lecture discussion	
III	Bio-Energy					
	1	Bio mass- Bio conversion technologies- Wet processes- Dry processes-	4	Understand the fundamentals of Biomass conversion processes & devices	Lecture discussion	Short Test, Formative Assessment I, II
	2	Photosynthesis- Bio gas generation-Factors affecting biodigestion or generation of gas	2	Explain the Bio gas generation and the factors affecting it	Lecture discussion	

	3	Classification of Bio gas plants - Constructional details of digesters	3	Aware from a technical point of view of Bio gas plants	Lecture, Illustration, Group discussion	
IV	Geo thermal Energy and Chemical Energy					
	1	Nature of geo thermal fields – Geo thermal sources - Hydrothermal resources - Vapour dominated systems - Liquid dominated systems Geo pressured resources - Magma resources	4	Outline the technologies that are used to harness the power of Geo thermal energy	Lecture discussion	Short Test, Formative Assessment II, III
	2	Fuel cells - Design and principle of operation of a fuel cell – Types of fuel cell – Advantages and disadvantages of fuel cells	2	Identify the types of practical fuel cells, their operational principles & basic electrochemistry for understanding the key process in fuel cells	Lecture discussion	
	3	Conversion efficiency of fuel cells – Types of electrodes – Work output and emf of fuel cells – Applications of fuel cells	3	Explore the methods to calculate fuel cell open circuit voltage, fuel cell loss & efficiency	Lecture discussion	
V	Energy from the ocean and Hydrogen energy					
	1	Introduction- Ocean thermal electric conversion(OTEC) - Methods of ocean thermal electric power generation- Open cycle OTEC system- Closed or Anderson OTEC cycle-	3	Understand about the OTEC and the various methods of power generation from ocean energy	Lecture discussion	Short Test, Formative Assessment III
	2	Heat exchangers- Bio fouling- Site selection- Energy utilization-Hybrid cycle- Prospects of ocean thermal energy conversion in India-	4	Explain the ocean energy utilization for various sectors	Lecture discussion	

	3	Hydrogen energy- Hydrogen production- Electrolytic production of hydrogen- Thermo chemical methods.	2	Able to account for the most central principles of Hydrogen production	Group discussion	
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Course instructor: M. Abila Jeba Queen **Head of the Department:**Dr.S.Mary Delphine