Programme Structure for Bachelor of Science (Basic/Hons.) (Physics) Programme (Subjects with Practical)

Sem.	Discipline Core(DSC) (Credits)	Discipline Elective(DSE) /Open Elective (OE) (Credits)	Ability Enhancement Compulsory Courses (AECC), Languages (Credits) (L+T+P)		Skill Enhancement Courses (SEC)			Total Credits
					Skill based (Credits) (L+T+P)	Value based (Credits) (L+T+P)		
I	DSC A1(4+2) DSC B1(4+2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)		SEC-1: (2) (1+0+2)	Yoga (1) (0+0+2)	Health &Wellness (1) (0+0+2)	25
II	DSC A2(4+2) DSC B2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)	Environmental Studies (2)		Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
Exit option with Certificate (48 credits)								
III	DSC A3(4+2) DSC B3(4+2)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs. each)		SEC-2: (2)(1+0+2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
IV	DSC A4(4+2) DSC B4(4+2)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs. each)	Constitution of India (2)		Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
Exit option with Diploma in a particular Discipline (96 credits)								
V	DSC A5(3+2) DSC A6(3+2) DSC B5(3+2) DSC B6(3+2)				SEC-3: SEC (2) (1+0+2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	24
VI	DSC A7(3+2) DSC A8(3+2) DSC B7(3+2) DSC B8(3+2)				SEC-4: Professional Communication (2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	24
Exit with Bachelor of Degree in a particular Discipline (140 credits)								
VII	DSC A/B9(3+2) DSC A/B10(3+2) DSC A/B11(3)	DSC A/B E-1 (3) DSC A/B E-2 (3) Res. Methodology (3)						22
VIII	DSC A/B12(3) DSC A/B13(3) DSC A/B14(3)	DSC A/B E-3 (3) DSC A/B E-4 (3) Research Project (6)*						21
Award of Bachelor of Degree with Honours, B.Sc (Hons.) 180 credits)								

*In lieu of the research Project, two additional elective papers/ Internship may be offered.

Note: 1) Instruction hours per week: DSC-4 hrs; Practical-4 hrs; OE-3 hrs.

2) Max marks: DSC - 100 (IA 40+Exam 60); Practical – 50 (IA 25+Exam 25); OE – 100 (IA 40+Exam 60).

3) The theory IA will be based on (i) Average of 2 tests: 20 marks, (ii) activity/ seminars/ projects :20 marks.

4) The practical IA will be based on (i) Regular performance:15 marks, (ii) test/seminars: 10 marks.

5) Duration of Annual Examination: Theory-2hrs; Practical-4hrs.

Curriculum Structure-Physics

(Core and Electives)

Semesters- I to X

SEM	DSC	Core Papers
Sem-1	A1	Mechanics and Properties of Matter
Sem-2	A2	Electricity and Magnetism
Sem-3	A3	Wave Motion and Optics
Sem-4	A4	Thermal Physics and Electronics
Sem-5	A5 A6	1. Classical Mechanics and Quantum Mechanics- I 2. Elements of Atomic, Molecular Physics
Sem-6	A7 A8	1. Elements of Nuclear Physics and Nuclear Instruments 2. Elements of Condensed Matter Physics
Sem-7	A9 A10 A11	1. Mathematical Methods of Physics – I 2. Classical Electrodynamics. 3. Experimental methods of Physics 4. Research Methodology (Select Two DSE subjects from the Pool B-I shown below)
Sem-8	A12 A13 A14	1. Classical Mechanics and Quantum Mechanics-II 2. Statistical Mechanics 3. Astrophysics & Astronomy 4. Research Project* (Select Two DSE subjects from the Pool B-II shown below) *In lieu of the research Project, two additional elective papers/ Internship may be offered.
Sem-9	A15	1. Mathematical Methods of Physics – II (Select One DSE subjects from the Pool B-III shown below) 2. Research Project
Sem-10	A17	1. Quantum Mechanics – III (Select One DSE subjects from the Pool B-IV shown below) 2. Research Project

* The Courses of 3rd Semester and above need to be revisited.

Open Electives for 1st and 2nd Semester

Sem.	Courses
1.	Energy Sources
2.	Astronomy and Space Mission

Discipline Specific Electives for 7th to 10th Semesters

	7th Sem Electives Pool B-I (Select any two)		8th Sem Electives Pool B-II (Select any two)
A.	Condensed Matter Physics-1	A.	Atomic & Molecular Physics-1
B.	Nuclear and Particle Physics	B.	Materials Physics & Nano materials
C.	Theoretical and Computational Physics-I	C.	Lasers and non-linear optics
D.	Biophysics	D.	Plasma Physics
E.	Astronomy and Astrophysics	E.	Physics of Semiconductor devices

	9th Sem Electives (Specialization papers) Pool B-III		10th Sem Electives (Specialization papers) Pool B-IV
A.	Condensed Matter Physics-2	A.	Condensed Matter Physics-3
B.	Nuclear and Particle Physics-2	B.	Nuclear and Particle Physics-3
C.	Atomic & Molecular spectroscopy-1	C.	Atomic & Molecular spectroscopy-2
D.	Materials Physics & Nanophysics –1	D.	Materials Physics & Nanophysics -2
E.	Theoretical and Computational Physics-I	E.	Theoretical and Computational Physics-2
F.	Astronomy and Astrophysics-1	F.	Astronomy and Astrophysics-2

Detailed Syllabus for Semesters I & II

B.Sc., Physics

Detailed Syllabus for Semesters I & II

Semester – I

Mechanics and Properties of Matter

Programme Outcomes (POs)

PO-1: Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO-2: Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO-3: Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO-4: Ethics: Apply the professional ethics and norms in respective discipline.

PO-5: Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO-6: Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs) (UGC guidelines)	**1**	**2**	**3**	**4**	**5**	**6**
CO-1: Will learn fixing units, tabulation of observations, analysis of data (graphical/analytical)	**x**	**x**				x
CO-2: Will learn about accuracy of measurement and sources of errors, importance of significant figures.	**x**	**x**				
CO-3: Will know how g can be determined experimentally and derive satisfaction.	**x**					
CO-4: Will see the difference between simple and torsional pendulum and their use in the determination of various physical parameters.	**x**			**x**	**x**	**x**
CO-5: Will come to know how various elastic moduli can be determined.	**x**				x	**x**
CO-6: Will measure surface tension and viscosity and appreciate the methods adopted.	**x**	**x**				
CO-7: Will get hands on experience of different equipment.	**x**	**x**	**x**		**x**	**x**

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course are Marked ‘X’ in the intersection cell if a course outcome addresses a particular program outcome.

Mechanics & Properties of Matter		Hrs
Credit : 4+2	**Unit – 1 Theory : 4 hours /Week**	
Chapter No. 1	**Units and measurements:** System of units (CGS and SI), dimensions of physical quantities, dimensional formulae. Minimum deviation, errors and error analysis **Vectors:** Instantaneous velocity and acceleration, Derivative of planar vector of constant magnitude but changing direction. Arbitrary planar motion, radial and transverse component of velocity and acceleration, deduction of the results of uniform circular motion.	(13)
Chapter No. 2	**Momentum and Energy**: Work and energy, Conservation of linear and angular momentum. Conservation of energy with examples. Motion of rockets. Problems	
Chapter No. 3	**Special Theory of Relativity:** Inertial and no-inertial frames of reference, Galelian transformation equation, Galelian principle of relativity. Search for absolute frame of reference, Ether concept, Null result of Michelson Morley experiment, Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Twin paradox, Relativistic addition of velocities, Einstein's mass energy relation-photon box experiment. Problems	
Topics for self study	**Self Study** **Units and measurements:** Measurement of length, mass and time. Laws of Motion: Newton's Laws of motion. Dynamics of single and a system of particles. Centre of mass.	
	Suggested Activities	
Activity No. 1	i). Students can measure diameters of small balls of different size and estimate their volumes. ii). Students can measure lengths of nails of different size. iii). Students can measure volume of a liquid. iv). Students can measure distances and put the result both in CGS and SI units in 2, 3 and 4 significant figures. Ask them to mention the precession of the measurement. v). students can estimate standard deviations wherever possible.	
Activity No. 2	Students can try and understand conservation of energy in every day examples. For example: i) What happens in solar conservation panels ii) Pushing an object on the table it moves iii) Moving car hits a parked car causes parked car to move. In these cases, energy is conserved. How? Understand and verify if possible. Students can try and understand conservation of momentum with help of coins and balls by referring to websites. Reference: https://www.youtube.com/	

Unit – 2		
Chapter No. 4.	**Laws of Motion:** Conservative and non-conservative forces. Deduction of conservation of energy in conservative force field. Centre of mass. Simple harmonic motion – vertical oscillations of the light loaded spring, expression for force constant and determination of acceleration due to gravity, Problems	(3)
Chapter No. 5.	**Dynamics of Rigid bodies**: Rotational motion about an axis, Relation between torque and angular momentum, Rotational energy. Moment of inertia: Theorem of perpendicular axis and Theorem of parallel axes, Moment of Inertia of a rectangular Lamina, Circular disc and ring and solid cylinders. Flywheel, theory of compound pendulum and determination of 'g'. Problems	(7)
Chapter No. 6.	**Gravitation:** Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's laws (statements). Satellite in a circular orbit. Problems	(3)
Topics for self study (If any) Chapter 7	Escape velocity, Geosynchronous orbits. Basic idea of global positioning system (GPS).	
	Suggested Activities	
Activity No. 3	Activity: Moment of inertia is an abstract concept. It simply gives a measure of rotational inertia of a rigid body and it is proportional to the product of the square of radius, r of the body and its mass, m. Students by Referring to websites, students can construct and perform simple experiments to verify that MI α mr^2. Students can try to understand law of inertial with the help of coins and balloons by referring to websites.	
	Reference : www.khanacademy.org, www.pinterest.com, www.serc.cerleton.edn, https://www.youtube.com	
Activity No. 4	Activity: Prepare suitable charts and give seminar talks related to moment of inertia, gravitation and planetary motion.	
Activity No. 5	(i) Rolling of different disc and cylinders on inclined plane to understand the moment of inertia. (ii) Listing and discussing the moment of inertia of bodies come across in daily life.	

Unit - 3		
Chapter No. 8	**Elasticity:** Hooke's law - Stress-strain diagram, elastic moduli-relation between elastic constants, Poisson's Ratio-expression for Poisson's ratio in terms of elastic constants. Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder. Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, η and σ by Searle's method Bending moment of beams, Cantilever bending and uniform bending, I - section of girders. Problems.	(13)
	Suggested Activities	
Activity No. 6	Activity: Arrange a steel spring with its top fixed with a rigid support on a wall and a meter scale alongside. Add 100 g load at a time on the bottom of the hanger in steps. This means that while putting each 100g load, we are increasing the stretching force by 1N. Measure the extension for loads up to 500g. Plot a graph of extension versus load. Shape of the graph should be a straight line indicating that the ratio of load to extension is constant. Go for higher loads and find out elastic limit of the material.	
Activity No.7	Activity: Repeat the above experiment with rubber and other materials and find out what happens after exceeding elastic limit. Plot and interpret.	
Activity No 8	Activity: Classifying different materials in to elastic and plastic materials. Studying the bending magnitudes of different shape and material rods.	

Unit - 4		
Chapter No. 9	**Surface tension:** Definition of surface tension. Surface energy, relation between surface tension and surface energy, pressure difference across curved surface example, excess pressure inside spherical liquid drop, angle of contact., Surface tension by drop weight method, Interfacial surface tension, Problems.	(13)
Chapter No. 10	**Viscosity:** Streamline flow, turbulent flow, equation of continuity, determination of coefficient of viscosity by Poisulle's method, Stoke's method. Problems.	
Topics for self study (If any)	Variation of surface tension with temperature, Surface tension by Capillarity rise, Application of viscosity.	

Suggested Activities		
Activity No.9	1. Measure surface tension of water and other common liquids and compare and learn i) Why water has high ST? think of reasons. ii) Check whether ST is a function of temperature? You can do it by heating the water to different temperatures and measure ST. iii) Plot ST versus T and learn how it behaves. Mix some quantity of kerosene or any oil to water and measure ST. Check whether ST for the mixture is more or less than pure water. List the reasons.	
Activity No. 10	Activity: 2. Collect a set of different liquids and measure their viscosity. i) Find out whether sticky or non-sticky liquids are most viscous. List the reasons. ii) Mix non sticky liquid to the sticky liquid in defined quantities and measure viscosity. Find out viscosity is increasing or decreasing with increase of non-sticky liquid concentration. iii) Do the above experiment by mixing sticky liquid to the non-sticky liquid. Find out change in viscosity with increase of concentration of sticky liquid. List the applications where concept of Viscosity plays a dominant role	

Text Books:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Mechanics by, New Eition	D. S. Mathur	S.Chand & Co.	2000
2	Mechancis and Relativity by 3rd Edition,	Vidwan Singh Soni,	PHI Learning Pvt. Ltd.	2013
3	Mechanics Berkeley Physics Course, Vol.1:	Charles Kittel, et.al.	Tata McGraw-Hill	2007
4	Properties of Matter	Brijlal & Subramanyam.	S.Chand & Co	2014
5	Physics for Degree Students	CL Aurora & PS Hemne	S.Chand & Co	2010
6	Mechanics	J C Upadhyaya	Himalaya	2016

References Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Principles of Physics 9th Edn,	Resnick, Halliday & Walker,	Wiley	2013
2	Conceptual Physics, 10th Edn	Paul G Hewit	Pearson	2012
3	Introduction to Special Theory of Relativity	Robert Resnick	Wiley Student Edition	2014
4	Physics for Scientists and Engineers	Jewett & Serway	Cengage learning India Pvt Ltd, Delhi	2012
5	The Feynman Lectures on Physics – Vol 1	Richard P Feynman, Robert B Leighton, Mathew Sands	Narosa Publishing House	1986
6	Physics – (International Student Edition)	Marcelo Alonso & Edward J Finn	Addison – Wesley	1999
7	Concepts of Modern Physics	Arthur Beiser	Tata Mcggraw Hill	1998
8	Modern Physics	Kenneth Krane	Wiley	2012
9	Newtonian Mechanics	AP French	Viva Books	2017
10	Modern Physics	G Aruldhas & P Rajgopal	PHI Learning Pvt. Ltd.	2009

List of Experiments to be performed in the Laboratory:

1.	Determination of g using bar pendulum (two hole method and L versus T graphs).
2.	Determination of moment of inertia of a Fly Wheel.
3.	Determination of rigidity modulus using torsional pendulum.
4.	Modulus of rigidity of a rod – Static torsion method.
5.	Determination of elastic constants of a wire by Searle's method.
6.	Young's modulus by Koenig's method.
7.	Viscosity by Stokes' method.
8.	Verification of Hooke's law by stretching and determination of Young's Modulus.
9.	Determination of surface tension of a liquid by drop weight method.
10	Study of motion of spring and to calculate the spring constant, g and unknown mass.
11.	Determination of Young's modulus of a bar by the single cantilever method.
12.	Determination of Young's modulus of a bar by uniform bending method.
13.	Radius of capillary tube by mercury pellet method.
14	Verification of parallel and perpendicular axis theorems.
15	Determination of interfacial tension between two liquids using drop weight method.
16	Determination of viscosity of liquids by Poiseuille's method.

(Minimum EIGHT experiments have to be carried out).

Reference Book for Laboratory Experiments

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Advanced Practical Physics for students	B.L. Flint and H.T. Worsnop	Asia Publishing House.	1971
2	A Text Book of Practical Physics	I. Prakash & Ramakrishna	Kitab Mahal, 11th Edition	2011
3	Advanced level Physics Practicals	Michael Nelson and Jon M. Ogborn	Heinemann Educational Publishers, 4th Edition	1985
4	A Laboratory Manual of Physics for undergraduate classes	D.P.Khandelwal	Vani Publications.	1985
5	BSc Practical Physics Revised Ed	CL Arora	S.Chand & Co	2007
6	An advanced course in practical physics	D. Chatopadhyay, PC Rakshit, B.Saha	New Central Book Agency Pvt Ltd	2002

Semester – II

Electricity & Magnetism

Programme Outcomes

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
i. Will demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.	x	x				
ii. Will explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.	x					
iii. Will be able to apply Gauss's law of electrostatics to solve a variety of problems.	x	x			x	
iv. Will describe the magnetic field produced by magnetic dipoles and electric currents.	x					
v. Will be able to explain Faraday-Lenz and Maxwell laws to articulate the relationship between electric and magnetic fields.	x					
vi. Will be in position to describe how magnetism is produced and list examples where its effects are observed.	x				x	x
vii. Will be able to apply Kirchhoff's rules to analyze AC circuits consisting of parallel and/or series combinations	x	x			x	x

	of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor.						
viii.	Will understand and able to apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity,• Maximum Power Transfer, etc. and their applications in electronics, electrical circuit analysis, and electrical machines.	**x**	**x**			**x**	**x**

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Electricity & Magnetism		**Hrs**
Unit – 1		
Chapter No. 1	**Topics to be covered:** Electric charge and field Coulomb's law, electric field strength, electric field lines, point charge in an electric field and electric dipole, work done by a charge (derivation of the expression for potential energy), Problems.	3
Chapter No. 2	**Topics to be Covered** Gauss's law and its applications (electric fields of a (i) spherical charge distribution, (ii) line charge and (iii) an infinite flat sheet of charge).	3
Chapter No. 3	**Topics to be Covered** Electric potential, line integral, gradient of a scalar function, relation between field and potential. Potential due to point charge and distribution of charges (Examples: potential associated with a spherical charge distribution, infinite line charge distribution, infinite plane sheet of charges). Constant potential surfaces, Potential due to a dipole and electric quadrupole. Problems	7
Topics for self study(If any)	Constant potential surfaces - for self learning Work out problems listed in the reference	
	Suggested Activities	
Activity No. 1	1. Learn the difference between and DC and AC electricity and their characteristics. Voltage and line frequency standards in different countries. 2. A small project report on production of electricity as a source of energy: Different methods	

	3. With the help of glass rod, plastic rod, silk, and fur demonstrate the generation of charge and electrostatic attraction and repulsion.	
Activity No. 2	1. Learn to use a multimeter (analog and digital) to measure voltage, current and resistance. Continuity testing of a wire. 2. Learn about household electrical connection terminals: Live, neutral and ground and voltage between the terminals. Role of earthing and safety measures	
Unit – 2		
Chapter No. 4.	**Topics to be covered** Conductors in electrostatic field Conductors and insulators, conductors in electric field. Capacitance and capacitors, calculating capacitance in a parallel plate capacitor, parallel plate capacitor with dielectric, dielectrics: an atomic view. Energy stored in a capacitor, Dielectric and Guass's law, Problems.	6
Chapter No. 5.	**Topics to be covered** Electric currents and current density. Electrical conductivity and Ohm's law. Physics of electrical conduction, conduction in metals and semiconductors, circuits and circuit elements: Variable currents in capacitor circuits, Resistor, inductor and capacitor and their combination, charging and discharging of capacitor. Force on a moving charge. Problems.	7
Topics for self study(If any)	Currents and voltage in combination of R, L and C circuits, Kirchoff's laws of voltage & Current	
	Suggested Activities	
Activity No. 3	1. Learn about electrical appliances which work with AC and DC electricity 2. Learn about types of resistors and their colour codes and types of capacitors(electrolytic and non-electrolytic)	
Activity No. 4	1. Learn about power transmission: 3-phase electricity, voltage and phase 2. Visit a nearby electrical power station. Interact with line men, Electrical engineers and managers. Discuss about power loss in transmission. How to reduce it? 3. Prepare a small project report on street lighting and types of electrical bulbs.	

Unit – 3		
Chapter No.6	**Topics to be covered** Magnetism Definition of magnetic field, Ampere's law and Biot-Savart law (magnetic force and magnetic flux), Magnetic force on a current carrying conductor, Hall effect. Electromagnetic induction, conducting rod moving in a magnetic field, law of induction and mutual inductance, self inductance and energy stored in a magnetic field. Problems.	5
Chapter No. 7	**Topics to be covered** Alternating current circuits: Resonant circuit, alternating current, quality factor, RL, RC, LC, LCR circuits, admittance and impedance, power and energy in AC circuits. Filters – High and Low and band pass filters (qualitative), Problems.	8
Topics for self study(If any)	Force acting on a moving charge in electric and magnetic fields – Lorentz force, Magnetic dipole moment – torque on a magnetic dipole.	
Suggested Activities		
Activity No. 5	**Activity:** 1. Prepare a small project report on street lighting and types of electrical bulbs. 2. Learn the measurement of electric current using tangent galvanometer.	
Activity No.6	**Activity:** Build a small coil with insulated copper wire. Connect an ammeter micro/milli ammeter. Verify magnetic induction using a powerful bar magnet.	
Unit - 4		
Chapter No. 8	Electromagnetic waves: Scalar and vector fields, operator grad, the gradient of a scalar function, integration theorems – line integral, surface integral, volume integral, divergence and curl of a vector, Gauss and Stokes theorems (qualitative), Equation of continuity, Maxwell's equations, displacement current, electromagnetic wave, energy transported by electromagnetic waves. Electromagnetic waves in different frames of reference, the field of a current loop, magnetic moment, Electric current in atoms, electron spin and magnetic moment, magnetization and magnetic susceptibility.	10
Chapter No. 9	**Topics to be covered:** Types of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials. B-H hysteresis curves.	3
Topics for self study(If any)	B-H curves and its characteristics Ferrites	

Suggested Activities		
Activity No.7	1. Prepare a small project report on production of magnetic field: Permanent magnets, electromagnets and superconducting magnets. 2. Learn the principle of working of a Gauss meter to measure magnetic field	
Activity No. 8	1. Model the earth's magnetic field with a diagram. Explain the effect of tilt of the earth's axis and reasons for the change in the tilt of the earth's axis over thousands of years.	
Activity No 9	Identifying the magnetic meridian of the earth and measuring the magnetic dip at a place using the magnetic pointer. Discussion on magnetic equator	

Text Books:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics for Degree Students Volume 1	CL Aurora & PS Hemne	S.Chand & Co	2010
2	Fundamentals of Magnetism and Electricity	DN Vasudeva	S Chand & Co	2011
3	Electricity and Magnetism	R Murugeshan	S Chand & Co	2019
4	Electricity and Magnetism	D C Tayal	Himalaya	1989

References Books:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics-Part-II,	David Halliday and Robert Resnick	Wiley Eastern Limited	2001
2	Berkeley Physics Course, Vol-2, Electricity and Magnetism, Special Edition	Edward M Purcell	Tata Mc Graw-Hill Publishing Company Ltd, New Delhi	2008
3	The Feynman Lectures on Physics – Vol II	Richard P Feynman, Robert B Leighton, Mathew Sands	Narosa Publishing House	1986
4	Physics for Scientists and Engineers	Jewett & Serway	Cengage learning India Pvt Ltd, Delhi	2012
6	Physics – (International Student Edition)	Marcelo Alonso & Edward J Finn	Addison – Wesley	1999

List of Experiments to be performed in the Laboratory

1.	Experiments on tracing of electric and magnetic flux lines for standard configuration.
2.	Verification of Maximum Power Transfer Theorem.
3.	Analysis of Phasor diagram.
4.	Determination of capacitance of a condenser using B.G.
5.	Determination of mutual inductance using BG.
6.	Charging and discharging of a capacitor (energy dissipated during charging and time constant measurements.
7.	Series and parallel resonance circuits (LCR circuits).
8.	Impedance of series RC circuits- determination of frequency of AC.
9.	Study the characteristics of a series RC and RL Circuit.
10.	Determination of self inductance of a coil.
11.	Verification of laws of combination of capacitances and determination of unknown capacitance using de - Sauty bridge.
12.	Determination of B_H using Helmholtz double coil galvanometer and potentiometer.
13.	Low pass and high pass filters.
14.	Charge sensitiveness of BG.
15.	Field along the axis of a coil.
16.	Low resistance by potentiometer .

(Minimum EIGHT experiments have to be carried out).

Reference Book for Laboratory Experiments

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Advanced Practical Physics for students	B.L. Flint and H.T. Worsnop	Asia Publishing House.	1971
2	A Text Book of Practical Physics	I. Prakash & Ramakrishna	Kitab Mahal, 11th Edition	2011
3	Advanced level Physics Practicals	Michael Nelson and Jon M. Ogborn	Heinemann Educational Publishers, 4th Edition	1985
4	A Laboratory Manual of Physics for undergraduate classes	D.P.Khandelwal	Vani Publications.	1985
5	BSc Practical Physics Revised Ed	CL Arora	S.Chand & Co	2007
6	An advanced course in practical physics	D. Chatopadhyay, PC Rakshit, B.Saha	New Central Book Agency Pvt Ltd	2002

Question paper pattern for I and II Semester Examinations

Max. marks: 60

Part A

Answer any FOUR out of six questions. Each questions carry 2 marks. 4x2=8

1.
2.
3.
4.
5.
6.

Part B 4x10=40

Answer **All** questions.

7a) One question from Unit I for 4 marks.
b) One question from Unit I for 6 marks.

OR

8a) One question from Unit I for 4 marks.
b) One question from Unit I for 6 marks.

9a) One question from Unit II for 4 marks.
b) One question from Unit II for 6 marks.

OR

10a) One question from Unit II for 4 marks.
b) One question from Unit II for 6 marks.

11a) One question from Unit III for 4 marks.
b) One question from Unit III for 6 marks.

OR

12 a) One question from Unit III for 4 marks.
b) One question from Unit III for 6 marks.

13a) One question from Unit IV for 4 marks.
b) One question from Unit IV for 6 marks.

OR

14a) One question from Unit IV for 4 marks.
b) One question from Unit IV for 6 marks.

Part C

Answer any THREE out of four questions (one PROBLEM from each unit). Each questions carry 4 marks. 3x4=12

15 (a)
(b)
(c)
(d)

Total Marks = 60

Scheme of practical final examination (I and II semester)

Instructions:

i) Minimum 8 experiments should be done (otherwise student is not allowed to sit for semester examination)

ii) Knowledge of the experiment:-

- Student knowledge is judged based on the performance of the handling equipments & recognising suitable devices used in the experiment. Questions must be asked to test basic knowledge of concerned the experiment only.

Marks allotment for practical

Allotment of marks	I & II semesters
Record book	8
Formula	3
Diagram/circuit, Exptal set up	3
Observation & trails	6
Knowledge of the experiment	3
Result & accuracy	2
Total marks	25

OPEN ELECTIVES

(SEM I to II)

Open Elective 1

ENERGY SOURCES

Programme Outcomes

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
CO - 1: Will be able to comprehend the varieties of energy sources and differentiate between the renewable and non-renewable sources of energy	**x**	**x**				
CO - 2: Will know the significance of solar energy and the different techniques to harness the solar energy	**x**	**x**				
CO - 3: Will gain the idea of the formation of waves and standing wave pattern, analysis of longitudinal and transverse waves.	**x**	**x**			**x**	
CO - 4: Will acquire the knowledge of wind energy and the methods to tap the energy from the blowing wind to generate electrical power.	**x**	x		x		
CO - 5: Will come to know about the conventional energy sources and its impact on the climate	**x**	x			**x**	

CO - 6: Will acquire the skill to set up a model to show the production of energy from different energy sources	**x**				**x**	**x**
CO - 7: Will be able to explain the different energy sources and how they are beneficial for the development of Technology.	**x**	**x**			**x**	**x**
CO - 8: Will be able to understand the problems of global warming and other climatic impact of the reckless usage of energy resources	**x**			**x**	**x**	**x**

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

ENERGY SOURCES

		No. of lectures
Unit-I	**Non-Renewable energy sources**	
	Chapter-1: Introduction	
	Energy concept-sources in general, its significance & necessity. Classification of energy sources: Primary and Secondary energy, Commercial and Non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy, Based on Origin-Examples and limitations. Importance of Non-commercial energy resources.	**04**
	Chapter-2: Conventional energy sources	
	Fossil fuels & Nuclear energy- production & extraction, usage rate and limitations. Impact on environment and their issues& challenges. Overview of Indian & world energy scenario with latest statistics- consumption & necessity. Need of eco-friendly & green energy & their related technology.	**09**
	Total	**13**
Unit-II	**Renewable energy sources**	
	Chapter-1: Introduction:	
	Need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.	**05**
	Chapter 2 : Solar energy:	
	Solar Energy-Key features, its importance, Merits & demerits of solar energy, Applications of solar energy. Solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell -brief discussion of each. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.	**08**
	Total	**13**

Unit-III	**Chapter-3: Wind and Tidal Energy harvesting**:	
	Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy.	**07**
	Chapter-4 : Geothermal and hydro energy	
	Geothermal Resources, Geothermal Technologies.	**02**
	Hydropower resources, hydropower technologies, environmental impact of hydro power sources.	**03**
	Carbon captured technologies, cell, batteries, power consumption.	**01**
	Total	**13**
	Activity 1. Demonstration of on Solar energy and wind energy using training modules at Labs. 2. Conversion of vibration to voltage using piezoelectric materials. 3. Conversion of thermal energy into voltage using thermoelectric (using thermocouples or heat sensors) modules. 4. Project report on Solar energy scenario in India 5. Project report on Hydro energy scenario in India 6. Project report on wind energy scenario in India 7. Field trip to nearby Hydroelectric stations. 8. Field trip to wind energy stations like Chitradurga, Hospet and Gadag. 9. Field trip to solar energy parks like Yeramaras near Raichur. 10. Videos on solar energy, hydro energy and wind energy.	
	Reference Books: 1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi 2. Solar energy - M P Agarwal - S Chand and Co. Ltd. 3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd. 4. Godfrey Boyle, “Renewable Energy, Power for a sustainable future”, 2004, Oxford University Press, in association with The Open University. 5. Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009 6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA). 7. http://en.wikipedia.org/wiki/Renewable_energy	

Open Elective 2

Astronomy & Space Mission

Programme Outcomes

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
CO – 1 : Will come to know the historical growth of Astronomy and the accumulation of knowledge.	**x**	**x**				
CO – 2 : Will be able to understand the basic principle of optical instruments such as telescope, binoculars.	**x**	**x**				
CO – 3 : Will acquire the skills to set up the telescope and recognize the star clusters and also the planets and satellites.	**x**	**x**			**x**	
CO- 4 : Will acquire the knowledge of wind energy and the methods to tap the energy from the blowing wind to generate electrical power.	**x**	x	x			
CO – 5 : Will come to know about the conventional energy sources and its impact on the climate	**x**	x			**x**	
CO-6 : Will be able to explain the stellar evolution and evolution of the universe.	**x**				**x**	**x**

CO- 7 : Will be able to explain the principle of Rocket launching and other space machines. .	x	x			x	x
CO-7 : Will know the Indian Space program and its contribution for the nation building.	x			x	x	x

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Astronomy & Space Mission

Topic	Hours
Unit 1: History & Introduction	**13**
Ancient Astronomy Vedic Astronomy, Ancient Astronomy – Aryabhata, Varahamihira, Bhaskara Greek, Sumerian, Mayan, Egyptian, Arabic and Chinese Observations	3
Medieval Astronomy: Geocentric Model, Heliocentric Model Observations by Tycho Brahe, Kepler, Galileo, Herschel and others.	3
Tools for Astronomy: Invention of Telescopes Pin Hole, Binoculars, Telescopes & Imaging.	3
Modern Astronomy Hubble's discovery, Stellar Evolution (Brief), Microwave, Radio Telescopes	2
Observational Terminologies Cardinal Directions, Azimuth, Altitude, Measurements using Compass and Hand. Equatorial Co-ordinates, Light years, Magnitude, Colors.	2
Unit 2: Observational Astronomy	**13**
The Sun Ecliptic and the Orientation of the Earth, Seasons - Solstices and Equinox, Observations of the Sun from Earth during seasons. Zero-shadow day Sunspots.	2
The Moon Earth-Moon system – Phases, Lunar Eclipses, Ecliptic and Lunar Orbital Plane – Nodes, Lunar Month, Full Moon Names.	2

Inner Planets: Mercury & Venus Observational History, Observational Windows, Appearanc, Apparitions, Elongations, Superior Conjunctions, Inferior Conjunctions, Transits. **Outer Planets: Mars, Jupiter & Saturn** Observational History, Observational Windows, Appearance, Frequency of Oppositions Oppositions, Conjunctions, Galilean Moons, Saturn's Rings **Distant or Minute Objects: Uranus, Neptune & Asteroids** Observational History, Observational Windows, Asteroid Belt, Prominent Asteroids.	5
Comets & Meteors Origin, Orbital Nature, Historical Observations, Prominent Comets and Asteroids., Meteors, Origins and Showers	2
Occultations, Transits and Eclipses Definitions, Prominent Occultations and Transits, Eclipses – Types and prominent occurrences. Famous Eclipses in the past.	2
Unit 3: Space Missions	**13**
Introduction to Space Missions: Rockets, types and their applications, Different types of orbits, Artificial satellites – basic idea and their applications, Introduction to Space Missions, Beginning of Space Missions - World and India, Applications of Space Research, Space crafts, Launching Vehicles. **Topics for Self-study**: Major Space Centres in the World (at least 10) – brief idea about their location, establishment, capabilities and achievements. People behind space programs – at least 2 from India. Successful Missions (Any Five).	6
Indian Space Research Organisation (ISRO): About ISRO and its Goals, History of Creation. General Satellite Programmes: The IRS series, The INSAT series. Gagan Satellite Navigation System, Navigation with Indian Constellation (NavIC), Other satellites. Launch vehicles: Satellite Launch Vehicle (SLV), Augmented Satellite Launch Vehicle (ASLV), Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle (GSLV). Experimental Satellites: Details and applications (Any Five) Earth Observation Satellites: Details and applications (Any Five) Communication satellites: Details and applications (Any Five) **Topics for Self study**: Chandrayaan 1: Details and applications. Mars Orbiter Mission: Details and applications.	7

References:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	The Amateur Astronomer	Sir Patrick Moore	Springer	2006
2	Handbook of Practical Astronomy	Gunter D. Routh	Springer	2009
3	Fundamental Astronomy	Hannu Karttunen	Springer	2007
4	Guide to Night Sky	P. Shankar	KRVP	2007
5	The Complete Idiot's Guide to Astronomy	Christopher De Pree and Alan Axelrod	Pearson	2001
6	The story of Astronomy In India	Chander mohan	Research Gate	2015
7	Trigonometry	-	Inc. BarCharts	
8.	Stargazing for Dummies	Steve Owens	John Wiley & Sons	2013
9.	A Skywatcher's Year	Jeff Kanipe	Cambridge University Press	1999
10.	The Casual Sky Observer's Guide	Rony De Laet	Springer	2012
11.	https://www.isro.gov.in/			

Question paper pattern for Open Elective for I and II Semester

Internal Assessment: 40 marks

Semester Examination: 60 marks

UNIT I, II & III Internal choice for each unit

Questions carrying 1 x 8 = 8

1 x 7 = 7

1 x 5 = 5

Total 20 x 3 = 60