Table 5: B.Sc. Semester I

Sr No	Course Category	Name of the course (Title of the Paper)	Course code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical					
					Th	Tu	P		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
1	Subject (One will be Major and other Minor in Semester III)	Subject 1: Mechanics and Properties of Matter	B-PH111T	4.5	2	--	--	2	2	30	20	25
		Subject 1 Lab	B-PH112P		--	--	2	1	4	30	20	25
		Subject 2:			2	--	--	2	2	30	20	25
		Subject 2 Lab			--	--	2	1	4	30	20	25
2	GE	Everyday Physics	B-PH113T		2	--	--	2	2	30	20	25
		Storytelling Physics	B-PH114T		2	--	--	2	2	30	20	25
3	VSEC	Physical Measurement techniques	B-PH115P		--	--	4	2	4 - 6	60	40	50
		Designing Power Supplies	B-PH116P		--	--	4	2	4 - 6	60	40	50
4	AEC	English Compulsory			2	--	--	2	2	30	20	25
5	VEC	Environmental Studies			2	--	--	2	2	30	20	25
6	IKS	Introduction to Metaphysics	B-PH117T		2	--	--	2	2	30	20	25
7	CC	NSS /NCC / Sports / Cultural			--	--	4	2	--	--	100	50
Total					14	--	16	22	--	390	360	--

Table 6: B.Sc. Semester II

Sr No	Course Category	Name of the course (Title of the Paper)	Course code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical					
					Th	Tu	P		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
1	Subject (One will be Major and other Minor in Semester III)	Subject 1:- Thermodynamics and Statistical Physics	B-PH121T	4.5	2	--	--	2	2	30	20	25
		Subject 1 Lab	B-PH122P		--	--	2	1	4	30	20	25
		Subject 2:			2	--	--	2	2	30	20	25
		Subject 2 Lab			--	--	2	1	4	30	20	25
2	GE	Basic Concepts in Physics	B-PH123T		2	--	--	2	2	30	20	25
		Physics of Solar System	B-PH124T		2	--	--	2	2	30	20	25
3	VSEC	Maintenance of Household appliances	B-PH125P		--	--	4	2	4 - 6	60	40	50
		Electrical and Electronics Measurement techniques	B-PH126P		--	--	4	2	4 - 6	60	40	50
4	AEC	English Compulsory			2	--	--	2	2	30	20	25
5	VEC	Constitution of India			2	--	--	2	2	30	20	25
6	IKS	Indian Contribution to Astronomy	B-PH127T		2	--	--	2	2	30	20	25
7	CC	NSS /NCC / Sports / Cultural			--	--	4	2	--	--	100	50
Total					14	--	16	22	--	390	360	--

Table 7: B.Sc. Semester III

Sr No	Course Category	Name of the course(Title of the Paper)	Course code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical					
					Th	Tu	P		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
1	DSC	Paper 1 Waves and Oscillations	B-PH231T	5.0	2	--	--	2	2	30	20	25
		Paper 2: Electrostatics and Magnetostatics	B-PH232T		2	--	--	2	2	30	20	25
		DSC Lab	B-PH233P		--	--	4	2	4 - 6	60	40	50
2	Minor	Paper 1: Physics of waves and Oscillations	B-PH234T		2	--	--	2	2	30	20	25
		Paper 2:- Static Electricity and Magnetism	B-PH235T		2	--	--	2	2	30	20	25
		Minor Lab	B-PH236P		--	--	4	2	4 - 6	60	40	50
3	GE	Physics of Planet Earth	B-PH237T		2	--	--	2	2	30	20	25
4	VSEC	C Programming	B-PH238P		--	--	4	2	4 - 6	60	40	50
5	AEC	Second Language			2	--	--	2	2	30	20	25
6	FP	Field Project			--	--	4	2	4 - 6	--	100	50
7	CC	NSS / NCC / Sports / Cultural			--	--	4	2	--	--	100	50
Total					12	--	20	22	--	360	440	--

Table 8: B.Sc. Semester IV

Sr No	Course Category	Name of the course (Title of the Paper)	Course Code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical					
					Th	Tu	P		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
1	DSC	Paper 1:- Introduction to Quantum Mechanics	B-PH241T	5.0	2	--	--	2	2	30	20	25
		Paper 2:- Concepts in Electricity	B-PH242T		2	--	--	2	2	30	20	25
		DSC Lab	B-PH243P		--	--	4	2	4 - 6	60	40	50
2	Minor	Paper 1:- Concepts in Quantum Mechanics	B-PH244T		2	--	--	2	2	30	20	25
		Paper 2:- Basic concepts in Electricity	B-PH245T		2	--	--	2	2	30	20	25
		Minor Lab	B-PH246P		--	--	4	2	4 - 6	60	40	50
3	GE	Introduction to Astronomy	B-PH247T		2	--	--	2	2	30	20	25
4	VSEC	Computer hardware and maintenance	B-PH248P		--	--	4	2	4 - 6	60	40	50
5	AEC	Second Language			2	--	--	2	2	30	20	25
6	CEP	Community Service			--	--	4	2	4 - 6	0	100	50
7	CC	NSS / NCC / Sports / Cultural			--	--	4	2	--	0	100	50
Total					12	--	20	22	--	360	440	--

Table 9: B.Sc. Semester V

Sr No	Course Category	Name of the course (Title of the Paper)	Course Code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical					
					Th	Tu	P		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
1	DSC	Paper 1:- Atomic and Nuclear Physics	B-PH351T	5.5	3	--	--	3	3	45	30	38
		Paper 2:- Modern Optics	B-PH352T		3	--	--	3	3	45	30	38
		DSC Lab	B-PH353P		--	--	6	3	6	90	60	75
		Paper 3:- Basic Electronics	B-PH354T		2	--	--	2	2	30	20	25
		DSC Lab	B-PH355P		--	--	2	1	4	30	20	25
2	DSE	Elective 1:- Astrophysics 2:- Acoustics	B-PH356T		2	--	--	2	2	30	20	25
		DSE Lab	B-PH357P		--	--	4	2	4 - 6	60	40	50
3	Minor	Paper 1:- Physics of Atoms and Nucleus	B-PH358T		2	--	--	2	2	30	20	25
		Minor Lab	B-PH358P		--	--	2	1	4	30	20	25
4	VSEC	Basic circuit Designs	B-PH358P		--	--	4	2	4 - 6	60	40	50
5	CEP	Community Service			--	--	2	1	--	--	50	25
Total					12	--	20	22		450	350	--

Table 10: B.Sc. Semester VI

Sr No	Course Category	Name of the course (Title of the Paper)	Course Code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical					
					Th	Tu	P		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
1	DSC	Paper 1:- LASER fundamentals and Fiber optics	B-PH361T	5.5	3	--	--	3	3	45	30	38
		Paper 2:- Theory of relativity	B-PH362T		3	--	--	3	3	45	30	38
		DSC Lab	B-PH363P		--	--	6	3	6	90	60	75
		Paper 3:- Introduction to Solid State Physics	B-PH364T		2	--	--	2	2	30	20	25
		DSC Lab	B-PH365P		--	--	2	1	4	30	20	25
2	DSE	Elective 1:- Complex analysis 2:- Communication Electronics	B-PH366T		2	--	--	2	2	30	20	25
		DSE Lab	B-PH367P		--	--	4	2	4 - 6	60	40	50
3	VSEC	Optical Components	B-PH368T		--	--	4	2	4 - 6	60	40	50
4	OJT	Internship / Apprenticeship (Related to DSC)			--	--	8	4	--	--	200	100
Total					10		24	22		390	460	--

Table 11: B.Sc. Semester-VII (Honors)

Sr No	Course Category	Name of the course (Title of the Paper)	Course Code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
					Th	Tu	P					
1	DSC	Paper 1:- Mathematical Physics	B-PH471T	6.0	4	--	--	4	3	60	40	50
		Paper 2:- Electrodynamics	B-PH472T		4	--	--	4	3	60	40	50
2	DSE	Elective:- 1. Numerical Methods 2. Solid State Electronics	B-PH473T		4	--	--	4	3	60	40	50
3	DSC /DSE	Lab	B-PH474P		--	--	12	6	6 - 8	180	120	150
4	RM	Research Methodology			4	--	--	4	3	60	40	50
Total					16	--	12	22		420	280	--

Table 12: B.Sc. Semester-VIII (Honors)

Sr No	Course Category	Name of the course (Title of the Paper)	Course Code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
					Th	Tu	P					
1	DSC	Paper 1:- Quantum Mechanics - I	B-PH481T	6.0	4	--	--	4	3	60	40	50
		Paper 2:- Classical Mechanics	B-PH482T		4	--	--	4	3	60	40	50
2	DSE	Elective: 1:- Molecular Modeling and Simulations Elective: 2:- Applied Digital Electronics	B-PH483T		4	--	--	4	3	60	40	50
3	DSC /DSE	Lab	B-PH484P		--	--	12	6	6 - 8	180	120	150
4	OJT	Internship / Apprenticeship (Related to DSC)	B-PH485P		--	--	8	4	--	--	200	100
Total					12	--	20	22		360	440	--

Table 13: B.Sc. Semester-VII (Honors with Research)

Sr No	Course Category	Name of the course (Title of the Paper)		Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
					Th	Tu	P					
1	DSC	Paper 1:- Mathematical Physics	B-PH471T	6.0	4	--	--	4	3	60	40	50
		Paper 2:- Electrodynamics	B-PH472T		4	--	--	4	3	60	40	50
2	DSE	Elective:- 1. Numerical Methods 2. Solid State Electronics	B-PH473T		4	--	--	4	3	60	40	50
3	DSC /DSE	Lab	B-PH474P		--	--	4	2	4 - 6	60	40	50
4	RM	Research Methodology	B-PH475T		4	--	--	4	3	60	40	50
5	RP	Research Project / Dissertation (Core)	B-PH475P		--	--	8	4	--	--	200	100
Total					16	--	12	22		300	400	--

Table 14: B.Sc. Semester-VIII (Honors with Research)

Sr No	Course Category	Name of the course (Title of the Paper)	Course Code	Level	Teaching Scheme (hrs)			Total Credit	Evaluation Scheme			
					Theory	Tutorial	Practical		Duration of Examination (Hrs)	Semester End Evaluation (SEE)	Continuous Internal Evaluation (CIE)	Minimum Passing Marks
					Th	Tu	P					
1	DSC	Paper 1:- Quantum Mechanics - I	B-PH481T	6.0	4	--	--	4	3	60	40	50
		Paper 2:- Classical Mechanics	B-PH482T		4	--	--	4	3	60	40	50
2	DSE	Elective: 1:- Molecular Modeling and Simulations Elective: 2:- Applied Digital Electronics	B-PH483T		4	--	--	4	3	60	40	50
3	DSC /DSE	Lab	B-PH484P		--	--	4	2	4 - 6	60	40	50
4	RP	Research Project / Dissertation 1 (Core)	B-PH485P		--	--	8	4	--	--	200	100
		Research Project / Dissertation 2 (Core)	B-PH486P		--	--	8	4	--	--	200	100
Total					12	--	20	22		240	560	--

Total Credits:

1. Three-Year UG Degree Program: 132
2. Four-Year UG Degree Program: 176

Table 15: Table showing course category wise credit distribution semester wise

Exit Point / Course Category	**Certificate in Science**	**Diploma in Science**	**Three Year Bachelor of Science**	**Bachelor of Science (Honors) Degree**	**Bachelor of Science (Honors with Research) Degree**
Major Credits	6	12	32	36	28
Minor Credits	6	12	3	--	--
GE	8	4	--	--	--
VSEC	8	4	4	--	--
AEC	4	4	--	--	--
VEC	4	--	--	--	--
IKS	4	--	--	--	--
CC	4	4	--	--	--
FP	--	2	--	--	--
CEP	--	2	1	--	--
OJT	--	--	4	4	--
RP	--	--	--	--	12
RM	--	--	--	4	4
Total Credits	44	44	44	44	44

Table 16: Table showing total marks in theory and Practical semester wise

Semester	Theory	Practical	Total Marks
1	350	400	750
II	350	400	750
III	300	500	800
IV	300	500	800
V	300	500	800
VI	250	600	850
VII (Honors)	400	300	700
VIII (Honors)	300	500	800
VII (**Honors with Research**)	400	300	700
VIII (**Honors with Research**)	300	500	800
For Honors	2550	3700	6250
For Research	2550	3700	6250

Sr No	Course Category	Name of the course (Title of the Paper)	**Course code**	Level	Teaching Scheme (hrs)			Total Credit
					Theory	Tutorial	Practical	
					Th	Tu	P	
1	Subject (One will be Major and other Minor in Semester III)	Subject 1: Mechanics and Properties of Matter	B-PH111T	4.5	2	--	--	2
		Subject 1 Lab	B-PH112P		--	--	2	1
		Subject 2:			2	--	--	2
		Subject 2 Lab			--	--	2	1
2	GE	Everyday Physics	B-PH113T		2	--	--	2
		Storytelling Physics	B-PH114T		2	--	--	2
3	VSEC	Physical Measurement techniques	B-PH115P		--	--	4	2
		Designing Power Supplies	B-PH116P		--	--	4	2
4	AEC	English Compulsory			2	--	--	2
5	VEC	Environmental Studies			2	--	--	2
6	IKS	Introduction to Metaphysics	B-PH117T		2	--	--	2
7	CC	NSS /NCC / Sports / Cultural			--	--	4	2
Total					14	--	16	22

B.SC.I, SEM I

DSC: Mechanics and Properties of Matter, B-PH111T Credit: 2

Objective: To provide the necessary information regarding mechanics and properties of matter.

Course Outcomes: After completing this course, students should be able to

1. Distinguish inertial, non-inertial and rotational frames of reference
2. Explain the concept of fictitious and Coriolis forces
3. Solve collision problems and determine motion regular/irregular bodies
4. Determine mechanical properties of solids
5. Solve problems based on surface tension and viscosity of liquids

Syllabus

Unit I: **(7.5 Hrs)**

Mechanics: Newton's law of motion, motion in a plane, components of velocity and acceleration in different coordinate system, Centripetal acceleration, Coriolis force and its applications. System of particles, Center of mass, Equation of motion, Conservation of linear and angular momentum, Conservation of energy, Elastic and inelastic collisions, Moments of inertia and their products, Moment of inertia of cylinder and sphere, Principal moments and axes.

Unit-II **(7.5 Hrs)**

Elasticity: Introduction, Hooke's law, Elastic constants (Y, K, η) and relation between them, Poisson's ratio, Elastic limit, Work done in stretching a wire, Twisting couple on a solid cylinder, Work done in twisting solid cylinder (wire), Bending of beam, Bending moment, External and internal bending moment, Cantilever supported at one end and at both end, Torsional pendulum, and Maxwell needle.

Unit III: **(7.5 Hrs)**

Viscosity: Streamline and turbulent flow, Coefficient of viscosity, Equation of continuity, Euler's equation, Bernoulli's theorem and its applications (Lift of an Airplane, Atomizer) , Poiseuilli's formula, Reynolds number, Terminal velocity, Stokes law by the method of dimension, Variation of viscosity with temperature.

Unit IV: **(7.5 Hrs)**

Surface tension: Introduction, Relation between radius of curvature, pressure and surface tension. Angle of contact and wetting, Surface energy, Pressure difference across a liquid surface: Excess pressure inside a spherical liquid drop, Excess pressure inside a soap bubble. Surface tension by Jaeger's, Quincke's and Capillary rise methods

References & Text books:

1. Applied Fluid Mechanics, by Mott Robert, Pearson Benjamin Cummir, VI Edition, Pearson Education/Prentice Hall International, New Delhi
2. Properties of Matter, by D. S. Mathur, Shamlal Chritable Trust New Delhi
3. Properties of Matter, by Brijlal
4. Physics for Degree Students B.Sc.-Part-I, by- C. L. Arora, Dr. P. S. Hemne, S Chand & Company.
5. General Properties of matter, by J. C. Upadhyay, Ram Prasad & Sons

6. Mechanics, by D. S. Mathur, S Chand.
7. Mechanics, by B. M. Roy, Das Ganu Publications.
8. A text book of properties of Matter, by N. S. Khare& S. Kumar.
9. Mechanics & Properties of Matter, by J. C. Upadhyaya.

DSC: LAB, B-PH112P Credit: 2

Objective: To provide the practical skill of mechanics, properties of matter and thermodynamics

Course Outcomes: After completing this course, students should be able to

1. Handle and use the basic measurement tools in laboratory
2. Determine mechanical properties of matter by various methods
3. Demonstrate thermal properties of matter and related the concepts
4. Analyse and compare the results obtained by various methods

List of the experiments:

1. Range and least count of Instruments, measurements using various instruments and error analysis (vernier callipers, screw gauge, traveling microscope, spectrometer etc.)
1. Acceleration due to gravity by bar pendulum
2. Young's modulus by cantilever.
3. Young's modulus by bending of beam.
4. Young's modulus by vibrational method.
5. Modulus of rigidity by Torsional pendulum.
6. Modulus of rigidity by Maxwell's needle.
7. Determination of η by statical method.
8. To determine Coefficient of Viscosity of water by Poiseulle's method.
9. Surface tension of a liquid by Quincke's method.
10. Surface tension of a liquid by Capillary rise method.
11. To determine the moment of inertia of a body using torsion pendulum.
12. To determine the moment of inertia of a fly-wheel.

References:

1. B. Sc. Physics practical by C. L. Arora
2. B. Sc. Physics practical by H. Singh, P.S. Hemne
3. B. Sc. Physics practical by Gita Sanon

GE: Everyday Physics: B-PH113T Credit: 2

Objective: To provide day to day life physics information or phenomena

Course Outcomes: After completing this course, students should be able to

1. Handle and use the basic knowledge of optical phenomena
2. Understand the phenomena about the motion of the bodies.
3. Handle the electric gadgets.
4. Understand the phenomena about the solar devices and thermal equipments.

Unit-I **(7.5 Hrs)**

Reflection, refraction, diffraction, interference, scattering (elementary ideas only) – examples from daily life – apparent depth, blue color of sky, twinkling of stars, Concave and convex mirrors, Lenses – focal length, power of a lens, refractive index, prism, dispersion. Human eye, defects of the eye – myopia, hypermetropia, presbyopia and astigmatism and their correction by lens.

Unit II **(7.5 Hrs)**

Velocity, acceleration, momentum, Inertia, force - laws of motion. Newton's law of gravitation, acceleration due to gravity, mass and weight, apparent weight, weightlessness Rotational motion, Moment of inertia, torque, centripetal and centrifugal acceleration examples- banking of curves, centrifugal pump, and roller coasters.

Unit III: **(7.5 Hrs)**

Ohms law, current measurements, voltage measurements, AC and DC voltages, battery eliminators, Dry cell battery, Working of Heater, Electric iron, water heating rod, Fuse, refrigerates, coolers and fans, precautions while handling household electric and electronic equipment,

Unit IV: **(7.5 Hrs)**

Laws of thermodynamics, heat engine, Pressure cooker working, gas Geezers, basic knowledge of surface tension, capillary action, viscosity, elasticity, Solar cell, solar battery, solar heater

References:

1. Physics of Everyday phenomena, by Griffith, Mc-Graw Hill
2. The physics of Everyday things by James Kakalios, Hachette UK publication.

GE: Storytelling Physics: B-PH114T Credit: 2

Objective: To provide the necessary information regarding development of physics via different happenings.

Course Outcomes:

After completing this course, students should be able to

1. Understand the motion of earth and related laws
2. To understand the nature of smallest part the elements
3. To understand the discovery of high energy electromagnetic radiations
4. Understand the possible origin of universe

Unit I: The History of The Earth's Rotation

Aristotle's concept about the universe, Copernicus theory, Brahe's Model of the Universe, Kepler's laws of planetary motion, Fundamental forces: Gravitational force, Electromagnetic force, Weak nuclear force, Strong nuclear force

Unit II: Story of Atomic Models

Structure of atom, Atomic number, Mass number, Atomic models: John Dalton's atomic model, Plum pudding model, Rutherford's model of the atom, Bohr's model of the atom, Electron Cloud Model/Quantum Mechanics Model of Atom

Unit III: Discovery of X-rays and Radioactivity

An introduction to Electromagnetic spectrum, Wavelength and frequency relationship, Discovery of X-rays, X-ray properties, X-ray uses

Radioactivity process, Discovery of Radioactivity, Alpha decay, Beta decay, Gamma Decay, Law of radioactive decay, Applications of radioactivity

Unit IV: Discovery of Big-Bang and Gamma Ray Bursts

Big Bang hypothesis, Accidental discovery of Big-Bang, Experiments supporting the existence of Big-Bang, Timeline of Big-Bang: Singularity, Inflation epoch, Cooling Epoch, Structure epoch

Gamma Ray Bursts: Concept of Supernova Explosion, Origin of GRBs, Discovery of GRBs, Importance of GRBs

References:

1. Concept of Physics by H. C. Verma
2. The physical universe: An introduction to Astronomy by Frank shu; University Science book publication
3. Kimayagar by Achyut Godbole, Rajhans Publication
4. NCERT books 11th and 12th Physics

VSEC: Physical Measurement Techniques, (B-PH115P) Credits:2

Objective: To provide the knowledge of day to day measuring instruments

Course Outcomes:

After completing this course, students should be able to

1. to measure parameters by suitable instruments.
2. calibrate the measuring tools.
3. understand the accuracy in the measurements.

Experiments

1. Use of ruler, thermometer, stopwatch, digital balance, measuring cylinder for measurement of different physical quantities
2. To Measure the diameter of a coin using Vernier callipers
3. To measure the inner diameter of a cylinder using Vernier callipers
4. To measure the diameter of a pin using micrometre screw gauge
5. To measure the thickness of a given sheet using micrometre screw gauge
6. To measure the diameter of a capillary tube using travelling microscope
7. To find the Refractive Index of a Glass Slab using a travelling microscope
8. To measure the radius of curvature of a convex lens using spherometer
9. To measure the angle of prism using spectrometer
10. Measurement of joint's range of motion using goniometer

References

1. B. Sc. Physics practical by C. L. Arora
2. B. Sc. Physics practical by H. Singh, P.S. Hemne
3. B. Sc. Physics practical by Gita Sanon

VSEC: Designing Power Supply, (B-PH116P) Credits:2

Objective: To provide the knowledge of power supply and batteries.

Course Outcomes:

After completing this course, students should be able to

1. design power supply of various output current and voltage.
2. Understand the selectivity of battery for various electronic devices.
3. Understand the precautions to avoid the electronics instruments to get damage.

Experiments Based On:

1. To study the voltage versus time graph of dry cell and step down transformer using CRO
2. To study the circuit of half wave rectifier
3. To study the circuit of full wave rectifier
4. To study the circuit of bridge rectifier
5. To study different types of filters
6. To prepare a Zener regulated power supply
7. To prepare an IC regulated power supply using 78xx series
8. To prepare an IC regulated power supply using 79xx series
9. To prepare a dc dual power supply of ± 5 volts
10. To prepare a variable voltage regulated power supply using IC LM 317

References:

1. Basic electronics by V. K. Mehata
2. B. Sc. Practical Physics by C. L. Arora
1. Basic Electronics (Solid State), by B. C. Theraja.
2. Electronic Principles by A. Malvino and D. J. Bates (Mc Graw Hill Education, India)

IKS: Introduction to Metaphysics, B-PH117T, Credit: 2

Objective: To introduce the concepts in metaphysics and classical Indian philosophy

Course Outcomes: After completing this course, students should be able to

1. Elaborate the metaphysical theories held by the different schools of classical Indian philosophy.
2. Compare the metaphysical theories held by the different schools of classical Indian philosophy.
3. Formulate the salient features of Indian metaphysics and epistemology.
4. Communicate the different views of reality and knowledge in Indian philosophy.

Unit I

7.5hrs

What is Metaphysics? Metaphysics and physics, Nature and scope of metaphysics, Concepts in Metaphysics: Mind and body, Existence, Universals and particulars, Causation, Substance, Identity, Persistence through time, Modality.

Unit II

7.5hrs

Types of metaphysical theory, Platonism, Aristotelianism, Kantianism, Idealism, Materialism, Naturalism, The epistemology of metaphysics,

Unit III

7.5hrs

Classical Indian Metaphysics, Orthodox Schools: Sankhya, Yoga, Nyaya, Vaisesika, Purva-Mimansa, Vedanata.

Unit IV

7.5hrs

Heterodox Schools: Jainism, Buddhism, Charvaka. Contemporary metaphysics, Analytic metaphysics in the 20th century.

References:

1. Metaphysics: A Very Short Introduction By Stephen Mumford · 2012
2. Metaphysics: The Key Concepts
3. By Nikk Effingham, Helen Beebee, Philip Goff · 2010
4. Roy W Perret. An Introduction to Indian Philosophy. UK: Cambridge University Press, 2016.
5. P. K. Mukhopadhyaya. Indian Realism. Calcutta: Lexington Books,1984.

Sr No	Course Category	Name of the course (Title of the Paper)	**Course code**	Level	Teaching Scheme (hrs)			Total Credit
					Theory	Tutorial	Practical	
					Th	Tu	P	
1	Subject (One will be Major and other Minor in Semester III)	Subject 1:- Thermodynamics and Statistical Physics	B-PH121T	4.5	2	--	--	2
		Subject 1 Lab	B-PH122P		--	--	2	1
		Subject 2:			2	--	--	2
		Subject 2 Lab			--	--	2	1
2	GE	Basic Concepts in Physics	B-PH123T		2	--	--	2
		Physics of Solar System	B-PH124T		2	--	--	2
3	VSEC	Maintenance of Household appliances	B-PH125P		--	--	4	2
		Electrical and Electronics Measurement techniques	B-PH126P		--	--	4	2
4	AEC	English Compulsory			2	--	--	2
5	VEC	Constitution of India			2	--	--	2
6	IKS	Indian Contribution to Astronomy	B-PH127T		2	--	--	2
7	CC	NSS /NCC / Sports / Cultural			--	--	4	2
Total					14	--	16	22

BSc Physics SEM-II

DSC: Thermodynamics and Statistical Physics, B-PH121T Credit: 2

Objective: To provide the knowledge regarding thermodynamics and statistical physics.

Course Outcomes: After completing this course, students should be able to

1. Explain the laws of thermodynamics and establish the limit on efficiency of Cornot's cycle
2. Derive the Maxwell's general relation and explain its applications
3. Analyse the experimental results using concepts in statistical mechanics
4. Develop framework for solving thermodynamic problems using statistical mechanics

Syllabus

Unit I: 7.5 hrs.

Thermodynamics I: Thermodynamic variables, Thermal equilibrium and temperature, Zeroth law of thermodynamics, Thermodynamic scales of temperature, Thermodynamic processes (Reversible and Irreversible), Indicator diagram, First law of thermodynamics, Carnot's cycle and it's efficiency, Carnot's theorem

Unit II: 7.5 hrs.

Thermodynamics II: Entropy, Second and third law of thermodynamics, Maxwell general relationship [$\delta(T, S)/ \delta(x, y) = \delta(P,V)/ \delta(x, y)$] and it's applications, Joules coefficient, Porous plug experiment, Liquefaction of gases- Boyle's temperature and inversion temperature, Liquefaction of Helium, Air conditioning (Concept only).

Unit III: 7.5 hrs.

Statistical physics I: Probability and frequency, Joint and Conditional probability, Mean value, variance, probability distribution, thermodynamic probability, Principle of a priori probability, Binomial distribution: mean values, fluctuations

Unit IV: 7.5 hrs.

Statistical physics II: Maxwell velocity distribution: Mean values and applications (1D, 2D and 3D) of Maxwell velocity distributions, μ- space, Gamma space, Phase space, accessible and inaccessible states, macro and micro states, Concept of Ensembles and their types.

References and Text books:

1. Heat, Thermodynamics and Statistical Physics, by Pragati Prakashan , Singhal, Agrawal.
2. Heat and Thermodynamics, by Brijlal, Subramanyam.
3. Heat, thermodynamics and statistical physics, by Brijlal, Subramayam and Hemne.
4. Heat and thermodynamics, by C. L. Arora.

DSC: LAB, B-PH122P

Objective: To provide the practical knowledge of thermodynamics

Course Outcomes: After completing this course, students should be able to

List of Experiments

1. To determine the pressure coefficient of air by constant volume air thermometer.
2. To verify the Stefan's law of radiation by using an incandescent lamp.
3. Thermal conductivity of a metal rod using Forbes method.
4. Thermal conductivity of a bad conductor by Lee's disc method.
5. To determine the critical temperature and critical pressure of a gas.
6. To determine the coefficient of thermal conductivity of glass in the form of a tube.
7. To determine specific heat of a given liquid by method of cooling.
8. To determine the mechanical equivalent of heat (J) with the help of Joule's calorimeter.
9. To determine temperature coefficient of resistance of platinum using platinum resistance thermometer
10. Study of heating efficiency of electrical kettle with varying voltages.

References:

4. B. Sc. Physics practical by C. L. Arora
5. B. Sc. Physics practical by H. Singh, P.S. Hemne
6. B. Sc. Physics practical by Gita Sanon

GE: BASIC CONCEPTS IN PHYSICS B-PH123T Credits: 2

Objective:

1. To introduce the basic concepts of electrostatics
2. To inculcate a scientific awareness about optics and modern physics
3. To understand the atomic structure, radioactive nucleus and thermodynamics

Course Outcomes:

After completing this course, the learner will be able to

1. understand the electrostatics
2. understand optics and modern physics laws
3. understand the atomic structure, radioactive nucleus and thermodynamics

Unit I **7.5 Hrs**

Electric charges, Electric field, Electric flux, Electric potential, Electric current, drift velocity, mobility, electrical resistivity and conductivity, Kirchhoff's rules, Biot – Savart law, Ampere's law and its applications, Faraday's laws, induced EMF and current, Lenz's Law, Self and mutual induction.

Unit II **7.5 Hrs**

Reflection, Refraction, total internal reflection and optical fibers, Diffraction, Microscopes and astronomical telescopes and their magnifying powers, interference, Young's double slit experiment, coherent sources, Dual nature of radiation, Photoelectric effect, Matter waves.

Unit III **7.5 Hrs**

Structure of atom, Alpha-particle scattering experiment; Rutherford's model of atom, Bohr model of hydrogen atom, hydrogen line spectra, Composition of nucleus, nuclear force, Mass-energy relation, mass defect, nuclear fission, nuclear fusion.

Unit IV **7.5 Hrs**

Heat, Zeroth law of thermodynamics, First law of thermodynamics, Second law of thermodynamics, isothermal, adiabatic, reversible, irreversible, and cyclic processes, perfect gas, degrees of freedom, specific heat capacities of gases, mean free path, Avogadro, number, heat, work and internal energy.

References :

1. Concept of Physics by H. C. Verma
2. Heat and thermodynamics, by C. L. Arora
3. Optics, by Ajay Ghatak.
4. Atomic and Nuclear Physics, by N. Subramanyam, Brijlal.

GE: Physics of Solar System B-PH124T Credits: 2

Course objectives:

1. To introduce the learners to an exciting topic of Solar system
2. To inculcate a scientific awareness about the Solar system
3. To understand the origin and the structure of the Sun and the planets
4. To explore the properties of the planets in Solar system

Course outcomes:

After completing this course, the learner will be able to

4. explain the origin of the solar system
5. explain the various components of the Solar system
6. explain the origin and the types of planets
7. compare and contrast the terrestrial planets and the Jovian planets
8. describe, in a scientific way, the mechanism of energy production in the Sun

Unit I: Basics of the Solar system

7.5 hrs.

Invention of Solar system, components of solar system: planets and their satellites, minor planets (meteoroids, meteors and mereorites) comets, age determination of solar system

Unit II: Origin of the Solar system

7.5 hrs.

The nebular hypothesis, the condensation theory, formation of terrestrial planets and Jovian planets, formation of moons, rings and comets

Unit III: The Sun as a star

7.5 hrs.

Position of the Sun on H-R diagram, the atmosphere of the Sun, interior structure of the sun, chromospehere and corona of the Sun

Unit IV: Energy production in the Sun

7.5 hrs.

Structure of an atom, nuclear fission and fusion process, thermonuclear reaction, proton-proron chain reaction, CNO cycle, Solar neutrino experiment

References:

1. Seven Wonders of the Sky by Jayant Vishnu Narlikar,Cambridge University Press
2. Astrophysics for Physicists by Arnab Rai Chaudhari, Cambridge University Press
3. “Aakashashi jadale nate” by Jayant Vishnu Narlikar, Rajhans Publication
4. An Introduction to astrophysics by Baidyanath Basu, PHI Learning Pvt. Ltd.
5. The Physical Universe by Frank H. Shu, University of California, Berkeley

VSEC: Maintenance of household appliances, B-PH125P

Objectives: To understand handling and maintenance of household appliance based on electrical and thermo dynamical concepts.

Outcomes: Students will be able:

1. To understand refrigerator working and maintenance
2. To test the components household gadgets
3. To repair the same as above
4. To repair the concept of electrical and electronic gadgets
5. To able to perform the periodic maintenance

Experiments:

1. To repair the refrigerator having problems like poor cooling, not defrosting, faulty thermistor, door does not close well
2. To repair the refrigerator having problems like: condensation or formation of ice inside the unit, food in the refrigerator is frozen, bad odour
3. To inspect and clean filter, coils, blowers and fan of air conditioner
4. To lubricate motor, bearings and adjust or replace fan belt of air conditioner
5. To service the gas stove for regular maintenance
6. To change the broken induction glass top and to replace faulty induction coil in the induction stove
7. To repair mixer/ grinder for problems like: broken coupler, leakage from jar, tripping problem, blunt blades problem, motor is not rotating, jammed jar blades, spark and burning smell inside mixer grinder
8. To fix the problems of washing machine like: machine is leaking, noisy machine, machine moves around, spin problem, machine won't fill with water, Door opening problem, clogged machine/ won't drain, smelly (bad odour) problem, machine ruining clothing, switching on problem
9. To troubleshoot water purifier with problems like : unusual water taste or smell from the water purifier, slow water flow from the water purifier, water purifier's faucet is making unusual noises, water leakage from faucet or filter/ membrane, R/O water tank does not fill up
10. To repair vacuum cleaner for problems like: Loss of suction, clogged filter, jammed cleaning head, stick vacuum cleaner batteries

References:

1. Service manuals of household appliances from google

Electrical and Electronic measurement techniques: B-PH126P

Objectives: To study some electrical and electronics parameters, physical quantities or Properties

Outcomes: Students will be able:

To use DMM and CRO for electrical measurements
To test the components consisting of p-n junctions
To perform experiments using simulator
To understand the concept of electrical and electronic physical quantities

1. Study of digital multi-meter (DMM)
2. Study of cathode ray oscilloscope (CRO)
3. Testing of diode and transistor using DMM
4. Calibration of CRO for measurement of frequencies
5. To find the unknown frequency of a source using Lissajous figures
6. To find the Zener breakdown voltage
7. To find the knee voltage of a diode
8. Measurement of inductance using Maxwell bridge (using simulator link from virtual lab of IIT Kharagpur)
9. Measurement of capacitance by Schering bridge method (using simulator link from virtual lab of IIT Kharagpur)
10. Measurement of resistance using Wheatstone bridge (using simulator link from virtual lab of IIT Kharagpur)

References:

1. DMM and CRO manuals
2. BSc Physics practical by C L Arora
3. Virtual lab of IIT Kharagpur

IKS: Indian Contribution to Astronomy, B-PH127T Credits: 2

Course objectives:

- To introduce the learner to the exciting branch of astronomy
- To introduce the learner about the rise of astronomy in India
- To introduce the learner to the great ancient astronomers and their work
- To introduce the learner to the scientific concept of telescopes

Course outcomes:

After completing the course, the learner will be able to

1. explain the rise of astronomy India
2. understand the contribution of great scientist in the field of astronomy
3. explain the basic concept of astronomical telescope
4. elaborate the history of few ancient observatories in India

Unit I: Roots of Indian astronomy 7.5 Hrs

Worldwide rise of astronomy, rise of astronomy in India, Vedic astronomy, siddhantic astronomy, Zij astronomy, modern astronomy

Unit II: Contribution of Aryabhatta to Astronomy 7.5 Hrs

Motion of earth and other planets arround earth, motion of the Earth around itself, concept of day and night, solar and sidereal time, heliocentric and geocentric universe, theory be hinding the shing of moon

Unit III: Siddhantic era of indian astronomy 7.5 Hrs

Concept of longitude and latitude, concept of astrolabe, uses of astrolabe made by Mahendra Suri, Contribution of Bramhagupta and Varahamihira, Properties of gravitational force, motion of moon around earth, phases of moon,

Unit IV: Modern astronomy 7.5 Hrs

Discovery of astronomical telescope, types of astronomical telescopes, establishment of Madras observatory, establishment of Kodaikanal observatory, establishment of Nizamiah Observatory, U.P. state observatory in Nainital

References:

1. Astronomy in India- A perspective by Rajesh Kochhar & Jayant Narlikar, Indian National Science Academy
2. Astronomy in India: Past, Present, and Future by Rajesh Kochhar & Jayant Narlikar, Inter-University Centre for Astronomy & Astrophysics, 1993
3. Astronomy in India: A Historical Perspective, edited by Thanu Padmnabham, Springer Nature
4. Modern Astronomy in India by K.D. Abhaynkar, Journal of the Royal Astronomical Society of Canada, Vol. 58, p.218
5. The Story of Astronomy in India BY Chander Mohan

Sr No	Course Category	Name of the course(Title of the Paper)	**Course code**	Level	Teaching Scheme (hrs)			Total Credit	Eva
					Theory	Tutorial	Practical		
					Th	Tu	P		
1	DSC	Paper 1 Waves and Oscillations	B-PH231T	5.0	2	--	--	2	
		Paper 2: Electrostatics and Magnetostatics	B-PH232T		2	--	--	2	
		DSC Lab	B-PH233P		--	--	4	2	
2	Minor	Paper 1: Physics of waves and Oscillations	B-PH234T		2	--	--	2	
		Paper 2:- Static Electricity and Magnetism	B-PH235T		2	--	--	2	
		Minor Lab	B-PH236P		--	--	4	2	
3	GE	Physics of Planet Earth	B-PH237T		2	--	--	2	
4	VSEC	C Programming	B-PH238P		--	--	4	2	
5	AEC	Second Language			2	--	--	2	
6	FP	Field Project			--	--	4	2	
7	CC	NSS / NCC / Sports / Cultural			--	--	4	2	
Total					12	--	20	22	

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

DSC: BPH231T : PAPER- I (Waves and Oscillations)

Marks- 40 **Time- 30 hours**

Objective: To provide the knowledge of wave and oscillations and acoustics

Course Outcomes: After completing this course, students should be able to

1. Compare the behaviours of free, damped and forced oscillations
2. Apply the concepts based on CO1 in laboratory
3. Explain the propagation of mechanical waves and its applications
4. Define ultrasonic and acoustic waves and explain their applications

Unit I:

7.5 hrs.

Free oscillations: Introduction to linear and angular S.H.M., Differential equation of S.H.M. and its solution, Composition of two perpendicular linear S.H.M.s for 1:1 and 1:2 (analytical method), Lissajous's figures

Damped oscillations: Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and quality factor.

Unit II:

7.5 hrs.

Forced oscillations: Forced oscillation with one degree of freedom, Differential equation of forced oscillation and its solution, Resonance (Amplitude), Sharpness of resonance, Power dissipation, Quality factor and bandwidth

Waves in media: Speed of wave on a string, Standing waves, principle of superposition of waves, Phase velocity and group velocity, Harmonics, Quality of sound, Human ear and its response (Diagrammatic introduction only), Limit of human audibility, Intensity and loudness, bel and decibel, the musical scale, Temperaments and musical instruments

Unit III:

7.5 hrs.

Applied acoustics: Transducers and their characteristics (Crystal microphone, Moving coil loud speaker), Recording and reproduction of sound (Magnetic tape, Cine film, Compact disc), Acoustic of building, Reverberation and reverberation period, Sabine's formula, Factors affecting the acoustics of building, Requirements for good acoustics

Unit IV:

7.5 hrs.

Ultrasonics: Introduction, Properties and production of ultrasonic waves, piezoelectric effect, piezoelectric generator, Magneto-striction effect and oscillators, Frequency of ultrasonic waves, Application of ultrasonic waves (measurement of depth of sea, SONAR system and Medical science).

References and Text books:

1. Waves and Oscillations, by Stephenson.
2. A Text Book of Oscillations, waves and Acoustic, by Dr. M. Ghosh, Dr. D. Bhattacharya.

3. Oscillation, waves and sound, by Sharma and Saxena.
4. Waves and oscillation, by N. Subrahmanyam and Brijlal.
5. The Physics of waves and oscillation, by N. K. Bajaj, Tata McGraw-Hill, publishing co. ltd.
6. A Text Book of sound, by Khanna , Bedi
7. A Text Book of sound, by L. P. Sharma, Saxena (S. Chand)
8. Properties of Matter and Acoustics, by R. Murugeshan, Kiruthign Sivaprakash.
9. Fundamental of Acoustics 4th Edition, by Kinsler , John Wiley and Sons.
10. Basic Acoustics, by D. E. Hall, Oxford University Press.
11. A Text Book of Oscillations, Waves and Acoustics, by Dr. M. Ghosh, Dr. D. Bhattacharya (S. Chand)
12. Oscillation, Waves and Sound, by Sharma and Saxena.
13. Science and Technology of Ultrasonics, by Baldevraj, Narosa.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

DSC: BPH232T : PAPER- II (Electrostatics and Magneto-statics)

Marks- 40 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of electric field and dielectrics
2. To disseminate the fundamental knowledge of magnetism and magnetostatics
3. Provide opportunities for scientific study and creativity

OUTCOMES:

1. Students gain knowledge of electric field and dielectrics
2. They gain knowledge of magnetism and magnetostatics
3. Apply the knowledge to solve problems based on above properties to strengthen their concepts

Unit I: **7.5 hrs.**

Electrostatics: Coulombs law in vacuum in vector form, Force between two charges, Electric field intensity, Electric potential, Electric field intensity due to a point charge, Electric dipole, Electric dipole moment, Electric field intensity due to an electric dipole, Electric field as a negative gradient of potential, Conservative nature of the electric field.

Unit II: **7.5 hrs.**

Dielectric: Introduction, definition of polar and non polar molecules, Polarization of charges in a dielectric, Clausius - Mossotti equation, Three electric vectors D, E and P and

relation between them, Concept of capacitance, Parallel plate capacitor without and with dielectric, application of Gauss's law to parallel plate capacitor.

Unit III: **7.5 hrs.**

Magnetism: Introduction, Magnetic materials, Langevin's theory of diamagnetism, its application as superconductor, Critical magnetic field and Meissner effect, Langevin's theory of para magnetism, Ferromagnetism, Ferromagnetic domain, Curie temperature, Ferrimagnetism, Ferrites and its applications, Antiferromagnetism, Neel temperature.

Unit IV **7.5 hrs.**

Magnetostatics: Concept of magnetic field, Lorentz force equation, Magnetic dipole moment, angular momentum and gyromagnetic ratio, Biot- Savart's law, It's applications (B due to steady current in a long straight wire, B along the axis of circular coil), Ampere's law, It's applications(B for a solenoid, A Toroid), Magnetization current, Magnetic vectors, Gauss law of magnetization.

References and Text books:

1. Electricity and Magnetism, by D. C. Tayal
2. Electricity and Magnetism, by Rakshit, Chottopadhay
3. Electricity and Magnetism, by S. S. Atwood.
4. Electricity and Magnetism, by K. K. Tewari.
5. University physics, by J. C. Upadhyay, Himalaya publications.
6. Foundation of Electrodynamics, by Theory, Rietz and Millford.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

DSC: BPH233P: Practical

1. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.
2. To study the variation of magnetic field along the axis of a current carrying circular coil.
3. Study of magnetic field by vibration magnetometer.
4. To determine the dipole moment of a given liquid.
5. To determine magnetic susceptibility of $FeCl_3$.
6. Study the speed of waves on stretched string.
7. Determination of velocity of sound using volume resonator.
8. To determine frequency of A. C. Mains with a Sonometer using single/two magnetic wire.
9. To determine unknown frequency and to verify the law of inverse variation of frequency and volume of air by Helmholtz resonator.
10. To determine the velocity of sound wave in air (gas) with Kundt's tube.
11. Frequency of A.C. Mains by sonometer.
12. Study of Transformer (parameters determination).
13.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

Minor: BPH234T : PAPER- III (Physics Waves and Oscillations)

Marks- 40 **Time- 30 hours**

Objective: To provide the knowledge of wave and oscillations and acoustics

Course Outcomes: After completing this course, students should be able to

5. Compare the behaviours of free, damped and forced oscillations
6. Apply the concepts based on CO1 in laboratory
7. Explain the propagation of mechanical waves and its applications
8. Define ultrasonic and acoustic waves and explain their applications

Unit I:

7.5 hrs.

Free oscillations: Introduction to linear and angular S.H.M., Differential equation of S.H.M. and its solution, Composition of two perpendicular linear S.H.M.s for 1:1 and 1:2 (analytical method), Lissajous's figures

Damped oscillations: Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and quality factor.

Unit II:

7.5 hrs.

Forced oscillations: Forced oscillation with one degree of freedom, Differential equation of forced oscillation and its solution, Resonance (Amplitude), Sharpness of resonance, Power dissipation, Quality factor and bandwidth

Waves in media: Speed of wave on a string, Standing waves, principle of superposition of waves, Phase velocity and group velocity, Harmonics, Quality of sound, Human ear and its response (Diagrammatic introduction only), Limit of human audibility, Intensity and loudness, bel and decibel, the musical scale, Temperaments and musical instruments

Unit III:

7.5 hrs.

Applied acoustics: Transducers and their characteristics (Crystal microphone, Moving coil loud speaker), Recording and reproduction of sound (Magnetic tape, Cine film, Compact disc), Acoustic of building, Reverberation and reverberation period, Sabine's formula, Factors affecting the acoustics of building, Requirements for good acoustics

Unit IV:

7.5 hrs.

Ultrasonics: Introduction, Properties and production of ultrasonic waves, piezoelectric effect, piezoelectric generator, Magneto-striction effect and oscillators, Frequency of ultrasonic waves, Application of ultrasonic waves (measurement of depth of sea, SONAR system and Medical science).

References and Text books:

11. Waves and Oscillations, by Stephenson.
12. A Text Book of Oscillations, waves and Acoustic, by Dr. M. Ghosh, Dr. D. Bhattacharya.
13. Oscillation, waves and sound, by Sharma and Saxena.
14. Waves and oscillation, by N. Subrahmanyam and Brijlal.
15. The Physics of waves and oscillation, by N. K. Bajaj, Tata McGraw-Hill, publishing co. ltd.
16. A Text Book of sound, by Khanna , Bedi
17. A Text Book of sound, by L. P. Sharma, Saxena (S. Chand)
18. Properties of Matter and Acoustics, by R. Murugeshan, Kiruthign Sivaprakash.
19. Fundamental of Acoustics 4th Edition, by Kinsler , John Wiley and Sons.
20. Basic Acoustics, by D. E. Hall, Oxford University Press.
21. A Text Book of Oscillations, Waves and Acoustics, by Dr. M. Ghosh, Dr. D. Bhattacharya (S. Chand)
22. Oscillation, Waves and Sound, by Sharma and Saxena.

Science and Technology of Ultrasonics, by Baldevraj, Narosa.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

MINOR: BPH235T : (Static electricity and Magnetism)

Marks- 40 **Time- 30 hours**

OBJECTIVES:

1.To disseminate the knowledge of electric field and dielectrics

2.To disseminate the fundamental knowledge of magnetism and magnetostatics

3.Provide opportunities for scientific study and creativity

OUTCOMES:

1.Students gain knowledge of electric field and dielectrics

2.They gain knowledge of magnetism and magnetostatics

3.Apply the knowledge to solve problems based on above properties to strengthen their concepts

Unit I: **7.5 hrs.**

Electrostatics: Coulombs law in vacuum in vector form, Force between two charges, Electric field intensity, Electric potential, Electric field intensity due to a point charge, Electric dipole, Electric dipole moment, Electric field intensity due to an electric dipole, Electric field as a negative gradient of potential, Conservative nature of the electric field.

Unit II: **7.5 hrs.**

Dielectric: Introduction, definition of polar and non polar molecules, Polarization of charges in a dielectric, Clausius - Mossotti equation, Three electric vectors D, E and P and relation between them, Concept of capacitance, Parallel plate capacitor without and with dielectric, application of Gauss's law to parallel plate capacitor.

Unit III: **7.5 hrs.**

Magnetism: Introduction, Magnetic materials, Langevin's theory of diamagnetism, its application as superconductor, Critical magnetic field and Meissner effect, Langevin's theory of para magnetism, Ferromagnetism, Ferromagnetic domain, Curie temperature, Ferrimagnetism, Ferrites and its applications, Antiferromagnetism, Neel temperature.

Unit IV **7.5 hrs.**

Magnetostatics: Concept of magnetic field, Lorentz force equation, Magnetic dipole moment, angular momentum and gyromagnetic ratio, Biot- Savart's law, It's applications (B due to steady current in a long straight wire, B along the axis of circular coil), Ampere's law, It's applications(B for a solenoid, A Toroid), Magnetization current, Magnetic vectors, Gauss law of magnetization.

References and Text books:

7. Electricity and Magnetism, by D. C. Tayal
8. Electricity and Magnetism, by Rakshit, Chottopadhay
9. Electricity and Magnetism, by S. S. Atwood.
10. Electricity and Magnetism, by K. K. Tewari.
11. University physics, by J. C. Upadhyay, Himalaya publications.
12. Foundation of Electrodynamics, by Theory, Rietz and Millford.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

Minor : BPH236P : Practical

1. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.
2. To study the variation of magnetic field along the axis of a current carrying circular coil.
3. Study of magnetic field by vibration magnetometer.
4. To determine the dipole moment of a given liquid.
5. To determine magnetic susceptibility of $FeCl_3$.
6. Study the speed of waves on stretched string.
7. Determination of velocity of sound using volume resonator.
8. To determine frequency of A. C. Mains with a Sonometer using single/two magnetic wire.
9. To determine unknown frequency and to verify the law of inverse variation of frequency and volume of air by Helmholtz resonator.
10. To determine the velocity of sound wave in air (gas) with Kundt's tube.
11. Frequency of A.C. Mains by sonometer.
12. Study of Transformer (parameters determination).

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

GE: BPH237T: PAPER- V (Physics of Planet earth)

Marks- 40 **Time- 30 hours**

Course objectives:

- To inculcate the learner about the scientific knowledge of planet Earth
- To introduce the learner to the concept of origin and evolution of Earth
- To introduce the learner about the interior and the atmosphere of Earth
- To introduce the learner about the magnetic as well as thermal properties of planet Earth

Course outcomes:

After completing the course, the learner will be able to

- explain the origin, evolution and dynamics of planet Earth
- explain the interior and the atmosphere of Earth
- explain the magnetic as well as thermal properties of planet Earth

---

Unit I: Origin And Evolution Of Earth **7.5 Hrs**

Origin of Solar system, nebular hypothesis, condensation theory, terrestrial planets and jovian planets, the melting of solid Earth, Keplers laws of planetary motion, dynamic evolution of Solar system, speed and momentum of Earth, Gravitational potential of a nearly spherical body, Rotation, ellipticity and gravity

Unit II: Interior And Atmosphere of Earth **7.5 Hrs**

Formation of Earth's atmosphere, formation of the oscens, formation of Ozon layer, continental drift, sea floor spreading. Internal constitution of the earth, characteristics of lithosphere, and asthenosphere, causes of geodynamical process, geodynamic models, continental drift, Ocean floor spreading, plate tectonics and its geological implications, oceanic ridges, trenches and island arcs.

Unit III: Magnetic Properties Of Earth **7.5 Hrs**

Origin of geomagnetic field, theory of Earth's magnetism, Components of Earth's magnetic field, angle of dip, reversals of geomagnetic field, secular variations and westward drift, geomagnetic storms, polar wandering, geologic time, Palaeomagnetic studies of rock samples and their applications.

Unit IV: Thermal Proeprties of Earth **7.5 Hrs**

Importance of heat flow, thermal history of the earth, sources of heat generation and temperature distribution inside the earth, Jacob's hypothesis for liquid nature of the outer core, Radiogenic heat, Thermal contraction, gravitational energy and the heat capacity, Energy balance of the core, Thermodynamic efficiency, buoyancy forces and convective power.

References:

- An Introduction to astrophysics by Baidyanath Basu, PHI Learning Pvt. Ltd.
- The Physical Universe by Frank H. Shu, University of California, Berkeley
- Seven Wonders of the Sky by Jayant Vishnu Narlikar,Cambridge University Press
- Astrophysics for Physicists by Arnab Rai Chaudhari, Cambridge University Press
- Howell: Introduction to Geophysics

- Stacey: Physics of the Earth
- Lowrie: Fundamentals of Geophysics
- Chapman: Earth's Magnetism

Activities

- Experience the Zero shadow day. What will be the physics behind it?
- Think about the thermal properties of three phases of water found on earth.

Observe the orientation of freely suspended magnetic niddle. Is there any relation with Earth’s magnetic field?

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

VSEC C ProgrammingB-PH238P

2 Credits

1. C program to display “Hello World”
2. C program to sum 2 integers from user
3. C program to calculate simple interest
4. C program to multiply float numbers
5. C program to sort numbers (ascending or descending)
6. C program to calculate area of circle
7. C program to detect a Leap Year
8. C program to calculate volume of Sphere
9. C program to Calculate HCF and LCM
10. C program to sum Array Elements

References

1. **Let Us C: Authentic guide to C programming language - 19th Edition, by Yashavant Kanetkar**
2. **Learn C Programming from Scratch: A step-by-step methodology with problem solving approach, by Mohammad Saleem Mir**
3. **The C Programming Language 2e by Brian W. Kernighan / Dennis Ritchie**

SEM IV

Sr No	Course Category	Name of the course (Title of the Paper)	Course Code	Level	Teaching Scheme (hrs)			To Cr
					Theory	Tutorial	Practical	
					Th	Tu	P	
1	DSC	Paper 1:- Introduction to Quantum Mechanics	B-PH241T	5.0	2	--	--	
		Paper 2:- Concepts in Electricity	B-PH242T		2	--	--	
		DSC Lab	B-PH243P		--	--	4	
2	Minor	Paper 1:- Concepts in Quantum Mechanics	B-PH244T		2	--	--	
		Paper 2:- Basic concepts in Electricity	B-PH245T		2	--	--	
		Minor Lab	B-PH246P		--	--	4	
3	GE	Introduction to Astronomy	B-PH247T		2	--	--	
4	VSEC	Computer hardware and maintenance	B-PH248P		--	--	4	
5	AEC	Second Language			2	--	--	
6	CEP	Community Service			--	--	4	
7	CC	NSS / NCC / Sports / Cultural			--	--	4	
Total					12	--	20	2

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

DSC: BPH241T: PAPER- I (Introduction to Quantum Mechanics)

Marks- 40 **Time- 30 hours**

OBJECTIVES: 1. To disseminate the knowledge of quantum mechanics
2. Provide opportunities for scientific study and creativity

OUTCOMES: 1. Students gain knowledge of quantum mechanics
2. Apply the knowledge to solve problems based on above properties to strengthen their concepts

UNIT-I Unit I: 7.5 hrs.

Failure of classical physics to explain: black body radiations, wiens theory, Rayleigh-Jeans law, Planck's radiation law, photoelectric effect, characteristic of photoelectric effect, Einstein's explanation of photoelectric effect, Compton Effect, Rutherford's model of atom, Bohr's postulates, Wave particle duality, de Broglie's hypothesis.

Unit II: 7.5 hrs.

Superposition principle, construction of wave packet, Concept of wave velocity and group velocity,

Davisson and Germer experiment, Heisenberg's uncertainty principle and Heisenberg's gamma ray microscope,

Schrodinger's equation (Time dependent and time independent equations), Physical significance of wave function Ψ, normalization of wave function, Probability current density, Operators, Expectation values of a dynamical quantities, Ehrenfest's theorem.

UNIT III : 7.5 hrs.

Linear operators, Eigen value and Eigen functions. One-dimensional applications of Schrodinger equations: free particle, step potential, Particle in a one dimensional potential box, Particle in a one dimensional well, rectangular potential barrier.

UNIT IV: 7.5 hrs.

One dimensional linear harmonic oscillator, Three- dimensional linear harmonic oscillator, zero-point energy, spherically symmetric system and potential, separation of variables, solution of ø, solution of Θ, solution of R, wave equation of hydrogen atom, reduction of equivalent one-body problem, Schrodinger solution of hydrogen atom , selection rule, forbidden and allowed transition.

References:

1. Quantum Mechanics, Statistical Mechanics and SSP, by D. Chattopadhay, P. C. Rakshit.
2. Fundamentals of Quantum Mechanics, by P. R. Waghmare
3. Quantum Mechanics, by John L. Powel, Bernd Crasemann.
4. Quantum Mechanics, by Mathews and Venketesan.
5. Quantum Mechanics, by A. K. Ghatak, S. lokanathan.
6. Quantum Mechanics, by S. P. Singh, M. K. Bagde and Kamal Singh.
7. Quantum Mechanics, by Chatwal, Anand, Himalaya publications.
8. Advanced Quantum Mechanics, by- Satya Prakash, Pragati Publications.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

DSC: BPH242T: PAPER- II (Concept in electricity)

Marks- 40 **Time- 30 hours**

Objective: To provide the knowledge of various Ac circuits, power supply with their quality factors and solar energy devices

Course Outcomes: After completing this course, students should be able to

1. Explain the time dependent properties of electric fields and its applications
2. Mathematically model AC and DC Circuits and explain related concepts
3. Explain the required components and their roles in power supply
4. Explain the photovoltaic effect and determine the characteristics of PV systems

Unit I: **7.5 hrs.**

Time varying fields: Electromagnetic induction, Faradays laws in differential and integral form, Lenz's law, self and mutual induction, **Transformer**: Construction, working and its parameters, Energy losses.

Electric Currents: Current density, Equation of continuity, Kirchhoff's law, Rise and decay of current in LR and CR circuits, Decay of charge in LCR circuits

Unit II: A C Circuits **7.5 hrs.**

Application of complex number in solving an a. c. circuit: j- operator method, A.C. applied to pure resistive, pure inductive and pure capacitive circuit, application of j- operator in LR, CR and LCR circuit, Resonance, Sharpness of resonance, Series resonance circuit (Calculate I, Z, Φ and f_r),Q factor, Power in an a. c. circuit, Power factor.

Unit III:

7.5 hrs.

Power supply- Diode characteristics (Forward and reverse), Rectification using half wave and full wave rectifiers (Find Idc, Vdc, Irms, η and ripple factor), Working of Full wave bridge rectifier, Filters, regulated and unregulated power supply, line and load regulation.

Unit IV: **7.5 hrs.**

Solar Electricity: Potential of solar energy, solar radiation and measurements, types of solar energy collectors and their advantages and disadvantages, Solar thermal electric power generation, Need and characteristics of photovoltaic system (PV), PV models and equivalent circuits.

References

1. Electricity and Magnetism, by Brijlal,Subramanyam.
2. Fundamental of Magnetism and Electricity, by D.N.Vasudiva.
3. Electricity and Magnetism with Electronics, by K.K.Tewari.
4. Electricity and Magnetism, by K.K.Tewari.

5. Elements of Electronics, by M.K.Bagde,S.P.Singh, KSingh (S.Chand.)
6. Solid state Electronic Devices II Edition, by B.G. Streetman
7. Electronic devices & circuit theory by Boylestad & Nashelsky, PHI

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

DSC: BPH243P: Practical

1. To study the characteristics of micro phone.
2. Study of loudspeaker (woofer, squawker, tweeter) as a transducer.
3. Measurement of Inductance by phasor diagram method.
4. Measurement of Capacitance by phasor diagram method.
5. To study charging and discharging of a condenser through a resistor R.
6. To study growth/decay of current in LR circuit.
7. Study of growth of current in CR Circuit using microammeter.
8. Study of frequency response of series LCR circuit and determination of Q- factor.
9. Verification of Kirchhoff's laws, using electrical network.
10.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

Minor: BPH244T: PAPER- I (Concepts in Quantum Mechanics)

Marks- 40 **Time- 30 hours**

OBJECTIVES: 1. To disseminate the knowledge of quantum mechanics
2. Provide opportunities for scientific study and creativity

OUTCOMES: 1. Students gain knowledge of quantum mechanics
2. Apply the knowledge to solve problems based on above properties to strengthen their concepts

UNIT-I Unit I: 7.5 hrs.

Failure of classical physics to explain: black body radiations, wiens theory, Rayleigh-Jeans law, Planck's radiation law, photoelectric effect, characteristic of photoelectric effect, Einstein's explanation of photoelectric effect, Compton Effect, Rutherford's model of atom, Bohr's postulates, Wave particle duality, de Broglie's hypothesis.

Unit II: 7.5 hrs.

Superposition principle, construction of wave packet, Concept of wave velocity and group velocity,

Davisson and Germer experiment, Heisenberg's uncertainty principle and Heisenberg's gamma ray microscope,

Schrodinger's equation (Time dependent and time independent equations), Physical significance of wave function Ψ, normalization of wave function, Probability current density, Operators, Expectation values of a dynamical quantities, Ehrenfest's theorem.

UNIT III : 7.5 hrs.

Linear operators, Eigen value and Eigen functions. One-dimensional applications of Schrodinger equations: free particle, step potential, Particle in a one dimensional potential box, Particle in a one dimensional well, rectangular potential barrier.

UNIT IV: 7.5 hrs.

One dimensional linear harmonic oscillator, Three- dimensional linear harmonic oscillator, zero-point energy, spherically symmetric system and potential, separation of variables, solution of ø, solution of Θ, solution of R, wave equation of hydrogen atom, reduction of equivalent one-body problem, Schrodinger solution of hydrogen atom , selection rule, forbidden and allowed transition.

References:

9. Quantum Mechanics, Statistical Mechanics and SSP, by D. Chattopadhay, P. C. Rakshit.
10. Fundamentals of Quantum Mechanics, by P. R. Waghmare
11. Quantum Mechanics, by John L. Powel, Bernd Crasemann.
12. Quantum Mechanics, by Mathews and Venketesan.
13. Quantum Mechanics, by A. K. Ghatak, S. lokanathan.
14. Quantum Mechanics, by S. P. Singh, M. K. Bagde and Kamal Singh.
15. Quantum Mechanics, by Chatwal, Anand, Himalaya publications.
16. Advanced Quantum Mechanics, by- Satya Prakash, Pragati Publications.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

Minor: BPH245T: PAPER- II (Basic Concept in electricity)

Marks- 40 **Time- 30 hours**

Objective: To provide the knowledge of various Ac circuits, power supply with their quality factors and solar energy devices

Course Outcomes: After completing this course, students should be able to

5. Explain the time dependent properties of electric fields and its applications
6. Mathematically model AC and DC Circuits and explain related concepts
7. Explain the required components and their roles in power supply
8. Explain the photovoltaic effect and determine the characteristics of PV systems

Unit I: **7.5 hrs.**

Time varying fields: Electromagnetic induction, Faradays laws in differential and integral form, Lenz's law, self and mutual induction, **Transformer**: Construction, working and its parameters, Energy losses.

Electric Currents: Current density, Equation of continuity, Kirchhoff's law, Rise and decay of current in LR and CR circuits, Decay of charge in LCR circuits

Unit II: A C Circuits **7.5 hrs.**

Application of complex number in solving an a. c. circuit: j- operator method, A.C. applied to pure resistive, pure inductive and pure capacitive circuit, application of j- operator in LR, CR and LCR circuit, Resonance, Sharpness of resonance, Series resonance circuit (Calculate I, Z, Φ and f_r),Q factor, Power in an a. c. circuit, Power factor.

Unit III:

7.5 hrs.

Power supply- Diode characteristics (Forward and reverse), Rectification using half wave and full wave rectifiers (Find Idc, Vdc, Irms, η and ripple factor), Working of Full wave bridge rectifier, Filters, regulated and unregulated power supply, line and load regulation.

Unit IV: **7.5 hrs.**

Solar Electricity: Potential of solar energy, solar radiation and measurements, types of solar energy collectors and their advantages and disadvantages, Solar thermal electric power generation, Need and characteristics of photovoltaic system (PV), PV models and equivalent circuits.

References

8. Electricity and Magnetism, by Brijlal,Subramanyam.
9. Fundamental of Magnetism and Electricity, by D.N.Vasudiva.
10. Electricity and Magnetism with Electronics, by K.K.Tewari.
11. Electricity and Magnetism, by K.K.Tewari.

12. Elements of Electronics, by M.K.Bagde,S.P.Singh, KSingh (S.Chand.)
13. Solid state Electronic Devices II Edition, by B.G. Streetman
14. Electronic devices & circuit theory by Boylestad & Nashelsky, PHI

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

MINOR : BPH246P : Practical

1. To study the characteristics of micro phone.
2. Study of loudspeaker (woofer, squawker, tweeter) as a transducer.
3. Measurement of Inductance by phasor diagram method.
4. Measurement of Capacitance by phasor diagram method.
5. To study charging and discharging of a condenser through a resistor R.
6. To study growth/decay of current in LR circuit.
7. Study of growth of current in CR Circuit using microammeter.
8. Study of frequency response of series LCR circuit and determination of Q- factor.
9. Verification of Kirchhoff's laws, using electrical network.
10.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

GE: BPH247T: PAPER- II (Introduction to astronomy)

Marks- 40 **Time- 30 hours**

Course objectives:

- To inculcate a scientific awareness about the vastness of the space
- To introduce the learners to the exciting world of astronomy
- To explore and compare properties of the planets in solar system
- To understand the structure of the Universe and our position in it

Course outcomes:

After completing the course, the students are enable to

- identify the objects visible to the unaided eye in the night sky
- explain the phenomenon like seasons on the Earth, solar and lunar eclipses
- explain the dynamics of planets in solar system, use the orbital properties to estimate mass of the Sun
- compare and contrast the terrestrial planets and the Jovian planets
- derive the scientific understanding and explain the observed properties of stars and estimate
- their temperature, mass, size, etc.
- describe the scale of the Universe and the relative sizes of the different objects within the Universe

- describe the Earth's place in the Solar System, Galaxy, and Universe

---

Unit 1: Observational Astronomy 7.5 Hrs

Contribution of Ptolemy, Copernicus, Tycho Brahe, Johannes Kepler, Galileo Galilei Concepts of Positional Astronomy: the Celestial Sphere, the cardinal points and circles on the celestial sphere, the alt-azimuth, equatorial coordinate systems, Sidereal, Apparent and Mean solar time and their relations , Constellations and nomenclature of stars: Aries, Pisces, Orion, Canis major, Taurus, Leo, Summer Triangle and Big Dipper (Saptarsi)

Unit 2: The Solar System 7.5 Hrs

The Sun and its atmosphere, planetary system, elliptical orbits of planets and Kepler's laws Terrestrial planets, Jovian Planets, characteristics of terrestrial and Jovian planets, asteroids, meteors and meteorites, comets, Phases and motion of the Moon, solar and lunar eclipses, Seasons, origin of the solar system – the nebular model

Unit 3: Astronomical Measurements 7.5 Hrs

Concept of Astronomical Unit, light year, Parcsec, Distance measurement techniques: Radar ranging, parallax method, Luminosity, flux, surface brightness of a star, apparent and absolute magnitude, Distance-modulus relationship and it's application

Unit 4: Physics of Stars 7.5 Hrs

classification of stars, H-R Diagram and its salient features, Color index and temperatures of stars, Population I and Population II stars, Life cycle of a star, White dwarf, Neutron Stars, Black hole.

Reference:

- An Introduction to astrophysics by Baidyanath Basu, PHI Learning Pvt. Ltd.
- The Physical Universe by Frank H. Shu, University of California, Berkeley
- Seven Wonders of the Sky by Jayant Vishnu Narlikar,Cambridge University Press
- Astrophysics for Physicists by Arnab Rai Chaudhari, Cambridge University Press
- V. B. Bhatia , Textbook of Astronomy and Astrophysics with Elements of
- Cosmology, Narosa Publishing House, New Delhi.
- Astrophysics: Stars and Galaxies, K. D. Abhyankar, Tata McGraw Hill
- Publication
- An Introduction to astrophysics, Baidyanath Basu, PHI Learning Pvt. Ltd.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

GE: BPH248P: (Computer hardware and maintenance**)**

Marks- 40 **Time- 30 hours**