B.Sc. PHYSICS SYLLABUS

(UNDER CHOICE BASED CREDIT SYSTEM)

Applicable to the candidates admitted from 2023 onwards

PG & RESEARCH DEPARTMENT OF PHYSICS

BISHOP HEBER COLLEGE (AUTONOMOUS)

AFFILIATED TO BHARATHIDASAN UNIVERSITY

(NATIONALLY REACCREDITED AT THE 'A' GRADE BY NAAC WITH A CGPA OF 3.58 OUT OF 4)

RECOGNIZED BY UGC AS 'COLLEGE WITH POTENTIAL FOR EXCELLENCE'

TIRUCHIRAPPALLI – 620 017

Sem.	Part	Course	Course Title	Course Code	Hours / week	Credits	Marks		
							CIA	ESE	Total
I	I	Language I	□□□□□□□□□□□I	U23TM1L1	6	3	25	75	100
	II	English I	Prose and Short Stories	U23EG1L1	6	3	25	75	100
	III	Core I	Properties of Matter and Acoustics	U23PH101	5	5	25	75	100
		Core Prac. I	Core Practical I	U23PH1P1	3	3	40	60	100
		Allied I	Algebra, Calculus and Analytical Geometry of 3D	U23PHMY1	6	5	25	75	100
	IV	SEC I	Home Electrical Installation	U23PH1E1	2	2	25	75	100
		FC	Introductory Physics	U23PH1N1	2	2	100	--	100
					30	23			
II	I	Language II	□□□□□□□□□□□II	U23TM2L2	6	3	25	75	100
	II	English II	Poetry and Shakespeare	U23EG2L2	6	3	25	75	100
	III	Core II	Heat, Thermodynamics and Statistical Physics	U23PH202	5	5	25	75	100
		Core Prac. II	Core Practical II	U23PH2P2	3	3	40	60	100
		Allied II	Differential Equations, Laplace Transforms and Fourier Series	U23PHMY2	6	5	25	75	100
	IV	SEC II	Physics of Music	U23PH2E2	2	2	25	75	100
		SEC III	Experimental Simulation - Basics	U23PHPS3	2	2	40	60	100
					30	23			
III	I	Language III	□□□□□□□□□□□III	U23TM3L3	6	3	25	75	100
	II	English III	One Act Plays and Abridged Novel	U23EG3L3	6	3	25	75	100
	III	Core III	Mechanics	U23PH303	5	5	25	75	100
		Core Prac. III	Core Practical III	U23PH3P3	3	3	40	60	100
		Allied III	Chemistry for Physical Sciences - I	U23PHCY3	3	3	25	75	100
		Allied Prac. I	Chemistry Practical for Physical and Biological Sciences	U23PHCP1	3	2	40	60	100
	IV	SEC IV	Python Programming	U23PHPS4	1	1	100	--	100
		SEC V	Web Designing	U23PHPS5	2	2	40	60	100
		EVS I	Environmental Studies	U23EST41	1	--	--	--	--
					30	22			

IV	I	Language IV	□□□□□□□□□□□□IV	U23TM4L4	6	3	25	75	100
	II	English IV	Language through Literature	U23EG4L4	6	3	25	75	100
	III	Core IV	Optics and Laser Physics	U23PH404	5	5	25	75	100
		Core Prac. IV	Core Practical IV	U23PH4P4	3	3	40	60	100
		Allied IV	Chemistry for Physical Sciences - II	U23PHCY4	2	2	25	75	100
		Allied Prac. II	Chemistry Practical for Physical and Biological Sciences	U23PHCP2	3	3	40	60	100
	IV	SEC VI	Life Skills	U23PH4S6	2	2	100	--	100
		SEC VII	Service Learning	U23PH4S7	2	2	100	--	100
		EVS II	Environmental Studies	U23EST41	1	2	25	75	100
					30	25			
V	III	Core V	Electricity, Magnetism and Electromagnetism	U23PH505	5	4	25	75	100
		Core VI	Atomic and Nuclear Physics	U23PH506	5	4	25	75	100
		Core Prac. V	Core Practical V	U23PH5P5	6	4	40	60	100
		Core Project	Core Project with Viva Voce	U23PH5PJ	4	4	40	60	100
		Elective I	Energy Physics	U23PH5:A	4	3	25	75	100
		Elective II	Numerical Methods and C - Programming	U23PH5:B	4	3	25	75	100
	IV	VLO	Abundant Life	U23VLO51	2	2	100	--	100
			Human Values	U23VLO52					
		Internship	Internship/ Industrial Training Programme	U23PH5I1	--	2	100	--	100
					30	26			
VI	III	Core VII	Quantum Mechanics and Relativity	U23PH607	6	4	25	75	100
		Core VIII	Solid State Physics	U23PH608	6	4	25	75	100
		Core Prac. VI	Core Practical – VI	U23PH6P6	6	4	40	60	100
		Elective III	Nano Science and Nano Technology	U23PH6:A	5	3	25	75	100
		Elective IV	Analog and Communication Electronics	U23PH6:B	5	3	25	75	100
	IV	Extension Activity	Extension Activities	U23ETA61	--	1	--	--	--
		PCS	Concepts through Animation	U23PHPG1	2	2	100	--	100
					30	21			
				Total Credits :		140			

I B.Sc. MATHS

Allied Physics I: Theory – U23PHMY1, Practicals – I – U23PHPY1

Allied Physics II: Theory – U23PHMY2, Practicals – I – U23PHPY2

II B.Sc. CHEMISTRY

Allied Physics I: Theory – U23PHCY3, Practicals – I – U23PHCP3

Allied Physics II: Theory – U23PHCY4, Practicals – I – U23PHCP4

PROGRAMME OUTCOMES

PO1: Disciplinary knowledge:
Capable of demonstrating comprehensive knowledge and understandingof one or more disciplines that form a part of an undergraduateprogramme of study.

PO2: Communication Skills:
Ability to express thoughts and ideas effectively in writing and orallycommunicate with others using appropriate media; confidently shareone's views and express herself/himself; demonstrate the ability to listencarefully; read and write analytically and present complex information ina clear and concise manner to different groups.

PO3: Critical thinking:
Capability to apply the analytic thought to a body of knowledge; analyseand evaluate the proofs, arguments, claims, beliefs on the basis ofempirical evidences; identify relevant assumptions or implications;formulate coherent arguments; critically evaluate practices, policies andtheories by following scientific approach.

PO4: Problem solving:
Capacity to extrapolate from what one has learned and apply theircompetencies to solve different kinds of non-familiar problems, ratherthan replicate curriculum content knowledge; and apply one's learning toreal life situations.

PO5: Analytical reasoning:
Ability to evaluate the reliability and relevance of evidence; identifylogical flaws and holes in the arguments of others; analyze andsynthesize data from a variety of sources; draw valid conclusions andsupport them with evidence and examples, and addressing opposingviewpoints.

PO6: Research-related skills:
A sense of inquiry and capability for asking relevant/appropriatequestions, problem arising, synthesising and articulating; Ability torecognise cause-and-effect relationships, define problems, formulatehypotheses, test hypotheses, analyse, interpret and draw conclusionsfrom data, establish hypotheses, predict cause-and-effect relationships;ability to plan, execute and report the results of an experiment orinvestigation

PO7: Cooperation/Team work:
Ability to work effectively and respectfully with diverse teams; facilitatecooperative or coordinated effort on the part of a group, and act togetheras a group or a team in the interests of a common cause and workefficiently as a member of a team

PO8: Scientific reasoning:
Ability to analyse, interpret and draw conclusions fromquantitative/qualitative data; and critically evaluate ideas, evidence andexperiences from an open-minded and reasoned perspective.

PO9: Reflective thinking:
Critical sensibility to lived experiences, with self-awareness andreflexivity of both self and society.

PO10 Information/digital literacy:
Capability to use ICT in a variety of learning situations, demonstrateability to access, evaluate, and use a variety of relevant informationsources; and use appropriate software for analysis of data.

PO 11 Self-directed learning:
Ability to work independently, identify appropriate resources requiredfor a project, and manage a project through to completion.

PO 12 Multicultural competence:
Possess knowledge of the values and beliefs of multiple cultures and aglobal perspective; and capability to effectively engage in a multiculturalsociety and interact respectfully with diverse groups.

PO 13: Moral and ethical awareness/reasoning:
Ability to embrace moral/ethical values in conducting one's life,formulate a position/argument about an ethical issue from multipleperspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work,avoid unethical behaviour such as fabrication, falsification ormisrepresentation of data or committing plagiarism, not adhering tointellectual property rights; appreciating environmental and sustainabilityissues; and adopting objective, unbiased and truthful actions in allaspects of work.

PO 14: Leadership readiness/qualities:
Capability for mapping out the tasks of a team or an organization, andsetting direction, formulating an inspiring vision, building a team whocan help achieve the vision, motivating and inspiring team members toengage with that vision, and using management skills to guide people tothe right destination, in a smooth and efficient way.

PO 15: Lifelong learning:
Ability to acquire knowledge and skills, including, learning how tolearn", that are necessary for participating in learning activitiesthroughout life, through self-paced and self-directed learning aimed atpersonal development, meeting economic, social and cultural objectives,and adapting to changing trades and demands of work place throughknowledge/skill development/reskilling.

PROGRAMME SPECIFIC OUTCOMES

PSO1–Placement

Comprehend the physical principles and relate the theory and applications in core domains such as Properties of matter, Mechanics, Optics, Thermodynamics, Electricity and magnetism, Atomic and Molecular, Nuclear, Solid state Physics and Electronics.

PSO2–Entrepreneur

Evaluate mechanical, electrical and electronic systems and exhibit critical thinking and practical skills in solving real-time problems

PSO3–Research and Development

Determine the physical properties of materials, analyze and interpret the data using mathematical and computational techniques and contribute towards research and development.

PSO4–Contribution to Business World

Relate theory and applications, harness new ideas related to physics and allied sectors to produce employable, ethical and innovative professionals thereby contributing to multidisciplinary and interdisciplinary domains.

PSO5– Contribution to the Society

Apply diverse frames of physical concepts and demonstrate collaborative engagementwith stakeholders contributing to the development of the society.

Core Theory– I: PROPERTIES OF MATTER AND ACOUSTICS

Semester: I **Course Code: U23PH101**
Credits: 5 **Total No. of Hours: 5**

COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Measure different kinds of moduli of elasticity.	K5	I, II
CO2	Estimate surface tension of liquids subjected to boundary conditions	K5	III
CO3	Classify the liquids based on viscous property.	K4	III
CO4	Correlate the wave nature and analyze the laws of transverse vibrations	K4	IV
CO5	Investigate the factors affecting the acoustics of buildings	K3	V

2. A. SYLLABUS

Unit-I: Elasticity

Hooke's law – stress-strain diagram – elastic constants –Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses).

Unit-II: Bending of Beams

Cantilever– expression for Bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope.

Unit-III: Fluid Dynamics

Surface tension: definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar's method– variation of surface tension with temperature.

Viscosity: definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille's formula –corrections – terminal velocity and Stoke's formula– variation of viscosity with temperature.

Unit-IV: Waves and Oscillations

Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and sharpness of resonance.

Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer – determination of frequency using Melde's string apparatus.

Unit-V: Acoustics of Buildings and Ultrasonics

Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.

Ultrasonic waves: production of ultrasonic waves – Piezoelectric crystal method – magnetostriction effect – application of ultrasonic waves.

TOPICS FOR SELF STUDY

1. Applications of Elasticity
   https://www.youtube.com/watch?v=PRYtw9EQhug
   https://www.youtube.com/watch?v=YI9ke-cy_1g

2. Material Strength, Ductility and Toughness https://www.youtube.com/watch?v=WSRqJdT2COE

3. Understanding Bernoulli's Equation
   https://www.youtube.com/watch?v=DW4rItB20h4

TEXT BOOKS

1. R. Murugeshan, Properties of Matter, S. Chand and Co., New Delhi, 2017.
2. N. Subrahmanyam and BrijLal, A Text Book of Sound, Vikas Publishing House Pvt. Ltd., New Delhi, 1999.
3. D. S. Mathur, Elements of Properties of Matter, S. Chand & Co., New Delhi, 2010.

REFERENCE BOOKS

1. BrijLal and N. Subrahmanyam, Properties of Matter, Eurasia Publishing House Ltd., New Delhi,1993.
2. R.L. Saigal, Text book of Sound, S.Chand and Co., New Delhi, 1990.
3. R.P. Feynman, Feynman Lectures on Physics, Vol-I, Pearson, New Delhi, 2009.
4. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, John Wiley & Sons, 2013.

WEBLINKS

1. https://physics.info/elasticity/
2. https://physics.info/viscosity/
3. http://www.sound-physics.com/
4. https://nptel.ac.in/courses/115106119
5. https://nptel.ac.in/courses/112104026

5. MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*	*PO13*	*PO14*	*PO15*
CO1	H	H	L	H	H	L	M	L	L	L	H	H	M	H	H
CO2	H	M	L	H	M	L	M	L	M	L	H	M	M	M	M
CO3	H	H	M	H	M	L	M	L	L	L	H	M	M	M	M
CO4	H	M	M	H	H	M	L	L	L	L	H	H	H	M	M
CO5	H	M	M	L	M	M	M	M	L	M	H	M	M	M	M

U23PH101	PSO				
	PSO1	*PSO2*	*PSO3*	*PSO4*	*PSO5*
CO1	H	H	M	H	H
CO2	H	M	M	M	M
CO3	H	M	M	M	M
CO4	H	H	H	M	H
CO5	H	M	M	M	M

L-Low M-Moderate H- High

5. COURSEASSESSMENTMETHODS

Direct

1. Continuous Internal Assessment Test I &II
2. Open book test, learning report, Assignment, Seminar and Problem solving.
3. End Semester Examination

Indirect

1. Course-end survey

Course Co-ordinator
Dr. D. Giridharan

Core Theory– II: HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS

Semester: II **Course Code: U23PH202**
Credits: 5 **Total No. of Hours: 5**

1. COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Recall the fundamental laws of thermodynamics, radiation and statistical mechanics and their importance	K2	I, III, V
CO2	Summarize the theories related to low temperature, radiation and specific heat of solid, liquid and gas.	K2	I, II, III, IV
CO3	Model internal combustion engine, different experimental methods for production of low temperature, measurement of high temperature and specific heats of solid, liquid, gas.	K3	I, II, III, IV
CO4	Analyze the distribution of energy in black body spectrum, system of boson and fermions, variation of specific heat of solids and gases with respect to temperature.	K4	III, IV, V
CO5	Evaluate specific heat capacity of solid, liquid and gas theoretically.	K5	III, IV, V

2. A. SYLLABUS

Unit 1: Calorimetry&Low temperature physics

Calorimetry: specific heat capacity – specific heat capacity of gases C_P& C_V– Meyer's relation – Joly's method for determination of C_V – Regnault's methodfor determination of C_P

Lowtemperaturephysics: Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyletemperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetization.

Unit 2: Thermodynamics -I

zeroth law and first law of thermodynamics – P-V diagram – heat engine –efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.

Unit 3: Thermodynamics - II

second law of thermodynamics – entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram – thermodynamical scale of temperature – Maxwell's thermodynamical relations – Clasius-Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.

Unit 4: Heattransfer

Modes of heat transfer: conduction, convection and radiation.

Conduction: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination ofthermal conductivity of a bad conductor by Lee's disc method.

Radiation: black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law –Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.

Unit 5: Statistical Mechanics

Definition of phase-space – micro and macro states – ensembles –different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics – expression for distribution function – comparison of three statistics.

TOPICS FOR SELF STUDY

1. Calorimetry & Low temperature physics

https://www.physicsclassroom.com/class/thermalP/Lesson-2/Calorimeters-and-Calorimetry

2. Thermodynamics -I

https://nptel.ac.in/courses/112108148

3. Thermodynamics - II

https://www.grc.nasa.gov/www/k-12/airplane/thermo.html

4. Heat transfer

https://www.wisc-online.com/learn/natural-science/earth-science/sce304/heat-transfer-conduction-convection-radiation

5. Statistical Mechanics

https://onlinecourses.nptel.ac.in/noc19_ph10/preview

TEXT BOOKS

1. Brijlal& N. Subramaniam, 2018, Heat and Thermodynamics, S. Chand & Co.
2. Narayanamoorthy&KrishnaRao, 2013, Heat, Triveni Publishers, Chennai.
3. V.R.Khanna&R.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish & Co, Meerut
4. Brijlal and N. Subramanyam, 2018, Waves and Oscillations, Vikas Publishing House, New Delhi.
5. Ghosh, 2016, Text Book of Sound, S. Chand &Co.
6. R. Murugeshan&KiruthigaSivaprasath, 2013, Thermal Physics, S. Chand& Co.

REFERENCE BOOKS

1. J.B.Rajam&C.L.Arora, 1985, Heat and Thermodynamics, 8th edition, S.Chand& Co. Ltd.
2. D.S.Mathur, 2022, Heat and Thermodynamics, Sultan Chand & Sons.
3. Gupta, Kumar, Sharma, 2016, Statistical Mechanics, 26th Edition, S. Chand & Co.
4. Resnick, Halliday&Walker,2013, Fundamentals of Physics, 6th Edition.
5. Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.

WEBLINKS

1. https://youtu.be/M_5KYncYNyc
2. https://www.youtube.com/watch?v=4M72kQulGKk&vl=en

3. MAPPING SCHEME (PO, PSO & CO)

U23PH202	PO															PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PO13**	**PO14**	**PO15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	H	M	L	M	L	M	-	L	M	L	M	-	L	M	L	M	-	-	-	-
CO 2	H	L	L	L	M	L	L	M	-	M	L	L	M	-	M	M	L	L	M	M
CO 3	H	L	H	M	L	L	-	L	M	L	L	-	L	M	L	M	L	M	L	L
CO 4	M	H	-	L	H	L	L	L	M	H	L	L	L	M	H	M	M	-	L	M
CO 5	M	L	-	L	M	-	L	L	-	M	-	L	L	-	M	M	L	M	-	-

L-Low M-Moderate H- High

4. COURSEASSESSMENTMETHODS

(Kindly incorporate all evaluation modes as per your paper)

Direct

1. ContinuousAssessmentTest(ModelExams) I, II
2. Openbooktest,Assignment,Seminar,GroupPresentation, Project report, Poster preparation, Problem solving etc.
3. EndSemesterExamination

Indirect

1.Course-endsurvey

Course Co-Ordinator:

Dr.I. Devadoss

Core Theory– III: MECHANICS

Semester: III **Course Code: U23PH303**
Credits: 5 **Total No. of Hours: 5**

1. Course Outcomes

After the completion of this course the students will be able to

S.No.	Course Outcomes	Level	Unit Covered
CO 1	Explain the concept of Gravitation, gravity, friction and Equilibrium of a body in the presence and absence of external force.	K2	1
CO 2	Estimate the physical parameters involved in conservation laws and Momentum.	K5	2
CO 3	Determine the conservation of Energy due to electric field and magnetic field and explain the difference between conservative and non-conservative forces.	K5	3
CO 4	Calculate moment of inertia of regular geometric structures using parallel and perpendicular axes theorem.	K5	4
CO 5	Outline the concepts of classical mechanics and its applications.	K2	5

2. Syllabus

UNIT – 1 LAWS OF MOTION

Newton's Laws – forces – equations of motion – frictional force – motion of aparticlein a uniform gravitational field – types of everyday forces in Physics.

Gravitation: Classical theory of gravitation–Kepler's laws, Newton's law of gravitation – Determination of G by Boy's method – Earth-moon system – weightlessness – earth satellites – parking orbit – earth density – mass of the Sun – gravitational potential – velocity of escape – satellite potential and kinetic energy – Einstein's theory of gravitation – introduction –principle of equivalence – experimental tests of general theory of relativity – gravitational red shift – bending of light – perihelion of mercury.

UNIT – 2 CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM

Conservation of linear and angular momentum – Internal forces and momentum conservation – centre of mass – examples – general elastic collision of particles of different masses – system with variable mass – examples – conservation of angular momentum – torque due to internal forces – torque due to gravity – angular momentum about center of mass – proton scatteringby heavy nucleus.

UNIT – 3 CONSERVATION LAWS OF ENERGY

Introduction – significance of conservation laws – law of conservation of energy concepts of work- power – energy – conservative forces – potential energy and conservation of energy in gravitational and electric field – examples –non-conservative forces – general law of conservation of energy.

UNIT – 4 RIGID BODY DYNAMICS

Translational and rotational motion – angular momentum – moment of inertia – general theorems of moment of inertia – examples – rotation about fixed axis – kinetic energy of rotation – examples – body rollingalong a plane surface – body rolling down an inclined plane – gyroscopic precision – gyrostatic applications.

UNIT – 5 LAGRANGIAN MECHANICS

Generalized coordinates –degrees of freedom – constraints - principle of virtual work and D' Alembert's Principle – Lagrange's equation from D' Alembert's principle – application –simple pendulum – Atwood's machine..

Topics for Self Study

1. Basicof Gravitation and laws of conservation.
2. Rigid Body Systems.
3. Basic Terminology in Classical Dynamics.
4. Pendulum Theory & Modelling Oscillations –Fluid mechanics and its Application.

TEXT BOOKS

1. J.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai.
2. P.DuraiPandian, LaxmiDuraiPandian, MuthamizhJayapragasam,2005, Mechanics, 6th revised edition, S.Chandand Co.
3. D.S.Mathur and P.S.Hemne, 2000, Mechanics, Revised Edition, S.Chandand Co.
4. Narayanamurthi, M.andNagarathnam. N, 1998, Dynamics. The National Publishing,Chennai.
5. Narayanamurthi, M. and Nagarathnam, N, 1982, Statics, Hydrostatics and Hydrodynamics, The National Publishers, Chennai.

REFERENCE BOOKS

1. Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesely.
2. Halliday, David and Robert, Resnick, 1995, Physics Vol.I. New Age, International, Chennai.
3. Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi

WEBLINKS

1. https://youtu.be/X4_K-XLUIB4
2. https://nptel.ac.in/courses/115103115
3. https://www.youtube.com/watch?v=p075LPq3Eas
4. https://www.youtube.com/watch?v=mH_pS6fruyg
5. https://onlinecourses.nptel.ac.in/noc22_me96/preview
6. https://www.youtube.com/watch?v=tdkFc88Fw-M
7. https://onlinecourses.nptel.ac.in/noc21_me70/preview

4. MAPPING SCHEME (PO, PSO & CO)

CO	PO														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO 1	H	H	M	M	M	M	L	L	L	H	M	H	L	L	M
CO 2	H	M	H	M	M	M	L	L	L	M	H	M	L	L	M
CO 3	H	M	M	H	M	M	L	M	M	M	M	M	M	M	L
CO 4	H	H	H	H	H	M	L	L	M	M	L	M	M	M	L
CO 5	H	M	M	M	M	M	L	L	M	M	L	L	M	L	M

CO	PSO				
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	H	M	L
CO 2	H	H	M	M	M
CO 3	H	M	H	H	H
CO 4	H	H	H	M	M
CO 5	H	M	M	H	L

L-Low M-Moderate H- High

COURSE ASSESMENT METHODS

Direct Methods (Synchronous)

- Surprise Class tests and Quizzes
- Continuous Assessments (Two Internal Tests)
- Group Discussions and Seminar Presentations
- End Semester Examinations

In-Direct Methods (Asynchronous)

- Assignments and Industry/Field visits
- Course end survey/Feedbacks

Core Theory– IV: OPTICS AND LASER PHYSICS

Semester: IV **Course Code: U23PH404**
Credits: 5 **Total No. of Hours: 5**

COURSE OUTCOMES:

At the end of the course the student will be able to:

CO	Course Outcomes	Level	Unit Covered
CO1	Gain basic knowledge on the methods of rectifying different defects in lenses and articulate technological applications of eyepieces	K2	I
CO2	Explain the principle of superposition of waveand study the design and working of interferometer	K2	II
CO3	Illustrate the phenomenon of diffraction and determines the wavelength and apply mathematical principles to analyze the optical instruments	K3	III
CO4	Analyze the concepts of polarization to estimate the optical activity of liquids	K5	IV
CO5	Explain the basics of laser and the operations of different types of lasers	K4	V

SYLLABUS

UNIT – I: LENS AND PRISMS

Fermat's principle of least time – postulates of geometrical optics – thick and thin lenses – focal length, critical thickness, power and cardinal points of a thick lens – narrow angled prisms.

Lens: lens makers formula (no derivation) – aberrations: spherical aberration,chromatic aberrations, coma,and astigmatism– curvature of the field – distortion – chromatic aberrations methods.

Prism: dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope.

Eyepieces: advantage of an eyepiece over a simple lens – Huygen's and Ramsden's eyepieces, construction and working –merits and demerits of the eyepiece.

Resolving power: Rayleigh's criterion for resolution – limit of resolution for the eye – resolving power of, (i)

Prism (ii) grating (iii) telescope

UNIT – II: INTERFERENCE

Division of wave front, Fresnel's biprism – fringes with white light – division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light – colours of thin films applications – air wedge – Newton's rings.

Interferometers: Michelson's interferometer – applications, (i) determination of the wavelength of a monochromatic source of light, (ii) determination of the wavelength and separation D_1 and D_2 lines of sodium light, (iii) determination of a thickness of a mica sheet.

UNIT – III: DIFFRACTION

Fresnel's assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens –Fresnel type of diffraction – diffraction pattern due to a straight edge – positions of maximum and minimum intensities – diffraction due to a narrow slit – Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine wavelengths – width of principal maxima.

UNIT – IV: POLARISATION

Optical activity – optically active crystals –polarizer and analyzer–double refraction – optic axis, principal plane – Huygens's explanation of double refraction in uniaxial crystals – polaroids and applications – circularlyand elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel's explanation – specific rotation – Laurent half shade polarimeter – experiment to determine specific rotatory power.

UNIT – V: LASERS

General principles of lasers – properties of lasers action – spontaneous and stimulated emission – population inversion – optical pumping – He-Ne laser (principle and working) – CO_2 laser (principle and working) semiconductor laser – laser applications – holography.

Topics for Self-Study

Properties of optical materials - Managing optical defects in imaging applications – Fibre Optics – Lens Design -

TEXTBOOKS:

1. Subramaniam. N&Brijlal, 2014,Optics, 25th edition,S.Chand &Co.
2. S.L.Gupta,V.Kumar & R.C.Sharma,1997,Elements of Spectroscopy, 13th Edition, Pragati Prakashan, Meerut.
3. G.Aruldhass,2000,Molecular Structure and Spectroscopy,II edition.PHIPvt Ltd, New Delhi.
4. P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi.
5. K.Rajagopal, 2008, Engineering Physics, PHIPvt Ltd, New Delhi.
6. V.Rajendran, 2012, Engineering Physics, Tata McGraw Hill.

REFERENCE BOOKS

1. Agarwal B.S, 2011,Optics, KedernathRamnath Publishers, Meerut.
2. Sathyaprakash, 1990,Optics,VII edition, RatanPrakashanMandhir, New Delhi.
3. C.N.Banewell, 2006, Introduction to Molecular Spectroscopy,IV edition,TMH Publishing Co,New Delhi.
4. AjoyGhatak, 2009,Optics, 4th edition, PHIPvt Ltd, New Delhi.
5. Singh &Agarwal,2002,Optics and Atomic Physics, 9th edition, PragatiPrakashan Meerut.
6. D.Halliday,R.Resnick and J. Walker, 2001, Fundamentals of Physics,6th edition, Willey, New York.
7. JenkinsA.Francis & White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., NewDelhi.

WEB SOURCES:

1. https://science.nasa.gov/ems/
2. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472

1. https://science.nasa.gov/ems/
3. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472
4. https://imagine.gsfc.nasa.gov/educators/gammaraybursts/imagine/index.html

1. http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/
2. http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	H	M	H	M	M	M	H	H	M	M
CO2	M	H	M	H	M	H	M	M	H	H
CO3	H	M	H	H	H	M	H	H	M	M
CO4	H	M	H	M	M	H	M	M	H	M
CO5	H	M	H	M	H	H	M	H	H	H

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	H	M	M
CO2	M	H	M	H	M
CO3	H	M	H	H	H
CO4	H	M	H	M	M
CO5	H	M	H	M	H

COURSEASSESSMENTMETHODS

DIRECT

- Continuous Assessment Test I & II
- Openbooktest;Cooperativelearningreport,Assignment;Journalpaperreview,Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (asapplicable)
- EndSemester Examination

INDIRECT

- Course-endsurvey

Core Theory– V: ELECTRICITY, MAGNETISM ANDELECTROMAGNETISM

Semester: V **Course Code: U23PH505**
Credits: 4 **Total No. of Hours: 5**

1. **COURSE OUTCOMES**

After the completion of this course the students will be able to

S.No.	Course Outcomes	Level	Unit Covered
CO1	Explain the fundamental laws of Electrostatics, Magnetostatics and electromagnetism.	K2	I, II, III & V
CO2	Explain the principles behind the electric and magnetic instruments and Organize experiments to determine the absolute values of inductance, Figure of merit of Galvanometer, Q factor and power factor of LCR circuits.	K3	I, II, III & IV
CO3	Analyse the behavior of circuits containing Inductance, Capacitance and Resistance connected in different combinations.	K4	IV
CO4	Evaluate the electric, magnetic and electromagnetic fields due to different electric structures and current circuits.	K5	I, II & III
CO5	Estimate the energy involved in sharing of charges, Magnetization and in electromagnetic waves.	K6	I, III & V

2. A. SYLLABUS

Unit-I: Capacitors and ThermoElectricityCapacitor –principle – capacitance of spherical and cylindrical capacitors – capacitance of a parallel plate capacitor (with and without dielectric slab) – effect of dielectric – Carey Foster bridge – temperature coefficient of resistance – Seebeck effect – laws of thermoemf – Peltier effect – Thomson effect – thermoelectric diagrams –uses of thermoelectric diagrams – thermodynamics of thermo couple - determination of Peltier and Thomson coefficients.

Unit-II: Magnetic effect of Current

Biot and Savart's law – magnetic induction due to circular coil – magnetic induction due to solenoid – Helmholtz tangent galvanometer –force on a current element by magnetic field – force between two infinitely long conductors – torque on a current loop in a field - moving coil galvanometer – damping correction – Ampere’s circuital law – differential form – divergence of magnetic field – magnetic induction due to toroid.

Unit-III: Magnetism and Electromagnetic Induction

Magnetic induction B – magnetization M - relation between B, H and M – magnetic susceptibility – magnetic permeability – experiment to draw B-H curve – energy loss due to hysteresis - Importance of hysteresis curves – Faraday and Lenz laws –vector form – self-induction – coefficient of self-inductance of solenoid – Anderson's method – mutual induction – coefficient of mutual inductance between two coaxial solenoids – coefficient of coupling - earth inductor- determination of angle of dip(Φ)

Unit-IV: Transient and Alternating Currents

Growth and decay of current in a circuit containing resistance and inductance – growth and decay of charge in a circuit containing resistance and capacitor – growth and decay of charge in an LCR circuit (expressions for charge only) – peak, average and rms values of ac – LCR series and parallel circuits – resonance condition – Q factor – power factor

Unit-V: Maxwell's equations and Electromagnetic waves

Maxwell's equations in vacuum, material media– physical significance of Maxwell's equations – displacement current – plane electromagnetic waves in free space – velocity of light – Poynting vector– electromagnetic waves in a linear homogenous media – refractive index

B. TOPICS FOR SELF STUDY

Types of capacitors

https://www.electronics-tutorials.ws/

Secondary cells

http://www.chem.libretexts.org/

Three phase AC generators

https://www.toppr.com/

The method of electrical images.

https://web.mit.edu/

TEXT BOOKS

1. R. Murugeshan, Electricity and Magnetism, S. Chand and Co., New Delhi, 2017.(UNIT I,II,IV and V)
2. Brijlal and N. Subrahmanyam, Electricity and Magnetism, RatanPrakashanMandir, Agra, 2000.(UNIT III)

REFERENCE BOOKS

1. D. N. Vasudeva, Fundamentals of Magnetism and Electricity, S. Chand & Co, 2013.
2. N.K. Sehgal, K.L. Chopra and D.L. Sehgal, Electricity and Magnetism, Sultan Chand and Sons, New Delhi, 2014.
3. K.K. Tiwari, Electricity and Magnetism, S. Chand and Company, New Delhi, 2018.
4. David J. Griffith, Introduction to Electrodynamics, Prentice Hall of India, 2015.

5. Paul A. Tipler and G. Mosca, Physics for Scientist and Engineers, W.H.Freeman, New York, 2003.

WEBLINKS

https://www.edx.org/course/electricity-and-magnetism

https://nptel.ac.in/courses/115/106/115106122/

MAPPING SCHEME (PO, PSO & CO)

CO	PO														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO 1	H	M	L	L	M	L	M	M	M	H	M	M	L	L	M
CO 2	H	M	L	H	M	M	L	L	M	M	H	M	L	L	M
CO 3	H	M	M	H	M	M	L	M	L	M	M	M	M	M	L
CO 4	H	H	M	H	H	M	L	L	M	M	L	M	M	M	L
CO 5	H	M	M	M	M	M	L	L	M	M	L	L	L	L	M

CO	PSO				
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	H	M	M
CO 2	H	H	M	M	M
CO 3	H	M	H	H	H
CO 4	H	H	H	H	M
CO 5	H	M	M	H	L

L-Low M-Moderate H- High

5. COURSEASSESSMENTMETHODS

Direct

1. ContinuousAssessmentTest(ModelExams) I,II
2. Openbooktest;Cooperativelearningreport,Assignment,Seminar,GroupPresentation, Project report, Poster preparation, Problem solving etc.
3. EndSemesterExamination

Indirect

1. Course-endsurvey

Core Theory– VI: ATOMIC AND NUCLEAR PHYSICS

Semester: V **Course Code: U23PH506**
Credits: 4 **Total No. of Hours: 5**

1. COURSE OUTCOMES (CO)

After the completion of this course, the students will be able to:

CO NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the basics of atom models, quantum numbers, coupling schemes, quark model of classification of elementary particles, and cosmic rays.	**K2**	**I & V**
CO2	Apply the concepts of atom models to explain the spectral behavior of atoms when they are free and under the influence of external magnetic fields.	**K3**	**II**
CO3	Summarize the concepts of radioactivity and nuclear reactions.	**K3**	**III &IV**
CO4	Analyze the magnetic moments of an electron, and radioactive decay.	**K4**	**I&IV**
CO5	Compare the atom models, atomic spectral characteristics, nuclear models, radioactive elements, and elementary particles.	**K5**	**I to V**

2. A. SYLLABUS

Unit-I: Vector Atom Model (? Hours)

Introduction to atom model – vector atom model – electron spin – spatial quantization – quantum numbers associated with vector atom model – L-S and J-J coupling – Pauli's exclusion principle – magnetic dipole moment due to orbital motion and spin motion of the electron – Bohr magnetron – Stern and Gerlach experiment – selection rules – intensity rule.

Unit-II: Atomic Spectra (? Hours)

Origin of atomic spectra – excitation and ionization potentials – Davis and Goucher's method – spectral terms and notations – fine structure of sodium D-lines – Zeeman effect – Larmor's theorem – quantum mechanical explanation of normal Zeeman effect – anomalous Zeeman effect (qualitative explanation) –

Paschen-Back effect – Stark effect.

Unit-III: Radioactivity **(? Hours)**

Discovery of radioactivity – natural radioactivity – properties of alpha rays, beta rays, and gamma rays – Geiger-Nuttal law – alpha particle spectra – Gammow's theory of alpha decay (qualitative study) – beta ray spectra – neutrino theory of beta decay – nuclear isomerism – internal conversion – non-conservation of parity in weak interactions.

Unit-IV: Nuclear Reactions **(? Hours)**

Conservation laws of nuclear reaction – Q-value equation for a nuclear reaction – threshold energy – scattering cross section – artificial radioactivity – application of radioisotopes – classification of neutrons – models of nuclear structure – liquid drop model – shell model.

Unit-V: Elementary Particles **(? Hours)**

Classification of elementary particles – fundamental interactions – elementary particle quantum numbers – Isospin and strangeness quantum number – Conservation laws and symmetry – quarks – quark model (elementary ideas only) – discovery of cosmic rays – primary and secondary cosmic rays – latitude effect – altitude effect.

Professional Components: Seminars, Webinars, Field Trips, Industrial Visits and Projects.

TOPICS FOR SELF STUDY

1.The development of the atomic model
https://www.wired.com/2009/09/the-development-of-the-atomic-model/
2.Theory, experiment and fine structure
https://physicsworld.com/a/theory-experiment-and-fine-structure/
3. Advances in atomic physics
https://www.science.gov/topicpages/a/a-z+atomic+physics
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4563599/?tool=pmcentrez
4. Understanding atomic spectra
https://chem.libretexts.org/Courses/Furman_University/CHM101%3A_Chemistry_and_Global_Awareness_(Gordon)/04%3A_Valence_Electrons_and_Bonding/4.02%3A_Understanding_Atomic_Spectra
5. Nuclear Physics
https://www.sciencedirect.com/topics/physics-and-astronomy/nuclear-physics

TEXT BOOKS

1. R. Murugeshan, Modern Physics, S. Chand and Co., 18e, New Delhi, 2016. **(**All units**)** (Units I and II – Problems)
2. N. Subrahmanyam,Brij Lal and JivanSeshan, Atomic and Nuclear Physics, S. Chand and Co., New Delhi, 2018.(All units)
3. J. B. Rajam, Modern Physics, S. Chand and Co., New Delhi, 1957.
4. D. L. Sehgal,K. L. Chopra and N. K. Seghal, Modern Physics, Sultan Chand and Sons, New Delhi, 2013.

5. Arthur Beiser, Concept of Modern Physics, McGraw Hill Publication, 6th Edition, 2009.

REFERENCE BOOKS

1. Perspective of Modern Physics, Arthur Beiser, McGraw Hill.
2. Modern Physics, S. Ramamoorthy, National Publishing and Co.
3. Laser and Non-Linear Optics by B.B. Laud, Wiley Easter Ltd., New York,1985.
4. Tayal, D.C., 2000 – Nuclear Physics, Edition, Himalaya Publishing House, Mumbai.
5. Irving Kaplan (1962) Nuclear Physics, Second Edition, Oxford and IBH Publish and Co, New Delhi.
6. J.B. Rajam, Atomic Physics, S. Chand Publication, 7th Edition.
7. Roy and Nigam, Nuclear Physics (1967) First edition, Wiley Eastern Limited, New Delhi.

WEBLINKS

1. https://nptel.ac.in/courses/115/105/115105100/
2. https://nptel.ac.in/courses/115/106/115106057/
3. https://nptel.ac.in/courses/115/101/115101003/
4. https://www.edx.org/learn/nuclear-physics
5. https://www.youtube.com/watch?v=-WIAoAG4SyA
6. https://www.youtube.com/watch?v=5yvv-tEq4Yo
7. https://onlinecourses.nptel.ac.in/noc20_ph19/preview
8. https://ocw.mit.edu/courses/8-701-introduction-to-nuclear-and-particle-physics-fall-2020/
9. https://www.coursera.org/learn/particle-physics

MAPPING SCHEME (PO, PSO & CO)

	PO															PSO				
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PO-13	PO-14	PO-15	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	H	M	H	M	M	M	H	L	M	M	L	M	M	H	H	M	M	M	M
CO2	L	H	M	H	M	M	M	H	L	M	M	L	M	M	H	H	M	M	M	M
CO3	L	H	M	H	M	M	M	H	L	M	M	L	M	M	H	H	M	M	M	M
CO4	L	H	H	H	H	M	M	H	L	M	M	L	M	M	H	H	H	H	H	H
CO5	L	H	H	H	H	M	M	H	L	M	M	L	M	M	H	H	H	H	H	H

L- Low M-Moderate H-High

COURSE ASSESMENT METHODS

Direct

1. Surprise Class tests and Quizzes
2. Continuous Assessments (Two Internal Tests)
3. Group Discussions and Seminar Presentations
4. End Semester Examinations

Indirect

1. Assignments and Industry/Field visits
2. Course end survey/Feedbacks

Course Co-ordinator: Dr. S. Franklin

Core Theory– VII: QUANTUM MECHANICS AND RELATIVITY

Semester: VI **Course Code: U23PH607**
Credits: 4 **Total No. of Hours: 6**

COURSE OUTCOMES (CO)

After the completion of this course, the students will be able to:

CO NO.	Course Outcomes	Level	Unit Covered
CO1	Explain various postulates of special theory of relativity.	**K2**	**I**
CO2	Outline the importance of transformation equations and also the general theory of relativity..	**K2**	**II**
CO3	Analyze the wave nature of matter and understand its importance	**K3**	**III**
CO4	Deduce Schrodinger equation and also realize the use of operators.	**K4**	**IV**
CO5	Solve simple problems using Schrödinger equation	**K6**	**V**

SYLLABUS

UNIT-I: SPECIAL THEORY OF RELATIVITY

Michelson-Morley experiment–frames of reference – Galilean Relativity – postulates of special theory of relativity – Lorentz transformation – consequences – time dilation–concept of simultaneity – Doppler effect – length contraction–variation of mass with velocity – Einstein's mass-energy relation– relativistic momentum – energy relation

UNIT-II: TRANSFORMATION RELATIONS

Transformation of velocity, mass, energy and momentum – four vector – invariance under transformation – Lorentz transformation and velocity addition equations in terms of hyperbolic functions.

GENERAL THEORY OF RELATIVITY: Inertial and Gravitational mass – Principle of equivalence – Experimental evidences for General theory of Relativity

UNIT-III: PHOTONS AND MATTER WAVES

Difficulties of classical physics and origin of quantum theory – black body radiation – Planck's law – Einstein's photoelectric equation – Compton effect – pair production – De Broglie waves – phase velocity and group velocity – Davisson and Germer's experiment – uncertainty principle – consequences –

illustration of Gamma ray microscope.

UNIT-IV: OPERATORS AND SCHRÖDINGER EQUATION

Postulates of quantum mechanics – Wave function and its interpretation – Schrödinger's equation – linear operators – Eigenvalue – Hermitian operator – properties of Hermitian operator– observable – operators for position, linear Momentum, angular momentum components –commutator algebra –commutator between these operators –expectation values of position and momentum –Ehrenfesttheorem.

UNIT-V: SOLVING SCHRÖDINGER EQUATION FOR SIMPLE PROBLEMS

One-dimensional problems: (i) particle in a box, (ii) barrier penetration problem – quantum mechanical tunneling, (iii) linear harmonic oscillator.

higher dimensional problems: (i) Rigid rotator (qualitative), (ii) Hydrogen atom (qualitative).

TEXT BOOKS

1. Modern Physics, R. Murugeshan, KiruthigaSivaprasath,S. Chand and Co.,17th Revised Edition, 2014.
2. Concepts of Modern Physics, A.Beiser, 6th Ed., McGraw-Hill, 2003.
3. Special Theory of Relativity,S. P.Puri, Pearson Education, India, 2013.
4. Quantum Mechanics, GhatakandLoganathan, Macmillan Publications.
5. Quantum mechanics – Satyaprakash and Swati Saluja. KedarNath Ram Nathand Co.

REFERENCE BOOKS

1. Fundamentals of Modern Physics, Peter J. Nolan, 1stEdition, 2014, by Physics
2. Quantum Mechanics, V. Devanathan, Narosa Pub. House, Chennai, 2005.
3. Quantum Mechanics, V.K. Thangappan, New Age International, New Delhi.
4. A Text Book of Quantum Mechanics, Mathews andVenkatesan, Tata McGraw Hill, New Delhi.
5. Introduction to Quantum Mechanics, Pauling and Wilson, McGraw Hill Co., NewYork.

WEB RESOURCES:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/qapp.html
2. https://swayam.gov.in/nd2_arp19_ap83/preview
3. https://swayam.gov.in/nd1_noc20_ph05/preview
4. https://www.khanacademy.org/science/physics/special-relativity/minkowski-spacetime/v/introduction-to-special-relativity-and-minkowski-spacetime-diagrams

MAPPING SCHEME (PO, PSO & CO)

CO	PO														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO 1	H	H	H	H	H	H	H	M	H	M	M	M	L	L	M
CO 2	H	H	M	H	M	M	H	M	M	M	H	M	L	L	M
CO 3	M	M	H	M	H	H	M	H	H	H	M	M	M	M	L
CO 4	M	H	H	H	H	H	H	M	M	M	L	M	M	M	L
CO 5	H	M	H	H	M	M	H	M	M	H	L	L	L	L	M

CO	PSO				
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	H	M	M
CO 2	H	H	M	M	M
CO 3	H	M	H	H	H
CO 4	H	H	H	H	M
CO 5	H	M	M	H	L

COURSE ASSESMENT METHODS

Direct

1. Surprise Class tests and Quizzes
2. Continuous Assessments (Two Internal Tests)
3. Group Discussions and Seminar Presentations
4. End Semester Examinations

Indirect

1. Assignments and Industry/Field visits
2. Course end survey/Feedbacks

CORE VIII: SOLID STATE PHYSICS

Semester: VI **Course Code: U23PH608**
Credits: 5 **No. of hours: 5**

1. COURSE OUTCOMES

At the end of this course, the students will be able to,

CO NO.	Course Outcomes	Level	Unit Covered
CO1	Analyze types of bonding and crystal structure using XRD	**K4**	**I**
CO2	Interpret the phonon spectrum, electrical and thermal properties of solids	**K2**	**II**
CO3	Estimate the susceptibility of magnetic and ferroelectric materials and classify them	**K5**	**III**
CO4	Investigate the dielectric properties of materials	**K6**	**IV**
CO5	Categorize the semiconducting and superconducting materials and study its properties	**K4**	**V**

2. SYLLABUS

UNIT-I: BONDING IN SOLIDS, CRYSTAL STRUCTURE

Types of bonding – Primary bonds: ionic bonding – bond energy of NaCl molecule – lattice energy of NaCl molecule –covalent bonding – metallic bonding – hydrogen bonding – Secondary bonds: Van-der-Waals bonding – dispersion bond – dipole bond - crystal lattice – lattice translational vectors – lattice with basis – unit cell – Bravais' lattices – Miller indices – procedure for finding them –packing ofSC, BCC and FCC and HCP structures– structures of NaCl and diamond crystals –reciprocal lattice – reciprocal lattice vectors – Properties – reciprocal lattices to SC, BCC and FCC structures – Brillouin zones – X-rays – Bragg's law(simple problems) – experimental methods: Laue method, powder method and rotating crystal method

UNIT-II: ELEMENTARY LATTICE DYNAMICS

Lattice vibrations and phonons: linear monoatomicand diatomic chains. acoustical and optical phonons – qualitativedescription of the phonon spectrum in solids –Dulong and Petit's Law – Einstein and Debye theories ofspecific heat of solids – T^3 law (qualitative only)–properties of metals – classical free electron theory of metals(Drude-Lorentz) – Ohm's law – electrical and thermal conductivities – Weidemann-Franz' law –Sommerfeld'squantum free electron theory (qualitative only)

UNIT-III: MAGNETIC AND FERROELECTRIC PROPERTIES OF SOLIDS

Permeability, susceptibility, relation between them – classification of magnetic materials – properties ofdia, para,ferro, ferri materials –antiferromagnetism–Langevin'stheory of diamagnetism – Langevin'stheory of paramagnetism– Curie-Weiss law – Weiss theory of ferromagnetism(qualitative only) – Heisenberg's quantum theory of ferromagnetism – domains – discussion of B-H curve –hysteresis and energy loss – soft and hard magnets – magnetic alloys.

UNIT-IV: DIELECTRIC PROPERTIES OF MATERIALS

Polarization and electric susceptibility –local electric field of an atom – dielectric constant and polarisability – polarization processes: electronic polarization–ionic, orientational and space charge polarization - calculation of polarisability values –internal field –Clausius-Mosotti relation –frequency dependence of dielectric constant –dielectric loss – effect of temperature on dielectric constant – dielectric breakdown and its types – classical theory of electric polarisability –normal and anomalous dispersion - complex dielectric constant – complex permittivity spectra Debye equation– optical phenomena - optical permittivity spectrum – applications of dielectrics - Ferroelectric effect: Curie-Weiss Law – ferroelectric domains, P-E hysteresis loop.

UNIT-V: FERROELECTRIC, SEMICONDUCTING and SUPERCONDUCTING PROPERTIES OF MATERIALS

Elementary band theory:Kronig-Penny model – band gap(no derivation) – conductor, semiconductor (P and N type) and insulator – carrier concentration – Fermi level of intrinsic and extrinsic semiconductors – conductivity of semiconductor – mobility – Hall effect – measurement of conductivity (four probe method) - Hall coefficient.

Superconductivity:experimentalresults –critical temperature –critical magnetic field – Meissner effect – type-I and type-II superconductors – London's equation and penetration depth – isotope effect – idea of BCS theory (no derivation) – AC and DC Josephson effects (Concepts only) – Applications of superconductors..

TOPICS FOR SELF STUDY

1. Quasi crystals

https://www.youtube.com/watch?v=lmr4kETnwi0

http://home.iitk.ac.in/~anandh/presentations/Quasicrystals_Nobel.pdf

2. Advanced Magnetoresistive Materials: Giant Magnetoresistance, MagnetoTunnel

https://www.routledge.com/rsc/downloads/ch_2_9781315119595.pdf

https://www.youtube.com/watch?v=7qHbv9QFoC0

https://www.youtube.com/watch?v=hCcb-w58IY0

3. Synthesis of High temperature superconductors

https://physlab.org/wp-content/uploads/2016/04/Superconductor_manual1.pdf

https://www.youtube.com/watch?v=RdlCCxOXcoM

TEXT BOOKS

1. Introduction to Solid State Physics,Kittel, Willey Eastern Ltd (2003).
2. Solid state Physics, Rita John, 1st edition, TataMcGraw Hill publishers (2014).
3. Solid State Physics , R L Singhal, Kedarnath Ram Nathand Co., Meerut (2003)
4. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India
5. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
6. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning
7. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer
8. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
9. Solid State Physics, M.A. Wahab, 2011, Narosa Publishing House, ND

REFERENCE BOOKS

1. PuriandBabber – Solid State Physics – S.ChandandCo. New Delhi.
2. Kittel - Introduction to solid state physics, Wiley and Sons, 7th edition.
3. Raghavan - Materials science and Engineering, PHI
4. Azaroff - Introduction to solids, TMH
5. S. O. Pillai - Solid State Physics, Narosa publication
6. A.J. Dekker - Solid State Physics, McMillan India Ltd.
7. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India

WEB RESOURCES

1. https://nptel.ac.in/courses/115105099/
2. https://nptel.ac.in/courses/115106061
3. https://nptel.ac.in/courses/115/104/115104109/

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**
CO1	H	L	M	M	L	M	L	M	L	L	L	L	L	L	L
CO2	H	L	M	M	L	M	L	M	L	L	L	L	L	L	L
CO3	H	L	H	M	L	H	L	M	M	L	M	L	L	L	M
CO4	H	L	H	M	L	M	L	L	L	L	M	L	L	L	L
CO5	H	L	M	M	L	L	L	L	L	L	M	L	L	L	L

U23PH608	**PSO**				
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	L	H	H	M
CO2	M	L	H	L	M
CO3	H	M	H	L	M
CO4	M	L	M	M	M
CO5	M	L	M	M	M

5. COURSE ASSESSMENT METHODS

Direct

1. Continuous Assessment Test I & II
2. Assignment, Group Discussion, Quiz, Slip test, Innovative practice,Seminar and End Semester Examination

Indirect

1. Course-end survey

Course Coordinator:Mr. A. John Samuel

Elective I: ENERGY PHYSICS

Semester: V **Course Code: U23PH5:A**
Credits: 3 **Total No. of Hours: 4**

1. COURSE OUTCOMES

After the completion of this course the students will be able to,

CO. No	Course Outcomes	Level	Unit Covered
CO1	Explain the non-conventional and renewable energy sources	K2	I
CO2	Analyse themerits and demerits of energy sources	K4	I
CO3	Discuss the importance of solar energy	K3	II
CO4	Outline the basic components of Wind Energy Conversion Systems	K2	III
CO5	Explain the advantages and disadvantagesof biogas plants and Analyze the installation and applications of fuel cells	K2 & K3	IV & V

SYLLABUS

Unit-1:INTRODUCTION TO ENERGY SOURCES

Energy consumption as a measure of prosperity – world energy future – energy sources and their availability – conventional energy sources – non-conventional and renewable energy sources – comparison – merits and demerits.

Unit-2: SOLAR ENERGY

Solar energy Introduction – solar constant – solar radiation at the Earth's surface – solar radiation geometry – Solar radiation measurements – solar radiation data –solar energy storage and storage systems – solar pond – solar cooker – solar water heater – solar greenhouse – types of greenhouses – solar cells.

Unit-3: WIND ENERGY

Introduction –nature of the wind – basic principle of wind energy conversion – wind energy data and energy estimation – basic components of Wind Energy Conversion Systems (WECS) – advantages and disadvantages of WECS – applications – tidal energy

Unit-4: BIOMASS ENERGY

Introduction – classification – biomass conversion technologies –photosynthesis – fermentation - biogas

generation –classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages and disadvantages.

Unit-5: ENERGY STORAGE

Importance of energy storage- batteries - lead acid battery -nickel-cadmium battery – fuel cells – types of fuel cells – advantages and disadvantages of fuel cells – applications of fuel cells - hydrogen storage.

B. TOPICS FOR SELF-STUDY

1. *ENERGY SOURCES*
   https://www.aakash.ac.in/important-concepts/physics/conventional-and-non-conventional-sources-of-energy
2. *SOLAR ENERGY*
   https://www.energy.gov/eere/solar/how-does-solar-work
3. *WIND ENERGY*
   https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy
4. *BIOMASS ENERGY*
   https://www.homebiogas.com/blog/advantages-and-disadvantages-of-biogas/

TEXT BOOKS

1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4thEdn.
2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rdEdn.
3. D P Kothari, K P Singal, RakeshRajan, PHI Learning Pvt Ltd, 2011, 2nd Edn.

REFERENCE BOOKS

1. John Twidelland Tony Weir, Renewable Energy Resources, Taylor and Francis, 2005, 2ndEdn.
2. S.A. Abbasi and NasemaAbbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008.
3. M. P. Agarwal, Solar Energy, S. Chand and Co. Ltd., New Delhi,1982
4. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.

WEBLINKS

https://archive.nptel.ac.in/courses/115/103/115103123/

https://archive.nptel.ac.in/courses/103/103/103103206/

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**
CO1	H	M	L	H	L	L	M	L	H	M	L	M	M	M	M
CO2	H	M	L	H	M	L	M	L	L	M	H	M	M	M	L
CO3	H	H	M	H	H	L	M	L	L	L	M	M	M	L	M
CO4	H	M	M	H	L	M	L	L	L	L	M	M	M	L	L
CO5	H	M	M	M	M	M	L	M	M	L	M	H	M	M	L

U23PH608	**PSO**				
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	H	H	M	H	H
CO2	H	H	M	M	M
CO3	H	M	H	M	L
CO4	H	M	M	M	M
CO5	H	M	H	M	L

L-Low *M-Moderate* *H- High*

COURSE ASSESSMENT METHODS

Direct

1. Continuous Assessment Test(ModelExams) I,II
2. Openbooktest;Cooperativelearningreport,Assignment,Seminar,etc.
3. EndSemesterExamination

Indirect

1.Course-endsurvey

Elective II: NUMERICAL METHODS AND C – PROGRAMMING

Semester: V **Course Code: U23PH5:B**
Credits: 3 **Total No. of Hours: 4**

1**. COURSE OUTCOMES**

After the completion of this course the student will be able to:

CO.NO	Course outcomes	Level	Unit Covered
CO1	Understand different numerical approaches to solve algebraic and transcendental equation	K1	I
CO2	Analyze the newton forward and backward interpolation	K2	II
CO3	Develop algorithm and draw flow chart to solve simple problems	K3	III
CO4	Recall the basic structure of C program using constants, variables, datatypes and operators	K4	IV
CO5	Demonstrate the conditional and looping statements to understand the concept of programming language	K5	V

SYLLABUS

Unit I: NUMERICAL SOLUTIONS

Determination of zeros of polynomials – roots of linear and nonlinear algebraic and transcendental equations – bisection and Newton-Raphson methods – convergence and divergence of solutions.

Unit II: NUMERICAL DIFFERENTIATION, INTEGRATION AND CURVE FITTING

Newton's forward and backward interpolation – Lagrange's interpolation – Newton-Raphson method to find square root and cube roots – principle of least squares – fitting a straight line and exponential curve – trapezoidal rule – Simpson's 1/3 and 1/8 rule

Unit III: ALGORITHM, FLOW CHART AND PROGRAM

Development of algorithm – flow chart for solving simple problems– average of set of numbers – greatest, smallest – conversion of Fahrenheit to Celsius and Celsius to Kelvin, miles to kilometer – sorting set of numbers in ascending and descending order – square matrix, addition, subtraction and multiplication of order (2x2) using arrays.

Unit IV: INTRODUCTION TO C

Importance of C – basic structure of C programming – constants, variables and data types and data types – character set, key words and identifiers – declaration of variables and data types – operators – expressions: arithmetic, relational, logical, assignment – increment and decrement – conditional – comma operators.

Unit V: CONTROL STRUCTURE

Decision making with if, if-else, nested if – switch –go to – break – continue –while, do while, for statements – arrays, one dimensional and two dimensional – declaring arrays – storing arrays in memory – initializing arrays – simple programs

TOPICS FOR SELF STUDY

Symbolic constants – Multidimensional arrays – Function-String handling functions – Pointer-

Files and Programs

TEXT BOOKS

1. Numerical methods,Singaravelu,Meenakshipublication,4thEdn., 1999.
2. Numerical methodsP.Kandasamy, K.Thilagavathy, K. Gunavathi, S.Chand, 2016
3. Programming in C, Balagurusamy, TMG, ND, 2012
4. Numerical Analysis,,M.K.Venkatraman, NPH, 2013
5 Numerical Analysis, B.D.Gupta, Konark Publishers, New Delhi, 2013

REFERENCE BOOKS

1. Schaum's outline series, Theory and Problems of programming in C, C.Byronand S. Gottfried, Tata McGraw Hill 2003

2.Numerical methods and C Programming, Veerarajan, 2015.

WEBLINKS

1. https://www.w3schools.com/c/c_intro.php

2.https://www.javatpoint.com/flowchart-in-c-programming-language

3.https://en.wikibooks.org/wiki/Introduction_to_Numerical_Methods/Numerical_Differentiation

4.https://en.wikipedia.org/wiki/Numerical_integration

5.https://www.tutorialspoint.com/cprogramming/c_operators.htm

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**
CO1	M	H	M	H	H	H	M	M	L	M	L	M	M	M	M
CO2	M	H	M	H	H	H	M	M	L	M	H	H	M	M	L
CO3	M	H	H	H	H	H	M	M	M	L	M	L	L	L	M
CO4	M	H	M	H	H	H	M	M	L	L	M	M	L	L	L
CO5	M	M	H	H	H	H	M	M	L	L	M	H	M	M	L

U23PH608	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	H	H	H
CO2	M	H	H	H	H
CO3	L	H	H	H	M
CO4	L	H	H	H	M
CO5	L	H	H	H	L

L-Low M-Moderate H- High

COURSE ASSESSMENT METHOD

Direct

1. ContinuousAssessmentTest(ModelExams I,II)
2. Open book test, Cooperative learning report,Assignment,Seminar,GroupPresentation,Posterpreparation,Problems olvingetc.
3. EndSemesterExamination

Indirect

1. Course-endsurvey

Elective III: NANOSCIENCE AND NANO TECHNOLOGY

Semester: VI **Course Code: U23PH6:A**
Credits: 3 **Total No. of Hours: 5**

1. **COURSE OUTCOMES**

After the Completion of the Course the students will be able to:

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the principle of Nanoscience and technology	K2	1
CO2	Estimate the properties of nanomaterials	K5	1
CO3	Classify methods for fabrication and vaccum techniques	K3	2
CO4	Explain the characterization techniques for nanomaterials	K5	3
CO5	Analyze various fieldsof applications of nanomaterials	K4	4

SYLLABUS

Unit I:NANOSCIENCE AND NANOTECHNOLOGY

Nanoscale– nature and nanostructures – nanostructures: 0D, 1D,2D– surface to volume ratio– size effect – excitons – quantum confinement– metal based nanoparticles (metal and metal oxide) – nanocomposites (non-polymer based) – carbon nanostructures – fullerene –SWCNT and MWCNT

Unit II: PROPERTIES OF NANOMATERIALS

Introduction –mechanical behavior –elastic properties – hardness and strength – ductility and toughness – superplastic behavior – optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties – magnetic properties – super paramagnetism – electrochemical properties – properties of CNTs.

Unit III: FABRICATION METHODS AND VACUUM TECHNIQUES

Top-down and bottom-up approaches – electrochemical method – chemical and physical vapour depositions (CVD and PVD) – plasma arc discharge – sputtering – thermal evaporation – pulsed laser deposition – ball milling – lithography: photolithography – e-beam lithography – sol-gel methods – synthesis of CNT.

Unit IV: CHARACTERIZATION TECHNIQUES

Scanning probe microscopy – scanning tunneling microscopy – atomic force microscopy – scanning electron microscopy – transmission electron microscopy –powder XRD method: determination of structure and grain size analysis – UV-visible and photoluminescence spectroscopy.

Unit V: APPLICATIONS OF NANOMATERIALS

Medicine: Drug delivery – photodynamic therapy – molecular motors –energy: fuel cells –rechargeable batteries – supercapacitors– photovoltaics. Sensors: nanosensors based on optical and physical properties – electrochemical sensors – nanobiosensors. Nanoelectronics: CNTFET – display screens – GMR read/write heads – nanorobots –applications of CNTs.

TOPICS FOR SELF STUDY

1.Nanostructures: 0D, 1D,2D

https://www.nanowerk.com/what-are-nanomaterials.php

*2.*Top-down and bottom-up approaches
https://chemistnotes.com/nanochemistry/synthesis-of-nanomaterials-bottom-up-and-top-down-approach/
3. Applications of Nanomaterials
https://www.intechopen.com/chapters/71346

TEXT BOOKS:

1. K.K.Chattopadhyay and A.N.Banerjee, (2012), Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd.,

2. M.A. Shah, Tokeer Ahmad (2010), Principles of Nanoscience and Nanotechnology, Narosa Publishing House Pvt Ltd.

3. Mick Wilson, et al (2005) Nanotechnology, Overseas Press.

REFERENCE BOOKS :

1. Richard Booker and Earl Boysen, (2005) Nanotechnology, Wiley Publishing Inc. USA
2. J.H.Fendler (2007) Nano particles and nano structured films; Preparation, Characterization and Applications, John Wiley and Sons
3. B.S.Murty, et al (2012) Textbook of Nanoscience and Nanotechnology, Universities Press

WEBLINKS

1. https://www.niehs.nih.gov/health/topics/agents/sya-nano/index.cfm
2. https://www.academia.edu/12425398/CHARACTERIZATION_OF_NANO_MATERIALS

MAPPING SCHEME (PO, PSO&CO)

	PO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO14	PO15
CO1	H	M	L	L	L	L	-	-	-	H	L	L	M	L
CO2	M	M	M	L	H	M	-	-	L	M	M	H	L	M
CO3	M	L	L	-	M	L	L	-	L	M	H	L	L	L
CO4	H	M	M	H	M	L	L	-	L	M	M	H	L	M
CO5	M	M	L	M	H	L	L	L	M	M	M	M	M	L

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	L	L
CO2	M	M	M	L	H
CO3	M	L	L	M	M
CO4	H	M	M	H	M
CO5	H	M	L	M	H

L-Low M-Moderate H- High

COURSEASSESSMENTMETHOD

Direct

1. ContinuousAssessmentTest(ModelExams) I, II
2. Openbooktest,Quizzes,Assignment,Seminar, Problem Solving, Slip test, Surprise test,etc.
3. EndSemesterExamination

Indirect

1. Course-endsurvey/Feedback

ELECTIVE - IV: ANALOG AND COMMUNICATION ELECTRONICS

SEMESTER :VI **COURSE CODE: U23PH6:B**

CREDITS: 3 **NO. OF HOURS: 5**

COURSE OUTCOMES

After the completion of this course the students will be able to:

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Analyze the physical operation and applications of semiconductor devices like diodes, rectifiers and filters	K4	I
CO2	Explain the basic principles of biasing and transistor amplifiersand categorize the different power amplifier circuits, their design and use in electronics and communication circuits	K4	II
CO3	Infer the characteristics of feedback amplifier circuits and analyze different oscillator circuits for various range of frequencies	K4	III
CO4	Construct circuits for various mathematical operations using operational amplifier	K6	IV
CO5	Learn and analyze the operations of sequential and combinational digital circuits	K4	V

SYLLABUS

Unit-1: Diodes

Diode characteristics – rectifiers - clipper circuits, clamping circuits. half wave rectifier, center tapped and bridge fullwave rectifiers, calculation of efficiency and ripple factor. DC power supply: Block diagram of a power supply, Filter – Shunt capacitor filter – π filter – LC filter. Zener diode -V-I characteristics - voltage regulator.

Unit-2: Transistor Amplifiers

Transistor configurations: CB, CE CC modes – I-V characteristics and hybrid parameters of a transistor (basic ideas only) – DC load line – Q point- Voltage divider bias method – RC coupled CE amplifier –power amplifiers – classification of power amplifiers: A, B, C – push pull amplifiers – tuned amplifiers.JFET – Structure – Characteristics – Parameters.

Unit-3: Transistor Oscillators

Feedback amplifier - principle of feedback, positive and negative feedback of voltage and current gain, advantages of negative feedback - Barkhausen's criterion. Transistor oscillators: Hartely, Colpitt, Wien Bridge, Tuned Collector and Phase shift oscillators.

Unit-4: Operational Amplifiers

Differential amplifiers – OPAMP characteristics –IC 741 pin configuration – inverting and non-inverting amplifiers – unity follower –summing and difference amplifiers – differentiator and integrator – D/A Conversion – Binary weighted and R-2R Ladder Method - A/D Successive Approximation Method - astablemultivibrator (square wave generator) – monostable vibrator.

Unit-5: Modulation and Demodulation

Theory of amplitude modulation - frequency modulation – comparison of AM and FM – phase modulation – sampling theorem – pulse width modulation – pulse modulation systems: PAM, PPMand PCM – demodulation: AM and FM detection - duper heterodyne receiver (block diagram).

TOPICS FOR SELF STUDY

1. Characteristics, Working and Applications of LED

https://www.youtube.com/watch?v=IEju3AT1olk

2. MOSFET structure and characteristics

https://www.youtube.com/watch?v=l9LBIy9Ioxo

TEXT BOOKS

1. N.N. Bhargava, D.C. Kulshreshtha and S.C. Gupta, Basic Electronics and Linear Circuits, McGraw Hill Education (India) Private Limited, New Delhi, 2015.
2. V.K. Mehta, Rohit Mehta, Principles of Electronics 7e, S. Chand, New Delhi, 2005.
3. V.Vijayendran - Integrated Electronics, S.Vishwanathan Publishers, Chennai.
4. B.L. Theraja - A Text Book of Electrical Technology.
5. John D. Ryder - Electronic fundamentals and Applications.
6. Malvino - Electronic Principles, Tata McGraw Hill.

REFERENCES BOOKS

1. M.C. Gupta, Principles of Electronics, DhanpatRai and Sons, New Delhi, 1997.
2. T. L. Floyd, Electronic Devices, Pearson Education, New York, 2004.
3. David A. Bell, Electronic Devices and Circuits, Oxford University Press, New Delhi, 2008.
4. B. Grob - Basic Electronics, 6th edition, McGraw Hill, NY, 1989.
5. Herbert Taub and Donald schilling - Digital Integrated Electronics, McGraw Hill, NY.
6. Ramakant A. – Op amp principles and linear integrated circuits, Gaykward
7. Bagde and S. P. Singh - Elements of Electronics.
8. Millman and Halkias- Integrated Electronics, Tata McGraw Hill.

WEBLINKS

1. https://www.electronics-tutorials.ws/diode/diode_8.html
2. https://nptel.ac.in/courses/115/102/115102103/
3. https://www.queenmaryscollege.edu.in/eresources/undergraduateprogram/py157
4. www.ocw.mit.edu>...> Circuits and Electronics
5. www.ocw.mit.edu>...> Introductory Analog Electronics Laboratory
6. https:// www.elprocus.com> semiconductor devices
7. https:// www.britannica.com>technology
8. https://nptel.ac.in/courses/115/102/115102103/#watch

MAPPING SCHEME (PO, PSO& CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	H	H	H	H	H	H	M	H	M	H	-	-	-	M
CO2	H	H	M	H	M	M	H	M	M	M	M	-	-	L	M
CO3	M	M	H	L	H	H	L	H	H	H	M	L	-	-	M
CO4	M	H	H	H	H	H	H	M	L	M	M	-	L	L	M
CO5	H	M	H	H	M	M	H	M	M	H	L	-	L	-	L

U23PH6:B	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	M
CO2	H	M	H	M	L
CO3	H	M	M	L	L
CO4	M	M	H	L	L
CO5	H	M	M	L	L

L-Low M-Moderate H- High

COURSE ASSESSMENT METHODS

Direct

1. Continuous Internal AssessmentTests I & II
2. Model Exam
3. Openbooktest, Assignment, Quiz, Seminar,Group Discussion, Poster preparation, Problem solving etc.
4. EndSemesterExamination

Indirect

1.Course-endsurvey

Course Co – ordinator: Mrs. R. Vidhya

SEC-I: HOME ELECTRICAL INSTALLATION

Semester: I **Course Code: U23PH1E1**
Credits: 2 **Total No. of Hours: 2**

1. COURSE OUTCOMES:
At the end of the course, the student will be able to:

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Outline the various laws and its applications- Ohms Law, Kirchhoff's Voltage and Current Laws.	**K2**	**1**
CO2	Explain the types of electrical wiring & various heating appliances	**K2**	**2**
CO3	Recall the basics of electricity and explain the functioning of several home appliances	**K1**	**3**
CO4	Explain the conversion of electrical energy in to different forms	**K4**	**4**
CO5	Outline the risk factors and precautionary steps to avoid electric shock.	**K3**	**5**

Syllabus

UNIT-I: SIMPLE ELECTRICAL CIRCUITS

Charge, current, potential difference, resistance – simple electrical circuits – DC ammeter, voltmeter, ohmmeter – Ohm's law – difference between DC and AC – advantages of AC over DC – electromagnetic induction - transformers – inductors/chokes – capacitors/condensers – impedance – AC ammeter, voltmeter –symbols and nomenclature

UNIT-II: TRANSMISSION OF ELECTRICITY

Production and transmission of electricity – concept of power grid – Series and parallel connections – technicalities of junctions and loops in circuits –transmission losses (qualitative) – roles of step-up and step-down transformers – quality of connecting wires – characteristicsof single and multicore wires

UNIT-III: ELECTRICAL WIRING

Different types of switches – installation of twoway switch – role of sockets, plugs, sockets - installation of meters – basic switch board – electrical bell – indicator – fixing of tube lights and fans – heavy equipment like AC, fridge, washing machine, oven, geyser, jet pumps – provisions for inverter – gauge specifications of wires for various needs

UNIT-IV: POWER RATING AND POWER DELIVERED

Conversion of electrical energy in to different forms – work done by electrical energy – power rating of electrical appliances – energy consumption – electrical energy unit in kWh – calculation of EB bill – Joule's heating – useful energy and energy loss – single and three phase connections – Measures to save electrical energy – energy audit

UNIT-V: SAFETY MEASURES

Insulation for wires – colour specification for mains, return and earth – Understanding of fuse and circuit breakers – types of fuse: kit-kat, HRC, cartridge, MCB, ELCB – purpose of earth line – lighting arrestors – short circuiting and over loading – electrical safety – tips to avoid electrical shock – first aid for electrical shock – fire safety for electric current

TOPICS FOR SELF STUDY

1. Electricity and basic principle
   https://www.anixter.com/en_us/resources/literature/technical-references/the-basic-principles-of-electricity.html
2. Types of wiring
   https://www.dfliq.net/blog/electrical-house-wiring/
3. Reverse osmosis purifier
   https://www.freshwatersystems.com/blogs/blog/what-is-reverseosmosis
4. Transformer
   https://circuitglobe.com/what-is-a-transformer.html

TEXT BOOKS

1. Wiring a House: 5th Edition by Rex Cauldwell, (2014).
2. Black and Decker Advanced Home Wiring, 5th Edition: Backup Power - Panel Upgrades - AFCI Protection - "Smart" Thermostats, by Editors of Cool Springs Press, (2018).
3. Complete Beginners Guide to Rough in Electrical Wiring: by Kevin Ryan (2022).

REFERENCE BOOKS

1. S.P. Bali, Consumer Electronics, Pearson Education, New Delhi, 2008.
2. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology, S. Chand & Co., 2014.

WEBLINKS

https://www.esabna.com/euweb/mig_handbook/592mig6_2.htm
https://www.constellation.com/energy-101/electrical-safety-tips.html
https://nptel.ac.in/courses/112/105/112105129/

MAPPING SCHEME (PO, PSO& CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	M	L	L	L	-	-	L	-	-	M	H	-	-	-	M
CO2	L	-	-	L	-	L	L	-	-	M	M	-	-	L	M
CO3	L	L	L	M	L	L	L	M	M	H	M	L	-	-	M
CO4	M	-	-	L	-	L	L	L	L	M	M	-	L	L	M
CO5	L	L	-	L	-	-	L	-	L	H	L	-	L	-	L

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	-	M	L	M
CO2	H	L	M	H	L
CO3	M	-	L	L	L
CO4	M	L	M	L	L
CO5	L	-	L	L	L

L – Low ***M – Moderate*** ***H - High***

5. COURSEASSESSMENTMETHODS

Direct

1. ContinuousAssessmentTest(ModelExams) I,II
2. Openbooktest;Cooperativelearningreport,Assignment,Seminar,etc.
3. EndSemesterExamination

Indirect

1.Course-endsurvey

SEC-II: PHYSICS OF MUSIC

Semester: II **Course Code: U23PH2E2**
Credits: 2 **Total No. of Hours: 2**

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Outline the basic concept of sound and its properties	K2	I
CO2	Explain their knowledge of understanding about simple vibrating systems and quality of sound	K2	II
CO3	Correlate the musical tone, superposition of simple tones and resonance	K2	III
CO4	Investigate about production of musical sounds and correlate the connection between physics and music	K4	IV
CO5	Examine digital recording, digital processing, and digital filtering in studios	K4	V

SYLLABUS

UNIT-I: SCIENTIFIC STUDY OF MUSIC

Vibrations of atoms of matter– vibrations coupling to air – propagation of sound waves in air, other media, fluids and solids – velocity, frequency, wavelength, time period, intensity: definition and unit fs – classification of sound on frequency and velocity– human and animal sound perception– mechanism of ear and hearing – psychoacoustics

UNIT-II: SIMPLE VIBRATING SYSTEMS

Simple harmonic motion – tuning fork– amplitude, phase, energy,energy loss/damping/ dissipation – power – travelling waves and standing waves– laws of vibration in stretched strings– one-dimensional medium – open and closed organ pipes – over tones, harmonics – quality of sound: pitch, timber, loudness – octaves, musical notes

UNIT-III: MUSICAL TONE

Pure/simple tones – sine/cosine waves– well-defined frequencies, wavelengths, amplitudes and phases– partial tones – assembly of pure tones– mix of different frequencies and amplitudes– complex tone – superposition of simple tones – complex waveform– periodic complex waveform – formants – resonances–

sound envelope

UNIT-IV: PRODUCTION OF MUSICAL SOUNDS

Human voice, mechanism of vocal sound production – larynx (sound box)

Stringed Instruments: Plucked and bowed, guitar, mandolin, etc.

Wind instruments: Whistles, flute, saxophone

Percussion instruments: Plates, membranes, drums

Electronic instruments: Keyboards, electric guitars - analog and digital sound synthesizers,–MIDI instrument– computer generated music

UNIT-V: RECORDING OF MUSIC AND SOUND

Edison phonograph – cylinder and disk records – magnetic wire and tape recorders – digital recording (e.g. to CD, DVD, etc.)– analog transducers, condenser, dynamic microphones, loudspeaker – complex sound fields – near and far fields of acoustic– spectral analysis techniques – continuous and discrete Fourier transforms, digital signal processing – digital filtering – specifications of recording studios

TOPICS FOR SELF STUDY

1. Audio System Engineering
https://www.youtube.com/watch?v=Qim3K57Th20&t=91s
2. The Physics of Music: Crash Course Physics
https://www.youtube.com/watch?v=XDsk6tZX55g

TEXTBOOKS

1. Physics and Music: The Science of Musical Sound by Harvey White (2014)
2. Good Vibrations – The Physics of Music by Barry Parker, (2009)
3. The History of Musical Instruments by Curt Sachs, (2006)
4. Physics and Music: Essential Connections and Illuminating Excursions byKinko Tsuji and Stefan C. Müller(2021)

REFERENCE BOOKS

1. Harvey White- Physics and Music: The Science of Musical Sound - (Dover Books on Physics)-2014
2. Neville H. Fletcher, Thomas D. Rossing- The Physics of Musical Instruments -2008
3. Richard E Berg, Physics of Sound 3rd Edition, Pearson India-2014
4. Bryan H. Suits, Physics Behind Music: An Introduction-Cambridge University Press-2023

WEBLINKS

1. Understanding the physics of music, plus a free SQUILT lesson - elementalscience.com
2. The Physics of Sound (futurelearn.com)
3. The physics of music (bu.edu)
4. 4.The Physics of Music: Waves, Beats & Frequencies | Sciencing

MAPPING SCHEME (PO, PSO& CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	M	L	L	L	H	H	L	L	M	H	M	M	L	M
CO2	H	H	M	L	L	L	L	L	H	M	M	H	M	L	M
CO3	H	M	L	L	L	L	L	L	L	H	M	L	M	L	M
CO4	H	H	L	L	L	L	L	L	L	M	M	M	L	L	M
CO5	H	H	L	L	L	L	L	L	L	H	L	-	L	-	L

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	M
CO2	H	M	H	L	L
CO3	H	H	M	L	L
CO4	H	H	M	M	L
CO5	H	H	M	M	L

L – Low ***M – Moderate*** ***H - High***

COURSE ASSESSMENT METHODS

Direct

4. Continuous Assessment Test(Model Exams) I,II
5. Open book test, Assignment, Quiz, Seminar, Group Presentation, Poster preparation, Problem solving etc.
6. End Semester Examination

Indirect

1.Course-endsurvey

SEC- III: EXPERIMENTAL SIMULATION - BASICS

(THEORY AND PRACTICALS)

Semester: II **Course Code: U23PHPS3**
Credits: 2 **Total No. of Hours: 2**

CO. NO.	Course Outcomes	Level
CO1	understand the concept of Physics experiments using virtual lab	**K2**
CO2	analyze the experimental value through virtual lab	**K3**
CO3	They can also test multiple scenarios, compare, and determine which one is the most effective without trying them in real life	**K3**
CO4	Students can conduct the same experiment multiple times to ensure they completely understand the concept..	**K5**
CO5	Since all the experiment results are recorded, maintaining communication between teachers and students becomes more efficient. Students can also access the laboratory on any device from any location, making them indispensable for contactless learning.	**K6**

SYLLABUS

(Any fifteen Experiments)

1. Screw Gauge
2. Vernier Calipers
3. Simple Pendulum
4. Ohm's law and resistance
5. Potentiometer-Internal Resistance of a Cell
6. Sonometer
7. AC Sonometer
8. Spectrometer-Prism
9. Refractive index of liquid

10. Young's Modulus
11. Meter bridge-Resistance of a wire
12. Metre Bridge-Law of Combination of resistors
13. Diode Characteristics
14. Zener Diode
15. Potentiometer-Comparison of emf
16. Conversion of Galvanometer to Ammeter
17. Conversion of Galvanometer to Voltmeter
18. Concave Mirror-Focal Length by u-v method
19. Convex Mirror-Focal Length
20. Concave Lens-Focal Length

References:

1. www.vlab.co.in

(Note: Sufficient references and e-books are available in the above websites)

MAPPING SCHEME (PO, PSO& CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	H	H	H	M	M	H	H	H	M	M	H	L	L	M
CO2	H	H	H	H	L	H	H	H	M	L	L	H	M	L	M
CO3	H	H	H	H	L	H	H	H	M	L	M	L	M	M	M
CO4	H	H	H	H	L	H	H	H	M	L	L	M	L	L	L
CO5	H	H	H	M	L	L	M	H	M	L	L	-	L	-	L

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	M
CO2	H	M	H	L	M
CO3	M	H	M	L	L
CO4	H	H	H	M	L
CO5	H	H	M	M	L

L – Low ***M – Moderate*** ***H – High***

COURSE ASSESSMENT METHOD

Direct

1. Continuous Assessment Test (Model Exams) I, II
2. Open book test; Cooperative learning report, Assignment, Seminar, Group Presentation, Project report, Poster preparation, Problem solving etc.
3. End Semester Examination

Indirect

1.Course-endsurvey

SEC- IV: PYTHON PROGRAMMING

(THEORY AND PRACTICALS)

Semester: III **Course Code: U23PHPS4**
Credits: 1 **Total No. of Hours: 1**

COURSE OUTCOMES (CO)

After the completion of this course the student will be able to:

CO. NO.	Course outcomes	Level	Unit Covered
CO1	Recall the basic structure of python program using constants, variables, datatypes and list.	**K1**	**I**
CO2	Demonstrate the conditional and looping statements to understand the concept of programming language	**K2**	**II**
CO3	Apply the different categories of user defined function and classes in python	**K3**	**III**
CO4	Analyse the appropriate functions and libraries for drawing the plots and data analysis	**K4**	**IV**
CO5	Evaluate the fundamental data structures and associated algorithms for solving substantial problems in python	**K5**	**III, IV, V**

2. A. SYLLABUS

Unit- I: Introduction to Python **(13 hours)**

Python on different operating systems - Variables –Strings – Numbers – Comments – List – Changing, Adding and Removing Elements –Organizing a List – Looping through List – Making Numerical List.

Unit- II: Conditions and Loops **(13 hours)**

Conditional Tests - If statements with Lists – Dictionaries – Nesting - While statement – Infinite loops – – Continue statement – For loops – Counting and summing loops – Maximum and minimum loops - Loop with Lists and Dictionaries.

Unit- III: Functions and Class **(13 hours)**

Functions – Styling - Creating and Using a Class – Importing classes – Opening files – Text files – Reading files – Searching through files – Selecting files names from user – Writing files –Testing a Function – Testing a Class.

Unit- IV: Python Libraries **(13 hours)**

Basic Numpy: 2D Numpy Arrays - Pandas: Basic data manipulation - Matplotlib: Basic plotting – Plot types - Image functions - Axis functions - Figure functions - 2D and 3D plots - Annotations and texts

Unit- V: Numerical Analysis using Python **(13 hours)**

Solution of Algebraic and Transcendental Equation: Bisection method - Newton's method – Solution of System of equations: Gauss elimination - Least squares approximation – Interpolation Methods: Lagrange, Newton, Piecewise linear – Solving ODEs: Euler method, Runge-Kutta method - Numerical Integration: Trapezoidal, Simpson's rule.

B. TOPICS FOR SELF STUDY

Web applications: Django – Starting an App – Making pages – Building an additional page.

C. TEXT BOOKS

1. Eric Matthes, Python Crash Course - 2nd Edition, No Starch Press (2019)
2. Wes McKinney, Python for Data Analysis - O'Reilly Media (2013)
3. Charles R. Severance, Python for Everybody: “Exploring data using Python 3”, Schroff Publishers, 1ed, 2017, ISBN 978-9352136278.
4. Timothy Sauer, Numerical Analysis, 2nd Edition, Pearson (2012)

D. REFERENCES BOOKS

1. Allen Downey, Think Python: “How to think like a computer scientist”, Schroff’ Reilly Publishers, 2ed, 2016, ISBN 978-9352134755.
2. Timothy C. Needham, Python for Beginners: A crash course guide to learn python in 1 week, 2017.

E. WEBLINKS

1. https://wiki.python.org/moin/BeginnersGuide
2. https://learning.edx.org/course/course-v1:Microsoft+DAT208x+1T2020a/home
3. https://www.tutorialspoint.com/matplotlib/matplotlib_pyplot_api.htm

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	M	H	M	H	H	H	M	M	L	M	M	H	L	L	M
CO2	M	H	M	H	H	H	M	M	L	L	L	H	M	L	M
CO3	M	H	H	H	H	H	M	M	L	L	M	L	M	M	M
CO4	M	H	H	M	H	H	M	L	L	L	L	M	L	L	L
CO5	M	H	H	M	H	H	M	L	L	L	L	-	L	-	L

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	H	H	M
CO2	M	H	H	H	M
CO3	L	H	H	H	L
CO4	L	H	H	H	L
CO5	L	H	H	H	L

L - Low M - Moderate H - High

5. COURSE ASSESSMENT METHOD

Direct

4. Continuous Assessment Test (Model Exams) I, II
5. Open book test; Cooperative learning report, Assignment, Seminar, Group Presentation, Project report, Poster preparation, Problem solving etc.
6. End Semester Examination

Indirect

1.Course-endsurvey

SEC- V: WEB DESIGNING

(THEORY AND PRACTICALS)

Semester: III **Course Code: U23PHPS5**
Credits: 2 **Total No. of Hours: 2**

1. COURSE OUTCOMES (CO)

After the completion of this course the students will be able to:

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Develop HTML coding for webpage	**K2**	**I**
CO2	Demonstrate and display HTML web site folders.	**K3**	**II**
CO3	Design graphics and hyperlinks in web pages	**K3**	**III**
CO4	Implement other software within the webpage using various methods.	**K6**	**IV**
CO5	Create HTML functions to link different web pages	**K6**	**V**
CO6	Create, edit, delete and manage different forms and fields in a website	**K6**	**V**

2. A. SYLLABUS

Unit-I: Creating a Webpage **(5 hours)**

Web organization – finding websites and webpages – display HTML source code – create HTML web site folders – view a webpage – modify a webpage – format text with HTML tags 2.8

Unit-II: Formatting and Linking Website Pages **(5 hours)**

Structure of website – center text – add horizontal line to a webpage - changing font face – create hyperlinks on webpages – create a bulleted list – create a numbered list – create multi pages for a website

Unit -III: Animating Webpages **(5 hours)**

Change text colour – change background colour – experiment with website colours – change hyperlink colours – acquire and insert graphics – align graphics relative to text – format a graphic as a hyperlink – change graphic border.

Unit-IV: Working in a Website Program **(5 hours)**

Exploring the interface of website design and management software – design a new website – view a website – add pages to website – format web pages – link pages in a linear structure.

Unit -V: Publishing the Website **(5 hours)**

Presentation, interaction and information design – change background graphics and other properties of pages in a website – create a random axes navigation system – test hyperlinks and page properties – prepare and publish website.

Practical: Physics based Web designing

1. HTML program to print the detail of solar system using tables.

2. Webpage for form filling
3. Webpage to explain concepts using hyperlinks.
4. Webpage to explain concepts using animated picture, movie and sound.

B. TOPICS FOR SELF STUDY

1. Structure text and image content for the web using HTML5.
   https://www.youtube.com/watch?v=u7aE3WAoIcg
2. Create hyperlinks to link to other pages
   https://www.youtube.com/watch?v=GmzUr4Tdeb0
3. Preparation of conference event web page
   https://www.youtube.com/watch?v=IYIj9MM5EHc

C. TEXT BOOKS

1. C. Xavier, World Wide Web Design with HTML, McGraw Hill, 2001.
2. C. Xavier, Web Technology and Design, New Age International, 2007

D. REFERENCE BOOKS

1. Terry A. Morris, Basics of Web Design: HTML5 & CSS, 3 Addison-Wesley, 2012.
2. Jennifer T. Campbell, Web Design: Introductory, Cengage Learning, 2017.

E. WEBLINKS

1. https://nptel.ac.in/courses/106/105/106105084/

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	H	M	M	L	H	M	L	L	M	M	H	L	L	M
CO2	M	H	L	H	L	M	M	L	L	L	L	H	M	L	M
CO3	M	L	L	H	L	M	L	L	L	L	M	L	M	M	M
CO4	H	H	M	M	L	H	M	L	L	L	L	M	L	L	L
CO5	M	L	M	H	L	H	L	L	L	L	L	-	L	-	L

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	L	M	M
CO2	L	L	M	H	L
CO3	M	L	H	H	M
CO4	M	H	M	H	M
CO5	M	M	H	H	M

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct

1. Continuous Assessment Test(Model Exams) I,II

2. Open book test; Cooperative learning report, Assignment, Seminar, Group Presentation, Project report, Poster preparation, Problem solving etc.

3. End Semester Examination

Indirect

1.Course-endsurvey

Course Co- ordinator: Dr. Sasikumar

SEC-VII: ELECTRICAL WIRING AND ENERGY CONSERVATION

(SERVICE-LEARNING COURSE)

Semester: IV **Course Code: U23PH4S7**
Credits: 2 **Total No. of Hours: 2**

Course Outcomes

After the completion of this course the students will be able to

CO No.	Course Outcomes	K - Level	Unit
CO1	Comprehend the key concepts of S-L and differentiate the community service and Service-Learning	K2	1
CO2	Identify the nuances and shortcomings in electrical wiring	K3	2
CO3	Analyze the cost-effectiveness of alternate energy sources	K4	3
CO4	Assess the energy management systems, prepare and present an energy audit report	K5	4
CO5	Elaborate on the role of alternative energy resources to cater to the needs of the target group	K6	5

SYLLABUS

Unit 1: Concepts of Service-Learning

Service-Learning – Definition, difference between community service and service-learning, Principles; Whole Person Education. Identifying Community Needs, Community Partners, Reflection, Reciprocity. Public Dissemination; Understanding of community dynamics. Project Planning Stages and report preparation

Classroom Activity:

i. Group discussion on Civic/Social responsibility (Display of Video/Documentary film (Through this activity Students should recognize the civic responsibility of the society)
ii. Conduct role-play/games/drawing to provide problem-solving skill and ignites critical thinking.
iii. Group activity to frame questionnaire to identify the community needs
iv. Reflection on identifying the need of the community (Students go to the community to identify the community needs and reflect on their experience)

Unit 2: Fundamentals of Electrical Wiring (Theoretical Concepts)

Electricity – Basic principles - Practical units of electricity - International system (S.I) of units – Measurement of Electrical quantities like Voltage, Currents, Resistance, Impedance, power factor and energy - Electric shock – Precautions to avoid electric shock – Rescue steps in electric Shock – Methods of resuscitation - General Safety of Tools & equipment. Wiring system – Electric supply to house and factories – Types of wiring – Megger testing – Testing procedure of voltage current - Importance of Earthing- Fuses and circuit breakers in houses

Classroom Activity:

i. Assignment on the basic concepts of electricity
ii. Seminar by the students explaining the need for effective wiring
iii. Group Discussion on the awareness of electrical wiring in the society
iv. Hands-on Training on measuring electrical quantities and safety measures to the students
v. Designing Pamphlets for the resuscitation/safety measures/Wiring types/Testing Procedures etc.
vi. Handouts on wiring systems/Safety tools/Units of electricity/Electric shock etc.
vii. Group activity to illustrate the precautionary steps to avoid electric shock and the methods to rescue from shock

Unit 3: Alternate Energy Sources (Theoretical Concepts)

Energy consumption – Energy scenario (world and India) – An economic concept of energy-Principles of energy conservation and energy audit – Types of energy audit – Energy conservation approach - Alternative Energy Sources - Solar energy – Design of solar systems – Installation and maintenance – Wind energy – Windmill – Installation and maintenance – Hydropower – Micro Hydro systems – Biogas – Green energy.

Classroom Activity:

i. Framing questionnaires to analyze the energy consumed by society.
ii. Collecting data from the newspaper/reports related to energy resources/energy. conservation/Alternate Energy Resources.
iii. Case studies on renewable energy resources
iv. Group discussion on identifying a suitable type of energy audit needed for the chosen community
v. Pamphlets explaining the appropriate utilization of energy resources.
vi. Group brainstorming for energy-related ideas to use in daily life.
vii. Pictorial representation of the percentage of energy consumed by the community.

Unit 4: Energy Audit (Community Engagement)

Electrical energy auditing - Representation of energy consumption: Pie charts – Sankey diagrams – Load Profile – Electrical Energy Management: Renovation and modernization of electrical fans, lights, pumps and motors

Field Activity

i. Community needs assessment report – electrical energy audit (selection of the area and scope)
ii. Graphs to show the availability and consumption of energy
iii. Hands-on-Training for the community to install simple electrical appliances (light, fan etc.)
iv. Journal (Recording individual observations & reflections)
v. Video presentations on energy management/renovation of electrical appliances/modern lights, fans etc.,

Unit 5: Energy Management (Community Engagement)

Energy Audit and assessment – Awareness and alternatives – Reduction of energy consumption – Design and Development of alternative energy resources

Field Activity

i. Community needs assessment report – energy audit (selection of the area and scope)
ii. Post-analysis based on the questionnaire prepared by the students
iii. Visual maps and linkage diagrams to represent the various resources available in the village and how they are utilized
iv. Awareness to the community on energy consumption
v. Journal (Recording individual observations & reflections)
vi. Feedback from the community and peer group
vii. Installation of alternative energy resources in collaboration with NGO, Government and other agencies.

Text Books

1. Basic Electrical Engineering, M.L. Anwani, Dhanpat Rai Co. Ltd., Delhi.
2. Electrical Wiring: An Introduction: 2nd en, Satheesh Kumar, Ane Books, India, 2020.
3. Electrical Measurements and Measuring Instruments, R.K.Rajput, S Chand and Company Limited, New Delhi, 2019
4. Non – Conventional Energy, G. D. Rai, 4th Ed., Khanna Publishers, New Delhi, 2017.
5. Solar Energy Utilization, G. D. Rai, Khanna Publications, New Delhi, 2012.
6. James Larminie, John Lowry, "Electric Vehicle Technology Explained", John Wiley & Sons Ltd, 2003.

c. References

1. Consumer Electronics, S.P. Bali, Pearson Education, New Delhi, 2008.
2. A Textbook of Electrical Technology, B. L. Theraja and A. K. Theraja, S. Chand & Co.,2005.
3. Solar Energy, Fourth Edition, S. P. Sukhatme, J K Nayak, Tata McGraw Hill, Publishing Company, Limited, New Delhi, 1990.
4. Solar Energy Engineering – Jui Sheng Hsieh, New Jersey, Prentice Hall, 1986.

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	H	M	M	H	H	M	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	M	M	H	H	H	H	H	M	H	M
CO3	H	H	H	H	H	M	H	H	H	H	M	H	M	H	H
CO4	H	H	H	M	H	H	M	H	H	H	H	M	H	H	H
CO5	H	H	M	H	H	H	H	H	H	H	H	M	H	H	H

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	H	H
CO2	H	M	H	H	M
CO3	H	H	M	H	H
CO4	H	H	H	M	H
CO5	H	H	H	H	H

EVALUATION

Continuous Internal Assessment (CIA)

S. No.	Classroom Activities	Marks
1.	Class Participation and Discussion	**10**
2.	Problem Identification (Community Needs)	**10**
3.	Journal (Reflection)	**20**
4.	Attendance	**10**
	Total	**40**

S. No.	Community Activities	Marks
1	Field work report / Mini Project	40
2	Student presentation and Viva-voce	20
	Total	**60**
	Grand Total 40 + 60	**100**

Foundation Course: INTRODUCTORY PHYSICS

Semester: I **Course Code: U23PH1N1**

Credits: 2 **Total No. of Hours: 2**

COURSE OUTCOMES

CO No.	Course Outcomes	K - Level	Unit
CO1	Apply concept of vectors to understand concepts of Physics and solve problems	K3	1
CO2	Analyze different forces present in Nature while learning about phenomena related to these different forces.	K3	2
CO3	Quantify energy in different process and relate momentum, velocity and energy	K3	3
CO4	Differentiate different types of motions they would encounter in various courses and understand their basis	K4	4
CO5	Relate various properties of matter with their behaviour and connect them with different physical parameters involved.	K4	5

UNIT – I: MEASUREMENTS

Vectors, scalars –examples for scalars and vectorsfrom physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions– standard physics constants

UNIT – II: FORCE

Different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces

UNIT – III: ENERGY

Different forms of energy– conservation lawsof momentum, energy – typesof collisions –angular momentum– alternate energy sources–real life examples

UNIT – IV: MOTION

Types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion – comparisonof light and sound waves – free, forced, damped oscillations

UNIT – V: FLUIDS

Surface tension – shape of liquid drop – angle of contact – viscosity –lubricants – capillary flow – diffusion – real life examples– properties and types of materials in daily use- conductors, insulators – thermal and electric

TEXT BOOKS:

1. D.S. Mathur, 2010, Elements of Properties of Matter, S.Chand and Co
2. Brijlal and N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co.

REFERENCE BOOKS:

1. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chand and Co.

WEB SOURCES:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/
2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	H	H	H	H	H	H	M	H	M	M	M	M	M	H
CO2	M	H	H	H	H	H	H	M	M	M	M	M	M	M	M
CO3	H	H	H	H	H	M	H	M	H	M	M	H	M	H	H
CO4	H	H	H	M	H	H	M	M	H	M	H	M	M	H	H
CO5	H	H	M	H	H	H	H	M	H	H	H	M	H	H	H

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	L	M
CO2	H	M	L	H	M
CO3	M	H	L	H	H
CO4	M	L	H	M	H
CO5	H	M	M	L	H

5. **COURSE ASSESSMENT METHODS**

Direct

1. Continuous Assessment Test (Model Exams) I, II
2. Presentation, Project report, Poster preparation etc.
3. End Semester Examination

Indirect

1.Course-endsurvey

PCS: CONCEPTS THROUGH ANIMATION

(THEORY AND PRACTICALS)

Semester: VI **Course Code: U23PHPG1**
Credits: 2 Total No. of Hours: 2
SYLLABUS

COURSE OUTCOMES(CO)
After the successful completion of this course the students will be able to:

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Apply the basic tools of Flash, Photoshop and Adobe Premier software.	**K3**	**I, III, V**
CO2	Develop action scripts and record audio for the E-content	**K5**	**II, V**
CO3	Organize a new Photoshop and video files with multiple layer adjustments such as exploring, deleting and merging etc.	**K3**	**III, V**
CO4	Synchronize audio and video files as per the desired timeline.	**K5**	**I, II, V**
CO5	Edit audio and video files using appropriate tools	**K5**	**I, II, III, IV, V**

Unit-I: Animations with Flash

Creating a new animation file – insertion of content in frames – add and delete frames and key frames – creating frame by frame animation – preview and testing of animation – create motion and path animations – usage of layers.

Unit -II: Enhancing animations

Recording a sound file – editing a sound file – importing sound into an animation program – adding sound and text to animation – animating text - adding buttons to animation – action scripts to control an animation.

Unit -III: Introducing Photoshop 7.0

Introduction – opening and finding images – creating a new file – the tool box – options bar - Layers - Exploring layers - creating layers - deleting layers - renaming layers - linking layers – adjustment and merging layers – creating a type layer.Changing background image – enhancing a portrait photograph**.**

Unit -IV: Creating images for web page with Photoshop

Image dimensions – converting images – rotating and flipping the canvas – cropping using marquee - Drawing and Painting – Fore and background colour – lifting – using shape and line tools – using brush tool – using pencil tool – using paint bucket tool – using eraser tool.

Unit -V: Working with video

Capturing video from a camera – importing video from other digital sources – editing a video – creating

slow motion– adding effects – adding transitions- understand lighting effects for a video – adding titles – adding audio tracks.

Unit -VI: Animation in Photoshop

Recent advancement in the course - only for discussion – Unit 6 will not be included for examination

TOPICS FOR SELF-STUDY

1. Animation
   https://www.youtube.com/watch?v=HpiVYB-T7j4
2. Exploring 3D Photoshop
   https://www.youtube.com/watch?v=u5crxEaZHkY**Error! Hyperlink reference not valid.**
3. Motion Capture
   https://www.youtube.com/watch?v=H6NaNydNAEc**Error! Hyperlink reference not valid.**
4. Printing in Photoshop
   https://www.youtube.com/watch?v=2GaLODO7cGA**Error! Hyperlink reference not valid.**

C. TEXT BOOKS

1. Daven Brown and et.al., Adobe – Web Development for the Designer, Macmillan, 1997.
2. S. Weixel, J. Fulton, K. Barkslade, C. B. Morse and B. Morse, Multimedia Basics, Eswar Press, Chennai, 2004.
3. Brigitta Hosea, Macromedia Flash 8, Focal press Elsevier, USA

D. WEBLINKS

1. https://www.education.ne.gov/wp-content/uploads/2017/07/basicanimationwithfash.pdf
2. https://helpx.adobe.com/in/animate/how-to/import-video.html
3. https://www.youtube.com/watch?v=wujHrMtCnp8
4. https://www.youtube.com/watch?v=Q3Wa09eZW3w
5. https://www.youtube.com/watch?v=EJjmxxJrMxI
6. https://www.youtube.com/watch?v=n9fwiNyDHLI
7. https://www.youtube.com/watch?v=epkIPcVGxFo

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	H	-	L	L	-	L	L	-	M	L	L	-	L	L
CO2	L	L	L	M	L	M	M	L	L	M	M	L	L	M	L
CO3	M	L	L	M	-	L	L	L	-	M	L	L	-	L	L
CO4	L	L	L	L	L	L	M	-	L	M	M	-	L	M	-
CO5	H	H	M	H	H	H	H	M	H	H	H	M	H	H	M

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	L	M
CO2	L	L	L	L	M
CO3	M	L	L	L	H
CO4	L	M	L	L	H
CO5	L	L	M	L	H

L – Low M – Moderate H – High

COURSE ASSESSMENT METHODS

Direct

1. Continuous Assessment Test (Model Exams) I, II
2. Presentation, Project report, Poster preparation etc.
3. End Semester Examination

Indirect

1.Course-endsurvey

Course co-ordinator: Dr. Ranjith Dev Inbaseelan

ALLIED PHYSICS – I (FOR I B.Sc. MATHS)

Semester: I **Course Code: U23PHMY1**
Credits: 3 **Total No. of Hours: 3**

COURSE OUTCOMES (CO)

After the successful completion of this course the students will be able to:

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Explain the types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.	K2	I
CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life.	K2	II
CO3	Compare basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology.	K4	III
CO4	Analyze the knowledge about electric current resistance capacitance in terms of potential electric field and electric correlate The connection between electric field and magnetic field and analyze them mathematically verify circuits and apply the concepts to construct circuits and study them.	K4	IV
CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits.	K5	V

SYLLABUS:

Unit – I: WAVES AND OSCILLATIONS

simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method.

Unit – II: PROPERTIES OF MATTER

Elasticity: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – torsion of a wire – determination of rigidity modulus by torsional pendulum

Viscosity: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method,

Surface tension: definition – molecular theory – droplets formation–shape, size and lifetime.

Unit – III: HEAT AND THERMODYNAMICS

Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.

Unit – IV: ELECTRICITY AND MAGNETISM

potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit - fuses and circuit breakers in houses.

Unit – V: DIGITAL ELECTRONICS

logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification.

B. TOPICS FOR SELF STUDY

1. Ultrasound

https://www.mayoclinic.org/tests-procedures/ultrasound/about/pac-20395177

2. Elasticity

https://en.wikipedia.org/wiki/Elasticity_(physics)

3. Heat engine

https://byjus.com/jee/heat-engine/

4. Biot-Savart's law

https://en.wikipedia.org/wiki/Biot%E2%80%93Savart_law

5. Boolean algebra

https://en.wikipedia.org/wiki/Boolean_algebra

C. TEXT BOOKS

1. R. Murugesan (2001), Allied Physics, S. Chand and Co, New Delhi.
2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi.
3. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand and Co., New Delhi.
4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8^{th} edition), S.ChandandCo., New Delhi.
5. R.Murugesan(2005), Optics and Spectroscopy, S.Chand and Co, New Delhi.
6. A.Subramaniyam, Applied Electronics2^{nd}Edn.,National Publishing Co., Chennai.

D. REFERENCE BOOKS

1. ResnickHalliday and Walker(2018).Fundamentals of Physics(11^{th}edition),JohnWilleyand Sons, Asia Pvt.Ltd., Singapore.
2. V.R.Khanna and R.S.Bedi (1998), Textbook of Sound1^{st}Edn. Kedharnaath Publish and Co, Meerut.

3. N.S.KhareandS.S.Srivastava (1983), Electricity and Magnetism10thEdn.,AtmaRamandSons, New Delhi.
4. D.R.KhannaandH.R. Gulati(1979). Optics,S. Chand andCo.Ltd.,New Delhi.
5. V.K.Metha(2004).Principles of electronics 6thEdn. S.Chand and company.

E. WEBLINKS

1. https://minerva.union.edu/newmanj/Physics100/Color,%20Eye,%20&%20Waves/oscillations_and_waves.htm
2. https://collegedunia.com/exams/properties-of-matter-science-articleid-702
3. https://www.texasgateway.org/resource/122-first-law-thermodynamics-thermal-energy-and-work
4. https://byjus.com/physics/electricity-and-magnetism/
5. https://byjus.com/physics/digital-electronics/

MAPPING SCHEME (PO, PSO& CO)

U23PHMY1	PO															PSO				
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	M	L	H	M	L	H	L	H	M	H	H	H	M	H	L	L	M	L
CO2	H	H	H	L	H	M	M	L	L	M	H	L	L	M	H	H	L	L	M	M
CO3	H	M	M	L	M	L	L	L	L	L	L	M	M	L	L	M	L	L	L	M
C04	H	M	M	L	L	L	L	M	M	H	L	L	L	M	L	H	L	L	M	L
CO5	H	L	L	L	L	L	L	L	L	M	M	L	M	L	M	M	L	L	L	L

L-Low M-Moderate H-High

5. COURSE ASSESMENT METHODS

Direct

1. Continuous Assessment Test (Model exams) I,II
2. Open book test; Cooperative learning report, assignment, seminar, group presentation, Project report, poster preparation, Problem solving etc.

Indirect

1. Course-end survey

Course Co-ordinator: Mr. T. Yesudoss

ALLIED PHYSICS – II (FOR I B.Sc MATHS)

SEMESTER: II **CODE: U23PHMY2**

CREDITS: 3 **NO. HOURS/WEEK: 3**

COURSE OUTCOMES (CO)

After the successful completion of this course the students will be able to:

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns.	K2	I
CO2	Compare the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate interdisciplinary nature of science and in solar energy related applications.	K4	II
CO3	Categorize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy.	K4	III
CO4	Utilize the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa.	K3	IV
CO5	Classify the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices	K4	V

SYLLABUS:

Unit – I: OPTICS

Interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity

Unit – II: ATOMIC PHYSICS

Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric devices

Unit – III: NUCLEAR PHYSICS

Nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – heavy water disposal, safety of reactors: seismic and floods – nuclear fusion – thermonuclear reactions – differences between fission and fusion.

Unit – IV: INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES

Frame of reference – postulates of special theory of postulates of special theory of – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence.

Unit – V: SEMICONDUCTOR PHYSICS

Band theory of solids - Types of semiconductor p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment)

B. TOPICS FOR SELF STUDY

1. Normal incidence

https://www.encyclopedia.com/science/dictionaries-thesauruses-pictures-and-press-releases/normal-incidence#:~:text=normal%20incidence%20The%20condition%20in,%22normal%20incidence%20.%22

2. Einstein's photo electric equation

https://byjus.com/physics/einsteins-explaination

3. Magic Numbers

https://www.science.gov/topicpages/m/magic+numbers

4. Galilean transformation equations

https://www.seas.upenn.edu/~amyers/SpecRel.pdf

5. Characteristics of P-N Junction diode

https://byjus.com/physics/p-n-junction

C. TEXT BOOKS

1. Subramaniam. N & Brijlal, 2014, Optics, 25th edition,S.Chand &Co.
2. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics 18e, S. Chand and Co., 2014.
3. Revised by G.S. Gupta & S.S. Gupta Theory of relativity, Twenty first edition 2009.
4. V.K. Mehta and Rohit Mehta, Principles of Electronics 7e, S. Chand, New Delhi, 2005.

D. REFERENCE BOOKS

1. Singh Devraj, Fundamentals of Optics, Prentice Hall India, New Delhi, 2010.
2. BrijLal, N. Subrahmanyam and JivanSeshan, Atomic and Nuclear Physics, S. Chand, New Delhi, 2006.
3. D.C. Tayal, Nuclear Physics, Himalaya Publication, Mumbai, 2015.
4. Paul A. Tipler and G. Mosca, Physics for Scientist and Engineers, W.H. Freeman, New York, 2003.
5. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill, New Delhi, 1984.

E. WEBLINKS

6. https://optics.byu.edu/docs/opticsbook.pdf
7. http://www.gammaexplorer.com/wp-content/uploads/2014/03/Atomic-Physics.pdf
8. https://www.fisica.net/nuclear/Martin%20-%20Nuclear%20and%20Particle%20Physics%20-%20An%20Introduction.pdf
9. https://folk.ntnu.no/henrt/skolefag/Introduction%20to%20General%20Relativity.pdf
10. https://www.optima.ufam.edu.br/SemPhys/Downloads/Neamen.pdf

5. MAPPING SCHEME (PO, PSO& CO)

	PO															PSO				
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	H	M	H	H	L	H	L	H	M	H	H	H	M	H	M	L	M	L
CO2	H	L	H	H	L	M	M	L	L	M	H	L	L	M	H	M	L	H	M	L
CO3	M	H	M	L	M	L	L	L	L	L	L	M	M	L	L	H	M	L	L	M
C04	M	M	M	L	L	L	L	M	M	H	L	L	L	M	L	H	L	M	L	H
CO5	H	L	L	M	L	L	L	L	M	M	M	L	M	L	M	M	L	L	L	M

L-Low M-Moderate H-High

5. COURSE ASSESMENT METHODS

Direct

3. Continuous Assessment Test (Model exams) I,II
4. Open book test; Cooperative learning report, assignment, seminar, group presentation, Project report, poster preparation, Problem solving etc.

Indirect

2. Course-end survey

Course Co-ordinator: Mr. T. Yesudoss

ALLIED PHYSICS – I (FOR II B.Sc. CHEMISTRY)

SEMESTER: III **CODE: U23PHCY3**

CREDITS: 3 **NO. HOURS/WEEK: 3**

COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.	K2	I
CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life.	K2	II
CO3	Compare basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology.	K4	III
CO4	Analyze the knowledge about electric current resistance capacitance in terms of potential electric field and electric correlate The connection between electric field and magnetic field and analyze them mathematically verify circuits and apply the concepts to construct circuits and study them.	K4	IV
CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits.	K5	V

SYLLABUS:

Unit – I: WAVES AND OSCILLATIONS

simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method.

Unit – II: PROPERTIES OF MATTER

Elasticity: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – torsion of a wire – determination of rigidity modulus by torsional pendulum

Viscosity: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method,

Surface tension: definition – molecular theory – droplets formation–shape, size and lifetime.

Unit – III: HEAT AND THERMODYNAMICS

Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.

Unit – IV: ELECTRICITY AND MAGNETISM

potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit - fuses and circuit breakers in houses.

Unit – V: DIGITAL ELECTRONICS

logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification.

B. TOPICS FOR SELF STUDY

1. Ultrasound

https://www.mayoclinic.org/tests-procedures/ultrasound/about/pac-20395177

2. Elasticity

https://en.wikipedia.org/wiki/Elasticity_(physics)

3. Heat engine

https://byjus.com/jee/heat-engine/

4. Biot-Savart's law

https://en.wikipedia.org/wiki/Biot%E2%80%93Savart_law

5. Boolean algebra

https://en.wikipedia.org/wiki/Boolean_algebra

C. TEXT BOOKS

6. R. Murugesan (2001), Allied Physics, S. Chand and Co, New Delhi.
7. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi.
8. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand and Co., New Delhi.
9. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8^{th} edition), S.ChandandCo., New Delhi.
10. R.Murugesan(2005), Optics and Spectroscopy, S.Chand and Co, New Delhi.

6. A.Subramaniyam, Applied Electronics2^{nd}Edn.,National Publishing Co., Chennai.

D. REFERENCE BOOKS

5. ResnickHalliday and Walker(2018).Fundamentals of Physics(11^{th}edition),JohnWilleyand Sons, Asia Pvt.Ltd., Singapore.
6. V.R.Khanna and R.S.Bedi (1998), Textbook of Sound1^{st}Edn. Kedharnaath Publish and Co, Meerut.
7. N.S.KhareandS.S.Srivastava (1983), Electricity and Magnetism10^{th}Edn.,AtmaRamandSons, New

Delhi.
8. D.R.KhannaandH.R. Gulati(1979). Optics,S. Chand andCo.Ltd.,New Delhi.
5. V.K.Metha(2004).Principles of electronics 6thEdn. S.Chand and company.

E. WEBLINKS

11. https://minerva.union.edu/newmanj/Physics100/Color,%20Eye,%20&%20Waves/oscillations_and_waves.htm
12. https://collegedunia.com/exams/properties-of-matter-science-articleid-702
13. https://www.texasgateway.org/resource/122-first-law-thermodynamics-thermal-energy-and-work
14. https://byjus.com/physics/electricity-and-magnetism/
15. https://byjus.com/physics/digital-electronics/

MAPPING SCHEME (PO, PSO& CO)

U23PHCY3	PO															PSO				
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	M	L	H	M	L	H	L	H	M	H	H	H	M	H	L	L	M	L
CO2	H	H	H	L	H	M	M	L	L	M	H	L	L	M	H	H	L	L	M	M
CO3	H	M	M	L	M	L	L	L	L	L	L	M	M	L	L	M	L	L	L	M
C04	H	M	M	L	L	L	L	M	M	H	L	L	L	M	L	H	L	L	M	L
CO5	H	L	L	L	L	L	L	L	L	M	M	L	M	L	M	M	L	L	L	L

L-Low M-Moderate H-High

5. COURSE ASSESMENT METHODS

Direct

1. Continuous Assessment Test (Model exams) I,II
2. Open book test; Cooperative learning report, assignment, seminar, group presentation, Project report, poster preparation, Problem solving etc.

Indirect

1. Course-end survey

Course Co-ordinator: Mr. T. Yesudoss

ALLIED PHYSICS – II FOR (II B.Sc CHEMISTRY)

SEMESTER: IV **CODE: U23PHCY4**

CREDITS: 2 **NO. HOURS/WEEK: 2**

COURSE OUTCOMES (CO)

After the successful completion of this course the students will be able to:

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns.	K2	I
CO2	Compare the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate interdisciplinary nature of science and in solar energy related applications.	K4	II
CO3	Categorize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy.	K4	III
CO4	Utilize the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa.	K3	IV
CO5	Classify the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices	K4	V

SYLLABUS:

Unit – I: OPTICS

Interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity

Unit – II: ATOMIC PHYSICS

Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric

devices

Unit – III: NUCLEAR PHYSICS

Nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – heavy water disposal, safety of reactors: seismic and floods – nuclear fusion – thermonuclear reactions – differences between fission and fusion.

Unit – IV: INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES

Frame of reference – postulates of special theory of postulates of special theory of – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence.

Unit – V: SEMICONDUCTOR PHYSICS

Band theory of solids - Types of semiconductor p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment)

B. TOPICS FOR SELF STUDY

1. Normal incidence

https://www.encyclopedia.com/science/dictionaries-thesauruses-pictures-and-press-releases/normal-incidence#:~:text=normal%20incidence%20The%20condition%20in,%22normal%20incidence%20.%22

2. Einstein's photo electric equation

https://byjus.com/physics/einsteins-explaination

3. Magic Numbers

https://www.science.gov/topicpages/m/magic+numbers

4. Galilean transformation equations

https://www.seas.upenn.edu/~amyers/SpecRel.pdf

5. Characteristics of P-N Junction diode

https://byjus.com/physics/p-n-junction

C. TEXT BOOKS

1. Subramaniam. N & Brijlal, 2014, Optics, 25th edition,S.Chand &Co.
2. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics 18e, S. Chand and Co., 2014.
3. Revised by G.S. Gupta & S.S. Gupta Theory of relativity, Twenty first edition 2009.
4. V.K. Mehta and Rohit Mehta, Principles of Electronics 7e, S. Chand, New Delhi, 2005.

D. REFERENCE BOOKS

1. Singh Devraj, Fundamentals of Optics, Prentice Hall India, New Delhi, 2010.
2. BrijLal, N. Subrahmanyam and JivanSeshan, Atomic and Nuclear Physics, S. Chand, New Delhi, 2006.
3. D.C. Tayal, Nuclear Physics, Himalaya Publication, Mumbai, 2015.
4. Paul A. Tipler and G. Mosca, Physics for Scientist and Engineers, W.H. Freeman, New York, 2003.
5. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill, New Delhi, 1984.

E. WEBLINKS

1. https://optics.byu.edu/docs/opticsbook.pdf
2. http://www.gammaexplorer.com/wp-content/uploads/2014/03/Atomic-Physics.pdf
3. https://www.fisica.net/nuclear/Martin%20-%20Nuclear%20and%20Particle%20Physics%20-%20An%20Introduction.pdf
4. https://folk.ntnu.no/henrt/skolefag/Introduction%20to%20General%20Relativity.pdf
5. https://www.optima.ufam.edu.br/SemPhys/Downloads/Neamen.pdf

MAPPING SCHEME (PO, PSO& CO)

U23 PHCY4	PO															PSO				
CO	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	H	M	H	H	L	H	L	H	M	H	H	H	M	H	M	L	M	L
CO2	H	L	H	H	L	M	M	L	L	M	H	L	L	M	H	M	L	H	M	L
CO3	M	H	M	L	M	L	L	L	L	L	L	M	M	L	L	H	M	L	L	M
C04	M	M	M	L	L	L	L	M	M	H	L	L	L	M	L	H	L	M	L	H
CO5	H	L	L	M	L	L	L	L	M	M	M	L	M	L	M	M	L	L	L	M

L-Low M-Moderate H-High

5. COURSE ASSESMENT METHODS

Direct

1. Continuous Assessment Test (Model exams) I,II
2. Open book test; Cooperative learning report, assignment, seminar, group presentation, Project report, poster preparation, Problem solving etc.

Indirect

1. Course-end survey

Course Co-ordinator: Mr. T. Yesudoss

CORE PRACTICAL - I

Semester: I **Course Code: U23PH1P1**
Credits: 3 **Total No. of Hours: 3**
COURSE OUTCOMES

After the completion of this course the student will be able to

CO.NO	Course outcomes	Level	Experiment covered
CO1	Determine surface tension and interfacial tension by weight drop method	**K5**	**7**
CO2	Measure the coefficient of viscosity of low and highly viscous liquids using Poiseullie's flow and Stoke's method	**K5**	**8 & 9**
CO3	Estimate the rigidity modulus for different materials with and without masses using torsion method	**K6**	**1, 2 & 6**
CO4	Estimate Young's modulus for different materials using non uniform and uniform bending method	**K6**	**3, 4**
CO5	Estimate Young's modulus for different materials using cantilever load depression method and Determine g and K using compound pendulum.	**K6**	**5, 10**

SYLLABUS

List of experiments

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of Young's modulus by uniform bending – load depression graph.
4. Determination of Young's modulus by non-uniform bending – scale & telescope.
5. Determination of Young's modulus by cantilever – load depression graph.
6. Determination of rigidity modulus by static torsion.
7. Determination of surface tension & interfacial surface tension by drop weight method.
8. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
9. Determination of viscosity by Poiseullie's flow method.
10. Determination of g using compound pendulum.
11. Digital Screw Gauge - Basic measurements
12. Digital Vernier Caliper – Dimensions of materials

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	H	-	L	H	-	-	-	-	L	M	L	L	-	L	L
CO2	H	L	H	H	-	M	-	H	M	M	M	L	L	M	L
CO3	H	-	-	H	L	L	-	-	-	M	L	L	-	L	L
CO4	H	-	-	H	L	L	-	-	-	M	M	-	L	M	-
CO5	H	H	M	H	H	H	H	M	H	H	H	M	H	H	M

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	M
CO2	H	H	H	M	L
CO3	H	L	L	H	M
CO4	H	L	L	H	M
CO5	H	H	H	M	L

L – Low M – Moderate H – High

COURSE ASSESSMENT METHODS

Direct
1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect
1. Course-end survey

Course Co-ordinator: Mrs. R. Vidhya

CORE PRACTICAL - II

Semester: II **Course Code: U23PH2P2**
Credits: 3 **Total No. of Hours: 3**

COURSE OUTCOMES

After successful completion of the course, the students will be able to:

C. No	Course Outcomes	Level	Experiment covered
CO1	Determine thermal constants (specific heat,) of substances.	K1	1,2,3,4
CO2	Analyze the properties and thermal conductivity of Good and Bad conductors and its values.	K5	5,6
CO3	Design the circuit to verify the stefan's Boltzmans law.	K6	8
CO4	Analyze the calorific values using bomb calorimeter	K4	07
CO5	Determine the velocity of sound and verify the transverse laws using sonometer and the frequency of AC mains using Sonometer and find wavelength, period, amplitude using Melde's method.	K1	9, 10,11,12

SYLLABUS

List of Experiments

1. Specific heat of a liquid- Newton's law of cooling.
2. Determination of specific heat by cooling – graphical method.
3. Determination of specific heat capacity of solid
4. Specific heat capacity of a liquid - Joule's calorimeter.
5. Thermal capacity of a bad conductor Lee's disc method.
6. Determination of thermal conductivity of good conductor by Searle's method
7. Bomb Calorimeter – Calorific values of different bio masses.
8. Verification of Stefan's-Boltzmans law
9. Velocity of sound through a wire using Sonometer
10. To verify the laws of transverse vibration using Melde's apparatus.
11. To compare the mass per unit length of two strings using Melde's apparatus.
12. Frequency of AC by using sonometer.
13. Dispersive characteristics of biomaterials
14. Polari meter – Optical activities of liquids

MAPPING SCHEME (PO, PSO & CO)

	PO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	M	-	L	-	-	-	M	H	L	M	L	L	-	L	L
CO2	H	M	M	H	M	H		L	M	M	M	L	L	M	L
CO3		H	M	L	H	H	H	M		M	L	L	-	L	L
CO4	M	L		H	H	L		M	M	M	M	-	L	M	-
CO5	H	H	M	M		H	M	L	H	H	H	M	H	H	M

	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	-	-	M	M
CO2	H	H	M	-	-
CO3	M	L	L	L	M
CO4	H	H		M	-
CO5		M	L	L	L

L – Low M – Moderate H – High

COURSE ASSESSMENT METHODS

Direct
1. Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.
3. End Semester Examination

Indirect
1. Course-end survey

Course Co-ordinator: Mr. N. Raja

CORE PRACTICAL - III

Semester: III **Course Code: U23PH3P3**
Credits: 3 **Total No. of Hours: 3**

1. COURSE OUTCOMES (CO)

After successful completion of the course the students will be able to:

CO NO.	Course outcomes	Level	Experiment covered
CO 1	Construct circuits to learn about the concept of electricity	**K1**	**1,2,3**
CO 2	Illustrate the functions of important circuits that are using field along axis of current carrying coil.	**K2**	**4,5**
CO 3	Conduct experiments to measure the resistance in the path of current	**K3**	**6,7,8**
CO 4	Analyze the quality of different parameters that affect a circuit	**K4**	**10,11,14,15**
CO 5	Estimate the sensitivity of a galvanometer (B.G)	**K5**	**12,13**

2. A. SYLLABUS

List of Experiments

ELECTRICITY

Minimum of Eight Experiments from the list:

1. Calibration of low range and high range voltmeter using potentiometer
2. Calibration of ammeter using potentiometer.
3. Measurement of low resistances using potentiometer.
4. Determination of field along the axis of a current carrying circular coil.
5. Determination of earth's magnetic field using field along axis of current carrying coil.
6. Determination of specific resistance of the material of the wire using PO box.
7. Determination of resistance and specific resistance using Carey Foster's bridge.
8. Determination of internal resistance of a cell using potentiometer.
9. Determination of specific conductance of an electrolyte.
10. Determination of e.m.f of thermo couple using potentiometer
11. Determination of capacitance using Desauty's bridge and B.G./Spot galvanometer/head phone.
12. Determination of figure of merit of BG or spot galvanometer.
13. Comparison of EMF of two cells using BG. Comparison of capacitance using BG.
14. Transistor Characteristics-CE configuration.
15. Full wave rectifier-Percentage of regulation.

MAPPING SCHEME (PO, PSO & CO)

U23P H3P3	PO															PSO				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	M	H	H	H	H	M	M	M	M	M	M	L	M	L	H	H	H	M	H
CO2	H	M	H	M	H	H	M	H	H	M	L	H	M	M	M	H	H	H	M	H
CO3	H	M	H	M	H	H	M	M	M	M	L	M	L	M	L	H	L	L	H	H
CO4	H	M	L	H	H	H	M	H	L	M	M	L	L	M	H	H	L	L	H	H
CO5	H	H	H	M	H	H	H	M	L	H	L	L	L	M	M	H	H	H	M	H

L-Low M-Moderate H- High

COURSE ASSESSMENT METHODS

(Kindly incorporate all evaluation modes as per your paper)

Direct

7. Continuous Assessment Test (Model Exams) I, II
8. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
9. End Semester Examination

Indirect

1. Course-end survey

Course Co-Ordinator: **Dr. I. Devadoss**

CORE PRACTICAL - IV

Semester: IV **Course Code: U23PH4P4**
Credits: 3 **Total No. of Hours: 3**

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO. NO.	Course outcomes	Level	Experiments covered
CO 1	Recall the laws in specific area and apply it to estimate the physical properties of materials	**K1**	**1-17**
CO2	Determine refractive index of given prism by spectrometer	**K5**	**1,2,3**
CO3	Conduct experiments to measure the physical observables by applying the phenomenon of interference	**K3**	**5,6**
CO4	Analyze the quality of equipment's based on the observations	**K4**	**1-17**
CO5	Conduct experiments to determine the wavelength using laser	**K5**	**6,9,15**

List of Experiments (Any eight)

1. Determination of refractive index of prism using spectrometer.
2. Determination of refractive index of liquid using hollow prism and spectrometer
3. Determination of dispersive power of a prism.
4. Determination of radius of curvature of lens by forming Newton's rings.
5. Determination of thickness of a wire using air wedge.
6. Determination of resolving power of Diffraction grating using Laser
7. Determination of Cauchy's Constants.
8. Determination of refractive index of a given liquid by forming liquid lens
9. Determination of refractive index using Laser.
10. Determination of resolving power of grating
11. Determination of resolving power of telescope
12. Comparison of intensities using Lummer Brodhum Photometer.
13. Determination of range of motion using Searles goniometer.
14. Verification of Newton's formula for a lens separated by a distance.
15. Determination of wavelengths, particle size using Laser/Monochromatic source.
16. Spectrometer - i-d curve
17. Spectrometer - i-i' curve

MAPPING SCHEME (PO, PSO & CO)

	PO															PSO				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	-	L	H	-	-	-	-	L	H	-	L	H	-	-	H	H	H	M	H
CO2	H	L	H	H	-	M	-	H	M	H	L	H	H	-	M	H	H	H	M	H
CO3	H	-	-	H	L	L	-	-	-	H	-	-	H	L	L	H	L	L	H	H
CO4	H	-	-	H	L	L	-	-	-	H	-	-	H	L	L	H	L	L	H	H
CO5	H	-	L	H	-	-	-	-	L	H	-	L	H	-	-	H	H	H	M	H

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct

1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect

1. Course-end survey

CORE PRACTICAL - V

Semester: V **Course Code: U23PH5P5**
Credits: 4 **Total No. of Hours: 6**

1. COURSE OUTCOMES

After successful completion of this course, the students will be able to:

CO. NO.	Course Outcomes	Level	Experiment Covered
CO1	Determine wave length of visible light (direct and oblique method) using spectrometer- Grating.	**K5**	**1-18**
CO2	Analyze the quality of equipment's based on the observations	**K4**	**20-32**
CO3	Conduct experiments to measure the physical observables.	**K3**	**28,29,30,31,37,38**
CO4	Conduct experiments to demonstrate the relation between different properties of materials	**K5**	**20,21**
CO5	Develop assembly language program to perform various operations using 8085 microprocessors	**K6**	**9**

List of Experiments (Any twelve)

1. Diffraction grating Normal incidence.
2. Diffraction grating minimum deviation.
3. Diffraction at a wire.
4. Specific rotation of sugar solution.
5. Bi-prism – Determination of □.
6. Thickness of a thin film of Bi-prism
7. Brewster's law – polarization
8. Double refraction (□e and □o)
9. Y – by Corlus method.
10. Dispersive power of plane diffraction grating.
11. Diffraction a straight edge.
12. Kundt's tube – Velocity of sound, Adiabatic Young's modulus of the material of the rod.
13. Forbe's method – Thermal conductivity of a metal rod.
14. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines.
15. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines.
16. Spectrometer – (i-d) curve.
17. Spectrometer – (i-i′) curve.
18. Spectrometer – Narrow angled prism.

19. Rydberg's constant
20. e/m Thomson method
21. h by photocell
22. Spectral response of photo conductor (LDR).
23. Potentiometer –Resistance and Specific resistance of the coil.
24. Potentiometer – E.M.F of a thermocouple.
25. Carey Foster's bridge - Temperature coefficient of resistance of the coil.
26. Deflection Magnetometer – Determination of Magnetic moment of a bar magnet and $B_H$using circular coil carrying current.
27. Vibration magnetometer - Determination of B_H using circular coil carrying current– Tan B position.
28. B.G – Figure of Merit – Charge Sensitivity
29. B.G – Absolute capacity of a condenser
30. B.G – High resistance by leakage
31. Potentiometer – Calibration of high range voltmeter
32. Self-inductance of the coil – Anderson's bridge
33. C program – Biggest and smallest of a set of numbers
34. C program – Arranging the numbers in ascending and descending order
35. C program – Arranging the words in alphabetical order
36. Potentiometer – Temperature co-efficient of a thermistor
37. Conversion of galvanometer into ammeter
38. Conversion of galvanometer into voltmeter

MAPPING SCHEME (PO, PSO & CO)

	PO															**PSO**				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	-	L	H	-	-	-	-	L	H	-	L	H	-	-	H	H	H	M	H
CO2	H	L	H	H	-	M	-	H	M	H	L	H	H	-	M	H	H	H	M	H
CO3	H	-	-	H	L	L	-	-	-	H	-	-	H	L	L	H	L	L	H	H
CO4	H	H	-	H	L	L	-	M	-	H	-	-	H	L	L	H	L	L	H	H
CO5	H	-	L	H	-	-	-	-	L	H	-	L	H	-	-	H	H	H	M	H

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct

1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect

1. Course-end survey

CORE PRACTICAL - VI

Semester: VI **Course Code: U23PH6P6**
Credits: 4 **Total No. of Hours: 6**

COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. NO.	Course Outcomes	Level	Experiments Covered
CO1	Explain the characteristics of diodes, transistors, FET and UJT and its working as an amplifier.	**K4**	**1,2,3,6,12-16**
CO2	Recall basic logic gates, Boolean algebra and modify digital circuits using K-map.	**K6**	**24-28**
CO3	Design amplifier and oscillator circuits using bipolar transistors.	**K6**	**8-11**
CO4	Analyze adder, subtractor, differentiator, integrator, D/A convertor and filter circuits using operational amplifier.	**K6**	**17-21, 29**
CO5	Develop assembly language program to perform various operations using 8085 microprocessors	**K6**	**29-37**

List of Experiments (Any twelve)

1. Zener diode – voltage regulations
2. Bride rectifier using diodes
3. Clipping and clamping circuits using diodes.
4. Characteristics of a transistor – (CE mode)
5. Characteristics of a transistor – (CB mode).
6. RC coupled CE transistor amplifier - single stage.
7. Transistor Emitter follower.
8. Colpitt's oscillator -transistor.
9. Hartley oscillator - transistor.
10. Astablemultivibrator - transistor.
11. Bistablemultivibrator - transistor.
12. FET - characteristics.
13. FET - amplifier (common drain)
14. UJT -characteristics
15. AC circuits with L,C,R -Series resonance.
16. AC circuits with L,C,R - Parallel resonance.
17. Operational amplifier - inverting amplifier and summing.
18. Operational amplifier - non-inverting amplifier and summing.
19. Operational amplifier – differential amplifier
20. Operational amplifier - differentiator and integrator.
21. Operational amplifier - D/A converter by binary resistor method.
22. 5V, IC Regulated power supply.

23. Construction of seven segment display.
24. Study of gate ICs – NOT, OR, AND, NOR, NAND, XOR, XNOR
25. Verification of De Morgan's theorem using ICs –NOT, OR, AND
26. NAND as universal building block.
27. NOR as universal building block.
28. Half adder and full adder using basic logic gate ICs
29. Microprocessor 8085 – addition (8 bit only)
30. Microprocessor 8085 – subtraction (8 bit only)
31. Microprocessor 8085 – multiplication (8 bit only)
32. Microprocessor 8085 – division (8 bit only)
33. Microprocessor 8085 – square (8 bit only)
34. Microprocessor 8085 – square root (8 bit only)
35. Microprocessor 8085 – largest/smallest of numbers (8 bit only)
36. Microprocessor 8085 –ascending/descending order
37. Microprocessor 8085 – Fibonacci series
38. Half subtractor and full subtractor using basic logic gate ICs
39. Op amp – Low pass filter
40. K-map – simplification of Boolean expressions

MAPPING SCHEME (PO, PSO & CO)

	PO															**PSO**				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	H	-	H	M	H	-	-	-	H	H	-	H	M	H	H	H	H	H	H
CO2	H	H	-	H	M	H	-	-	-	H	H	-	H	M	H	H	H	H	H	H
CO3	H	H	-	H	M	H	-	-	-	H	H	-	H	M	H	H	H	H	H	H
CO4	H	H	-	H	M	H	-	-	-	H	H	-	H	M	H	H	H	H	H	H
CO5	H	H	-	H	M	H	-	-	-	H	H	-	H	M	H	H	H	H	H	H

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct
1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect
1. Course-end survey

CORE PROJECT WITH VIVA-VOCE

Semester: V **Course Code: U23PH5PJ**

Credits: 4 **Total No. of Hours: 4**

ALLIED PHYSICS PRACTICALS – I
(I B.Sc. MATHS)

Semester: I **Course Code:U23PHPY1**
Credits: 3 **Total No. of Hours: 3**

COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. NO.	Course Outcomes	Level	Experiment Covered
CO1	Measure the coefficient of viscosity of liquids using graduated burette method and find surface tension using drop weight method	**K5**	**5,6**
CO2	Recall basic logic gates, Boolean algebra and modify digital circuits using K-map.	**K6**	**11-13**
CO3	Examine specific heat capacity of two different liquids and measure specific resistance using Carey fosters bridge.	**K4**	**7, 15**
CO4	Apply optical theory find the refractive index of prism using spectrometer.	**K3**	**14**
CO5	Test Laws of transverse vibrations and find AC frequency of a given string and young's modulus of a non-uniform bending of a bar using pin and Microscope method.	**K4**	**8,1-4**

List of Experiments (Any eight)

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever,scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method
7. Specific heat capacity of a liquid – half time correction
8. Verification of laws of transverse vibrations using sonometer
9. Calibration of low range voltmeter using potentiometer
10. Determination of thermo emf using potentiometer
11. Verification of truth tables of basic logic gates using ICs
12. Verification of De Morgan's theorems using logic gate ICs.
13. Use of NAND as universal building block.
14. Spectrometer-Refractive index of glass prism.
15. Carey Foster bridge-Resistance and specific resistance.

MAPPING SCHEME (PO, PSO & CO)

	PO															PSO				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H
CO2	H	H	H	M	H	H	M	M	M	H	H	H	M	H	H	H	H	H	M	H
CO3	H	M	H	M	H	H	M	M	-	H	M	H	M	H	H	H	L	L	H	H
CO4	H	M	L	L	H	H	M	M	-	H	M	L	L	H	H	H	L	L	H	H
CO5	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct

1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect

1. Course-end survey

ALLIED PHYSICS PRACTICALS – I
(II B.Sc. CHEMISTRY)

Semester: III **Course Code: U23PHCP3**
Credits: 3 **Total No. of Hours: 3**

COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. NO.	Course Outcomes	Level	Experiment Covered
CO1	Measure the coefficient of viscosity of liquids using graduated burette method and find surface tension using drop weight method	**K5**	**5,6**
CO2	Recall basic logic gates, Boolean algebra and modify digital circuits using K-map.	**K6**	**11-13**
CO3	Examine specific heat capacity of two different liquids and measure specific resistance using Carey fosters bridge.	**K4**	**7, 15**
CO4	Apply optical theory find the refractive index of prism using spectrometer.	**K3**	**14**
CO5	Test Laws of transverse vibrations and find AC frequency of a given string and young's modulus of a non-uniform bending of a bar using pin and Microscope method.	**K4**	**8,1-4**

List of Experiments (Any eight)

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever,scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method
7. Specific heat capacity of a liquid – half time correction
8. Verification of laws of transverse vibrations using sonometer
9. Calibration of low range voltmeter using potentiometer
10. Determination of thermo emf using potentiometer
11. Verification of truth tables of basic logic gates using ICs
12. Verification of De Morgan's theorems using logic gate ICs.
13. Use of NAND as universal building block.
14. Spectrometer-Refractive index of glass prism.
15. Carey Foster bridge-Resistance and specific resistence.

MAPPING SCHEME (PO, PSO & CO)

	PO															PSO				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H
CO2	H	H	H	M	H	H	M	M	M	H	H	H	M	H	H	H	H	H	M	H
CO3	H	M	H	M	H	H	M	M	-	H	M	H	M	H	H	H	L	L	H	H
CO4	H	M	L	L	H	H	M	M	-	H	M	L	L	H	H	H	L	L	H	H
CO5	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct

1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect

1. Course-end survey

ALLIED PHYSICS PRACTICALS – II
(I B.Sc. MATHS)

Semester: II **Course Code:U23PHPY2**
Credits: 3 **Total No. of Hours: 3**

COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. NO.	Course Outcomes	Level	Experiment Covered
CO1	Recall basic logic gates, Boolean algebra and modify digital circuits using K-map.	**K2**	**13,14**
CO2	Determine the Horizontal intensity of earth magnetic field and magnetic moment using Tangent galvanometer.	**K5**	**10**
CO4	Examine specific heat capacity of two different liquids using Newton's law of cooling method and thermal conductivity of a bad conductor using Lee's disc and PO method.	**K4**	**7,8**
CO5	Apply optical theory find the radius of curvature of a given convex lens using Newton rings method and the refractive index of prism using spectrometer.	**K3**	**1-5**
CO6	Test Laws of transverse vibrations and find AC frequency of a given string	**K4**	**6**

List of Experiments

1. Radius of curvature of lens by forming Newton's rings
2. Thickness of a wire using air wedge
3. Wavelength of mercury lines using spectrometer and grating
4. Refractive index of material of the lens by minimum deviation
5. Refractive index of liquid using liquid prism
6. Determination of AC frequency using sonometer
7. Specific resistance of a wire using PO box
8. Thermal conductivity of poor conductor using Lee's disc
9. Determination of figure of merit table galvanometer
10. Determination of Earth's magnetic field using field along the axis of a coil
11. Characterisation of Zener diode
12. Construction of Zener/IC regulated power supply
13. Construction of AND, OR, NOT gates using diodes and transistor
14. NOR gate as a universal building block

MAPPING SCHEME (PO, PSO & CO)

	PO															PSO				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H
CO2	H	H	H	M	H	H	M	M	M	H	H	H	M	H	H	H	H	H	M	H
CO3	H	M	H	M	H	H	M	M	-	H	M	H	M	H	H	H	L	L	H	H
CO4	H	M	L	L	H	H	M	M	-	H	M	L	L	H	H	H	L	L	H	H
CO5	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct

1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect

1. Course-end survey

ALLIED PHYSICS PRACTICALS – II
(II B.Sc. CHEMISTRY)

Semester: IV **Course Code: U23PHCP4**
Credits: 3 **Total No. of Hours: 3**

COURSE OUTCOMES

After the successful completion of this course the students will be able to:

CO. NO.	Course Outcomes	Level	Experiment Covered
CO1	Recall basic logic gates, Boolean algebra and modify digital circuits using K-map.	**K2**	**13,14**
CO2	Determine the Horizontal intensity of earth magnetic field and magnetic moment using Tangent galvanometer.	**K5**	**10**
CO4	Examine specific heat capacity of two different liquids using Newton's law of cooling method and thermal conductivity of a bad conductor using Lee's disc and PO method.	**K4**	**7,8**
CO5	Apply optical theory find the radius of curvature of a given convex lens using Newton rings method and the refractive index of prism using spectrometer.	**K3**	**1-5**
CO6	Test Laws of transverse vibrations and find AC frequency of a given string	**K4**	**6**

List of Experiments

1. Magnetic moment of a field along the axis of a coil using deflection magnetometer method
2. Magnetic field intensity of a field along the axis of a coil using deflection magnetometer method.
3. (i) Series and (ii) Parallel resistance of a given coils using Meter bridge.
4. Specific resistance of a given coil using Carey Foster's Bridge
5. Forward bias resistance and Reverse bias resistance of PN Junction diode using its V-I characteristics circuit method
6. Forward bias resistance and Reverse bias resistance of zener diode using its V-I characteristics circuit method.
7. Algebraic operations of AND, OR and NOT gates using discrete component.
8. Construct the full wave rectifier and verify its percentage of regulation
9. Sonometer – Determination of AC frequency

MAPPING SCHEME (PO, PSO & CO)

	PO															PSO				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PO 13**	**PO 14**	**PO 15**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H
CO2	H	H	H	M	H	H	M	M	M	H	H	H	M	H	H	H	H	H	M	H
CO3	H	M	H	M	H	H	M	M	-	H	M	H	M	H	H	H	L	L	H	H
CO4	H	M	L	L	H	H	M	M	-	H	M	L	L	H	H	H	L	L	H	H
CO5	H	M	H	M	H	H	M	M	L	H	M	H	M	H	H	H	H	H	M	H

L-Low M-Moderate H- High

5. COURSE ASSESSMENT METHODS

Direct

1.Continuous Assessment Test (Model Practical Exams)
2. Record, Assignment, Problem solving, Design new circuits and set up, Skill Assessment etc.,
3. End Semester Examination

Indirect

1. Course-end survey