



**PSGR
Krishnammal College for Women**



DEPARTMENT OF PHYSICS

LEARNING OUTCOMES- BASED CURRICULAR FRAMEWORK (LOCF)

BACHELOR OF PHYSICS (B.Sc Physics-Aided)

2023-2026 BATCH

PROGRAMME LEARNING OUTCOMES-UG

At the end of the programme the students will

- PLO1** : Have enhanced academic abilities, personal qualities and transferable skills which will give them an opportunity to develop as responsible citizens.
- PLO2** : Excel in the competencies and value required for leadership to serve a rapidly evolving global community
- PLO3** : Acquire sound knowledge in the concepts and significance of the various physical phenomena.
- PLO4** : Be able to apply the theories learnt and the skills acquired to solve real time problems and to develop the interest to gauge the physical properties of materials.
- PLO5** : Be able to effectively apply the core concepts through information technology
- PLO6** : Be endowed with creative and analytical skills, to equip them to become entrepreneurs and to find employability in core companies and software based industries.

PROGRAMME SPECIFIC OUTCOMES

At the time of graduation the students will

- PSO1** : Gain a wide spectrum of skills which will enable them to solve both theoretical and experimental problems.
- PSO2** : Acquire laboratory skills as per standards, and will proficiently handle the electrical and electronic instruments.
- PSO3** : Understand the importance of energy conservation.
- PSO4** : A the skill to gauge the physical properties of materials.
- PSO5** : Be able to make effective use of information technology.

**DEPARTMENT OF PHYSICS
CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION
SCHEME OF EXAMINATION
BACHELOR OF PHYSICS - 2023-2026 BATCH**

Semester	Part	Subject Code	Title of the Paper		In struction Hours/ week	Total contact hours	Tutorials	Duration of exam (In hrs)	Maximum Marks			Credits
									CA	ESE	Total	
I	I	TAM2301/ HIN2301/ FRE2301	Language T/H/F Paper I	Lan	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper I	Eng	6	88	2	3	25	75	100	3
	III	PS23C01	Core Physics Paper I: Mechanics, Properties of Matter and Sound	CC	6	88	2	3	25	75	100	5
		PS23CP1	Core Physics Practical I	CC	3			-	-	-	-	-
		CE23A03/ TH23A01	Allied Chemistry Paper-I (offered to B.Sc Physics)/ Mathematical Statistics- I	GE	4	58	2	3	25	75	100	4
		CE23AP2	Allied Chemistry Practicals (offered to B.Sc Physics)	GE	3			-	-	-	-	-
IV	NME23B1/ NME23A1/ NME23ES	Basic Tamil I/ Advanced Tamil I/ Introduction to Entrepreneurship	AE C	2	30	-	3	100	-	100	2	
	I	TAM2302/ HIN2302/ FRE2302	Language T/H/F Paper II	Lan	6	88	2	3	25	75	100	3
	II	ENG2302	English Paper II	Eng	5	73	2	3	25	75	100	3
		PS23C02	Core Physics Paper II Heat and Thermodynamics	CC	6	88	2	3	25	75	100	5

II	III	PS23CP1	Core Physics Practicals – I	CC	3	84	-	3	25	75	100	4
		CE23A04/ TH23A02	Allied Chemistry Paper –II (offered to B.Sc Physics)/ Mathematical Statistics –II	GE	5/ 6	73/ 88	2	3	20*	55*	75	4 /5
		CE23AP2	Allied Chemistry Practicals (offered to B.Sc Physics)	GE	3	84	-	3	15 [#]	35 [#]	50	2
	IV	NME23B2/ NME23A2	Basic Tamil II/ Advanced Tamil II (outside class hours)	AEC	2	-	-	-	100	-	100	Grade
		23PEPS1	Professional English for Physical Sciences	AEC	2	25	5	-	100	-	100	2
		NM23GAW	GENERAL AWARENESS		-	-	-	-	-	-	100	-
III	I	TAM2303/ HIN2303/ FRE2303	Language III – Tamil Paper III/ Hindi Paper III/ French Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2303	English Paper III	E	5	73	2	3	25	75	100	3
	III	PS23C03	Electricity and Magnetism	CC	4	58	2	3	25	75	100	4
		PS23CP2	Physics Practical – II	CC	3		-	-	-	-	-	-
			Allied – I									
		TH23A12	Mathematics for Physics- I	GE	7	103	2	3	25	75	100	5
		PL23A01 PL23AP1	Allied Botany Paper- I Allied Botany Practical	GE	5 2	73 30	2 -	3 -	20 -	55 -	75 ^e -	4 -
		AS23A01 AS23AP1	Allied Zoology Paper I Allied Zoology Practical	GE	5 2	73 30	2 -	3 -	20 -	55 -	75 ^e -	4 -
		PS23SCE1/ CS23SBGP	Skill Based Subject I: Coursera- IoT and Embedded Systems / GEN - AI	SE C	3	45/ 44	-/1	-	100	-	100	3
	IV	NM23DTG	Design Thinking	AE C	2	30	-	-	100	-	100	2
		NM22UHR	Universal Human Values and Human Rights #	AE CC	-	-	-	-	10 0	-	100	Gr.
I-V	VI	16BONL1 16BONL2	Online Course 1 Online Course 2	AC C	-	-	-	-	-	-	-	

CC – Core Courses

GE – Generic Elective

AEC – Ability Enhancing Course

ACC – Ability Credit Course

AECC– Ability Enhancement Compulsory Course

CA – Continuous Assessment

ESE - End Semester Examination

FSA – Finishing School Part A

SEC – Skill Enhancement Course

- Self Study

*** CA conducted for 25 converted to 20, ESE conducted for 75 converted to 55.**

CA conducted for 25 converted to 15, ESE conducted for 50 converted to 35

PS23C01	MECHANICS, PROPERTIES OF MATTER AND SOUND	Category	L	T	P	Credit
		III	88	2	-	5

Preamble

To give the students fundamental ideas on conservation laws, rotational and vibrational motion of rigid bodies, elasticity, viscosity, surface tension and basics of sound.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand and define the laws involved in mechanics , properties of matter and sound	K2
CLO2	Analyze the behavior of various bodies due to kinematic and dynamic forces acting on the body.	K4
CLO3	Apply the key evidence of the classical description of the properties of matter	K3
CLO4	Recall the principles and basic equations and apply them to unseen problems	K4
CLO5	Acquire problem solving skills on par with industry	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	M	M	S	S	S	S
CLO2	S	S	S	S	S	S
CLO3	S	S	S	S	S	S
CLO4	S	S	S	L	S	S
CLO5	S	M	M	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

Unit I

18 Hrs

Impact of elastic bodies and Friction

Conservation Laws – Collision - Impulse of a force – Fundamental principle of impact - Direct impact of two smooth spheres - loss of K.E due to direct impact of two smooth spheres-Oblique impact of a smooth sphere on a fixed smooth plane – oblique impact of two smooth spheres and loss of K.E due to oblique impact – friction – Laws of friction – angle of friction – cone of friction – Experimental method for determining co-efficient of friction between two surfaces- Equilibrium of a body on a rough inclined plane acted upon by an External force.

Unit II

18Hrs

Rigid Body Dynamics

Rigid body – rotational and vibrational motion – Torque – angular momentum – Angular impulse – moment of inertia – radius of gyration – dimensions and units of moment of inertia – Analogous parameters in translational and Rotational motion.

Simple Harmonic Motion

Composition of two simple harmonic motions in a straight line – Composition of two simple harmonic motions of equal time periods at right angles – Lissajous Figures – Experimental methods – Uses of Lissajous Figures

Unit III

17 hrs

Elasticity

Elasticity – Three types of elastic moduli and relation between them – Poisson's ratio – Bending of beams – Expression for bending moment – Depression of the loaded end of a Cantilever – uniform – non uniform bending – theory – experiment – pin and microscope method – work done in uniform bending – Koenig's method – non-uniform bending – theory – expression for couple per unit twist – determination of rigidity modulus – Static torsion method with scale and telescope – Rigidity modulus by torsion pendulum with mass – I section girders.

Unit IV

17 hrs

Viscosity and Surface tension

Viscosity – Poiseuille's formula for the flow of a liquid through a capillary tube – corrections – Poiseuille's method to determine the coefficient of viscosity of liquid – Ostwald's viscometer – variation of viscosity with temperature and pressure – Searle's viscometer (rotating cylinder method). Effect of temperature on brake oils in cars.

Surface tension – work done in increasing the area of the surface – work done in blowing a bubble- experimental determination of surface tension – Jaeger's method- Quincke's method – variation of surface tension with temperature – drop weight method- experimental determination of interfacial tension between water and kerosene.

Unit V**18 hrs****Sound**

Velocity of transverse waves along stretched string – Laws of transverse vibration of strings – Melde's experiment – Siren – Determinations of frequency of a tuning fork by revolving drum method and phonic stroboscopic method – Means of Lissajous method

Acoustics – Reverberation – Sabine's reverberation formula – Determination of absorption coefficient. **Ultrasonics** – properties – production – Galton whistle – Magnetostriction oscillator – Piezo-electric oscillator- detection and application.

Importance of Industry 4.0 in Physics.

Text Books

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Murugesan.R	Mechanics and Mathematical Methods	S.Chand & Co Ltd, New Delhi	2006	Reprint
2	Mathur D.S	Mechanics	S. Chand & Co Ltd, New Delh	2012	2 nd Edition
3	R.Murugesan	Properties of Matter	S.Chand and Company Pvt Ltd	2013	11 th edition
4	Saighal.R.L	Textbook of Sound	S.Chand & Co Ltd	1998	2 nd Edition
5	P. Kaliraj, T. Devi	Higher Education for Industry 4.0 and Transformation to Education 5.0			

Reference Books

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Bhargava & Sharma	A Text Book of Mechanics	Ratan Prakashan Mandir	1990	7 th Edition
2	Brijlal Subramanyam	Properties of Matter	S. Chand and Company Pvt Ltd	1995	3 rd Edition
3	Murugesan. R	Properties of matter, Sound and thermal physics	S. Chand & Co Ltd	2011	1 st Edition

Pedagogy

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation, Weblinks, NPTEL Lectures.

Course Designers

1. Dr. M. Lavanya

PS23C02	HEAT AND THERMODYNAMICS	Category	L	T	P	Credit
		III	88	2	-	5

Preamble

The aim of this course is to acquire knowledge in heat transfer, entropy, production of low temperature and liquefaction of gases, thermal radiation and statistical thermodynamics.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Understand the central concepts and basic idea on specific heat, entropy, quantum theory of radiation	K2
CLO2.	Apply the concepts of low temperature physics in liquefaction of gases	K3
CLO3.	Use the tools needed to formulate and solve problems in thermodynamical systems such as gases, heat engines etc	K3
CLO4.	Become familiarize with the concepts of thermodynamical potentials.	K3
CLO5.	Distinguish the particles based on the concepts and principles of Statistical Physics	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	M	M	S	S	M	S
CLO2	S	S	S	S	M	S
CLO3	S	S	S	M	M	S
CLO4	S	S	S	S	L	S
CLO5	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

Unit I

18 Hrs

Kinetic theory of gases

Postulates of kinetic theory of gases – derivation of expression for pressure exerted by gas - Maxwell's Law of Distribution of Velocities (no derivation), Mean Free Path - Brownian motion – Langevin's theory of Brownian motion – Einstein's theory of Brownian motion – degree's of freedom – Maxwell's law of equipartition of energy - van der Waal's equation of state – critical constants – experimental determination of critical constants.

Quantum Theory of Specific Heat

Specific heat of solids - Dulong and Petits law and the deduction – failure of Dulong and Petit's law – Einstein's theory and its limitation – Debye theory of specific heat of solids – specific heat of gases – Variation of specific heat of diatomic gases with temperature – applications of high specific heat capacity of water.

Unit II

17 Hrs

Low Temperature Physics

Methods of production of low temperatures – Expression for temperature inversion – Principle of regenerative cooling - Joule Thomson effect – Porous plug experiment – its theory and result – Joule Thomson effect for perfect and real gases – Liquefaction of Hydrogen & Helium – Helium I and Helium II - Lambda point - super fluidity – adiabatic demagnetization – application in refrigerators and deep freezers.

Unit III

16 Hrs

Thermal Physics

Quantum theory of radiation- Planck's hypothesis – average energy of Planck's oscillator – Planck's radiation law and its experimental verification - Derivation of Planck's law – Derivation of Wein's law and Rayleigh-Jean's from Planck's law – Stefan's and Wein's displacement laws from Planck's law – Room heaters and radiators in cars - solar thermal system (water heater)

Unit IV

18 Hrs

Laws of Thermodynamics and Entropy

First law of thermodynamics and its consequences – Isothermal and adiabatic processes – reversible, irreversible and quasi-static processes – second law and entropy - physical significance of entropy - Entropy of a perfect gas - Thermo dynamic potentials- internal energy (U)- Helmholtz function (F)- Gibb's function (G) and enthalpy (H) – significance of thermodynamic potentials - Maxwell's thermodynamics relation – the (T_p-dS) equation – Clapeyron's latent heat equation using Maxwell's thermodynamics relation – understanding entropy in steam engines.

Unit V

17 Hrs

Statistical Physics

Probability- Macrostate and microstate – phase space – thermodynamic probability – Ensembles – Kinds of Ensembles (concepts only) – Maxwell's Boltzmann distribution law- Maxwell's Boltzmann distribution in terms of temperature – quantum statistics – Bose Einstein distribution law – Fermi - Dirac distribution law – Comparison of three statistics.

Text Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Brijlal N Subrahmanyam P.S.Hemne	Heat Thermodynamics and Statistical Physics and applications	S. Chand	2012	3 rd edition
2	R.Murugeshan Er. KiruthigaSivaprasath	Thermal Physics	S.Chand	2012	3 rd edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	A.B Gupta H.P. Roy	Thermal Physics	Arunabha Sen	2005	1 st edition
2	Agrawal Prakash	Thermal Physics	PragatiPrakashan	2015	27 th edition
3	Agrawal Prakash	Thermodynamics and Statistical Physics	PragatiPrakashan	2015	27 th edition

Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction, Weblinks, NPTEL Lectures.

Course Designers

1. Dr. G. Praveena

PS23CP1	CORE PRACTICALS I	Category	L	T	P	Credit
		III	-	-	3hrs/week	4

Preamble

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, Sound, Heat, Optics, Electricity and Magnetism.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems.	K2
CLO2.	Understand the usage of basic laws and theories to determine various properties of the materials given.	K2
CLO3.	Understand the application side of the experiments	K2
CLO4.	Use standard methods to calibrate the given low range voltmeter and ammeter and to measure resistance of the given coil and various physical quantities.	K3
CLO5.	Use of basic laws to study the spectral properties and optical properties of the given prism.	K3

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	L	L	L	L
CLO2	S	S	S	S	M	M
CLO3	S	S	S	S	M	M
CLO4	S	S	S	S	M	M
CLO5	S	S	S	S	M	M

S- Strong; M-Medium; L-Low

Syllabus

List of Experiments

1. Determination of Young's Modulus of the given rectangular beam by Non Uniform bending using Optic lever.
2. Determination of Young's Modulus of the given rectangular beam by Uniform bending using pin and microscope.
3. Determination of Rigidity modulus of the material of the given rod by using Static torsion apparatus.
4. Determination of Rigidity modulus of the material of the suspension wire using Torsion pendulum.
5. Determination of Moment of Inertia of the given disc by torsional oscillations.
6. Determination of frequency of AC mains using Sonometer.
7. Determination of Acceleration due to gravity using Compound pendulum.
8. Determination of thermal conductivity of the given bad conductor using Lee's disc method.
9. Determination of Refractive index of the given solid prism using Spectrometer
10. Determination of Refractive index of a liquid using hollow prism - Spectrometer
11. Determination of wavelength of prominent lines of mercury spectrum using grating by minimum deviation method using Spectrometer
12. Calibration of a low range voltmeter using Potentiometer
13. Calibration of a low range ammeter using Potentiometer
14. Determination of unknown resistance of the given coil of wire using potentiometer.
15. Determination of Moment of a magnet using deflection magnetometer by Tan C method.
16. Determination of B_H by measuring the field along the axis using deflection magnetometer.
17. Determination of Temperature co-efficient of resistance of a Thermistor using Wheatstone's bridge.
18. Determination of Spring Constant of different metals.
19. Determination of frequency of tuning fork using Melde's apparatus.
20. Determination of Planck's constant using different LEDs.

Pedagogy:

Demonstration and practical sessions

Course Designers:

1. Dr. M. Lavanya

PS23A01	ALLIED PHYSICS PAPER- I (For Chemistry)	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This paper introduces the students to the basic concepts of Elasticity, Rotational motion, Heat and thermodynamics, Sound, Optics, Atomic and Nuclear Physics

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Define the fundamental concepts of material properties, heat, sound, optics, atomic and nuclear physics	K1
CLO2	Demonstrate the practical concepts behind the optics, heat and sound through experimental setup	K2
CLO3	Apply the fundamental properties and the associated laws to understand physical systems	K2
CLO4	Analyze the thermo dynamical, optical properties of matter and to find its applications in various fields	K3

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	M	L	L
CLO2	S	M	S	M	S	L
CLO3	S	M	S	L	M	S
CLO4	S	M	S	S	S	S
CLO5	S	M	S	M	S	M

S- Strong; M-Medium; L-Low

Syllabus

Unit – I

11 Hrs

Properties of Matter

Elasticity: Moduli of elasticity – bending moment-expression – Young's modulus by uniform and non-uniform bending – theory and experiment – I-section girders – Torsion pendulum – couple per unit twist – work done in twisting – determination of the rigidity modulus of the material of the wire.

Unit - II

12 Hrs

Transmission of Heat

Conduction process: Thermal conductivity – Rectilinear field along a bar – Measurement of Thermal conductivity of a bad conductor by Lee's disc method

Convection process: Lapse rate – stability of atmosphere – Green house effect

Radiation process: Solar constant – Pyrheliometer – solar energy and its applications (flat plate collector & solar cooker) – concentration solar collector, Fresnel Lenses method.

Unit - III

11 Hrs

Thermodynamics, Sound:

Thermodynamics: Thermodynamic variables – Extensive and Intensive variables – Maxwell's Thermodynamic relation – Thermodynamic potential – Significance – relation of thermodynamics potentials with their variables

Ultrasonics: Piezo electric & Magnetostriction method – Principle – Construction – Working and Applications.

Unit - IV

12 Hrs

Optics:

Dispersion: Dispersive power-combination of prisms to produce (i) deviation without dispersion (ii) dispersion without deviation – direct vision spectroscope.

Interference: Air wedge – determination of diameter of a wire – Newton's rings-determination of refractive of a liquid

Polarization: Production, detection and analysis of different types of polarized light – quarter and half wave plates

Unit - V

12Hrs

Atomic Physics: Vector atom model – Quantum numbers associated with vector atom model – Pauli's exclusion principle – excitation and ionization potential – experimental determination – **Franck and Hertz method.**

Nuclear Physics: Elementary particles – classification – particles and antiparticles – conservation laws and symmetry – Quark model.

Books for Study:

S. No	Authors	Title of the Book	Publishers	Year of Publication
1	Brijlal Subramaniam	Heat and thermodynamics	S.Chand and Co, 16 th Edition.	2012
2	Brijlal Subramaniam & Hemne.P.S,	Heat thermodynamics and Statistical Physics	S.Chand and Co, 12 th edition	2011
3	Brijlal Subramaniam	Optics	S.Chand and Co, 21 st Edition	2012
4	Murugesan R	Allied Physics	S.Chand and Co, 1 st Edition	1998

Books for Reference:

S. No	Authors	Title of the Book	Publishers	Year of Publication
1	Jayaprakash. N	Heat and thermodynamics	S Chand and Co, 16 th Edition.	2012
2	Mathur D.S	Properties of Matter	S Chand and Co, 2 nd Edition	1970
3	Murugesan R	Modern Physics	S.Chand and Co , 9 th edition	2013

Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designers:

1. Dr.B.Punithaveni

References For E-Content:

1. <https://youtu.be/qQhOYbztNIQ>
2. <https://youtu.be/gcI-bkr7ilg>
3. <https://youtu.be/7tr4qWPgP40>
4. https://youtu.be/N5GAHntU_nQ
5. <https://youtu.be/hDP6egLrsdM>
6. <https://youtu.be/nmsPcTzIkrw>
7. <https://youtu.be/rAhvvyQBUt0>
8. <https://youtu.be/TUaTNzZ00oM>
9. <https://youtu.be/tDB3zP9MEZc>
10. <https://youtu.be/wvl0QAQCJyc>
11. <https://youtu.be/4nbBAG-848c>
12. https://youtu.be/nJXB0yD_wEw
13. https://youtu.be/K4Do_yWJt2k
14. <https://youtu.be/HH58VmUbOKM>
15. <https://youtu.be/DjnDX28l4xA>
16. <https://youtu.be/iVYGOWAtZCQ>
17. <https://youtu.be/SQtOYCeI-Pc>
18. <https://youtu.be/kykp-S8S5dU>

PS23A02	ALLIED PHYSICS PAPER- II (For Chemistry)	Category	L	T	P	Credit
		III	71	5	-	4

Preamble

This paper introduces the student to the basic concepts of AC Circuits, Magnetic materials, electronics and digital electronics

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Explore the fundamental concepts of physics	K1
CLO2	Import knowledge about the importance of material properties, heat, sound, optics, atomic and nuclear physics.	K2
CLO3	Understand the energy involved in nuclear reaction	K2
CLO4	Carry out the practical by applying these concepts	K3
CLO5	Get depth knowledge of physics in day today life	K3

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	M	L	L
CLO2	S	M	S	M	S	L
CLO3	S	M	S	L	M	S
CLO4	S	M	S	S	S	S
CLO5	S	M	S	M	S	M

S- Strong; M-Medium; L-Low

Syllabus

Unit – I

14 Hrs

Alternating currents:

Mean and RMS values of AC -Series and parallel resonant circuits-Power factor- power factor of an ac circuit containing resistance, inductance and capacitance -Transformer-construction-working-losses.

Unit – II

14 Hrs

Magnetic materials:

Magnetic Induction – Magnetization – Relation between the three magnetic vectors B, H and M– Magnetic susceptibility – Properties - diamagnetic – paramagnetic – ferromagnetic – anti ferromagnetism and ferrimagnetism – Electron theory of magnetism — Weiss’s theory of ferromagnetism - energy loss in hysteresis – importance of hysteresis curves.

Unit – III

14 Hrs

Semiconductor Diodes: P and N type semiconductors - PN Junction Diode - Current Flow Mechanism in Forward and Reverse Biased Diode - Zener Diode and Voltage Regulation - Principle and structure of (1) LEDs (2) Photodiode (3) Solar cell - Transistor – Characteristics of CB, CE and CC Configuration – Transistor biasing – Voltage divider biasing.

Unit – IV

14 Hrs

Two - terminal Devices and their Applications: Rectifier Diode: Half- wave Rectifiers - Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency - **Amplifiers:** Single stage amplifier (CE) - **Sinusoidal Oscillators:** Barkhausen's Criterion for self - sustained oscillations - RC Phase shift oscillator, determination of Frequency- Hartley oscillator.

Unit – V

15 Hrs

Digital Electronics:

Boolean algebra-DeMorgan’s theorem-OR, AND, NOT, XOR NOR and NAND gates-NOR and NAND gates as universal building blocks-half adder, full adder-RS flip flop-JK flip flop Operational amplifier: Characteristics-virtual ground-summing point-inverting and non inverting amplifier-adder-subtractor.

Text Book

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	R. Murugesan	Electricity and	S.Chand and Co	2005	Revised

		Magnetism			Edition
2	V.K. Metha	Principles of electronics	S.Chand and Co	1980	1 st Edition
3	Murugesan R	Allied Physics	S.Chand and Co	2005	1 st edition

Reference Books

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	V. Vijayendran	Introduction to Integrated Electronics	Viswanathan Publishers	2005	1 st Edition

Pedagogy

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, Power Point Presentation

Reference Links:

1. Mean and RMS values of AC - <https://www.youtube.com/watch?v=qDHsokTcgck>
2. Series & Parallel Resonant Circuits - <https://www.youtube.com/watch?v=G8KLJjq1E2o>
3. Transformer | Principle, Construction, Working and Efficiency - <https://www.youtube.com/watch?v=i29dCoSGa38>
4. Magnetization - <https://www.youtube.com/watch?v=C-OoUvKXbLU&t=2s>
5. Diamagnetic – paramagnetic – ferromagnetic -https://www.youtube.com/watch?v=wK7Jr1g4_ws
6. P and N type semiconductors - <https://www.youtube.com/watch?v=5ZNeDxfgYAE>
7. Different types of diodes - <https://www.youtube.com/watch?v=-EqOEiEQGLI>
8. Diode rectifier circuits - <https://www.youtube.com/watch?v=Xmu31a-59vw>
9. Single stage amplifier - <https://www.youtube.com/watch?v=NEiVSbPYWNE>
10. RC Phase Shift Oscillator - <https://www.youtube.com/watch?v=Gvb4GIV5ig8>
11. Hartley Oscillator - https://www.youtube.com/watch?v=3B_sBX_11Zw
12. Boolean Algebra and Logic gates - <https://www.youtube.com/watch?v=JQBRzsPhw2w>
13. Flip-flop - <https://www.youtube.com/watch?v=LTtuYeSmJ2g>
14. Operational amplifier - <https://www.youtube.com/watch?v=jsKSfaFQ4d4>

Course Designers

1. Dr. G. Praveena

PS23AP1	ALLIED PHYSICS PRACTICALS (For I BSc Chemistry Sem I and II and II BSc Mathematics Sem III and IV)	Category	L	T	P	Credit
		III	-	-	3 Hrs / week	3

Preamble

To enable the student to gain practical knowledge

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Gain knowledge in the scientific methods and learn the process of measuring different Physical variables	K1
CLO2	Educate The Basics Of Instrumentation, Data Acquisition And Interpretation of Results	K2
CLO3	Enhance The Students Understand The Concepts In Materials Properties	K2
CLO4	Have a deep knowledge of fundamentals of optics, electric circuits, magnetism and sound	K3

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	S	M	S
CLO2	S	S	S	S	S	S
CLO3	S	M	S	M	M	M
CLO4	S	M	M	S	M	S
CLO5	S	S	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

List of Experiments

Any Eighteen

1. Young's Modulus –Non- Uniform bending –Pin and Microscope
2. Young's Modulus – Uniform bending – Optic lever
3. Rigidity modulus - Static torsion
4. Rigidity Modulus - torsional pendulum
5. Moment of inertia - torsional pendulum
6. Acceleration due to gravity - compound pendulum
7. Thermal conductivity of a bad conductor – Lee's disc method
8. AC frequency - Sonometer
9. Refractive index of solid prism - spectrometer
10. Refractive index of liquid-Hollow prism - spectrometer
11. Wave length- Grating - Minimum deviation method - Spectrometer
12. Low range Ammeter Calibration - Potentiometer
13. Low range Voltmeter Calibration - Potentiometer
14. Moment of a magnet in the Tan C position
15. Volt-Ampere characteristic of a p-n junction diode in the forward and reverse directions
16. Logic gates - Verification of the truth table
17. Characteristics of Zener diode
18. Closed loop gain of Operational Amplifier in Inverting mode
19. Closed loop gain of Operational Amplifier in Non Inverting mode.

Pedagogy

Demonstration and Practical Sessions

Course Designers:

1. Mrs. T. Poongodi

PS23C03	ELECTRICITY AND MAGNETISM	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

The aim of this course is i) to acquire in-depth knowledge in electrostatics and magnetostatics so that students would apply theories of static and moving charges and extend its applications to instruments involving electric and magnetic fields and ii) to give idea on the fundamentals of electromagnetic conduction and electromagnetic waves.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Recall the basic knowledge of scalar, vector fields, AC/DC circuits and electromagnetic wave.	K1
CLO 2	Understand the concept of different laws in electrostatics, generation of currents and the variation of current in magnetic field.	K2
CLO 3	Apply theorems to construct and solve electrical circuits.	K3
CLO 4	Analyze the generation of magnetic fields by electrical currents through circuit laws.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO 1	M	M	S	S	M	S
CLO 2	S	M	S	S	M	S
CLO 3	S	M	S	S	S	S
CLO 4	S	M	S	S	S	S

S- Strong; M-Medium;

Syllabus

Unit I

12 Hrs

Vector Analysis:

Scalar and Vector fields, **gradient of a scalar field, divergence of a vector field, Curl of a vector field and their physical significance**^{1,2,3,4}, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss divergence theorem and Stoke's theorem of vectors (Statement and proof only)

Electrostatic Field:

Electric field, Continuous charge distribution, **Divergence and curl of electrostatic fields; Field lines, flux**^{5,6} and Gauss' law statement and its proof, applications of Gauss's law – uniformly charged spherical shell and conducting sphere, infinite line of charge, uniform infinite cylindrical charge and infinite plane sheet of charge, **Coulomb's Law**^{7,8}.

Unit II

12 Hrs

Electric potential:

Introduction to potential, Comments on potential^{9,10}, Poisson's and Laplace's equations, Potential of a localized charge distribution, electrostatic boundary value problems – Uniqueness theorem

Electrical Images:

Solution of field problems in case of a point charge near a grounded conducting infinite plane. Boundary value problems: in uniform external field for (1) insulated Conducting Sphere (2) **conducting spherical shell and (3) dielectric sphere**^{11,12,13}.

Unit III

11 Hrs

DC currents:

Growth and decay of charge in series RC circuit, **Growth and decay of current in series LR circuit**¹⁴, Growth and Decay of charge in series LCR circuit - **Damped, under-damped and over-damped conditions**

AC Circuits:

Series resonance circuit- Parallel LCR Circuit – Complex form of LCR circuits- j operator method - Characteristics of LCR Circuit: (1) Resonance, (2) Quality Factor, (3) Band Width and (4) Sharpness of Resonance - power consumed by the above circuits.

Unit IV

12 Hrs

Magnetic Field:

Magnetic force between current elements and definition of Magnetic Field **B**. Biot-Savart's Law and its simple applications: long straight wire and **circular loop**¹⁵. Current Loop as a Magnetic

Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) Solenoid and (2) **Toroid. Properties of B: curl and divergence**^{15,16,17}. Differential form of Ampere's circuital law- Magnetic scalar and Vector Potential -Importance.

Unit V

11 Hrs

Electromagnetic waves:

Equation of continuity – Displacement current – Significance of displacement current – Derivation of Maxwell's equations – Maxwell's equations in integral form - **Differential form – Plane electromagnetic waves – Transverse nature of electromagnetic waves**^{18,19,20} - Maxwell's equations in free space-Electromagnetic waves in free space- Poynting theorem (Statement and Proof)

Text Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	R. Murugesan	Electricity and Magnetism	S. Chand & Co Pvt Ltd	2019	8 th Edition
2	Dr. K. K. Tewari	Electricity and Magnetism	S. Chand & Co Pvt Ltd	2016	Revised Edition
3	Brijlal and N. Subrahmanyam	Electricity and Magnetism	S. Chand & Co Pvt Ltd	2017	18 th Edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	David J Griffith	Electrodynamics	Prentice Hall	2015	4 th Edition
2	Edward M. Purcell	Electricity and Magnetism, Berkeley Physics Course – Volume 2	Tata Mc-Graw Hill Education	2013	3 rd Edition
3	D C Tayal	Electricity and Magnetism	Himalaya Publishing House	2009	Revised edition

4	Sehgal, Chopra, Sehgal	Electricity and Magnetism	S. Chand and sons	2020	2 nd edition
5	A S Mahajan, A A Rangwala	Electricity and Magnetism	S. Chand and sons	2017	6 th edition

Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designer

1. Dr. N. Priyadharsini

References For E-Content

1. <https://www.youtube.com/watch?v=W8N8XswNei8>
2. <https://www.youtube.com/watch?v=gLsoAjuRWCw>
3. <https://www.youtube.com/watch?v=SZCsFS9izfQ>
4. <https://www.youtube.com/watch?v=v3ZC4Mo1fS0>
5. <https://www.youtube.com/watch?v=VBCzo91uUi8>
6. <https://www.youtube.com/watch?v=4VC3IHbuW8>
7. <https://www.youtube.com/watch?v=2GQTfpDE9DQ>
8. <https://www.youtube.com/watch?v=rYjo774UpHI>
9. https://www.youtube.com/watch?v=j3GrOKre_0
10. <https://www.youtube.com/watch?v=PEcPcNMfNks>
11. <https://www.youtube.com/watch?v=-SakEHbtryA>
12. <https://www.youtube.com/watch?v=jippPv6Gz14>
13. <https://www.youtube.com/watch?v=7YbLDIbv17w>
14. <https://www.youtube.com/watch?v=04THKYsONKA>
15. https://www.youtube.com/watch?v=I8X1EpH_VQY
16. <https://www.youtube.com/watch?v=sFre-bMvBeI>
17. <https://www.youtube.com/watch?v=yr0RkoUHgf0>
18. <https://www.youtube.com/watch?v=CX7X6YrVUdk>
19. <https://www.youtube.com/watch?v=pn9yxCxzJfY>
20. <https://www.youtube.com/watch?v=HvK35jjMb5I>

PS23CP2	PHYSICS PRACTICALS II	Category	L	T	P	Credit
		III	-	-	3 hrs/Week	-

Preamble

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the usage of basic laws and theories to determine various properties of the materials given.	K2
CLO2	Understand the application side of the experiments.	K2
CLO3	Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems.	K3
CLO4	Use standard methods to calibrate the given high range voltmeter and to measure the elasticity and thickness of the given material.	K3
CLO5	Use of basic laws to study the spectral properties and optical properties of the given prism and grating.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	L	L	L	L
CLO2	S	S	S	S	M	M
CLO3	S	S	S	S	M	M
CLO4	S	S	S	S	M	M
CLO5	S	S	S	S	M	M

S- Strong; M-Medium; L-Low

Syllabus

List of Experiments

Any 16

1. Young's Modulus – Uniform Bending – Koenig's Method
2. i-d curve- μ of the prism-Spectrometer
3. Dispersive Power of Grating – Spectrometer- Wave length of Mercury Spectral Lines by minimum deviation method
4. Refractive index (μ) of the material of the prism lens – Newton's rings method
5. Calibration of High Range Voltmeter –Potentiometer
6. Wave length of Mercury Spectral Lines – Grating - Normal Incidence –Spectrometer
7. Young's Modulus –Non-Uniform Bending – Koenig's Method
8. Thickness of a thin wire – Air Wedge method
9. EMF of thermocouple –Potentiometer
- 10.High resistance by i) Charging ii) Leakage using Ballistic Galvanometer
- 11.Comparison of Mutual Inductance's – Ballistic Galvanometer
- 12.Measurement of dielectric constant - Parallel Plate Capacitor Method
- 13.Series Resonant Circuit
- 14.Parallel Resonant Circuit
- 15.i) Verification of Truth Tables of IC Gates: OR, AND, NOT, XOR, NOR, and NAND
ii) Verification of Demorgan's theorem using Logic Gates
- 16.Verification of Truth Table of Half and Full Adders
- 17.Verification of NAND as a Universal Building Block
- 18.Verification of NOR as a Universal Building Block
- 19.Verification of Truth Tables of Half and Full Subtractor

Pedagogy

Demonstration

Course Designer

1. Dr. M. Lavanya

PS23A03	ALLIED PHYSICS PAPER- I (For Mathematics)	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This paper introduces the students to the basic concepts of Elasticity, Rotational motion, Heat and thermodynamics, Sound, Optics, Atomic and Nuclear Physics

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Define the fundamental concepts of material properties, heat, sound, optics, atomic and nuclear physics	K1
CLO2	Demonstrate the practical concepts behind the optics, heat and sound through experimental setup	K2
CLO3	Apply the fundamental properties and the associated laws to understand physical systems	K2
CLO4	Analyze the thermo dynamical, optical properties of matter and to find its applications in various fields	K3

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	M	L	L
CLO2	S	M	S	M	S	L
CLO3	S	M	S	L	M	S
CLO4	S	M	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

Unit – I

11 Hrs

Properties of Matter

Elasticity: Moduli of elasticity^{1,2}- bending moment-expression – Young's modulus by uniform and non-uniform bending-theory and experiment³- I-section girders-Torsion pendulum-couple per unit twist-work done in twisting –determination of the rigidity modulus of the material of the wire.

Unit - II

11 Hrs

Transmission of Heat

Conduction process: Thermal conductivity^{4,5}- Rectilinear field along a bar- Measurement of Thermal conductivity of a bad conductor by Lee's disc method

Convection process: Lapse rate-stability of atmosphere- Green house effect

Radiation process: Solar constant- Pyroheliometer- solar energy and its applications (flat plate collector & solar cooker)^{6,7,8,9,10} - concentration solar collector, Fresnel Lenses method.

Unit - III

11 Hrs

Thermodynamics, Sound:

Thermodynamics: Thermodynamic variables – Extensive and Intensive variables- Maxwell's Thermodynamic relation- Thermodynamic potential- Significance- relation of thermodynamics potentials with their variables

Ultrasonics: Piezo electric & Magnetostriction method – Principle- Construction – Working and Applications^{11,12,13}.

Unit - IV

11 Hrs

Optics:

Dispersion: Dispersive power-combination of prisms to produce (i) deviation without dispersion (ii) dispersion without deviation-direct vision spectroscope.

Interference: Air wedge-determination of diameter of a wire-Newton's rings-determination of refractive of a liquid

Polarisation: Production, detection and analysis of different types of polarized light-quarter and half wave plates^{14,15,16}

Unit - V**12Hrs**

Atomic Physics: Vector atom model¹⁷ -Quantum numbers associated with vector atom model - Pauli's exclusion principle-excitation and ionization potential-experimental determination- **Franck and Hertz method**¹⁷.

Particle Physics: Elementary particles – classification¹⁸- particles and antiparticles- conservation laws and symmetry- Quark model.

Books for Study:

S. No	Authors	Title of the Book	Publishers	Year of Publication
1	Brijlal Subramaniam	Heat and thermodynamics	S.Chand and Co, 16 th Edition.	2012
2	Brijlal Subramaniam & Hemne.P.S,	Heat thermodynamics and Statistical Physics	S.Chand and Co, 12 th edition	2011
3	Brijlal Subramaniam	Optics	S.Chand and Co, 21 st Edition	2012
4	Murugesan R	Allied Physics	S.Chand and Co, 1 st Edition	1998

Books for Reference:

S. No	Authors	Title of the Book	Publishers	Year of Publication
1	Jayaprakash. N	Heat and thermodynamics	S Chand and Co, 16 th Edition.	2012
2	Mathur D.S	Properties of Matter	S Chand and Co, 2 nd Edition	1970

3	Murugesan R	Modern Physics	S.Chand and Co , 9 th edition	2013
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Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designers:

1. Dr.G.Vanitha

References For E-Content:

19. <https://youtu.be/qQhOYbztNIQ>
20. <https://youtu.be/gcI-bkr7ilg>
21. <https://youtu.be/7tr4qWPgP40>
22. https://youtu.be/N5GAHntU_nQ
23. <https://youtu.be/hDP6egLrsdM>
24. <https://youtu.be/nmsPcTzIkrw>
25. <https://youtu.be/rAhvvyQBt0>
26. <https://youtu.be/TUaTNzZ00oM>
27. <https://youtu.be/tDB3zP9MEZc>
28. <https://youtu.be/wvl0QAQCJyc>
29. <https://youtu.be/4nbBAG-848c>
30. https://youtu.be/nJXB0yD_wEw
31. https://youtu.be/K4Do_yWJt2k
32. <https://youtu.be/HH58VmUbOKM>
33. <https://youtu.be/DjnDX28l4xA>
34. <https://youtu.be/iVYGOWAtZCQ>
35. <https://youtu.be/SQtOYCeI-Pc>
36. <https://youtu.be/kykp-S8S5dU>

PS23AP1	ALLIED PHYSICS PRACTICALS (For I BSc Chemistry Sem I and II and II BSc Mathematics Sem III and IV)	Category	L	T	P	Credit
		III	-	-	3 Hrs/ week	-

Preamble

To enable the student to gain practical knowledge

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Gain knowledge in the scientific methods and learn the process of measuring different Physical variables	K1
CLO2	Educate The Basics Of Instrumentation, Data Acquisition And Interpretation of Results	K2
CLO3	Enhance The Students Understand The Concepts In Materials Properties	K2
CLO4	Have a deep knowledge of fundamentals of optics, electric circuits, magnetism and sound	K3

Mapping with Programme Learning Outcomes

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	S	M	S
CLO2	S	S	S	S	S	S
CLO3	S	M	S	M	M	M
CLO4	S	M	M	S	M	S

S- Strong; M-Medium;

List of Experiments**Any Eighteen**

20. Young's Modulus –Non- Uniform bending –Pin and Microscope
21. Young's Modulus – Uniform bending – Optic lever
22. Rigidity modulus - Static torsion
23. Rigidity Modulus - torsional pendulum
24. Moment of inertia - torsional pendulum
25. Acceleration due to gravity - compound pendulum
26. Thermal conductivity of a bad conductor – Lee's disc method
27. AC frequency - Sonometer
28. Refractive index of solid prism - spectrometer
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31. Low range Ammeter Calibration - Potentiometer
32. Low range Voltmeter Calibration - Potentiometer
33. Moment of a magnet in the Tan C position
34. Volt-Ampere characteristic of a p-n junction diode in the forward and reverse directions
35. Logic gates - Verification of the truth table
36. Characteristics of Zener diode
37. Closed loop gain of Operational Amplifier in Inverting mode
38. Closed loop gain of Operational Amplifier in Non Inverting mode.

Pedagogy

Demonstration and Practical Sessions

Course Designers:

1. Mrs. T. Poongodi