



**MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL - 624101**



DEPARTMENT OF PHYSICS

B.Sc. PHYSICS

Curriculum Framework, Syllabus and Regulations

**(Based on TANSICHE Syllabus under Choice Based Credit Systems –
CBCS)**



(For the candidates to be admitted from the Academic Year 2023-24)

B.Sc., PHYSICS**Preamble**

Physics is one of the basic and fundamental sciences. The curriculum for the graduate programme in Physics is revised as per the UGC guidelines on Learning Outcome based Course Framework. The learner-centric courses let the student progressively develop a deeper understanding of various aspects of physics.

The new curriculum offer courses in the core areas of mechanics, acoustics, optics and spectroscopy, electricity and magnetism, atomic and nuclear physics, solid state, electronics and other fields. The courses will train students with sound theoretical and experimental knowledge that suits the need of academics and industry. In addition to the theoretical course work, the students also learn physics laboratory methods for different branches of physics, specialized measurement techniques, analysis of observational data, including error estimation and etc. The students will have deeper understanding of laws of nature through the subjects like classical mechanics, quantum mechanics, statistical physics etc. The problem solving ability of students will be enhanced. The students can apply principles in physics to real life problems. The courses like integrated electronics and microprocessors will enhance the logical skills as well as employability skills. The numerical methods and mathematical physics provide analytical thinking and provides a better platform for higher level physics for research.

The restructured courses with well-defined objectives and learning outcomes, provide guidance to prospective students in choosing the elective courses to broaden their skills not only in the field of physics but also in interdisciplinary areas. The elective modules of the framework offer students choice to gain knowledge and expertise in specialized domains of physics like astrophysics, medical physics, etc.

**TANSCHER REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM
FRAMEWORK FOR
UNDERGRADUATE EDUCATION**

Programme	B.Sc., Physics
Programme Code	
Duration	3 years [UG]
Programme Outcomes: (These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or the University for their Programme)	<p>PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study</p> <p>PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully; read and write analytically and present complex information in a clear and concise manner to different groups.</p> <p>PO3: Critical thinking: Capability to apply the analytic thought to a body of knowledge; analyse and evaluate the proofs, arguments, claims, beliefs on the basis of empirical evidences; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach.</p> <p>PO4: Problem solving:</p>

Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO5: Analytical reasoning:

Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO6: Research-related skills:

A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work:

Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8: Scientific reasoning:

Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking:

Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

PO10 Information/digital literacy:

Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 11 Self-directed learning:

Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 Multicultural competence:

Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society 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 multiple perspectives, 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 or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all

	<p>aspects of work.</p> <p>PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p>PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn“, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p>
<p>Programme Specific Outcomes:</p> <p>(These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or University for their Programme)</p>	<p>PSO1: Placement: To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2: Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations</p> <p>PSO3: Research and Development: Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4: Contribution to Business World: To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5: Contribution to the Society: To contribute to the development of the society by collaborating with stakeholders for mutual benefit</p>

WRITTEN EXAMINATION QUESTION PAPER PATTERN

Theory Paper (Bloom's Taxonomy based)

(Common for UG, PG, Certificate, Diploma and P.G.Diploma Programmes)

Intended Learning Skills	<p>Maximum 75 Marks Passing Minimum: 50% Duration: Three Hours</p>
Memory Recall/Example/ Counter Example / Knowledge about the Concepts/Understanding	<p>Part–A (10x2=20Marks) Answer ALL questions Each Question carries 2 marks</p>

	Two questions from each Unit
	Question 1 to Question 10
Descriptions/Application (problems)	Part-B (5x5=25Marks) Answer ALL questions Each question carries 5 Marks
	Either - or Type Both parts of each question from the same Unit
	Question 11 (a) or 11(b) to Question 15(a) or 15(b)
Analysis/Synthesis / Evaluation	Part-C (3x 10 = 30 Marks) Answer any THREE questions Each question carries 10 Marks
	There shall be FIVE questions covering all the five units
	Question 16 to Question 20

SYLLABUS FRAMEWORK FOR UG PROGRAMMES

(As per TANSCHÉ –From 2023 – 2024)

B.Sc. PHYSICS

SEMESTER – I

Part	Course Code	Course Title	Credit	No. of Hours	CIA	ESE	Total Marks
Part - 1	U23TAL11	Language 1 - Tamil	3	6	25	75	100
Part - 2	U23ENL21	Language 2 - English	3	6	25	75	100
Part - 3	U23PHT11	Core 1 Properties of Matter and Acoustics	5	5	25	75	100
	U23PHP11	Core 2 Practical	5	5	25	75	100
	U23PHA11	Subject Based Elective-I (Allied-1 Mathematics)	3	4	25	75	100
Part - 4	U23PHS1A / U23PHS1B	Skill Enhancement Course 1 (Advanced Mathematical Physics/Energy Physics)	2	2	25	75	100
	U23PHF11	Foundation Course(Introductory Physics)	2	2	25	75	100
TOTAL			23	30			

SEMESTER – II

Part	Course Code	Course Title	Credit	No. of Hours	CIA	ESE	Total Marks
Part - 1	U23TAL12	Language 1 - Tamil	3	6	25	75	100
Part - 2	U23TAL22	Language 2 - English	3	6	25	75	100
Part - 3	U23PHT22	Core 3 Heat, Thermodynamics and Statistical Physics	5	5	25	75	100
	U23PHP22	Core 4 Core Practical's	5	5	25	75	100
	U23PHA22	Subject Based Elective -2 (Allied-2 Mathematics)	3	4	25	75	100
Part - 4	U23PHS22	Skill Enhancement Course – 2 (Soft Skills)	2	2	25	75	100
	U23PHS23	Skill Enhancement Course – 3 (Electronics in Everyday life)	2	2	25	75	100
TOTAL			23	30			

COURSE	FIRST SEMESTER –CORE THEORY 1	
COURSE TITLE	PROPERTIES OF MATTER AND ACOUSTICS	
CREDITS	5	Course Code: U23PHT11
COURSE OBJECTIVES	Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers. It gives us information about the internal forces which act between the constituent parts of the substance. Students who undergo this course are successfully bound to get a better insight and understanding of the subject.	

UNITS	COURSE DETAILS
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: <i>Surface tension:</i> 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 <i>Viscosity:</i> 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. <i>Ultrasonic waves:</i> production of ultrasonic waves – Piezoelectric crystal method – magnetostriction effect – application of ultrasonic waves

UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures – seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chandand Co. 2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chandand Co 3. D.R.KhannaandR.S.Bedi, 1969, Textbook of Sound, AtmaRamand sons 4. BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition, Vikas Publishing House. 5. R.Murugesan, 2012, <u>Properties of Matter</u>, S.Chandand Co.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers 2. H.R.Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, R. Chand and Co. 3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html 3. https://www.youtube.com/watch?v=gT8Nth9NWPM 4. https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s 5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 7. http://www.sound-physics.com/ 8. http://nptel.ac.in/courses/112104026/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE OUTCOMES:

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

:

COURSE OUTCOMES	CO1	Relate elastic behavior in terms of three moduli of elasticity and working of torsion pendulum.
	CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.
	CO3	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering

		problems.
	CO4	Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains
	CO5	Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes (CO) for each course with program outcomes (PO) in the 3-point scale of STRONG (S), MEDIUM (M) and LOW (L).

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

COURSE	FIRST SEMESTER –CORE PRACTICAL 1	
COURSE TITLE	PRACTICAL 1	
CREDITS	5	Course Code: U23PHP11
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results	

Properties of Matter	
Minimum of Eight Experiments from the list:	
<ol style="list-style-type: none"> 1. Determination of rigidity modulus without mass using Torsional pendulum. 2. Determination of rigidity modulus with masses using Torsional pendulum. 3. Determination of moment of inertia of an irregular body. 4. Verification of parallel axes theorem on moment of inertia. 5. Verification of perpendicular axes theorem on moment of inertia. 6. Determination of moment of inertia and g using Bifilar pendulum. 7. Determination of Young's modulus by stretching of wire with known masses. 8. Verification of Hook's law by stretching of wire method. 9. Determination of Young's modulus by uniform bending – load depression graph. 10. Determination of Young's modulus by non-uniform bending – scale and telescope. 11. Determination of Young's modulus by cantilever – load depression graph. 	

12. Determination of Young's modulus by cantilever – oscillation method
13. Determination of Young's modulus by Koenig's method – (or unknown load)
14. Determination of rigidity modulus by static torsion.
15. Determination of Y , n and K by Searle's double bar method.
16. Determination of surface tension and interfacial surface tension by drop weight method.
17. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
18. Determination of critical pressure for streamline flow.
19. Determination of Poisson's ratio of rubber tube.
20. Determination of viscosity by Poiseuille's flow method.
21. Determination radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

Course Code: U23PHS1A

ADVANCED MATHEMATICAL PHYSICS	
Learning Objective: The fundamentals of matrices and vector calculus learnt in earlier course will enable students to learn advanced topics and theorems. The special functions and applications of partial differential equations will be of use in research at a later stage.	
UNITS	COURSE DETAILS
UNIT-I	MATRICES: introduction – special types of matrices – transpose – conjugate– conjugate transpose– symmetric and anti symmetric – Hermitian and skew Hermitian – orthogonal and unitary – properties – characteristic equation – roots and characteristic vectors – diagonalization– Cayley–Hamilton theorem –simple problems
UNIT-II	VECTOR CALCULUS: ∇ operator – divergence – second derivative of vector functions or fields –Laplacian operator – curl of a vector – line integral – line Integral of a vector field around an infinitesimal rectangle – curl of conservative field – surface integral – volume integral (without problem) – Gauss’s divergence theorem and proof – Stroke’s theorem and proof –simple problems.
UNIT-III	SPECIAL FUNCTIONS: definition –Beta function – Gamma function – evaluation of Beta function – other forms of Beta function – evaluation of Gamma function – other forms of Gamma function – relation between Beta and Gamma functions – simple problems.
UNIT-IV	FROBENIUS METHOD AND SPECIAL FUNCTIONS: singular points of second order linear differential equations and importance – singularities of Bessels and Laguerreequations, Frobenius method and applications to differential equations: Legendre and Hermitedifferential equations – Legendre and Hermitepolynomials – Rodrigues formula –generating function – orthogonality
UNIT-V	PARTIAL DIFFERENTIAL EQUATIONS: solutions to partial differential equations using separation of variables - Laplace’s equation in problems of rectangular – cylindrical and spherical symmetry – conducting and dielectric sphere in an external uniform electric field – wave equation and its solution for vibrational modes of a stretched string
TEXT BOOKS	1. Mathematical Physics, B.D. Gupta-Vikas Publishing House, 4 th Edition (2006) 2. Mathematical Physics, SatyaPrakash (Sultan Chand)
REFERENCE BOOKS	1. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris (2013, 7th Edn., Elsevier) 2. Mathematical Physics–H. K. Dass, Dr. Rama Verma (S. Chand Publishing) 3. Advanced Engineering Mathematics, Erwin Kreyszig (Wiley India) 4. Mathematical Physics and Special Relativity, M. Das, P.K. Jena and B.K. Dash (SrikrishnaPrakashan)

ELECTIVE COURSES (EC)

U23PHS1B - ENERGY PHYSICS	
Learning Objective: To get the understanding of the conventional and non-conventional energy sources, their conservation and storage systems.	
UNITS	COURSE DETAILS
UNIT-I	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-II	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-III	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-IV	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-V	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.
TEXT BOOKS	<ol style="list-style-type: none"> 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, 2ndEdn.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. John Twidell and Tony Weir, Renewable Energy Resources, Taylor and Francis, 2005, 2ndEdn. 2. S.A. Abbasi and Nasema Abbasi, 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.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE	FIRST SEMESTER – FOUNDATION COURSE
COURSE TITLE	U23PHF11 - INTRODUCTORY PHYSICS
CREDITS	5
COURSE OBJECTIVES	To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.

UNITS	COURSE DETAILS
UNIT-I	vectors, scalars –examples for scalars and vectors from physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions– standard physics constants
UNIT-II	different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces
UNIT-III	different forms of energy– conservation laws of momentum, energy –types of collisions –angular momentum– alternate energy sources– real life examples
UNIT-IV	types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion –comparison of light and sound waves – free, forced, damped oscillations
UNIT-V	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
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. D.S. Mathur, 2010, Elements of Properties of Matter, S.Chandand Co 2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chandand Co.
REFERENCE BOOKS	1. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chandand Co.
WEB RESOURCES	1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html https://science.nasa.gov/ems/ 2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE OUTCOMES:

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

COURSE OUTCOMES	CO1	Apply concept of vectors to understand concepts of Physics and solve problems
	CO2	Appreciate different forces present in Nature while learning about phenomena related to these different forces.
	CO3	Quantify energy in different process and relate momentum, velocity and energy
	CO4	Differentiate different types of motions they would encounter in various courses and understand their basis
	CO5	Relate various properties of matter with their behaviour and connect them with different physical parameters involved.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) in the 3-points scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

SECOND SEMESTER

COURSE	SECOND SEMESTER – CORE -3 THEORY
COURSE TITLE	U23PHT22 - HEAT, THERMODYNAMICS and STATISTICAL PHYSICS
CREDITS	5
COURSE OBJECTIVES	The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales. Practical exhibition and explanation of transmission of heat in good and bad conductor. Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation

UNITS	COURSE DETAILS
UNIT-I	CALORIMETRY: specific heat capacity – specific heat capacity of gases C_p and C_v – Meyer’s relation – Joly’s method for determination of C_v – Regnault’s method for determination of C_p LOW TEMPERATURE PHYSICS: Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyle temperature – temperature of inversion – liquefaction of gas by Linde’s Process – adiabatic demagnetisation.
UNIT-II	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-III	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 – Clausius-Clapeyron’s equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.
UNIT-IV	HEAT TRANSFER: modes of heat transfer: conduction, convection and radiation. <i>Conduction:</i> thermal conductivity – determination of thermal conductivity of a good conductor by Forbes’s method – determination of thermal conductivity of a bad conductor by Lee’s disc method. <i>Radiation:</i> 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.

COURSE OUTCOMES	CO1	Acquires knowledge on how to distinguish between temperature and heat. Introduce him/her to the field of thermometry and explain practical measurements of high temperature as well as low temperature physics. Student identifies the relationship between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand cryogenics, superconductivity, superfluidity and Condensed Matter Physics
	CO2	Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines
	CO3	Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy
	CO4	Study the process of thermal conductivity and apply it to good and bad conductors. Quantify different parameters related to heat, relate them with various physical parameters and analyse them
	CO5	Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac . Apply to quantum particles such as photon and electron

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) in the 3-point scale of STRONG (S), MEDIUM (M) and LOW (L).

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

COURSE	SECOND SEMESTER – CORE- 4 - PRACTICAL 2
COURSE TITLE	U23PHP22 - PRACTICAL 2
CREDITS	5
COURSE OBJECTIVES	Apply their knowledge gained about the concept of heat and sound waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results
HEAT, OSCILLATIONS, WAVES and SOUND	
Minimum of Eight Experiments from the list:	

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of good conductor by Searle’s method.
3. Determination of thermal conductivity of bad conductor by Lee’s disc method.
4. Determination of thermal conductivity of bad conductor by Charlton’s method.
5. Determination of specific heat capacity of solid.
6. Determination of specific heat of liquid by Joule’s electrical heating method (applying radiation correction by Barton’s correction/graphical method),
7. Determination of Latent heat of a vaporization of a liquid.
8. Determination of Stefan’s constant for Black body radiation.
9. Verification of Stefan’s-Boltzmann’s law.
10. Determination of thermal conductivity of rubber tube.
11. Helmholtz resonator.
12. Velocity of sound through a wire using Sonometer.
13. Determination of velocity of sound using Kundt’s tube.
14. Determination of frequency of an electrically maintained tuning fork
15. To verify the laws of transverse vibration using sonometer.
16. To verify the laws of transverse vibration using Melde’s apparatus.
17. To compare the mass per unit length of two strings using Melde’s apparatus.
18. Frequency of AC by using sonometer.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

U23PHS23 - ELECTRONICS IN EVERDAY LIFE**2Hours/2 Credits**

Objective: To make non-physics students understand basic electronic concepts and its applications in daily life.

UNIT I FUNDAMENTALS

Electrical and Electronic symbols – Resistors – Capacitors – Resistance wale – Capacitor wale – Electrical quantities – Electrical formulas – Magnetism – Meters – Fuse wire – Transistors – Integrated chips.

UNIT II ELECTRICAL APPLIANCES

Switchboard – Main box – Metal circular breakers (MCB) – AC – DC currents – Two phase – Three phase electrical connections – generators – uninterrupted power supply (UPS) – stabilizer – voltage regulators – Electrical devices – Iron box – Fan

UNIT III ELECTRONIC HOME APPLIANCES

Radio – Audio tape recorder, speaker – televisions – VCR – CD Player – DVD – calculators – Computers – Block diagram of a computer – Input device – Memory device – control unit – Arithmetic and logic unit – output device – microprocessor – RAM – ROM – scanner – printer – Digital camera – LCD Projectors – Display devices

UNIT IV COMMUNICATION ELECTRONICS

Principles of optical fiber cables (OFC) – Telephone – Mobile Phones – wireless phone – Antenna – Internet – Intranet

UNIT V SAFETY MECHANISM

Handling electrical appliances – power saving methods – hazards prevention methods – protection of Hi-Fi electronic devices.

Books for Study and reference:

1. S.S.Kamble – Electronics and Mathematics Data Book – Allied Publishers Ltd – 1997
2. William David Cooper, Electronic and Instrumentation and Measurement Technique (2nd Edition), 1978.