MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

Vaniyambadi – 635 751

PG & Research Department of Physics

Undergraduate Programme

Bachelor of Physics

From the Academic Year 2024-25

CONTENT

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION

1. Preamble

Physics is the most of basic of sciences. It seeks to understand natural phenomena in a quantitative manner, and to answer some of the oldest and deepest questions ever asked by human beings: What are things made of? Is there a limit to the smallest things that we can think of? Did the world have a beginning? Will it have an end? At the same time, it provides the base of much of the technology that we take for granted in the 21 st century: computers, artificial satellites, mobile phones, TV, microwave oven. Indeed, it will not be an exaggeration to say that modern human life is shaped by technologies that are largely based on a foundation of physics. Physics as a discipline has existed for three hundred years and has a large 'core' body of knowledge. Those who wish to pursue higher studies in the subject are thereby well equipped to choose their branch of study. The programme also aims at equipping future teachers (at college as well school level) with a thorough grounding in the subject. Since physics is the base of much of modern technology, the programme also gives adequate hands-on experience to students who may go on to work in applied fields. Finally, viewing physics as a training ground for the mind the programme also aims to equip those who go into other fields of work with logical thinking and a critical attitude.

PROGRAMME OUTCOMES (PO)

Programme	**B.Sc., Physics**
Programme Code	**US11**
Duration	**3 Years [UG]**
Programme Outcomes	**PO1:** Acquire knowledge in Physics to apply the knowledge in their day-to-day life for betterment of self and society. **PO2:** Develop critical, analytical thinking and problem-solving skills **PO3:** Develop research related skills in defining the problem, formulate and test the hypothesis, analyse, interpret, and draw conclusion from data. **PO4:** Address and develop solutions for societal and environmental needs of local regional and national development. **PO5:** Work independently and engage in lifelong learning and enduring proficient progress. **PO6:** Provoke employability and entrepreneurship among students along with ethics andcommunication skills. **PO7:** Understand the importance of ethical behavior in business contexts and be able to recognize and address ethical dilemmas they may encounter in their professional careers. **PO8:** Prepared for lifelong learning and professional development, including the ability to adapt to changes in technology, business practices, and economic conditions throughout their careers.
Programme Specific Outcomes:	**PSO1: Placement**: Acquire the ability to critically analyze complex real life problems using the laws of Physics with appropriate mathematical tools and thereby preparing the students to face various state/national level competitive exams. **PSO2: Entrepreneur:** Acquire employability and entrepreneurial skills through hands-on training in basic as well as advanced areas of Physics and to develop innovative scientific solutions for industrial and societal needs at local, regional, national and global levels. **PSO3: Contribution to the Society:** Create skills required for identifying socially relevant research problems, collection of data, analyze and interpret data leading to knowledge enhancement in addressing the societal challenges.

Eligibility for Admission:

Candidates for admission to the first year of the **Bachelor of Physics** course shall be required to have passed the **12th with Mathematics as a compulsory subject** by the Government of Tamilnadu or any equivalent.

Methods of Evaluation and Assessment

Methods of Evaluation		
Internal Evaluation		25 Marks
External Evaluation	End Semester Examination	75 Marks
	Total	**100 Marks**
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand / Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or overview	
Application (K3)	Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate Between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

Semester - I						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA11/24UFUR11	Tamil – I/Urdu-I	4	1	0	0	3
24UFEN11	English - I	4	1	0	0	3
24UPHC11	CC- I Properties of Matter & Acoustics	3	1	2	0	5
24UPHC12P	CC- II Properties of Matter & Acoustics Practicals	0	0	4	0	3
24UMAA14	EC-I Mathematics-I	3	1	0	0	3
24UPHS11/ 24UPHS12	SEC- I Home Electrical Installation/ Energy Physics	2	0	0	0	2
24UPHS13/ 24UPHS14	SEC – II Physics for Every Day Life / Astrophysics	1	1	0	0	2
24UPHF11	FC – Introductory Physics	1	1	0	0	2
TOTAL					**30**	23

Semester - II						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA21	Tamil – II/Urdu - II	4	1	0	0	3
24UFEN21	English – II	4	1	0	0	3
24UPHC21	CC – III Heat & Thermodynamics and Statistical Physics	3	1	2	0	5
24UPHC22P	CC - IV (Practical) Heat & Thermodynamics and Statistical Physics	0	0	4	0	3
24UPHA21	EC-II Mathematics II	4	2	0	0	5
24UPHS21	SEC – III Elements of Computer Science	1	0	1	0	2
24UAEC21	AEC – I Life Skill for Yoga	1	1	0	0	2
TOTAL					**30**	**23**

L-Lecture **T-Tutorial** **P-Practical** **S-Seminar** **C-Credit**

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, or Nanmudalvan within the fifth semester. Additionally, engaging in a specified Self-learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC11	Properties of Matter and Acoustics	Core	3	1	2	0	5	6	25	75	100

Learning Objectives	
LO1	Understand the linear relationship between stress (force per unit area) and strain(deformation) in elastic materials.
LO2	Understanding of the behaviour of beams under bending loads.
LO3	Fluid dynamics, you'll delve into the intricate behaviours of liquids and gases, understanding phenomena like surface tension and viscosity.
LO4	Develop critical thinking skills by investigating complex phenomena such as resonance and the behaviour of vibrating systems under various conditions.
LO5	Techniques for measuring and quantifying sound intensity and its perception by humans.

Unit	Content	Hours
1	**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).	18
2	**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– uniform bending – expression for elevation – experiment to determine Young's modulus using microscope- experiment to determine Young's modulus by Koenig's method .	18
3	**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.	18
4	**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.	18
5	**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 method – application of ultrasonic waves	18

CO	Course Outcomes
CO1	Relate elastic behavior in terms of three modulii 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
Textbooks:	
1	D.S. Mathur, 2010, Elements of Properties of Matter, S.Chand & Co.
2	Brij Lal & N. Subrahmanyam, 2003, Properties of Matter, S. Chand & Co
3	D.R. Khanna & R.S.Bedi, 1969, Textbook of Sound, AtmaRam & sons
4	Brij Lal and Subrahmanyam, 1995, A Text Book of Sound, second revised edition, Vikas Publishing House.
5	R. Murugesan,2012, Properties of Matter, S. Chand& Co.
Reference Books:	
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. Chand & Co.
3	A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
Web resources:	
1	https://www.biolinscientific.com/blog/what-are-surfactants-andhow-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-SuaSu1s&t=3s
5	http://www.sound-physics.com/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	2	3	3	3	3	3
Total	14	15	14	13	12	14	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.8	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC12P	Properties of Matter and Acoustics - Practical	Core - Practical	0	0	4	0	3	4	25	75	100

Learning Objectives	
LO1	These experiments cover a wide range of topics in mechanics and fluid mechanics and provide hands-on experience with experimental techniques and principles.
LO2	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

Unit	Content	Hours
1	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 & 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 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 & 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 Poiseullie's flow method -determination of radius by capillary tube & mercury pellet method. 21. Determination of g using compound pendulum	60

CO	Course Outcomes
CO	Students will able to understand and analysis the concept of properties of matter experiments and quantify the results
Textbooks:	
1	Basic and general experiments of Physics" Dr. Srinivasan"

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	2	3	3	3	3	3
Total	14	15	14	13	12	14	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.8	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS12	**ENERGY PHYSICS**	SEC-I	2	0	0	0	2	2	25	75	100

Learning Objectives	
LO1	Analyze the potential future scenarios of global energy usage.
LO2	To understand the solar energy principles, technologies, and applications.
LO3	To understanding of wind energy, its significance, and its role in the broader context of renewable energy utilization.
LO4	Analyse the environmental, social, and economic impacts of biomass energy utilization.
LO5	To study the importance of energy storage in modern energy systems.

Unit	Content	Hours
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.	6
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	6
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	6
4	**Biomass Energy:** introduction – classification – biomass conversion technologies –photosynthesis – fermentation - biogas generation –classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages & disadvantages.	6
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.	6

CO	Course Outcomes
CO1	Understanding the energy consumption and prosperity
CO2	Understanding the principles of semiconductor physics, solar cell operation, performance evaluation and system integration for solar energy conversion.
CO3	Identifying the components and functions of Wind Energy Conversion Systems.
CO4	Analyze various biomass conversion technologies, including their advantages and limitations.
CO5	Understanding of energy storage technologies, design, implementation and management of sustainable energy systems in various domains.
Textbooks:	
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:	
1	John Twidell& Tony Weir, Renewable Energy Resources, Taylor & 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 & Co. Ltd., New Delhi,1982 4. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.
Web resources:	
1	https://byjus.com/physics/energy/
2	https://www.britannica.com/science/energy
3	http://hyperphysics.phyastr.gsu.edu/hbase/egex2.html#:~:text=Energy%20can%20be%20defined%20as,within%20objects%20at%20normal%20temperatures.
4	http://hyperphysics.phy-astr.gsu.edu/hbase/Relativ/releng.html
5	https://archive.nptel.ac.in/courses/115/105/115105127/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	1	3	3	3	3	3
Total	14	15	14	13	12	13	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.6	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS11	Home Electrical Installation	SEC - II	2	0	0	0	2	2	25	75	100

Learning Objectives	
LO1	To learn about practical applications like using meters to measure electrical quantities accurately.
LO2	Demonstrate proficiency in troubleshooting and maintaining electrical systems.
LO3	To study the both theoretical knowledge and practical skills for safe and effective electrical installations.
LO4	Understanding the principles of electrical energy, being able to calculate energy consumption and electricity bills, identifying energy-saving opportunities.
LO5	By achieving these learning outcomes, students can develop the knowledge, skills, and attitudes necessary to safely and effectively perform home electrical installations.

Unit	Content	Hours
1	**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	6
2	**Transmission of Electricity:** production and transmission of electricity – concept of power grid – Series and parallel connections –transmission losses (qualitative) – roles of step-up and step-down transformers – quality of connecting wires – characteristics of single and multicore wires	6
3	**Electrical Wiring:** different types of switches – installation of two-way 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.	6
4	**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 – single and three phase connections.	6
5	**Safety Measures:** insulation for wires – colour specification for mains, return and earth – Understanding of fuse and circuit breakers – MCB, ELCB – purpose of earth line – short circuiting and over loading – electrical safety – tips to avoid electrical shock – first aid for electrical shock – fire safety for electric current	6

CO	Course Outcomes
CO1	The ability to analyze and design simple electrical circuits.
CO2	Gain a comprehensive understanding of the production and transmission of electricity.
CO3	Understand the principles of electrical circuits and safety practices.
CO4	To prepare participants to confidently and competently undertake electrical installations in residential settings while prioritizing safety, compliance, and professionalism.
CO5	Knowledge of electrical planning and design principles is important for successful installations.
Textbooks:	
1	Wiring a House: 5th Edition by Rex Cauldwell, (2014).
2	Black & 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	"Home Electrical Wiring: A Complete Guide to Home Electrical Wiring Explained by a Licensed Electrical Contractor" David W Rongey (2013)
2	Electrical Wiring Industrial 17th Edition Based on NEC 2020
Web resources:	
1	https://onlinecourses.nptel.ac.in/noc24_ph29/preview
2	https://archive.nptel.ac.in/courses/115/103/115103123/
3	https://www.scribd.com/document/291206127/Domestic-Electrical-Installation-pdf

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	1	3	3	3	3	3
Total	14	15	14	13	12	13	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.6	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS13	**ASTRO PHYSICS**	SEC-I	1	0	1	0	2	2	25	75	100

Learning Objectives	
LO1	Astrophysics is a branch of astronomy that deals with the physics of celestial objects and phenomena.
LO2	They use observations from telescopes, satellites, and other instruments, as well as theoretical models and simulations, to develop our understanding of the cosmos.
LO3	To understand the properties and behavior of astronomical objects such as stars, planets, galaxies, black holes, and the universe as a whole through the application of fundamental principles of physics.
LO4	Key areas of research in astrophysics include cosmology, the study of the origin, structure, and evolution of the universe; stellar astrophysics,
LO5	Investigate the structure and dynamics of galaxies and their clusters; and planetary science, which explores the composition, atmosphere, and geology of planets and other solar system bodies.

Unit	Content	Hours
1	**Telescopes:** Optical telescopes – magnifying power, brightness, resolving power and f/a ratio – types of reflecting and refracting telescopes – detectors and image processing – radio telescopes – Hubble space telescope.	6
2	**Solar System:** Bode's law of planetary distances – meteors, meteorites, comets, asteroids – Kuiper belt – Oort cloud – detection of gravitational waves – recent advances in astrophysics.	6
3	**Eclipses:** types of eclipses – solar eclipse – total and partial solar eclipse – lunar eclipse – total and partial lunar eclipse – transits. THE SUN: physical and orbital data – solar atmosphere – photosphere – chromosphere – solar corona – prominences – sunspots – 11year solar cycle – solar flares.	6
4	**Stellar Evolution:** H-R diagram – birth & death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae.	6
5	I. Visit to any one of the National Observatories. **Galaxies:** classification of galaxies – galaxy clusters –interactions of galaxies, dark matter and super clusters – evolving universe.	6

CO	Course Outcomes
CO1	Apply concept of vectors to understand concepts of the physics of celestial objects
CO2	Appreciate different behaviour of astronomical objects present in Nature while learning about phenomena related to these different astronomical objects
CO3	Quantify in different process and relate astrophysics include cosmology
CO4	Differentiate different types the composition, atmosphere, and geology of planets and other solar system bodies and understand their basis
CO5	Relate various properties of astrology's with their behaviour and connect them with different natural parameters involved.
Textbooks:	
1	Brijlal &N. Subramaniam, 2000, Heat and Thermodynamics, S.Chand& Co.
2	Narayanamoorthy&KrishnaRao, 1969, 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, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi.
5	Ghosh, 1996, Text Book of Sound, S.Chand&Co. 6. R.Murugeshan & Kiruthiga Sivaprasath, Thermal Physics, S.Chand& Co.
Reference Books:	
1	J.B.Rajam & C.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chand& Co. Ltd.
2	D.S.Mathur, Heat and Thermodynamics, Sultan Chand & Sons.
3	Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand & Co.
4	Resnick, Halliday&Walker,2010, Fundamentals of Physics, 6th Edition.
5	Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.
Web resources:	
1	https://www.space.com/26218-astrophysics.html
2	https://www.astro-physics.com/
3	https://web.astro.princeton.edu/academic/undergraduate-program/introduction-astrophysics
4	https://www.dundee.ac.uk/stories/what-astrophysics
5	https://www.holmarc.com/astro_physics.php

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	2	3	3	3	3	3
Total	14	15	14	13	12	14	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.8	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS14	**PHYSICS FOR EVERYDAY LIFE**	SEC - II	2	0	0	0	2	2	25	75	100

Learning Objectives	
LO1	Physics is all around us, shaping the world we live in and influencing countless aspects of our daily lives.
LO2	Understanding the basic principles of physics can not only help us appreciate the world around us but also make informed decisions in various aspects of our lives, from technology use to environmental stewardship.
LO3	Gravity: It keeps us grounded and affects everything from our ability to walk to the way objects fall.
LO4	Fluid dynamics: From the flow of water through pipes to the aerodynamics of vehicles, understanding fluid behavior helps optimize everything from plumbing systems to car designs.
LO5	Nuclear physics: Although less directly apparent, nuclear physics underpins technologies like medical imaging (MRI, PET scans) and nuclear energy production.

Unit	Content	Hours
1	**Mechanical Objects:** spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.	6
2	**Optical Instruments and Laser**: vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.	6
3	**Solar Energy:** Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.	6
4	**Physics Of Home Appliances:** bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners	6
5	**Indian Physicist And Their Contributions:** C.V.Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Dr. APJ Abdul Kalam and their contribution to science and technology.	6

CO	Course Outcomes
CO1	This includes comprehending Newton's laws of motion, the principles of conservation of energy and momentum, and basic concepts of thermodynamics.
CO2	Students should be able to recognize and apply physics principles in various everyday scenarios.
CO3	The course should help students develop problem-solving skills by applying physics principles to real-world situations.
CO4	This includes understanding the limitations of certain technologies or common misconceptions about physics concepts.
CO5	The course can emphasize interdisciplinary connections between physics and other fields such as biology, chemistry, engineering, and economics.
Textbooks:	
1	The Physics in our Daily Lives, Umme Ammara, Gugu cool Publishing, Hyderabad, 2019.
2	For the love of physics, Walter Lawin, Free Press, New York, 2011.
Reference Books:	
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. Chand & Co.
3	A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
Web resources:	
1	https://www.allenoverseas.com/blog/physics-in-daily-life-facts-examples-and-importance/
2	https://www.euroschoolindia.com/blogs/10-examples-of-physics-in-everyday-life/
3	https://www.geeksforgeeks.org/applications-of-physics-in-daily-life/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	1	3	3	3	3	3
Total	14	15	14	13	12	13	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.6	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHF11	**INTRODUCTORY PHYSICS**	FC	1	1	0	0	2	2	25	75	100

Learning Objectives	
LO1	The goal of introductory physics is to provide students with a basic understanding of the principles governing the physical world and to develop their problem-solving and critical thinking skills.
LO2	In introductory physics, students often learn about classical mechanics, which includes topics such as motion, forces, energy, and momentum.
LO3	It typically serves as a foundation for more advanced studies in physics and related fields.
LO4	Introductory physics is the branch of physics that covers the fundamental principles and concepts of the subject.
LO5	They also typically explore concepts in thermodynamics, electromagnetism, waves, optics, and occasionally elements of modern physics like relativity and quantum mechanics.

Unit	Content	Hours
1	**Measurements:** vectors, scalars –examples for scalars and vectors from physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions– standard physical constants.	6
2	**Forces:** different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces.	6
3	**Energy and momentum:** Different forms of energy– conservation Laws of momentum, energy – types of collisions –angular momentum– alternate energy sources–real life examples.	6
4	**Linear and circular motions:** 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.	6
5	**Properties of matter:** 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	6

CO	Course Outcomes
CO1	The course aims to show how the principles of physics are applied to real-world phenomena, ranging from motion of objects to the behaviour of electric circuits.
CO2	The course aims to develop students' problem-solving skills, particularly in applying physical principles to solve quantitative problems.
CO3	An introductory physics course often includes laboratory components where students conduct experiments to verify physical principles, analyze experimental data, and draw conclusions.
CO4	Physics relies heavily on mathematical tools for analysis and problem-solving.
CO5	The course aims to show how the principles of physics are applied to real-world phenomena, ranging from motion of objects to the behavior of electric circuits.
Textbooks:	
1	D.S. Mathur, 2010, Elements of Properties of Matter, S. Chand & Co
2	BrijLal & N. Subrahmanyam, 2003, Properties of Matter, S.Chand & Co.
Reference Books:	
1	H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S. Chand & Co.
Web resources:	
1	http://hyperphysics.phyastr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/
2	https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	2	3	3	3	3	3
Total	14	15	14	13	12	14	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.8	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC21	**Heat & Thermodynamics And Statistical Physics**	CC	6	0	0	0	5	6	25	75	100

Learning Objectives

LO1	Define key terms such as temperature, heat, work, and internal energy. Describe the laws of thermodynamics and their implications.
LO2	Apply the first law to various thermodynamic processes (isothermal, adiabatic, etc.), Solve problems involving energy conservation in thermodynamic systems.
LO3	Explain the concept of entropy and its significance in natural processes. Apply the second law to real- world systems and understand its implications for efficiency.
LO4	Analyze different thermodynamic cycles (e.g., Carnot cycle). Calculate efficiency and work output of various cycles.
LO5	Derive and apply the Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac distributions. Analyze systems of indistinguishable particles and their implications for classical and quantum gases.

Unit	Content	Hours
1	**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 method for determination of C_P **LOW TEMPERATURE PHYSICS:** Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyle temperature – temperatureofinversion–liquefactionofgasbyLinde'sProcess– adiabatic demagnetization.	18
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.	18
3	**THERMODYNAMICS-II:** second law of thermodynamics – entropychange in reversible and irreversibleprocesses–T- SdiagramMaxwell's thermodynamical relations –Clausius- Clapeyron's equation (first latent heat equation) – third law of thermodynamics–unattainabilityofabsolutezero– heatdeath.	18
4	**HEAT TRANSFER:** modes of heat transfer: conduction, convection and radiation. *Conduction*: thermal conductivity – determination of thermal conductivity of a good conductor and bad conductor. *Radiation*:blackbodyradiation(Ferry'smethod)–distributionof energy in black body radiation – Wien's law and Rayleigh Jean's law –Planck's law of radiation – Stefan's law.	18
5	**STATISTICALMECHANICS:**definitionofphase-space–micro and macro states – 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 – comparisonofthreestatistics.	18

CO	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.
CO2	Derive the efficiency of Carnot's engine. Discuss the implication soft laws of thermodynamics indiese land petrolengines
CO3	Able to analyze performance of thermodynamic systemsviz efficiency by problems. Get san insight in to thermodynamic properties like enthalpy, entropy
CO4	Study the process of thermal conductivity and apply it to good and bad conductors. Quantify different parameters relatedto heat, relate them with various physical parameter sandanalyse 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 photonan delectron
Textbooks:	
1	Brijlal&N.Subramaniam,2000,HeatandThermodynamics, S.Chand& Co.
2	Narayanamoorthy&KrishnaRao,1969,Heat,TriveniPublishers, Chennai. R.Murugeshan&KiruthigaSivaprasath,ThermalPhysics, S.Chand& Co.
3	V.R.Khanna&R.S.Bedi,19981stEdition,TextbookofSound, Kedharnaath Publish & Co, Meerut
4	Brijlal and N. Subramanyam, 2001, Waves and oscillations,VikasPublishingHouse,NewDelhi.
5	Ghosh,1996,TextBookofSound,S. Chand&Co.
Reference Books:	
1	J.B.Rajam&C.L.Arora,1976,HeatandThermodynamics,8th edition, S.Chand& Co. Ltd.
2	D.S.Mathur,HeatandThermodynamics,SultanChand&Sons.
3	Gupta,Kumar,Sharma,2013,StatisticalMechanics,26th Edition, S. Chand & Co.
4	Resnick,Halliday&Walker,2010,FundamentalsofPhysics,6th Edition.
5	Sears, Zemansky, Hugh D. Young,Roger A. Freedman 2021 UniversityPhysicswithModernPhysics15thEdition,Pearson.
Web resources:	
1	https://www.youtube.com/watch?v=4M72kQulGKk&vl=en
2	https://youtu.be/M_5KYncYNyc

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	2	3	3	3	3	3
Total	14	15	14	13	12	14	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.8	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC22P	**Heat & Thermodynamics and Statistical Physics Practical**	CC - P	0	0	5	0	2	5	25	75	100

Learning Objectives

LO1	Apply their knowledge gained about the concept of heat,
LO2	To resonance, calculate frequency of ac mains set up experimentation
LO3	To verify theories, quantify and analyze, able to do error analysis and correlate results
LO4	To understand the sound waves and its properties
LO5	To understand the thermal conductivity.

Unit	Content	Hours
	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 specific heat capacity of solid-method of mixtures. 5. Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction/graphical method), 6. Determination of Latent heat of a vaporization of a liquid. 7. Determination of Stefan's constant for Black body radiation. 8. Verification of Stefan's-Boltzmann's law. 9. Determination of thermal conductivity of rubber tube. 10. Velocity of sound through a wire using Sonometer. 11. Determination of velocity of sound using Kund's tube. 12. Determination of frequency of an electrically maintained tuning fork 13. To verify the laws of transverse vibration using sonometer. 14. To verify the laws of transverse vibration using Melde's apparatus. 15. To compare the mass per unit length of two strings using Melde's apparatus. Frequency of AC by using sonometer.	60

CO	Course Outcomes
CO1	Understand various postulates of special theory of relativity.
CO2	Appreciate the importance of transformation equations and also, the general theory of relativity**.**
CO3	Realize the wave nature of matter and understand its importance
CO4	Derive Schrodinger equation and also realize the use of operators.
CO5	Apply Schrödinger equation to simple problems.
Textbooks:	
1	Texbook of General Practical Experiments – Dr. Srinivasan
Reference Books:	
1	J.B.Rajam&C.L.Arora,1976,HeatandThermodynamics,8th edition, S.Chand& Co. Ltd.
2	D.S.Mathur,HeatandThermodynamics,SultanChand&Sons.

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	2	3	3	3	3	3
Total	14	15	14	13	12	14	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.8	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS21	**Elements of Computer Science**	SEC	1	0	1	0	2	2	25	75	100

Learning Objectives	
LO1	To provide an overview of the subjects of computer science.
LO2	To develop the knowledge of basic computers
LO3	To acquire knowledge of programming and software data structures.
LO4	To provide the knowledge about operating systems
LO5	To study and to understand the computer networks

Unit	Content	Hours
1	**Basics of a Computer** – – P.C. Architecture Functional block diagram of a computer. Processors Introduction to Microprocessor. CISC, RISC processors**.** Hardware, Software, Generations of computers. Hardware - functional units, Components of CPU, Memory – hierarchy, types of memory, Input and output devices.	6
2	**Software** – Systems software, application software, Software development – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures.	6
3	**Operating systems:** Functions of operating systems, types of operating systems, Device & Resource management. **Database Management Systems**: Data models - DBMS, Database Transactions, data centers, cloud services.	6
4	**Computer Networks:** Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, 5G communication. World Wide Web – Basics, role of HTML, Tools for web designing, Security – information security, cyber security, cyber laws	6
5	**Autonomous Systems:** IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development, natural language processing, image and video processing. Cloud Basics	6

CO	Course Outcomes
CO1	Know the working principles of functional units of a basic computer
CO2	Understand program development, the use of data structures and algorithms in problem solving.
CO3	Know the need and types of operating system, database systems.
CO4	Understand the significance of networks, internet, and WWW and cyber security.
CO5	Understand Autonomous systems, the application of artificial intelligence.
Textbooks:	
1	Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.
Reference Books:	
1	Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
2	Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
3	Computer Fundamentals, Anita Goel, Pearson Education India, 2010.
4	Elements of computer science, Cengage.
Web resources:	
1	https://siiet.ac.in/wp-content/uploads/2024/04/ELEMEMTS-OF-COMPUTER-SCIENCE-ENGINEERING-1.pdf
2	https://files.mlrit.ac.in/curriculum/all/cse/CSE-R22/1-2/ELEMENTS-OF-COMPUTER-SCIENCE-AND-ENGINEERING.pdf
3	https://www.studocu.com/in/document/jawaharlal-nehru-technological-university-hyderabad/computer-science-and-engineering/elements-of-computer-science-jntu/50699762
4	https://www.elementsofcomputerscience.com/
5	https://senecalearning.com/en-GB/revision-notes/ks3/computer-science/national-curriculum/3-1-1-elements-of-computer-systems

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	2	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	2	1	3	3	3	3	3
Total	14	15	14	13	12	13	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.6	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low