



Marudhar Kesari Jain College for Women (Autonomous)

Vaniyambadi

Regulations 2024- 2025

PG & Research Department of Physics

For

Undergraduate Programme

Bachelor of Physics

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LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE AND POSTGRADUATE 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 21st 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	3Years[UG]
Programme Outcomes	<p>PO1: Acquire knowledge in Physics to apply the knowledge in their day-to-day life for betterment of self and society.</p> <p>PO2: Develop critical, analytical thinking and problem-solving skills</p> <p>PO3: Develop research related skills in defining the problem, formulate and test the hypothesis, analyse, interpret, and draw conclusion from data.</p> <p>PO4: Address and develop solutions for societal and environmental needs of local regional and national development.</p> <p>PO5: Work independently and engage in lifelong learning and enduring proficient progress.</p> <p>PO6: Provoke employability and entrepreneurship among students along with ethics and communication skills.</p> <p>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.</p> <p>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.</p>
Programme Specific Outcomes:	<p>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.</p> <p>PSO2: Entrepreneur: Acquire employability and entrepreneurial skills through hands-on training 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.</p> <p>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.</p>

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 off beat situations, Discussion, Debating or Presentations	

Department of Physics

Semester -I							Semester -II						
Code	CourseTitle	Hours Distribution				C	Code	CourseTitle	HoursDistribution				C
		L	T	P	S				L	T	P	S	
24UFTA11/ 24UFUR11	Tamil –I/Urdu-I	4	1	0	0	3	24UFTA21	Tamil – II/Urdu -II	4	1	0	0	3
24UFEN11	English -I	4	1	0	0	3	24UFEN21	English –II	4	1	0	0	3
24UPHC11	CC- 1 Properties of Matter &Acoustics	3	1	2	0	5	24UPHC21	CC – 3 Heat & Thermodynamics and Statistical Physics	3	1	2	0	5
24UPHC12P	CC- 2 Practicals -I Properties of Matter & Acoustics	0	0	4	0	3	24UPHC22P	CC - 4 Practical -II Heat & Thermodynamics and Statistical Physics	0	0	4	0	3
24UMAA14	EC-1Mathematics-I	3	1	0	0	3	24UMAA24	EC-2 MathematicsII	4	2	0	0	5
24UPHS11/ 24UPHS12	SEC- 1 Home Electrical Installation/Energy Physics	2	0	0	0	2	24UPHS21	SEC – 3 Elements of Computer Science	1	0	1	0	2
24UPHS13/ 24UPHS14	SEC – 2 Physics for Every Day Life /Astrophysics	1	1	0	0	2	24UAEC21	AEC –I Life Skill for Yoga	1	1	0	0	2
24UPHF11	FC –Introductory Physics	1	1	0	0	2	TOTAL				30	23	
TOTAL		30				23	Semester –IV						
Code	CourseTitle	Hours Distribution				C	Code	CourseTitle	Hours Distribution				C
		L	T	P	S				L	T	P	S	
24UFTA31	Tamil -3	4	1	0	0	3	24UFTA41	Tamil –4	4	1	0	0	3
24UFEN31	English -3	4	1	0	0	3	24UFEN41	English –4	4	1	0	0	3
24UPHC31	CC –5 General and Classical Mechanics	3	1	2	0	5	24UPHC41	CC –7 Optics and LaserPhysics	5	1	0	0	5
24UPHC32P	CC – 6 Practical III - Electricity	0	0	4	0	2	24UPHC42P	CC – 8 Practical IV- LightExperiments	0	0	4	0	2
24UCHA31	EC - 3 Allied Chemistry- I	3	1	0	0	4	24UCHA41/ 24UPHA42	EC – 5 1. Allied Chemistry – II 2.Numerical Methods and Programming inC	3	1	0	0	4
24UCHA32P	EC – 4 Practical Allied Chemistry-I	0	0	2	0	2	24UCHA41P/ 24UPHA42P	EC – 6 1. Chemistry Practical forPhysical and Biological Sciences-II 2.Practical- Numerical Methods and Programming inC	0	0	2	0	2
24UPHS31/ 24UPHS32	SEC –4 1.Nanoscience and Nanotechnology 2. Physics of Medical Instruments	1	0	1	0	2	24UPHS41	SEC –5. Physics WorkshopSkills	1	1	0	0	2
24UAEC31	AEC – 2 Human Values and ProfessionalEthics	1	1	0	0	2	24UAEC41	AEC – 3 Environmental Studies and Disaster Management	1	1	0	0	2
TOTAL		30				23	TOTAL				30	23	

Semester -V							Semester -VI						
Code	Course Title	Hours Distribution				C	Code	Course Title	Hours Distribution				C
		L	T	P	S				L	T	P	S	
24UPHC51	CC – 9 Atomic and Molecular Physics	4	1	0	0	5	24UPHC61	CC- 13 Basic and Applied Electronics	4	1	0	0	4
24UPHC52P	CC- 10 General Experiments- Practical	0	0	4	0	3	24UPHC62P	CC – 14 Electronics Experiments-Practical	0	0	5	0	3
24UPHC53	CC – 11 Digital Electronics and Microprocessor –8085	4	0	0	0	4	24UPHC63P	CC – 15 Group-Project	0	0	0	5	4
24UPHC54P	CC - 12 Digital Electronics and Microprocessor –8085 Practical	0	0	3	0	2	24UPHE61/ 24UPHE62	EC – 9 1. Laser and Fiber optics 2. Radiation Safety	4	1	0	0	4
24UPHE51/ 24UPHE52	EC – 7 1. Relativity and Quantum Mechanics 2. Physics of Music	4	1	0	0	4	24UPHE63/ 24UPHE64	EC –10 1. Communication System 2. Digital Photography	4	1	0	0	4
24UPHE53/ 24UPHE54	EC – 8 1.Solid State Physics 2. Materials Science	4	1	0	0	4	24UPHP61	PEC – 1 Weather Forecasting	2	0	0	0	2
24UAEC51	AEC – 4 Gender Equality and Social Inclusion	2	0	0	0	2	24UPHL61	SLC – 1 Cell Phone Technology	0	0	0	3	2
24UPHIN51	Internship					2							
24UPHIK51	Ancient Indian Knowledge in Physics				2	–							
TOTAL						30	26	TOTAL				30	23
												141	+2*

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 Nanmulalvan 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 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
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-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-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	<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 & 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 Poiseuille'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.phy-astr.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.Murugesan & 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.html https://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 – temperature of inversion – liquefaction of gas by Linde's Process – 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 – entropy change in reversible and irreversible processes – T-S diagram Maxwell's thermodynamical relations – Clausius- Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.										18
4	HEAT TRANSFER: modes of heat transfer: conduction, convection and radiation. <i>Conduction:</i> thermal conductivity – determination of thermal conductivity of a good conductor and bad conductor. <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.										18
5	STATISTICAL MECHANICS: definition of phase-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 – comparison of three statistics.										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 systems viz 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 related to 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,19981 st Edition,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,8 th 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
	<ol style="list-style-type: none"> 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,8 th 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/ELEMENTS-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

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC31	GENERAL AND CLASSICAL MECHANICS	Core	5	0	0	0	5	5	25	75	100
Learning Objectives											
LO1	To have a basic understanding of the laws and principles of mechanics.										
LO2	To apply the concepts of forces existing in the system.										
LO3	To understand the forces of physics in everyday life										
LO4	To analyse the theory and application of rigid body motion										
LO5	To apply Lagrangian equation to solve complex problems										
Unit	Content										Hours
1	LAWS OF MOTION: Newton's Laws– forces – equations of motion- motion of a particle in a uniform gravitational field. Gravitation: Kepler's laws, Newton's law of gravitation – Determination of G by Boy's method -weightlessness – earth satellites – parking orbit – earth density -gravitational potential – escape velocity – potential and kinetic energy of satellite –Einstein's theory of gravitation – introduction –principle of equivalence.										15
2	CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM: conservation of linear and angular momentum – Internal forces and momentum conservation – center of mass-general elastic collision of particles of different masses – system with variable mass -conservation of angular momentum – torque due to internal forces – torque due to gravity.										15
3	CONSERVATION LAWS OF ENERGY: Introduction – significance of conservation laws – law of conservation of energy concepts of work- power – energy – conservative forces – potential energy and conservation of energy in gravitational and electric field- non-conservative forces – general law of conservation of energy.										15
4	RIGID BODY DYNAMICS: Translational and rotational motion – angular momentum – moment of inertia – general theorems of moment of inertia– rotation about fixed axis (solid and hollow sphere)– kinetic energy of rotation -body rolling along a plane surface – body rolling down an inclined plane – gyroscopic precision – gyrostatic applications.										15
5	LAGRANGIAN MECHANICS: generalized coordinates – degrees of freedom – constraints - principle of virtual work and D' Alembert's Principle –Lagrange's equation from D' Alembert's principle – application –simple pendulum – Atwood's machine.										15

CO	Course Outcomes
	Students will be able to
CO1	Apply the Newton's Law of motion, analyse general theory of relativity, Kepler's laws and realize the basic principles behind planetary motion.
CO2	Examine the conservation law of linear and angular momentum
CO3	Apply conservation law and calculate energy of various systems, understand and differentiate conservative and non-conservative forces
CO4	Examine rigid body dynamics and solve problems based on this concept
CO5	Appreciate Lagrangian system of mechanics, apply D' Alembert's principle
Textbooks:	
1	PJ.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai.
2	P.DuraiPandian, LaxmiDuraiPandian, MuthamizhJayapragasam,2005, Mechanics, 6threvised edition, S.Chand& Co.
3	D. S. Mathur & P. S. Hemne, 2000, Mechanics, Revised Edition, S.Chand& Co.
4	Narayanamurthi, M.&Nagarathnam. N, 1998, Dynamics. The National Publishing,Chennai.
5	Narayanamurthi, M. and Nagarathnam, N, 1982, Statics, 18 Hydrostatics and Hydrodynamics, The National Publishers, Chennai.
Reference Books:	
1	Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesely.
2	Halliday, David & Robert, Resnick, 1995, Physics Vol.I. New Age, International, Chennai.
3	Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi
Web resources:	
1	https://nptel.ac.in/courses/115103115
2	https://www.youtube.com/watch?v=p075LPq3Eas
3	https://onlinecourses.nptel.ac.in/noc22_me96/preview
4	https://onlinecourses.nptel.ac.in/noc21_me70/preview
5	https://www.youtube.com/watch?v=mH_pS6fruyg

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	2	3	3	3
CO2	3	3	3	3	3	2	3	2	3	3	3
CO3	2	3	3	2	3	2	3	2	3	3	3
CO4	3	3	3	3	3	2	3	3	3	3	3
CO5	3	3	3	2	3	2	3	3	3	3	3
Total	14	15	15	13	15	10	15	12	15	15	15
Average	2.8	3	3	2.6	3	2	3	2.4	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC32P	PRACTICALS-III ELECTRICITY	Core	0	0	4	0	2	4	25	75	100

Learning Objectives

LO	To learn to construct circuits with concept of electricity, current, resistance in the path of current and different parameters.
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Unit	Content	Hours
1	<p style="text-align: center;">Any eight experiments</p> <ol style="list-style-type: none"> 1. Calibration of low range and high range voltmeter using potentiometer 2. Calibration of ammeter using potentiometer. 3. Measurement of low resistances using potentiometer. 4. Determination of field along the axis of a current carrying circular coil. 5. Determination of earth's magnetic field using field along axis of current carrying coil. 6. Determination of specific resistance of the material of the wire using PO box. 7. Determination of resistance and specific resistance using Carey Foster's bridge. 8. Determination of internal resistance of a cell using potentiometer. 9. Determination of specific conductance of an electrolyte. 10. Determination of e.m.f of thermo couple using potentiometer 11. Determination of capacitance using Desauty's bridge and B.G./Spot galvanometer/head phone. 12. Determination of figure of merit of BG or spot galvanometer. 13. Comparison of EMF of two cells using BG. 14. Comparison of capacitance using BG. 	60

CO	Course Outcomes
CO	Students will be able to Construct circuit and demonstrate the analysis of different parameter of electricity.

Textbooks:

1	Dr. Srinivasan, Practical Physics Book, Chand & Co
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2ND YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCHA31	Allied Chemistry - I	EC-3	3	1	0	0	4	4	25	75	100
Learning Objectives											
LO1	To predict molecular properties using MO theory and analyze nuclear processes.										
LO2	To classify and discuss fuel gases and silicone properties/applications.										
LO3	To relate structure/bonding to properties using electronic effects.										
LO4	To apply thermodynamic principles and interpret phase diagrams.										
LO5	To perform volumetric calculations and select separation methods.										
Unit	Content									Hours	
1	Chemical Bonding and Nuclear Chemistry: Chemical Bonding: Molecular Orbital Theory - bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Applications of radioisotopes.									12	
2	Industrial Chemistry Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones.									12	
3	Fundamental Concepts in Organic Chemistry Hybridization: Orbital overlap, hybridization and geometry of CH ₄ , C ₂ H ₂ and C ₆ H ₆ . Electronic effects: Inductive effect and consequences on K _a and K _b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.									12	
4	Thermodynamics and Phase Equilibria: Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).									12	
5	Analytical Chemistry: Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques – extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.									12	

Course Outcomes	
CO	Students will be able to
CO1	Apply MO theory to predict molecular properties such as bond order and magnetism, and analyze nuclear processes including radioactive decay and nuclear reactions.
CO2	Classify various fuel gases and discuss the properties and applications of silicones in industrial and consumer contexts.
CO3	Correlate molecular structure and bonding with physical and chemical properties by analyzing electronic effects such as inductive, resonance, and hyperconjugation.
CO4	Utilize thermodynamic principles to analyze chemical systems and interpret phase diagrams to understand phase equilibria.
CO5	Conduct accurate volumetric calculations and select appropriate separation methods based on the physical and chemical properties of mixture components.
Textbooks:	
1.	F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus, “ <i>Basic Inorganic Chemistry</i> ”, 3 rd ed., Wiley, 1995.
2.	B.K. Sharma, “ <i>Industrial Chemistry</i> ”, 16 th ed., Goel Publishing House, 2017.
3.	Jonathan Clayden, Nick Greeves, Stuart Warren, Peter Wothers, “ <i>Organic Chemistry</i> ”, 2 nd ed., Oxford University Press, 2012.
4.	P.W. Atkins, J. de Paula, “ <i>Atkins' Physical Chemistry</i> ”, 11 th ed., Oxford University Press, 2017.
5.	Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, “ <i>Fundamentals of Analytical Chemistry</i> ”, 9 th ed., Cengage Learning, 2013.
Reference Books:	
1.	James E. Huheey, Ellen A. Keiter, Richard L. Keiter, “ <i>Inorganic Chemistry: Principles of Structure and Reactivity</i> ”, 4 th ed., Pearson, 1997.
2.	M.G. Fontana, “ <i>Industrial Chemistry</i> ”, 3 rd ed., McGraw-Hill, 2005.
3.	Paula Yurkanis Bruice, “ <i>Organic Chemistry</i> ”, 8 th ed., Pearson, 2016.
4.	J. Rajaram, J.C. Kuriacose, “ <i>Thermodynamics for Chemists</i> ”, 1 st ed., S Chand, 1999.
5.	Gary D. Christian, “ <i>Analytical Chemistry</i> ”, 7 th ed., Wiley, 2003.
Web resources:	
1.	www.khanacademy.org/science/chemistry
2.	https://chem.libretexts.org
3.	https://chem.libretexts.org/Bookshelves/Organic_Chemistry
4.	https://ocw.mit.edu/courses/chemistry/
5.	https://chem.libretexts.org/Bookshelves/Analytical_Chemistry

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	1	2	2	3	3	3
CO2	3	3	3	2	3	1	2	3	2	3	3
CO3	3	3	3	2	2	1	2	2	3	3	3
CO4	3	3	3	2	2	1	2	2	3	2	3
CO5	3	3	3	2	3	1	2	3	2	3	2
Total	15	13	13	10	13	05	10	12	13	14	14
Average	3.0	3.0	3.0	2.0	2.6	1.0	2.8	2.4	2.6	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2ND YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCHA32P	Allied Chemistry Practical - I	EC-4	0	0	2	0	2	2	25	75	100
Learning Objectives											
LO1	To perform standard titration procedures accurately.										
LO2	To demonstrate proficiency in using volumetric glassware (burette, pipette, volumetric flask) and other laboratory equipment essential for titrations safely.										
LO3	To perform stoichiometric calculations to determine the concentration of an unknown solution using titration data.										
LO4	To explain the underlying chemical principles of the specific type of titration being performed (acid-base, redox, or complexometric).										
LO5	To analyze titration data, including identifying sources of error and evaluating the precision and accuracy of their results.										
Unit	Content									Hours	
1	VOLUMETRIC ANALYSIS										
	1. Estimation of sodium hydroxide using standard sodium carbonate.										
	2. Estimation of hydrochloric acid using standard oxalic acid.										
	3. Estimation of ferrous sulphate using standard Mohr's salt.										
	4. Estimation of oxalic acid using standard ferrous sulphate.										
2	5. Estimation of potassium permanganate using standard sodium hydroxide.										
3	6. Estimation of magnesium using EDTA.										
4	7. Estimation of calcium using EDTA.										
5	8. Estimation of ferrous ion using diphenyl amine as indicator.										

SCHEME OF VALUATION
ALLIED CHEMISTRY PRACTICAL-I
(For Physics – II year/III Semester)

Internal assessment: 25 Marks

External assessment: 75 marks

Total: 100 marks

Max. Marks: 75

Record: 15 Marks

Volumetric Analysis: 60 Marks

Volumetric Analysis : 60 Marks (Maximum)

Short Procedure : 10 Marks

Error upto 2 % : 50 Marks

2 to 3 % : 40 Marks

3 to 4 % : 30 Marks

4 to 5 % : 20 Marks

> 5 % : 10 Marks

Arithmetic error : Deduct 1 mark

Wrong calculation : Deduct 20 % of marks scored

No calculation : Deduct 40 % of marks scored

Course Outcomes	
CO	Students will be able to
CO1	Design, carry out, record and interpret the results of volumetric titration.
CO2	Gain an understanding of the safe use of standard flask and volumetric pipettes, burette.
CO3	Perform stoichiometric calculations to determine the concentration of unknown solutions using data obtained from titration experiments.
CO4	Explain the underlying chemical principles governing various types of titrations, including acid-base, redox, and complexometric titrations, and their applications.
CO5	Analyze titration data, identify potential sources of error, and evaluate the precision and accuracy of experimental results.
Textbooks:	
1.	A.I. Vogel, " <i>A Textbook of Quantitative Inorganic Analysis</i> ", 4 th ed., Longman, 1978.
2.	J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, " <i>Vogel's Textbook of Quantitative Chemical Analysis</i> ", 6 th ed., Pearson, 2000.
3.	Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, " <i>Fundamentals of Analytical Chemistry</i> ", 9 th ed., Cengage Learning, 2013.
4.	Daniel C. Harris, " <i>Quantitative Chemical Analysis</i> ", 9 th ed., W. H. Freeman, 2015.
5.	Larry G. Hargis, " <i>Analytical Chemistry: Principles and Techniques</i> ", 1 st ed., Prentice Hall, 1988.
Reference Books:	
1.	Gary D. Christian, " <i>Analytical Chemistry</i> ", 7 th ed., Wiley, 2013.
2.	Douglas A. Skoog, F. James Holler, Stanley R. Crouch, " <i>Principles of Instrumental Analysis</i> ", 7 th ed., Cengage Learning, 2017.
3.	G. Svehla, " <i>Vogel's Qualitative Inorganic Analysis</i> ", 7 th ed., Pearson, 1996.
4.	Douglas A. Skoog, Donald M. West, F. James Holler, " <i>Analytical Chemistry: An Introduction</i> ", 7 th ed., Saunders College Publishing, 2000.
5.	David Harvey, " <i>Modern Analytical Chemistry</i> ", 1 st ed., McGraw-Hill, 2000.
Web resources:	
1.	https://www.wiredchemist.com/chemistry/instructional/laboratory-tutorials/volumetric-analysis?utm_source=chatgpt.com
2.	https://www.coursesidekick.com/chemistry/1516334?utm_source=chatgpt.com
3.	https://www.youtube.com/watch?v=INN9pdpHte0&utm_source=chatgpt.com
4.	https://en.wikipedia.org/wiki/Titration?utm_source=chatgpt.com
5.	https://geo1.tcu.edu/richards/Lab%204.pdf?utm_source=chatgpt.com

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	2	3	3	3
CO2	3	3	3	2	2	2	2	3	2	3	3
CO3	3	3	3	2	3	2	2	3	3	2	3
CO4	3	3	3	2	3	2	2	2	3	3	3
CO5	3	3	3	2	2	2	2	2	3	3	3
Total	15	15	15	10	13	10	10	12	14	14	14
Average	3.0	3.0	3.0	2.0	2.6	2.0	2.0	2.4	2.8	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS31	NANOSCIENCE AND NANOTECHNOLOGY	Skill	2	0	0	0	2	2	25	75	100
Learning Objectives											
LO1	To comprehend the fundamental principles of Nanoscience and Nanotechnology.										
LO2	To understand the properties of Nano-materials.										
LO3	To study the different types of fabrication methods of preparations.										
LO4	To analyze and study the characterization techniques of nanomaterials.										
LO5	To understand the applications of nanomaterials.										
Unit	Content										Hours
1	NANOSCIENCE AND NANOTECHNOLOGY: Nanoscale– nature and nanostructures – nanostructures: 0D, 1D,2D– surface to volume ratio– size effect –quantum confinement– metal based nanoparticles – nanocomposites (non-polymer based) – carbon nanostructures.										6
2	PROPERTIES OF NANO-MATERIALS: Mechanical behavior –elastic properties – hardness and strength – ductility and toughness –superplastic behavior – optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties – magnetic properties – super paramagnetism – electrochemical properties – properties of CNTs.										6
3	FABRICATION METHODS AND VACUUM TECHNIQUES: Top down and bottom-up approaches – electrochemical method – chemical & physical vapour depositions (CVD & PVD) – plasma arc discharge – sputtering – thermal evaporation – pulsed laser deposition – ball milling – sol-gel methods – synthesis of CNT.										6
4	CHARACTERIZATION TECHNIQUES: Atomic force microscopy – scanning electron microscopy – transmission electron microscopy –powder XRD method: determination of structure and grain size analysis – UV-visible and photoluminescence spectroscopy.										6
5	APPLICATIONS OF NANOMATERIALS: Medicine: drug delivery – photodynamic therapy – molecular motors –energy: fuel cells – rechargeable batteries – supercapacitors– photovoltaics. sensors: nanosensors based on optical and physical properties – electrochemical sensors-nanoelectronics: nanorobots.										6

Course Outcomes	
CO	Students will be able to
CO1	Explain the fundamental principles of Nanoscience and Nanotechnology.
CO2	Analyse the properties of nanomaterials
CO3	Identify and describe the different types of fabrication methods of preparations.
CO4	Describe the different methods of characterization techniques
CO5	Evaluate the economic and environmental benefits of applications of Nano-materials
Textbooks:	
1	K.K.Chattopadhyay and A.N.Banerjee, (2012), Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd.,
2	M.A. Shah, Tokeer Ahmad (2010), Principles of Nanoscience and Nanotechnology, Narosa Publishing House Pvt Ltd.
3	Mick Wilson, et al (2005) Nanotechnology, Overseas Press.
Reference Books:	
1	Richard Booker and Earl Boysen, (2005) Nanotechnology, Wiley Publishing Inc. USA
2	J.H.Fendler (2007) Nano particles and nano structured films; Preparation, Characterization and Applications, John Wiley & Sons
3	B.S.Murty, et al (2012) Textbook of Nanoscience and Nanotechnology, Universities Press
Web resources:	
1	https://www.ijnnonline.net/
2	http://www.sapub.org/journal/aimsandscope.aspx?journalid=1014
3	https://www.shiksha.com/engineering/nanotechnology-chp
4	https://www.coursera.org/courses?query=nanotechnology
5	https://onlinecourses.swayam2.ac.in/cec24_cy03/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3	3	3	3	3
CO2	2	2	2	2	2	2	3	2	3	3	3
CO3	2	2	3	2	2	3	3	2	3	3	3
CO4	2	3	2	3	2	2	3	2	3	3	3
CO5	3	3	2	2	2	3	3	3	3	3	3
Total	14	13	12	11	10	12	15	12	15	15	15
Average	2.8	2.6	2.4	2.2	2	2.4	3	2.4	3	3	3

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS32	PHYSICS OF MEDICAL INSTRUMENTS	Skill	2	0	0	0	2	2	25	75	100
Learning Objectives											
LO1	To learn about the modern tools and equipment used in measuring bio-potentials in medical practice and research.										
LO2	To gain in-depth knowledge about the principles of bio-potential recording systems, including the ECG, EEG, and EMG.										
LO3	To gain knowledge about the concept of diathermy and its applications in the operation theatre also explore the various radiation safety devices										
LO4	To understand the working principle of CT, MRI scanning, which is based on X-rays and to create cross-sectional images of the body.										
LO5	To identify the different types of radiography techniques and how X-rays are used in various diagnostic scenarios.										
Unit	Content										Hours
1	BIO-POTENTIALS AND ELECTRODES: transport of ions through cell membrane- resting and action potential - Characteristics of resting potential – bio-electric potential– components of bio-medical instrumentation – electrodes – electrode potential -types of electrodes – the pH electrode.										6
2	BIO-POTENTIAL BASED INSTRUMENTATION: Electrocardiography (ECG)-ECG lead configuration–block diagram of ECG recording set up - Electroencephalography (EEG) – origin of EEG – action and evoked potentials - block diagram of modern EEG set up – electromyography (EMG) – block diagram of EMG recording setup.										6
3	OPERATION THEATRE AND SAFETY: diathermy – block diagram of the electrosurgical diathermy– shortwave, microwave, ultrasonic diathermy – ventilators. RADIATION SAFETY: units of radiation - pocket dosimeter – pocket type radiation alarm – thermo-luminescence dosimeter.										6
4	MEDICAL IMAGING: nuclear imaging technique –computer tomography (CT) – principle -construction –block diagram of CT scanner – ultrasonic imaging systems – construction of transducer – display modes – MRI principle and instrumentation.										6
5	DIAGNOSTICS AND SPECIALITIES: X-rays in radiography – fluoroscopy – comparison– image intensifiers – angiography – applications of X-ray. LASER IN MEDICINE: laser interactions with biomolecules – advantages of laser surgery – endoscopy – types of endoscopes with their operation.										6

Course Outcomes	
CO	Students will be able to
CO1	Explain the concept of bio-potentials, including the transport of ions through cell membranes and the mechanisms of resting and action potentials.
CO2	Evaluate the modern tools and equipment used in measuring bio-potentials in medical practice and research.
CO3	Describe various types of diathermy techniques (shortwave, microwave, ultrasonic) and their applications in surgery.
CO4	Draw and analyze the block diagram of a MRI, CT scanner, identifying each component's role in the imaging process.
CO5	Explain the principles behind laser therapy, its interactions with biological tissues, and its specific applications in surgery.
Textbooks:	
1	Biomedical Instrumentation and measurement, Leslie Cromwell, PHI, 2015
2	Medical Instrumentation, M. Arumugam, Anuradha agencies, 1992
3	Medical Electronics, M.J.Kumar Doss, Prathibha Publishers, 1987
Reference Books:	
1	Medical Physics, John R. Cameron and James G. Skofronick, Thrift books, Atlanta, 1985
2	Electronic Instruments and Instrumentation Technology, M. M.M.Anand, PHI, 2015
Web resources:	
1	https://www.bing.com/ck/a?!&&p=f19d807c5befca2859194ecc8eed68b8357654840f53f35e984d5916e380fcc3JmltdHM9MTczODcxMzYwMA&ptn=3&ver=2&hsh=4&fclid=39e87f5f-7d46-6aea-0730-6d5d7c8a6be4&psq=PHYSICS+OF+MEDICAL+INSTRUMENTS&u=a1aHR0cHM6Ly96bGliLnB1Yi9ib29rL2hhbmRib29rLW9mLWJpb21lZGJyYWwtaW5zdHJ1bWVudGF0aW9uLTJnMWUxNTlhdXBsZw&ntb=1

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3	3	3	3	3
CO2	2	2	2	2	2	2	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	3	3	3
CO4	2	3	2	3	2	2	3	2	3	3	3
CO5	3	3	2	3	2	3	3	2	3	3	3
Total	13	13	12	13	10	12	15	11	15	15	15
Average	2.6	2.6	2.4	2.6	2	2.4	3	2.2	3	3	3

**SECONDYEAR–
SEMESTER III**

AEC– 2

HUMANVALUESANDINDIANKNOWLEDGESYSTEM

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UAEC31	AEC – 2: HUMAN VALUES AND INDIAN KNOWLEDGESYSTEM	AEC-2	1	1	0	0	2	2	25	75	100
Learning Objectives											
LO1	To identify and describe universal human values (Truth, Love, Peace, Righteousness, and Non-violence).										
LO2	To interpret Indian ethical concepts like Dharma, Karma, and Nishkama Karma.										
LO3	To discuss contributions of Aryabhata, Charaka, Sushruta, and Chanakya to science and governance.										
LO4	To Analyze ethical and scientific insights from Bhagavad Gita, Yoga Sutras, and Arthashastra.										
LO5	To Apply leadership and management lessons from Indian traditions in professional life.										
Unit	Content									Hours	
1	Introduction to Human Values: Meaning and importance of human values - Universal human values: Truth, Love, Peace, Righteousness, and Non-violence – Role of ethics and morality in personal and professional life Value-based education and character building.									6	
2	Ethics and Decision Making: Ethical theories: Utilitarianism, Deontology, and Virtue Ethics - Indian ethical concepts: Dharma, Karma, and Nishkama Karma - Ethical dilemmas and decision-making models-Application of human values in business, governance, and social life.									6	
3	Overview of Indian Knowledge System (IKS): Meaning and scope of IKS-Vedic and Upanishad wisdom: Science, Logic, and Spirituality Contributions of ancient Indian scholars:									6	

	Aryabhata, Charaka, Sushruta, Chanakya-Relevance of traditional knowledge in modern times.	
4	Science, Sustainability, and Indian Traditions: Indigenous knowledge and environmental sustainability - Ayurveda and holistic health systems Traditional Indian education system: Gurukul and knowledge etrans mission-Ethical and scientific insights from Indian texts: Bhagavad Gita, Yoga Sutras, Arthashastra.	6
5	Practical Applications and Contemporary Relevance: Indian knowledge system in modern science and technology - Leadership and management lessons from Indian traditions - Role of Yoga, Meditation, and Mindfulness in human well-being-Case studies on Ethical leadership and sustainable development.	6

CO	Course Outcomes
CO1	Understand the fundamental human values and their role in personal and professional life.
CO2	AnalyzeethicaltheoriesandIndianphilosophicalconceptsforethicaldecision-making.
CO3	Explore the Indian Knowledge System(IKS)and its contributions to science, philosophy, and governance.
CO4	Evaluate the role of traditional knowledge in sustainability, health, and education.
CO5	Apply Indian ethical principles and leadership lessons in contemporary challenges.

Textbooks:	
1	R.R.Gaur,R.Sangal,andG.P.Bagaria– <i>A Foundation Course in Human Values and Professional Ethics</i> , Excel Books,2019.
2	IntroductiontoIndianKnowledgeSystem-conceptsandapplications,BMahadevan,VinayakRajat Bhat, Nagendra Pavana RN,2022, PHI Learning Private Ltd, ISBN-978-93-91818-21-02.
3	AtextbookofAyurvediyaPhysiology-Prof.Dr.YogeshChandraMishra,ChaukhambhaPublication, edition2018.
Reference Books:	
1	Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan,
2	Dr.GirishNathJha,Dr.UmeshKumarSinghandDiwakarMishra,ScienceandTechnologyinAncient Indian Texts, DK Print World limited,
3	SriAurobindo– <i>TheLifeDivine</i> ,SriAurobindoAshram,1990.
4	M.Hiriyanna – <i>Indian Conception of Values</i> , Motilal Banarsidass,2005.
5	N.S.Ramaswamy– <i>Management Concepts from Indian Epics</i> , Bharatiya Vidya Bhavan, 1992.
Web resources:	
1	https://fssai.gov.in/FSSAIManual

Mapping with Programme Outcomes and Programme Specific Outcomes

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

3–Strong,2- Medium,1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC41	Optics and Laser Physics	Core	5	1	0	0	5	6	25	75	100
Learning Objectives											
LO1	To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics;										
LO2	To explain the behaviour of light in interference,										
LO3	To understand the different phenomena of diffraction										
LO4	To learn about the polarizer, analyser and its applications										
LO5	To understand the working and applications of laser										
Unit	Content										Hours
1	<p>LENS AND PRISMS: Postulates of geometrical optics – thick and thin lenses – focal length, critical thickness, power and cardinal points of a thick lens. Lens: lens makers formula (no derivation) – aberrations: spherical aberration, chromatic aberrations, coma, and astigmatism–curvature of the field – distortion – chromatic aberrations methods. Prism: dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope. Eyepieces: Huygen’s and Ramsden’s eyepieces, construction and working – merits and demerits of the eyepiece. Resolving power: Rayleigh’s criterion for resolution – limit of resolution for the eye.</p>										15
2	<p>INTERFERENCE: Types of wave front, Fresnel’s biprism – fringes with white light- interference in thin films due to (i) reflected light, (ii) transmitted light – colours of thin films -applications – air wedge – Newton’s rings. Interferometers : Michelson’s interferometer – applications, (i) determination of the wavelength of a monochromatic source of light, (ii) determination of the wavelength and separation D1 and D2 lines of sodium light, (iii) determination of a thickness of a mica sheet.</p>										15
3	<p>DIFFRACTION: Fresnel’s assumptions – zone plate– differences between a zone plate and a convex lens –Fresnel type of diffraction – diffraction pattern due to a straight edge – positions of maximum and minimum intensities – diffraction due to a narrow slit – Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine wavelengths – width of principal maxima.</p>										15
4	<p>POLARISATION: optical activity – polarizer and analyser–double refraction – optic axis, principal plane – Huygens’s explanation of double refraction in uniaxial crystals – polaroids and applications – circularly and elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel’s explanation – specific rotation – Laurent half shade polarimeter – experiment to determine specific rotatory power</p>										15

5	LASERS: General principles of lasers – properties of lasers – spontaneous and stimulated emission – population inversion – optical pumping – Principle and working of He-Ne laser – CO ₂ laser semiconductor laser – laser applications – holography.	15
CO	Course Outcomes	
	Students will be able to	
CO1	Outline basic knowledge of methods of rectifying different defects in lenses, articulate technological applications of eyepieces	
CO2	Discuss the principle of superposition of wave, use these ideas to understand the wave nature of light through working of interferometer	
CO3	Extend the knowledge about nature of light through diffraction techniques; apply mathematical principles to analyze the optical instruments	
CO4	Interpret basic formulation of polarization and gain knowledge about polarimeter, appraise its usage in industries	
CO5	Understand the principle and various types of lasers and its applications in industries.	
Textbooks:		
1	Subramaniam. N & Brijlal, 2014, Optics, 25 th edition, S.Chand & Co.	
2	R. Murugesan and Kiruthiga Sivaprasath, 2003, Optics and Spectroscopy, S.Chand & Co.	
3	P.R.Sasikumar, 2012, Photonics, PHI Pvt Ltd, New Delhi.	
4	K.Rajagopal, 2008, Engineering Physics, PHI Pvt Ltd, New Delhi	
5	Sathya prakash, 1990, Optics, VII edition, Ratan Prakashan Mandhir, New Delhi.	
Reference Books:		
1	Agarwal B.S, 2011, Optics, Kedernath Ramnath Publishers, Meerut.	
2	Singh & Agarwal, 2002, Optics and Atomic Physics, 9 th edition, Pragati Prakashan Meerut	
Web resources:		
1	https://science.nasa.gov/ems/	
2	https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UIGkb-8Pr6svxWo-LA&start_radio=1&dt=2472	
3	https://science.nasa.gov/ems/	
4	https://imagine.gsfc.nasa.gov/educators/gammaraybursts/imagine/index.html	
5	http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/	

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	2	2	3	3	3	3
CO2	2	2	2	2	2	2	2	3	2	2	3
CO3	2	3	2	2	2	2	2	2	3	2	3
CO4	2	2	2	2	2	2	2	3	2	3	3
CO5	2	2	2	2	3	2	2	3	2	3	3
Total	11	12	10	10	11	10	10	14	12	13	15
Average	2.2	2.4	2	2	2.2	2	2	2.8	2.4	2.6	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC41P	Practical IV- Light Experiments	Core	0	0	4	0	2	4	25	75	100

Learning Objectives

LO1	To demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.										
Unit	Content (Any Eight Experiments)										Hours
1	1. Determination of refractive index of prism using spectrometer. 2. Determination of refractive index of liquid using hollow prism and spectrometer 3. Determination of dispersive power of a prism. 4. Determination of radius of curvature of lens by forming Newton's rings. 5. Determination of thickness of a wire using air wedge. 6. Determination of Cauchy's Constants. 7. Determination of resolving power of grating 8. Determination of resolving power of telescope 9. Comparison of intensities using Lummer Brodhum Photometer. 10. Determination of range of motion using Searlesgoniometer. 11. Verification of Newton's formula for a lens separated by a distance. 12. Determination of refractive index of a given liquid by forming liquid lens 13. Determination of refractive index using Laser. 14. Determination of wavelengths, particle size using Laser/Monochromatic source. 15. Determination of resolving power of Diffraction grating using Laser 16. Determination of wire using Laser. 17. Bi-prism – Determination of refractive index.										60

CO	Course Outcomes
CO1	Students will be able to Understand and demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.
Textbooks:	
1	Practical Physics by Srinivasan by Chand & Co Publication

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCHA41	Allied Chemistry – II	Elective	3	1	0	0	4	4	25	75	100
Learning Objectives											
LO1	To apply IUPAC nomenclature and theories of coordination chemistry, and experimentally determine the hardness of water using the EDTA or Zeolite methods.										
LO2	To classify and illustrate the structures of carbohydrates and understand the properties of amino acids and the roles of DNA and RNA.										
LO3	To explain the principles of galvanic cells and use them for conductometric titrations and pH determination, while also understanding buffer solutions and electroplating.										
LO4	To determine the order of a reaction, calculate its half-life, and explain the role of catalysts and the Arrhenius equation.										
LO5	To explain the core principles of photochemistry and the laws governing it, and describe the various processes of light absorption and emission.										
Unit	Content										Hours
1	Co-ordination Chemistry and Water Technology: Co-ordination Chemistry: Definition of terms - IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to [Ni(CO) ₄], [Ni(CN) ₄] ²⁻ , [Co(CN) ₆] ³⁻ Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis. Hardness of water, determination of hardness of water using EDTA method, zeolite method										12
2	Carbohydrates and Amino acids: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose – fructose interconversion. Properties of starch and cellulose. Amino acids: Classification - preparation and properties of alanine. RNA and DNA (elementary idea only).										12
3	Electrochemistry: Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials – electrochemical series. Strong and weak electrolytes - ionic product of water - pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cellscorrosion and its prevention.										12
4	Kinetics and Catalysis: Order and molecularity. Integrated rate expression for I and II (2A Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.										12
5	Photochemistry: Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-Chloride and Hydroge-Bromide reaction. Jablonski Diagram - Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).										12

Course Outcomes	
CO	Students will be able to
CO1	To apply coordination chemistry principles to name complex compounds and to analyze the role of complexation in determining the hardness of water using volumetric methods.
CO2	To differentiate between major classes of carbohydrates and amino acids, illustrate their structures, and describe the fundamental biological functions of DNA and RNA.
CO3	To demonstrate an understanding of electrochemical cells and their applications, including the practical use of conductometric titrations and pH determination, as well as the principles of electroplating.
CO4	To experimentally determine reaction kinetics, predict reaction rates using the half-life and Arrhenius equation, and explain the function of different types of catalysis.
CO5	To explain the fundamental laws of photochemistry and apply them to describe processes of light absorption and emission, such as fluorescence and phosphorescence.
Textbooks:	
1	F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus, "Basic Inorganic Chemistry", 3rd ed., Wiley, 1995.
2	V.Veeraiyan, "Textbook of Ancillary Chemistry", High mount publishing house, Chennai, 1st ed., 2009
3	S.Vaithyanathan, "Text book of Ancillary Chemistry", Priya Publications, Karur, 2006.
4	Arun Bahl, B.S.Bahl, "Advanced Organic Chemistry", S.Chand and Company, New Delhi, 23rd ed., 2012.
5	P. W. Atkins, J. de Paula, J. Keeler, "Atkins' Physical Chemistry", Oxford University Press, Oxford, 11th ed., 2018.
Reference Books:	
1	James E. Huheey, Ellen A. Keiter, Richard L. Keiter, "Inorganic Chemistry: Principles of Structure and Reactivity", 4th ed., Pearson, 1997.
2	P.L.Soni, Mohan Katyal, "Text book of Inorganic Chemistry", Sultan Chand and Company, New Delhi, 20th ed., 2007.
3	Paula Yurkanis Bruice, " <i>Organic Chemistry</i> ", 8th ed., Pearson, 2016.
4	P.L.Soni, H.M.Chawla, "Text Book of Organic Chemistry", Sultan Chand & Sons, New Delhi, 29th ed., 2007.
5	R.Puri, L.R.Sharma, M.S.Pathania, "Text book Physical Chemistry", Vishal Publishing Co., New Delhi, 47th ed., 2018.
Web resources:	
1	https://nou.edu.ng/coursewarecontent/CHM%20423%20MARCH%202021_0.pdf
2	https://byjus.com/chemistry/carbohydrates/
3	https://www.nagwa.com/en/explainers/269168626823/

4	https://chem.libretexts.org/Bookshelves/Physical and Theoretical Chemistry Textbook Maps/Supplemental Modules (Physical and Theoretical Chemistry)/Kinetics
5	https://chem.libretexts.org/Bookshelves/Physical and Theoretical Chemistry Textbook Maps/Supplemental Modules (Physical and Theoretical Chemistry)/Photochemistry

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	1	2	2	3	3	3
CO2	3	3	3	2	3	1	2	3	2	3	3
CO3	3	3	3	2	2	1	2	2	3	3	3
CO4	3	3	3	2	2	1	2	2	3	2	3
CO5	3	3	3	2	3	1	2	3	2	3	2
Total	15	15	15	10	13	5	10	12	13	14	14
Average	3	3	3	2	2.6	1	2	2.4	2.6	2.8	2.8

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHA42	Numerical Methods and Programming in C	Elective	3	1	0	0	4	4	25	75	100
Learning Objectives											
LO1	Apply root-finding algorithms like Bisection, Newton-Raphson.										
LO2	Use interpolation methods such as Lagrange and Newton's forward/backward formulas										
LO3	To learn the basics of C programming										
LO4	To learn about control structure in C										
LO5	Analysis the convergence and efficiency of algorithms										
Unit	Content										Hours
1	NUMERICAL SOLUTIONS: Determination of zeros of polynomials – roots of linear and nonlinear algebraic and transcendental equations – bisection and Newton-Raphson methods.										12
2	NUMERICAL DIFFERENTIATION, INTEGRATION AND CURVE FITTING: Newton's forward and backward interpolation – Lagrange's interpolation – principle of least squares – fitting a straight line and exponential curve – trapezoidal rule – Simpson's 1/3 and 1/8 rule.										12
3	INTRODUCTION TO C: Importance of C – basic structure of C programming – constants, variables and data types – character set, key words and identifiers – declaration of variables and data types – operators – expressions: arithmetic, relational, logical, assignment – increment and decrement – conditional – comma operators.										12
4	CONTROL STRUCTURE: decision making with if, if-else, nested if – switch – go to – break – continue –while, do while, for statements – arrays, one dimensional and two dimensional – declaring arrays simple programs.										12
5	ALGORITHM, FLOW CHART AND PROGRAM: Development of algorithm – flow chart for solving simple problems–conversion of Fahrenheit to Celsius and Celsius to Kelvin, miles to kilometre – sorting set of numbers in ascending and descending order – square matrix, addition, subtraction and multiplication of order (2x2) using arrays.										12

CO	Course Outcomes
	Students will be able to
CO1	Understand numerical method.
CO2	Learn about numerical differentiation and curve fittings. /
CO3	Know about the basic C programming structures.
CO4	Implement in control structure in C
CO5	Interpret the algebraic form of conversions.
Textbooks:	
1	Numerical methods, Singaravelu, Meenakshipublication,4th Edn., 1999.
2	Numerical methods P.Kandasamy, K. Thilagavathy, K. Gunavathi, S. Chand, 2016
3	Programming in C. Balagurusamy, TMG, ND, 2012
4	Numerical Analysis, M.K. Venkatraman, NPH, 2013
5	Numerical Analysis, B.D. Gupta, Konark Publishers, New Delhi, 2013
Reference Books	
1	Schaum's outline series, Theory and Problems of programming in C, C. Byron& S. Gottfried, Tata McGraw Hill 2003
2	Numerical methods and C Programming, Veera Rajan, 2015.
Web resources:	
1.	https://madasmaths.com/archive/maths_booklets/standard_topics/various/numerical_solutions_of_equations.pdf
2.	https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004032250571912siddharth_bhatt_engg_Numerical_Differentiation_and_Integration.pdf
3.	https://www.geeksforgeeks.org/c/c-language-introduction/
4.	https://www.geeksforgeeks.org/dsa/control-structures-in-programming-languages/
5.	https://courses.minia.edu.eg/Attach/16036flowchart-algorithm-manual.pdf

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	3	3	3	3
CO2	2	3	3	2	2	1	2	3	3	3	3
CO3	3	3	3	2	2	2	2	3	3	3	3
CO4	3	3	3	2	2	2	2	3	3	3	3
CO5	2	3	3	2	2	2	2	3	3	3	3
Total	13	15	15	10	10	9	10	15	15	15	15
Average	2.6	3	3	2	2	1.8	2	3	3	3	3

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCHA41P	Chemistry Practical for Physical and Biological Sciences - II	Elective	0	0	2	0	2	2	25	75	100
Learning Objectives											
LO1	Different types of organic compounds with respect to their properties.										
LO2	Determination of elements in organic compounds.										
LO3	Identification of organic functional groups.										
LO4	Identify the components and structure of an unknown organic molecule.										
LO5	Skills to solve problems related to the identification of organic molecules through a series of tests and observations										
Unit	Content										Hours
1	Systematic Analysis of Organic Compounds The analysis must be carried out as follows: Preliminary Tests 1. To distinguish between aliphatic and aromatic compounds.										6
2	To distinguish – Saturated and unsaturated compounds										6
3	Detection of special elements (N, S, Halogens).										6
4	Identification of Functional group tests (Absence of special elements) - Phenol, Acids (mono & di), Aldehyde and Carbohydrate										6
5	Identification of Functional group tests (Presence of special elements) - Presence aromatic primary amine, Amides (mono & di).										6

CO	Course Outcomes
	Students will be able to
CO1	To demonstrate a comprehensive understanding of laboratory safety practices, including the ability to identify and respond appropriately to potential hazards.
CO2	To accurately identify the functional groups present in unknown organic compounds using a variety of chemical tests.
CO3	To effectively differentiate between aromatic and aliphatic compounds, as well as saturated and unsaturated compounds.
CO4	To competently analyze the special elements like nitrogen, sulphur and halogens in the given compounds.
CO5	To successfully prepare the specific functional groups to confirm their presence in organic compounds.

Textbooks:	
1	Venkateswaran V, Veerasamy R and Kulandaivelu A. R, "Basic Principles of Practical Chemistry", Sultan Chand & Sons, 2nd ed., 1997.
2	J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, "Vogel's Textbook of Quantitative Chemical Analysis", Pearson, 6th ed., 2000.
3	Donald L. Pavia, Gary M. Lampman, George S. Engel & Roger G. Gries, " <i>Experimental Organic Chemistry</i> ", Cengage Learning, 2005.
4	Jerry Mohrig, Craig Hammond & Paul F. Snyder, "Techniques in Organic Chemistry", Macmillan Learning, 4th ed., 2014.
5	Mann F. G and Saunders B. C, "Practical Organic Chemistry", Pearson Education, 4th ed., 1975.
Reference Books:	
1	Ralph J. Fessenden and Joan S. Fessenden, "Organic Chemistry Laboratory Manual", Brooks/Cole, 3rd ed., 1982.
2	Middleton H, "Organic Qualitative Analysis", Longmans, Green and Co., 1st ed., 1951.
3	Bansal R. K, "Laboratory Manual of Organic Chemistry", New Age International Publishers, 5th ed., 2010.
4	John Leonard, Barry Lygo and Garry Procter, "Advanced Practical Organic Chemistry", CRC Press, 3rd ed., 2013.
5	Lisa Nichols, "Organic Chemistry Laboratory Techniques", LibreTexts, 1st ed., 2016.
Web resources	
1	https://www.scribd.com/document/22912118/systematic-organic-analysis
2	https://celqusb.files.wordpress.com/2018/04/kupdf-com_systematic-identification-oforganic-compounds-wiley-shrinerhermannmorrillcurtininfuson.pdf
3	https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXI/chemistry/kelm207.pdf
4	https://archive.org/details/dli.ernet.288570
5	https://www.scribd.com/document/29184298/systematic-qualitative-organic-analysis

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	2	2	3	2
CO2	2	3	3	3	2	3	3	2	3	3	3
CO3	3	3	2	2	3	3	3	2	3	3	3
CO4	3	3	2	3	2	3	3	2	2	3	3
CO5	2	3	3	3	3	3	3	2	3	2	3
Total	13	15	13	14	13	15	15	10	13	14	14
Average	2.6	3	2.6	2.8	2.6	3	3	2	2.6	2.8	2.8

SCHEME OF VALUATION CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES - II (For Mathematics / Physics – II year/IV Semester)

Internal assessment : 25 Marks

External assessment : 75 Marks

Total : 100 Marks

Max. Marks : 75 Marks

Record : 10 Marks

Viva voce : 5 Marks

Organic Analysis : 60 Marks

Organic Analysis : 60 Marks

Preliminary Test : 10 Marks

Aliphatic or Aromatic : 5 Marks

Saturated or Unsaturated : 5 Marks

Tests for Special Elements : 10 Marks

Confirmation Tests : 15 Marks

Functional groups Tests : 15 Marks

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHA42P	Practical - Numerical Methods and Programming in C	Elective	0	0	2	0	2	2	25	75	100

Learning Objectives

LO	To equip the computational skill using various mathematical tools. To apply the software tools to explore the concepts of physical science. To approach the real time activities using physics and mathematical formulations..
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Unit	Content (Any Eight Experiments)	Hours
1	1. Lagrange's interpolation with Algorithm, Flow chart and output. 2. Fitting a straight line with Algorithm, Flow chart and output. 3. Numerical integration by the trapezoidal rule with Algorithm, Flow chart and output. 4. Newton's forward interpolation with Algorithm, Flow chart and output. 5. Newton's backward interpolation with Algorithm, Flow chart and output. 6. Numerical integration by Simpson's 1/8 rule with Algorithm, Flow chart and output. 7. Numerical integration by Simpson's 3/8 rule with Algorithm, Flow chart and output. 8. Finding Roots of a Polynomial - Newton Raphson Method. 9. Finding Roots of a Polynomial - Bisection Method. 10. Solution of Simultaneous Linear Equation by Gauss elimination method. 11. Matrix Multiplication. 12. Matrix Addition. 13. Sorting a List of Numbers (Ascending & Descending). 14. Write a program to calculate the factorial of a number. 15. Conversion of Fahrenheit to Celsius and vice versa	30

CO	Course Outcomes
CO	Students will be able to Understand the computational skill using various mathematical tools, to apply the softwares to explore the concepts of physical science.
Textbooks:	
1	Numerical Methods by G. Balaji

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS41	Physics Workshop Skills	Skill	1	1	0	0	2	2	25	75	100
Learning Objectives											
LO1	To identify the components and interpret specifications.										
LO2	To know the functions and working of different power supply system										
LO3	To know the principle and working of different electrical and electronics appliances										
LO4	To learn the concept of mass and media communications										
LO5	Explain the Identification, classification, and working principle of various Biomedical Instruments and application of these instruments in diagnosis, therapeutic treatment and imaging fields										
Unit	Content										Hours
1	TESTING OF DISCRETE COMPONENTS Resistors- types - Characteristics -Colour coding -resistors in series and parallel - Capacitors - types -Capacitor in Series and Parallel – Digital Multimeter - How to Use a Multimeter - Continuity Testing of Voltage - Current - Resistance -Diode and Transistor-Design of Bread board-Soldering Technique used in PCBs.										6
2	POWER SUPPLY Power Supply Unit - Regulated power supply- Zener diode voltage regulator-Inverter-Uninterrupted power supply (UPS) - Switched mode power supply (SMPS)-Cathode Ray Oscilloscope (CRO) and measurement of time period and frequency - Function generator.										6
3	ELECTRICAL & ELECTRONICS APPLIANCES Construction and Working of Electric iron Box - fans- Water Heater - Grinder-Microwave Oven-Washing Machine – Refrigerator-Air Conditioner.										6
4	MASS AND MEDIA COMMUNICATION Mobile Communication (GSM) -Android version- USB - Various Types of USB-C Port- Cable and Connectors - VGA- AV port - HDMI- DVI - S Video and Display port- Bluetooth - Wi-fi and Li-fi - Direct broadcast satellite (DBS)- DTH-Radar Communication System.										6
5	BIO-MEDICAL INSTRUMENTATION Principle, description, function and recording of ECG, and EEG -artificial pace maker- simulators -Heart lung machine –ventilators and nebulizers-Kidney dialysis machine- pH meter - Laser blood flow meter–Thermal scanner and pulse oximeter.										6

Course Outcomes	
CO	Students will be able to
CO1	Test the instruments with specific skills
CO2	Express the functions and working of linear power supply
CO3	Know the basics of analytical instruments and its calibration techniques.
CO4	Explain mobile communication and radar communication system
CO5	Demonstrate the principle and working of various biomedical equipment.
Textbooks:	
1	B.L. Theraja, A Text book of Electrical Technology, S.Chand& Co., New Delhi, 2007.
2	Robert A. Mammano, Power Supply Design Seminars, , Texas Instruments, 2017.
3	Basic Electrical Engineering -Vocational Theory-Plus One Text Book-TN State Board.
4	V.K. Metha, Principles of Electronics, V K Metha, S Chnd&Co.,New Delhi, 2001.
5	M.Arumugam M, Biomedical Instrumention, Anuradha Publications, Kumbakonam, 2011.
Reference Books:	
1	I.J. Nagrath and D. P. Kothari, Electrical Machines,Tata McGraw Hill, 1997.
2	M. D. Singh, K. B.Khanchandani Power Electronics, Tata McGraw Hill, 2006.
3	V. JeyasriArokiasamy, Mobile Communications,Technical Publications, 2009.
Web resources:	
1	https://www.electronicsforu.com/
2	https://www.electronics-tutorials.ws/supplies/power-supplies-for-beginners-part-1.html
3	https://lecturenotes.in/subject/199/analytical-instrumentation-ai
4	http://electrotel.com.ar/handbook-of-analytical-instruments-r-s-khandpur-downloadfull-version.pdf
5	https://www.youtube.com/watch?v=YbBSf8bnYgw

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	3	3	3	2	2	3	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3
Total	15	15	15	15	15	11	11	15	15	15	15
Average	3	3	3	3	3	2.2	2.2	3	3	3	3

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHS42	Communication System	Skill	1	1	0	0	2	2	25	75	100
Learning Objectives											
LO1	Understand the basic components of communication systems: transmitter and receiver										
LO2	Apply the concepts of fiber optics in communication systems.										
LO3	Explain key concepts of radar communications										
LO4	To learn the basics of satellite communications.										
LO5	Understand modern communication technology										
Unit	Content										Hours
1	RADIO TRANSMISSION AND RECEPTION: Basic Principals of Transmitter – modulation – amplitude modulation – limitations of amplitude modulation – frequency modulation – comparison of FM and AM – demodulation essentials in demodulation. Receivers: AM radio receivers – radio receiver, advantages – FM receiver – difference between FM and AM receivers.										6
2	FIBER OPTIC COMMUNICATION: Basic, types and applications of fiber optics – construction of optical fiber – classification based on the refractive index and modes of propagation – losses in optical fibers – attenuation–advantages of fiber optic communication.										6
3	RADAR COMMUNICATION: Basics, Types & Applications-radar range equation – antenna scanning –pulsed radar system – search radar –tracking radar – MTI Radar -Advantages, Limitations, Applications of MTI radar- Doppler effect– CW Doppler radar-CW radar Advantages, Limitations, Applications-Difference between MTI and Pulse Doppler Radar										6
4	SATELLITE COMMUNICATION: Elements of orbital mechanics (Kepler’s laws)-Equations of motion- Need of Satellite Communication-Working -Types – Advantage and disadvantages - Application of Satellite Communication- Benefits of Satellite Communication for India										6
5	MOBILE COMMUNICATION: Introduction – concept of cell basic cellular mobile radio system – cell phone – facsimile – important features of fax machine – application of facsimile – VSAT (very small aperture terminals) modem IPTV (internet protocol television) -Wi-Fi-4G/5G (basic ideas)										6

Course Outcomes	
CO	Students will be able to
CO1	Understand the Radio Transmission and Reception concepts.
CO2	Analysis the Fiber-Optics and to apply the concept in Communication system.
CO3	Know the Radar Communication for signal processing
CO4	Study the orbital trajectory to apply the concepts in Satellite Communication
CO5	Understand the Mobile Communication for today's fastest-growing and most impactful engineering domain.
Textbooks:	
1	V.K.Metha, Principles of Electronics, S. Chand & Co Ltd., 2013
2	Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand& Co, 2013
Reference Books:	
1	1. J.S. Chitode, Digital Communications, 2020, Unicorn publications
2	Senior John. M, Optical Fiber Communications: Principles and Practice, 2009, Pearson Education.
Web resources:	
1	https://www.etsi.org/deliver/etsi_gts/05/0505/05.02.00_60/gsmts_0505v050200p.pdf
2	https://www.utdallas.edu/~torlak/courses/ee4367/lectures/FIBEROPTICS.pdf
3	https://www.elprocus.com/radar-basics-types-and-applications/
4	https://www.tutorialspoint.com/satellite_communication/satellite_communication_introduction.htm
5	https://www.bfs.de/EN/topics/emf/mobile-communication/basics/basics_node.html

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3
Total	15	15	15	15	15	15	10	15	15	15	15
Average	3	3	3	3	3	3	2	3	3	3	3

SECOND YEAR FOURTH SEMESTER
AEC – 3 – ENVIRONMENTAL STUDIES & DISASTER MANAGEMENT

Course Code	Course name	Category	L	T	P	S	Credit	Hours	Marks		
									CIA	External	Total
24UAEC41	ENVIRONMENTAL STUDIES & DISASTER MANAGEMENT	AEC - 3	2	0	0	0	2	2	25	75	100

Learning Objectives

LO1	To provide basic knowledge of Environmental Science and Sustainability
LO2	To understand the Fundamentals of Disaster Management
LO3	To create awareness about Natural Disaster and Management
LO4	To familiarize students with Manmade Disaster and Management
LO5	To promote community participation and technological applications in disaster risk reduction

Unit	Contents	Hour
I	Environmental Science and Sustainability Ecosystem: structure, types, and functions - Biodiversity: importance and conservation strategies - Environmental pollution: types (Air & Water), causes, effects, and control measures - Climate change and global warming	5
II	Fundamentals of Disaster Management Concepts: disaster, hazard, vulnerability, risk, resilience - Types of disasters: natural and man-made - Disaster management cycle: prevention, mitigation, preparedness, response, recovery.	5
III	Natural Disasters and Management Earthquakes, floods, Oil spill disaster, cyclones, Tsunami, droughts, landslides, Heat wave - Causes, consequences, and case studies - Community and government measures for preparedness and mitigation. Role of Government in Disaster Management – NDMA, SDMA & DDMA. Community Based Disaster Management	8
IV	Man-Made Disasters and Management Industrial accidents, fires, chemical and nuclear hazards, Biological hazards, transport accidents - Impacts on society, economy, and environment - Disaster preparedness and management strategies - Case studies: Bhopal Gas Tragedy, Vizag Gas Leak, urban disasters.	7
V	Sustainable Development and Disaster Risk Reduction Principles of sustainable development and Sustainable Development Goals (SDGs) -	5

	Climate change and disaster interlinkages - Disaster risk reduction strategies: early warning systems, resilient infrastructure, policy framework. Role of technology, education, and media in environmental sustainability and disaster management	
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Course Outcomes

The students will be able to

CO1	Describe the importance of ecosystems, biodiversity, and methods of controlling pollution.
CO2	Understand the basic concepts of disaster management, hazards, risks, and resilience.
CO3	Explain the causes, effects, and control measures of major natural disasters.
CO4	Identify different types of man-made disasters and suggest safety and preparedness measures.
CO5	Recognize the role of sustainable development and disaster risk reduction strategies in protecting environment and society.

Textbooks

1	Government of India – Disaster Management Act, 2005
2	P.C. Mishra – Disaster Management and Mitigation

Reference Book

1	Erach Bharucha – Textbook of Environmental Studies
2	IGNOU Study Material – Disaster Management

Web Resources:

1	https://ndma.gov.in/
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Mapping Programme Outcomes and Programme Specific Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	3	3	3	3
CO2	3	3	3	3	3	2	3	3	3	3	2
CO3	3	3	3	3	3	2	3	3	3	3	2
CO4	3	2	3	3	3	2	3	3	3	3	2
CO5	3	2	3	3	3	2	3	3	3	3	2
Total	15	13	15	15	15	10	14	15	15	15	11
Average	3	2.6	3	3	3	2	2.8	3	3	3	2.2

3 – Strong, 2- Medium, 1- Low

THIRD YEAR –SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC51	Atomic and Molecular Physics	CORE	4	1	0	0	4	5	25	75	100
Learning Objectives											
LO1	To understand the determination of charge-to-mass ratio and properties of electrons and positive rays using classical experimental methods.										
LO2	To explain the principles and laws governing photoelectric emission and different types of photoelectric cells.										
LO3	To analyse the advanced atomic models and quantum numbers governing electron behavior in atoms.										
LO4	To describe the origin and behavior of spectral line splitting under magnetic fields.										
LO5	To understand the origin of molecular spectra and vibrational–rotational behavior of molecules using IR and Raman spectroscopy.										
Unit	Contents									No. of Hours	
1	The Electron and Positive Rays: e/m of electron by Dunnington's method – charge of electron by Millikan's oil drop method–properties of positive rays– e/m of positive rays by Thomson's parabola method (problems calculation of e/m ratio of positive rays)– Bainbridge and Dempster's mass spectrographs.									15	
2	Photoelectric Effect: Laws of Photoelectric emission–Leonard's experiment–Richardson and Compton experiment — Einstein's photoelectric equation – photoelectric cell– photo emissive cell –photovoltaic cell – photo conducting cell –applications of photoelectric cells(photomultiplier).									15	
3	Atomic Structure: Sommerfeld's relativistic atom model –vector atom model –various quantum numbers–L-S and J-J coupling– Pauli's exclusion principle –Magnetic dipole moment of an electron due to orbital and spin motion – Bohr magneton – Stern and Gerlach experiment.									15	
4	Splitting of Spectral Lines: Excitation, ionization and critical potentials – Davis and Goucher's method – optical spectra –spectral notation and selection rules-Zeeman effect–experimental arrangement and classical theory of normal Zeeman effect–Larmor's theorem–quantum theory of normal Zeeman effect–anomalous Zeeman effect –explanation of splitting of D1 and D2 lines of sodium.									15	
5	Molecular Physics: Introduction -Theory of the origin of pure rotational spectrum of a molecule-Non-Rigid Rotator-The energy of a diatomic molecule - Vibrating diatomic molecule as a harmonic oscillator-Infrared Radiation – Range of IR radiation-IR spectrometer–Instrumentation-Molecular vibrations of water molecule (H ₂ O)-Raman effect-Characteristics of Raman lines.									15	

COURSE OUTCOMES

Students will able to

CO1	Apply experimental techniques like Dunnington's, Millikan's, and Thomson's methods to calculate and analyze e/m ratios and mass spectrograph principles.
CO2	Analyze photoelectric phenomena using Einstein's equation and evaluate the working and applications of photo electric devices.
CO3	Apply quantum principles such as coupling schemes and exclusion principle to explain atomic structure and magnetic properties.
CO4	Analyze Zeeman effect and spectral transitions using classical and quantum approaches to interpret atomic spectra.
CO5	Apply concepts of rotational and vibrational spectroscopy to analyze molecular structure, IR instrumentation, and Raman spectral characteristics.

TEXTBOOKS

1	Murugesan, R. Modern Physics. Revised ed., S. Chand & Company Ltd.,2016.
2	Brijlal, and N. Subrahmanyam. Atomic and Nuclear Physics. 16th ed., S. Chand &Company Ltd.,2014.

REFERANCEBOOKS

1	Rajam, J. B. Modern Physics. Revised ed., S. Chand & Company Ltd.,2008
2	Sehgal, M. L., and K. L. Chopra. Modern Physics. Sultan Chand & Sons,2012.
3	Avadhanulu,M.N.AnIntroductiontoLasers:TheoryandApplications.S.Chand&Company Ltd.,2001.

WEBLINKS

1	https://www.bdu.ac.in/cde/SLM/M.Sc.%20Physics/II%20Year/Atomic%20%26%20Molecular%20physics%20%28Unit1%2C%20Unit2%29.pdf
2	https://www.youtube.com/watch?v=Ciul-dwaDcQ
3	https://onlinecourses.nptel.ac.in/noc23_ph16/preview

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	S	3	3	3	3	3
Total	14	15	14	13	12	12	12	15	15	15	15
Average	2.8	3	2.8	2.6	2.4	2.4	2.4	3	3.0	3.0	3.0

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC52P	General Experiments-Practical	Core	0	0	4	0	4	4	25	75	100
Learning Objectives											
LO	To strengthen understanding of optics, electricity, magnetism and thermal physics through hand on verification of physics laws										
Unit	Contents (any 8 experiments)										No. of Hours
1	1. Spectrometer-diffraction grating -Normal incidence-determination of dispersive power 2. Spectrometer-solid prism- determination of dispersive power 3. Bi-prism -Determination of refractive index. 4. Thickness of a thin film -Bi-prism 5. Diffraction at straight edge-Air wedge-determination of thickness of wire. 6. Spectrometer-Grating - Normal incidence - Wave length of Mercury spectral lines. 7. Spectrometer -Grating - Minimum deviation - Wave length of Mercury spectral lines. 8. Spectrometer -(i-d) curve. 9. Spectrometer -(i-i') curve. 10. Spectrometer -Narrow angled prism. 11. Potentiometer -E.M.F of a thermocouple. 12. Deflection Magnetometer -Determination of Magnetic moment of a bar magnet and BH using circular coil carrying current. 13. Vibration magnetometer - Determination of BH using circular coil carrying current-TanB position. 14. B.G-Figure of Merit-Charge Sensitivity										75
CO	Course Outcome										
	Students will able to Develop experimental skills including precise measurement, data recovery, graphical analysis and error estimation.										
Text Book	Srinivasan, K. Practical Physics. 12th ed., S. Chand & Company Ltd.,2012.										

THIRD YEAR –SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC53	Digital Electronics and Microprocessor 8085	CORE	4	0	0	0	4	4	25	75	100

Learning Objectives

LO1	To understand different number systems such as decimal, binary, octal, and hexadecimal and explain their characteristics.
LO2	To describe and construct half adder and full adder circuits and analyze their truth tables and logic expressions.
LO3	To explain the concept of sequential logic circuits and differentiate them from combinational circuits.
LO4	To explain the basic concepts of microprocessors and describe the features of the Intel 8085 microprocessor.
LO5	To understand the concept of data conversion between analog and digital signals.

Unit	Contents	No. of Hours
1	Number Systems and Boolean algebra: Decimal, binary, octal, hexadecimal numbers systems and their conversions – codes: BCD, gray and excess-3 codes – code conversions –complements (1's, 2's) –binary addition, binary subtraction using 1's & 2's complement methods – Boolean laws – De-Morgan's theorem – basic logic gates -universal Building blocks–standard representation of logic functions (SOP & POS) – minimization techniques (Karnaugh map: 2, 3, 4 variables)	12
2	Encoder and Decoder circuits: Half & full subtractor – parallel binary adder – multiplexers (4:1) & demultiplexers (1:4), encoder (8- line-to-3- line) and decoder (3-line-to-8-line), BCD to seven segment decoders.	12
3	Flip-flops: S-R Flip-flop , D type flip-flops, J-K Flip-flop, T flip-flops, master-slave flip-flop, truth tables, registers:-serial in serial out and parallel in and parallel out Counters: asynchronous counters -mod-8, mod-10, synchronous - 4-bit &ring counter Memories: ROM, RAM (static and dynamic), PROM, EPROM, RRAM, MRAM, Flash	12
4	Data Conversion Devices: Digital to Analog Conversion: DAC Specification-Weighted Resistor DAC-R-2R Ladder DAC Analog to Digital conversion: ADC specifications-Counter type ADC-Successive Approximation ADC-Dual Slope ADC	12
5	8085 Microprocessor: introduction to microprocessor–pin configuration of 8085- INTEL 8085 architecture -interrupts and its priority – Program Status Word (PSW) – instruction set of 8085 –addressing modes of 8085 –assembly language programming using 8085 –programmes for addition (8-Bit), subtraction (8-Bit), multiplication (8- Bit),division(8-Bit)–largest and smallest number in an array, Code conversion BCD to Binary, Binary to Decimal	12

COURSE OUTCOMES

Students will able to

CO1	Differentiate the number systems such as decimal, binary, octal, and hexadecimal and enable students to perform conversions between them.
CO2	Design and operation of arithmetic circuits such as half adder, full adder, half subtractor, full subtractor, and parallel binary adders.
CO3	Understand the concept of sequential logic circuits and their importance in digital electronics.
CO4	Describe the architecture and internal organization of the Intel 8085 microprocessor, including register organization.
CO5	Analyze the working principle of ADC and DAC

TEXTBOOKS

1	V.Vijayendran, Introduction to Integrated Electronics (Digital & Analog), S.Viswanathan, Printers & Publishers Private Ltd, Chennai,2007
2	Vijayendran, V. Digital Electronics and Microprocessor 8085. Viswanathan, S. Printers& Publishers Pvt. Ltd.,2009.

REFERANCEBOOKS

1	Mano, M. Morris. Digital Design. 3rd ed., Prentice Hall of India,2002.
2	Mithal, G. K. Electronic Devices and Circuits. Khanna Publishers,2006.
3	Salivahanan, S., and S. Arivazhagan. Digital Circuits and Design. Vikas Publishing House, 2009.

WEBLINKS

1	https://youtu.be/-paFaxfTCKI
2	https://youtu.be/s1DSZEaCX_g

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	1	1	3	2	2
CO2	3	3	3	2	2	1	2	1	3	3	2
CO3	3	3	3	2	2	1	2	1	3	3	3
CO4	3	3	3	3	3	2	1	1	3	3	3
CO5	3	3	3	3	3	1	1	2	3	3	3
Total	15	15	14	12	11	6	7	6	15	14	13
Average	3	3	2.8	2.4	2.2	1.2	1.4	1.2	3	2.8	2.6

3 – Strong, 2- Medium, 1-Low

THIRD YEAR – SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC54P	Digital Electronics and Microprocessor-8085 Practical	CORE	0	0	3	0	2	3	25	75	100

Learning Objectives

LO1	To design and analyze fundamental digital circuits and to develop programs for basic operations of microprocessor.	
Unit	Contents (any 8 experiments)	No. of Hours
1	1.5V DC Power Supply Circuit Using 7805 Voltage Regulator 2.Study of gate ICs – NOT, OR, AND, NOR, NAND, OR, XNOR 3.Verification of De Morgan's theorem using ICs –NOT, OR, AND 4.NAND and NOR as universal building blocks 5.Full adder and Full subtractor using NAND gates 6.Half adder / Half subtractor using NAND gates 7.Simplify the K-map of 3,4 variables, construct and verify logical circuits with truth table 8.Construct and verify JK Flip flop using IC 7376 & IC7476 9.9.Microprocessor 8085 – addition (8 bit only) and subtraction (8 bit only) 10.Microprocessor 8085 – multiplication (8 bit only) and division (8 bit only) 11.Microprocessor 8085 – square (8 bit only) 12.Microprocessor 8085 – square root (8 bit only) 13.Microprocessor 8085 – largest/smallest of numbers (8 bit only)	45

Course Outcomes

Students will able to

CO	Implement digital circuits on breadboards and verify their performance using truth tables and working principle of 8085.
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Textbook

1	Srinivasan, K. Practical Physics. 12th ed., S. Chand & Company Ltd., 2012.
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THIRD YEAR –SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE51	Relativity and Quantum Mechanics	Elective	4	1	0	0	4	5	25	75	100

Learning Objectives

LO1	To analyse variation of mass with velocity and relativistic dynamics
LO2	To derive and apply transformation equation for velocity, mass energy and momentum
LO3	To analyse Debroglie hypothesis and matter waves
LO4	To understand the postulates of quantum mechanics.
LO5	To interpret the physical meaning of wave function boundary conditions and normalization.

Unit	Contents	No. of Hours
1	Special Theory of Relativity: frames of reference–Galilean transformation–postulates of special theory of relativity – Lorentz transformation – consequences – time dilation–concept of simultaneity – Doppler effect – length contraction–variation of mass with velocity – Einstein’s mass-energy; Minkowski’s four dimensional space.	15
2	Transformation Relations: transformation of velocity, mass, energy and momentum –Four vector–invariance under transformation–Lorentz transformation and velocity addition equations in terms of hyperbolic functions. General Theory of Relativity: Inertial and Gravitational mass – Principle of equivalence – Experimental evidences for General theory of Relativity-Gravitational Redshift.	15
3	Photons and Matter Waves: difficulties of classical physics and origin of quantum theory–blackbodyradiation–Planck’s law—Comptoneffect–pairproduction–De Broglie waves – phase velocity and group velocity– Davisson and Germer’s experiment –uncertainty principle – Gamma ray microscope.	15
4	Operators and Schrödinger Equation: postulates of quantum mechanics – Wave function and its interpretation – Schrödinger’s equations (Time independent and dependant) – linear operators – Eigen value – Hermitian operator — observable – operators for position, linear and angular momentum components –commutator algebra –commutator between these operators. –Expectation values of position and momentum – Ehrenfest theorem.	15
5	Schrödinger Equation for Simple Problems: Schrödinger’s equations (Time dependant) –one dimensional problems: (i) particle in a box, (ii) barrier penetration problem – quantum mechanical tunneling, (iii) linear harmonic oscillator. Higher dimensional problems: (i) Rigid rotator (qualitative).	15

Course Outcomes

Students will able to

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.

TEXT BOOKS

1	Murugesan, R., and Kiruthiga Sivaprasath. Modern Physics. 17th rev. ed., S. Chand & Company,2014.
2	Satya Prakash, and Swati Saluja. Quantum Mechanics. KedarNath Ram Nath& Co.,2010.

REFERENCE BOOKS

1	Devanathan, V. Quantum Mechanics. Narosa Publishing House,2005.
2	Singh, S. P., and M. K. Bagde. Quantum Mechanics. S. Chand & Company,2000.
3	Gupta, Kumar, and Sharma. Quantum Mechanics. Jai Prakash Nath& Co.,2003.

WEB LINKS

1	http://hyperphysics.phy-astr.gsu.edu/hbase/qapp.html
2	https://swayam.gov.in/nd2_arp19_ap83/preview
3	https://swayam.gov.in/nd1_noc20_ph05/preview
5	minkowski-space time/v/introduction-to-specialrelativity-

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	1	1	3	2	2
CO2	3	3	2	2	1	2	1	1	3	2	2
CO3	3	3	2	2	1	1	1	1	3	2	2
CO4	3	3	3	2	2	1	1	1	3	3	3
CO5	3	3	3	3	2	2	1	1	3	3	3
Total	15	15	12	11	7	7	5	5	15	12	12
Average	3	3	2.4	2.2	1.4	1.4	1	1	3	2.4	2.4

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE52	Physics of Music	Elective	4	1	0	0	4	5	25	75	100
Learning Objectives											
LO1	To understand the scientific basis of sound, vibration, and human perception of music.										
LO2	To study simple vibrating systems and the principles governing musical sound generation.										
LO3	To analyse the formation of musical tones and complex waveforms using acoustic principles.										
LO4	To acquire knowledge about the production of musical sounds using vocal, acoustic, and electronic instruments.										
LO5	To understand the techniques involved in recording, processing, and analyzing music and sound.										
Unit	Contents										No. of Hours
1	Scientific Study of Music: vibrations of atoms of matter– vibrations coupling to air –propagation of sound waves in air, other media, fluids & solids–velocity, frequency, wavelength, time period, intensity: definition and unit fs – classification of sound on frequency and velocity– human & animal sound perception– mechanism of ear and hearing –psychoacoustics.										15
2	Simple Vibrating Systems: Simple harmonic motion–tuning fork–amplitude, phase, energy, energy loss/damping/dissipation – power – travelling waves and standing waves– laws of vibration in stretched strings– one-dimensional medium – open and closed organ pipes–over tones, harmonics–quality of sound: pitch, timber, loudness – octaves, musical notes.										15
3	Musical Tone: pure/simple tones – sine/cosine waves– well defined frequencies, wavelengths, amplitudes & phases– partial tones – assembly of pure tones– mix of different frequencies & amplitudes– complex tone – superposition of simple tones – complex waveform– periodic complex waveform – formants – resonances– sound envelope										15
4	Production of Musical Sounds: human voice, mechanism of vocal sound production – larynx (sound box) – stringed Instruments: plucked & bowed, guitar, mandolin, violin, piano, etc. – wind instruments: whistles, flute, saxophone, pipe organ, bag pipes, etc – percussion instruments: plates, membranes, drums, cymbals, xylophone etc. – electronic instruments: keyboards, electric guitars, rhythm pads, etc. – analog and digital sound synthesizers,–MIDI instrument– computer generatedmusic										15
5	Recording of Music & Sound: Edison phonograph – cylinder & disk records – magnetic wire and tape recorders – digital recording (e.g. to CD, DVD, etc.)– analog transducers, condenser, dynamic microphones, loudspeaker – complex sound fields– near & far fields of acoustic– spectral analysis techniques – continuous & discrete Fourier transforms, digital signal processing – digital filtering – specifications of recording studios										15

Course Outcomes

Students will able to

CO1	Explain the physics of sound propagation, vibration, and psychoacoustics related to music perception.
CO2	Analyse vibrating systems, standing waves, harmonics, and their role in musical sound production.
CO3	Describe the characteristics of pure and complex musical tones and waveform formation.
CO4	Discuss the working principles of vocal, string, wind, percussion, and electronic musical instruments.
CO5	Apply concepts of sound recording, digital signal processing, and acoustic analysis in music technology.

TEXT BOOKS

1	Physics and Music: The Science of Musical Sound by Harvey White(2014)
2	Physics and Music: Essential Connections and Illuminating Excursions by KinkoTsuji and Stefan

REFERENCE BOOKS

1	Good Vibrations – The Physics of Music by BarryParker, (2009)
2	The History of Musical Instruments by Curt Sachs,(2006)

WEB LINKS

1	https://www.msuniv.ac.in/images/distance%20education/learning%20materials/ug%20pg%2023/ug%202021/Bsc_physics_2023/sub_2324_bscphysics_2_physicsofmusic.pdf
2	https://phas.ubc.ca/~mav/POM.ht

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	1	2	3	2	1
CO2	3	3	1	2	1	1	1	2	3	2	1
CO3	3	2	1	2	2	1	1	2	3	2	2
CO4	2	2	2	1	2	1	1	2	2	3	2
CO5	2	3	2	3	3	1	1	2	2	3	3
Total	13	12	7	10	9	5	5	10	13	12	9
Average	2.6	2.4	1.4	2	1.8	1	1	2	2.6	2.4	1.8

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE53	Solid State Physics	Elective	4	1	0	0	4	5	25	75	100
Learning Objectives											
LO1	To understand the crystal structures and bonding										
LO2	To explain the thermal properties of solids using phonon concepts										
LO3	To distinguish between soft and hard magnetic materials										
LO4	To apply classical theory to calculate electric polarizability										
LO5	To analyse electrical conductivity and mobility										
Unit	Contents										No. of Hours
1	Bonding in Solids, Crystal Structure: Types of bonding-ionic bonding – bond energy of NaCl molecule – covalent bonding – metallic bonding – hydrogen bonding – Van der-Waals bonding – crystal lattice – lattice translational vectors – lattice with basis – unit cell – Bravais’ lattices – Miller indices – structures of NaCl – reciprocal lattice and vectors – reciprocal lattices to SC, BCC and FCC structures – Brillouin zones.										15
2	Elementary Lattice Dynamics: Lattice vibrations and phonons: linear monoatomic – qualitative description of the phonon spectrum in solids – Dulong and Petit’s Law – Einstein and Debye theories of specific heat of solids – T ³ law – properties of metals – classical free electron theory of metals (Drude-Lorentz) – Ohm’s law – electrical and thermal conductivities – Weidemann-Franz’ law.										15
3	Magnetic Properties of Solids: Permeability, susceptibility, relation between them – classification of magnetic materials – properties of dia, para, ferro, ferri and anti-ferromagnetism – Langevin’s theory of diamagnetism – Langevin’s theory of paramagnetism – Curie-Weiss law – domains – discussion of B-H curve – hysteresis and energy loss – soft and hard magnets – magnetic alloys.										15
4	Dielectric Properties of Materials: Polarization and electric susceptibility – local electric field of an atom – dielectric constant and polarisability – polarization processes: electronic polarization – calculation of polarisability – ionic, orientation and space charge polarization – internal field – Clausius-Mosotti relation – frequency dependence of dielectric constant – dielectric loss – effect of temperature on dielectric constant – dielectric breakdown and its types – classical theory of electric polarisability.										15
5	Ferroelectric & Superconducting Properties of Materials: Elementary band theory: Kronig-Penny model – band gap – conductor, semiconductor (P and N type) and insulator – conductivity of semiconductor – mobility – Hall effect - Hall coefficient – measurement of conductivity (four probe method) -. Super conductivity: experimental results – critical temperature – critical magnetic field – Meissner effect – type-I and type-II superconductors – Applications of superconductors.										15

Course Outcomes

Students will be able to

CO1	Classify and analyse the bonding & crystal structure
CO2	Understand the lattice dynamics and thus learn the electrical and thermal properties of materials.
CO3	Classifying magnetic material on the basis of their behaviour.
CO4	Comprehend the dielectric behavior of materials
CO5	Appreciate the ferroelectric and super conducting properties of materials.

TEXT BOOKS

1	Pillai, S. O. Solid State Physics. Narosa Publishing House,2010.
2	Arumugam, M. Solid State Physics. Anuradha Publications,2014.

REFERENCE BOOKS

1	Kittel, Charles. Introduction to Solid State Physics. Wiley Eastern Ltd.,2003.
2	Raghavan, V. Materials Science and Engineering. Prentice Hall of India,2004.
3	Singhal, R. L. Solid State Physics. Kedarnath Ram Nath & Co.,2003.

WEB LINKS

1	https://nptel.ac.in/courses/115105099/
2	https://nptel.ac.in/courses/115106061/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	1	1	3	2	1
CO2	3	3	2	2	1	2	2	1	3	2	2
CO3	3	3	2	2	1	1	2	1	3	2	2
CO4	3	3	2	2	1	1	1	2	3	2	2
CO5	3	3	3	2	2	1	1	2	3	3	3
Total	15	14	11	9	6	6	7	7	15	11	10
Average	3	2.8	2.2	1.9	1.2	1.2	1.4	1.4	3	2.2	2

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER V

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE54	Materials Science	Elective	4	1	0	0	4	5	25	75	100
Learning Objectives											
LO1	To understand the nature of crystal imperfections and their influence on material properties.										
LO2	To study elastic, inelastic, and viscoelastic deformation behavior of materials.										
LO3	To learn the mechanisms of plastic deformation, creep, and strengthening methods in materials.										
LO4	To acquire knowledge about optical materials, nonlinear optical materials, and display devices.										
LO5	To understand destructive and nondestructive testing methods used for material characterization and evaluation.										
Unit	Contents										No. of Hours
1	Crystal Imperfections: Point defects: vacancies (problems), interstitials, impurities, electronic defects – equilibrium concentration of point imperfections (problems)– application of point defects –line defects: edge dislocation(problems), screw dislocation – surface defects: extrinsic defects – intrinsic defects: grain boundaries, tilt & twist boundaries, twin boundaries, stacking faults – volume defects – effect of imperfections.										15
2	Material Deformation: Elastic behavior of materials – atomic model of elastic behavior –modulus as a parameter in design – rubber like elasticity – inelastic behavior of materials – relaxation process – viscoelastic behavior of materials – spring-Dash pot models of viscoelastic behavior of materials.										15
3	Permanent Deformation and Strengthening Methods of Materials: _Plastic deformation: tensile stress-strain curve – plastic deformation by slip – creep: mechanism of creep – creep resistant materials – strengthening methods: strain hardening, grain refinement – solid solution strengthening – precipitation strengthening.										15
4	Optical Materials: Optical absorption in metals, semiconductors and insulators – NLO materials and their applications – display devices and display materials: fluorescence and phosphorescence – light emitting diodes –liquid crystal displays.										15
5	Mechanical Testing: Destructive testing: tensile test, compression test, hardness test– nondestructive testing (NDT): radiographic methods, ultrasonic methods – thermal methods of NDT: thermography – equipment used for NDT: metallurgical microscope										15

Course Outcomes

Students will be able to

CO1	Explain different types of crystal defects and evaluate their effects on material properties.
CO2	Analyze elastic, viscoelastic, and inelastic behavior of materials using appropriate mechanical models.
CO3	Describe mechanisms of plastic deformation, creep, and various strengthening techniques in materials.
CO4	Discuss the optical properties of materials and the working principles of optical and display devices.
CO5	Apply destructive and nondestructive testing methods for the characterization and quality assessment of materials.

TEXT BOOKS

1	Pillai, S. O. Solid State Physics. Narosa Publishing House,2010.
2	Arumugam, M. Solid State Physics. Anuradha Publications,2014.

REFERENCE BOOKS

1	Kittel, Charles. Introduction to Solid State Physics. Wiley Eastern Ltd.,2003.
2	Raghavan, V. Materials Science and Engineering. Prentice Hall of India,2004.
3	Singhal, R. L. Solid State Physics. Kedarnath Ram Nath & Co.,2003.

WEB LINKS

1	https://nptel.ac.in/courses/115105099/
2	https://nptel.ac.in/courses/115106061/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	1	1	3	2	1
CO2	3	3	1	2	1	1	1	1	3	2	1
CO3	3	3	2	2	2	1	1	1	3	3	2
CO4	2	2	2	1	2	1	1	1	2	3	2
CO5	2	3	2	3	3	1	1	1	2	3	3
Total	13	13	8	10	9	5	5	5	13	13	9
Average	2.6	2.6	1.6	2	1.8	1	1	1	2.6	2.6	1.8

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER V

CourseCode	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UAEC51	Gender Equality and Social Inclusion	AEC	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	To understand the introduction to Gender and Social Inclusion										
LO2	To acquire knowledge on Gender inequality in society										
LO3	To equip Social Exclusion and Marginalized Group										
LO4	To understand Legal Frameworks and Policies										
LO5	To assimilate knowledge about Strategies for Promoting Equality and Inclusion										
Unit	Content										Hours
1	Introduction to Gender and Social Inclusion: Concepts Gender-Gender roles, stereotypes, and socialization - Meaning and importance of social inclusion- Intersectionality (gender, caste, class, disability, etc.) - Historical perspectives on gender inequality.										6
2	Gender Inequality in Society: Forms of gender discrimination (education, health, employment) - Gender-based violence and its types - Wage gap and economic inequality - Representation of gender in media and culture - Case studies on gender inequality (local and global).										6
3	Social Exclusion and Marginalized Groups: Understanding social exclusion-Marginalized communities (women, LGBTQ+ individuals, persons with disabilities, minorities) - Barriers to inclusion (social, economic, political) - Role of culture, tradition, and norms in exclusion - Impact of exclusion on development.										6
4	Legal Frameworks and Policies: National and international laws promoting gender equality - Human rights perspective on inclusion - Government policies and welfare programs - Role of institutions (NGOs, UN, civil society).										6
5	Strategies for Promoting Equality and Inclusion: Gender mainstreaming and inclusive development - Education and awareness programs - Role of media and technology - Empowerment approaches (economic, social, political) - Community participation and leadership - Measuring progress (indicators like SDGs)										6
Total										30	

CO	Course Outcomes
CO1	Understand the introduction to Gender and Social Inclusion
CO2	Acquire knowledge on Gender inequality insociety
CO3	Equip the knowledge on Social Exclusion and Marginalized Group
CO4	Understand Legal Frameworks and Policies towards gender Equality
CO5	Gain knowledge about Strategies for Promoting Equality and Inclusion
Text books:	
1	Development as Freedom, Amartya Sen, Publisher: Oxford University Press(1999).
Reference Books:	
1	Gender Trouble: Feminism and the Subversion of Identity, 2 nd Edition (1999 revised edition) Publisher: Routledge, London & NewYork.
2	David E. Newton, Gender Inequality: A Reference Handbook, BloomsburyAcademic, 2019.
3	Gender Inequality:A Reference Handbook, by DavidE.NewtonABC-CLIO,2019.
Web resources:	
1	GESI-Traning-Module.pdf
2	https://documents1.worldbank.org/curated/en/099035006282249712/pdf/P1607140e15b8e090b54c0c36d8244e86e.pdf
3	integrity-action-gesi-strategy-version-2.pdf
4	Major Marginalized Groups: A Closer Look - UrbanStudies
5	UNOPS GESI Mainstreaming in Projects Strategy(Final)

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	2	3	3	2	2	2
CO2	2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	3	2	3	3	2	2	2
CO4	2	2	2	2	2	2	2	2	3	2	2
CO5	3	3	3	2	3	2	3	3	3	2	2
Total	11	12	13	10	13	10	13	13	12	10	10
Average	2.2	2.4	2.6	2	2.6	2	2.6	2.6	2.4	2	2

3– Strong, 2-Medium,1-Low

THIRD YEAR –SEMESTER V

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHIN51	Internship	Internship	0	0	0	0	2	-	25	75	100
Learning Objectives											
LO1	Introduce the Working Ambience, Attitude, Adaptability, Problem Solving Ability, Ability to work with Supervisor, Ability to take Directions, etc.										
LO2	Expose on the different phases of Developing a Computer Solution with Team Spirit.										
LO3	Learn about Problem Solving Skills, Soft Skills and other related Skills required for the industry.										
LO4	To develop skill competencies specific to an occupation or profession.										
LO5	To acquire additional interpersonal communication and interaction skills										
S.No	REGULATIONS										Hour
I	<ol style="list-style-type: none"> 1. The students have to undergo 30 hours/15 days of Internship/ Industrial Training in the Industry during the holidays of the Semester holiday 2. During the fifth Semester, candidates are required to refine the work completed during their industry internship by incorporating constructive feedback received from the industry and/or the institution during reviews, and by further developing the project to meet industry standards. 3. The Candidates have to prepare and submit the manuscript of the Internship experience as a Report as per the requirements of the Department for Evaluation. 4. The submission of the Internship Report will be done at the end of the fifth Semester for Presentation and Viva-Voce during the Practical Examinations of the Semester. 5. The Passing Minimum for Internship is 40%. 6. Failure to submit the report or attend the Viva-Voce Examination will result in being marked as "Absent" in the examination. The student must submit the report appear for the Viva-Voce Examination in the subsequent years (within the time specified by MKJC (A) Rules). 7. A Faculty Member from the Department will act as a Guide to Supervise/Monitor the progress of the Candidates. 8. The Faculty Member will act as the Internal Examiner during the course of Internship as well as at the time of conducting the Viva-Voce Examination. 9. The Internal Marks for the Internship will be awarded by the concerned Guide /Internal Examiner. 10. The Internal and External Examiners shall both evaluate the Internship Report, Presentation and conduct the Viva-Voce Examination. 										30

CO	Course Outcomes
	Students will able to
CO1	Find the specific areas of interest, refine their skills and abilities.
CO2	Show a greater sense of self-awareness and appreciation for others.
CO3	Develop work habits and attitudes that are essential to succeed in the workplace.
CO4	Discover the importance of communication, interpersonal and other critical skills.
CO5	Integrate academic learning with industrial exposure to enhance professional competency

INTERNAL MARKS AWARDED FOR THE INTERNSHIP -25Marks
<ul style="list-style-type: none"> ✓ Internship Review 1 (During the beginning of the Semester) - 5Marks ✓ Internship Review 2 (During the end of the Semester)- 5Marks ✓ Progress of the Internship by the Candidate's active Participation- 15Marks
EXTERNAL MARKS AWARDED FOR THE INTERNSHIP -75Marks
<ul style="list-style-type: none"> ✓ Evaluation of the Internship Report - 50Marks ✓ Presentation & Viva-Voce Examination- 25Marks

THIRDYEAR-SEMESTER V

CourseCode	CourseName	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHIK51	Ancient Indian knowledge in Science	IKS	1	0	0	1	-	2	25	75	100
Learning Objectives											
LO1	To introduce students to the foundations, Scope, and significance of the Indian Knowledge System, including classical texts such as the Vedas and the Bhagavad-Gita.										
LO2	To understand the basic principles of ancient Indian astronomy including Earth's rotation, lunar phases, and planetary motion.										
LO3	To learn ancient Indian methods of astronomical calculations, eclipses, planetary observations, and astronomical instruments.										
LO4	To understand ancient Indian concepts of the atom and examine their parallels with Newton's laws of motion.										
LO5	To gain knowledge of the traditional understanding of light and acoustics, particularly in the context of Vedic science and astrology.										
Unit	Content										Hours
1	Indian Knowledge System: An Introduction: Introduction to Traditional Knowledge- The Vedic Corpus: Introduction to Vedas, Rigveda, Samaveda, Yajurveda, Atharvaveda, Philosophical System- Bhagavad-Gita.										6
2	Ancient Astronomy –I: Introduction to Indian astronomy, Aryabhatiya – Earth's rotation and explanation of day and night, Reflection and shining of the Moon, Basic concepts of planetary motion from Brahmasphutasiddhanta, Contributions of Varahamihira.										6
3	Astronomical Calculations: Planetary positions and conjunctions, Solar and lunar eclipses, Phases of the Moon, Heliacal rising and setting of planets, Cosmography from Siddhanta Shiromani, Ancient astronomical instruments from Yantra-kirnavali.										6
4	Concept of Atom: The concept of anu (atom) - Atomic Theory from Bhagavad-Gita-Ideas about the atomic theory-Teachings of Vaisesika- History of Electricity: From Ancient Times to the Modern Times- Different kinds of electricity-Laws of Motion-The Rishi Kanada's Vaisheshika Sutra-Newton's Laws-Matter States-Laws of Motion and Theory of Gravitation.										6
5	Concept of Light and Sound: Translation-Bhaskaracharya's Law of Gravity- Light-Jyotish (Vedic Astrology)-Prakasha (Illumination)- Jnana (Knowledge)- Surya (Sun)- Tejas (Radiance)- Hymn (chant) - Sound in Vedic Science-Importance of Acoustics-factors of acoustics.										6
Total										30	

CO	Course Outcomes
	Students will be able to
CO1	Explain the fundamental concepts, scope, and relevance of the Indian Knowledge System and its traditional sources such as the Vedas and the Bhagavad Gita.
CO2	Identify the unique features of Indian number systems and apply mathematical concepts developed by ancient Indian mathematicians such as Aryabhata.
CO3	Describe basic astronomical calculations, planetary phenomena, eclipses, and the role of ancient astronomical instruments.
CO4	Concepts of atom, matter, motion, gravitation, and electricity as discussed in ancient Indian texts and compare them with modern scientific principles.
CO5	Interpret the traditional Indian understanding of light, sound, and acoustics in the context of both spiritual and scientific frameworks.
Textbooks:	
1	Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R. N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.
Reference Books:	
1	Aryabhatiya of Aryabhata, K.S. Shukla and K.V. Sarma, Indian National Science Academy, 1976.
2	Mathematics in India: From Vedic Period to Modern Times, M.D. Srinivas and K. Ramasubramanian and M. S. Sriram, NPTEL course.
3	The Story of Astronomy in India, Chander Mohan
Web resources:	
1	https://indiafoundation.in/articles-and-commentaries/indias-ancient-scientific-knowledge/
2	https://www.ece.lsu.edu/kak/a3.pdf
3	https://www.holybooks.com/wp-content/uploads/The-Aryabhatiya-of-Aryabhata.pdf
4	https://prepp.in/news/e-492-brahmagupta-598-668-ce-ancient-india-history-notes
5	https://byjus.com/free-ias-prep/varahamihira/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	1	1	1	1	2	1	2	3	3	3	3
CO2	2	3	1	2	2	2	2	3	2	3	2
CO3	2	3	3	3	2	2	2	3	3	3	3
CO4	3	3	3	3	2	2	2	3	2	3	2
CO5	3	3	2	2	2	2	2	3	3	3	3
Total	11	13	10	11	10	9	10	15	13	15	13
Average	2.2	2.6	2	2.2	2.6	1.8	2.6	3	2.6	3	2.6

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC61	Basic and Applied Electronics	Core	4	1	0	0	4	5	25	75	100

Learning Objectives

LO1	Students will gain knowledge about semiconducting diodes and transistors.
LO2	To teach the different types of amplifiers and oscillators.
LO3	To learn the working multivibrators and wave shaping circuits.
LO4	To study the basics of fabrication of integrated circuits and fundamentals of operational amplifiers.
LO5	To expose the various applications of OP-AMP and 555Timer.

Unit	Content	Hours
1	Semiconducting Diodes & Transistors: Classification of solids and energy bands-PN Junction Diode-Full wave Bridge Rectifier-Zener Diode -Tunnel diode -Photo diode –Solar Cell-LED-FET-Construction and working Parameters - FET as an amplifier- UJT-Equivalent circuit and V-I characteristics of UJT - UJT as relaxation oscillator. Sensors, LDR, LM35 characteristics (for IoT applications)	15
2	Amplifiers & Oscillators: R-C coupled amplifier (Two stage)-Power amplifiers-Class A,B amplifier- Hybrid parameters-Determination of h parameters-h parameter equivalent circuit- -h parameters for a transistor in CE mode – Barkhausen Criterion- Sinusoidal oscillators -Hartley, Colpitt's, Phase shift and Weinbridge.	15
3	Multivibrators& Wave Shaping Circuits: Types of multivibrators-Transistor astable, monostable and Bistable multivibrators - Differentiating and Integrating-Circuits-Clipping circuits-Positive and Negative clipper-Biased clipper-Combination clipper-Clamping circuits-Positive clamper-Negativeclamper.	15
4	Integrated Circuits & Op-Amp: Integrated circuit-Classification of ICs – based on manufacturing process-Advantages-Limitations-Fabrication of Transistors, diodes, capacitors and resistors - Symbol and Terminals of an OP-AMP-characteristics - Inverting and Non-invertingamplifier	15
5	Op-Amp Applications & Timer: OP-AMP -Sign and Scale changer -Adder, subtractor, average-Integrator and differentiator - Logarithmic amplifier –Anti-logarithmicamplifier-555Timer-Internalstructure-555TimerasSchmittTrigger- 555 Timer as Astable multivibrator.	15

CO	Course Outcomes
	Students will be able to
CO1	Understand the classification of solids on the basis of band theory, construction, working and applications of semiconducting diodes and transistors.
CO2	Design the amplifier, oscillator circuits, and to learn their parameters.
CO3	Understand the multivibrators using transistors and the different wave shaping circuits.
CO4	Know the fabrication of integrating circuits, the structure and parameter of operational amplifier.
CO5	Analyze the different applications of op-amp circuits and 555 Timers.
Textbooks:	
1	V.K. Mehta and Rohit Mehta, Principles of Electronics, S Chand & Co., New Delhi,
2	M Arul Thalapati, Basic and Applied Electronics, Comptek, Publishers, Chennai
3	V. Vijayendran, Introduction to Integrated Electronics (Digital & Analog), S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2007
Reference Books:	
1	B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, S Chand & Co.,
2	R.S. Sedha, A Text Book of Applied Electronics, S Chand & Co., New Delhi, 2010.
3	Hand Book of Electronics - Gupta & Kumar, Pragati Prakashan, Meerut, 2014.
Webresources:	
1	https://www.youtube.com/watch?v=EkHch86UXpY
2	https://www.youtube.com/watch?v=jZ-pD8nVD6s&app=desktop
3	http://www.circuitstoday.com/category/clipping-and-clamping-circuits
4	https://www.youtube.com/watch?v=XsawrtWmm9M

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	2	1	3	1	1
CO2	3	3	2	2	2	2	1	1	3	2	2
CO3	3	2	2	1	2	2	1	1	3	2	2
CO4	3	3	2	2	1	1	2	1	3	2	2
CO5	3	3	3	2	2	1	1	1	3	2	3
Total	15	13	10	8	8	7	7	5	15	9	10
Average	3	2.6	2	1.6	1.6	1.4	1.4	1	3	1.8	2

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC62P	Electronics Experiments Practical	Core	0	0	5	0	3	5	25	75	100

Learning Objectives

LO1	To demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.	
Unit	Content (Any Eight Experiments)	Hours
1	<ol style="list-style-type: none"> 1. Transistor - Phase shift oscillator. 2. Bridge rectifier using diodes 3. Clipping and clamping circuits using diodes. 4. Transistor – Hartely oscillator. 5. FET-Amplifier. 6. UJT-Relaxation Oscillator. 7. D/A converter-4-bit binary weighted resistor method. 8. OP-AMP-Voltage follower, Adder, Subtractor, Averager (inverting mode). 9. OP-AMP- Differentiator and Integrator 10. OP-AMP- Inverting amplifier with frequency gain response. 11. OP-AMP-Astable multivibrator. 12. Operational amplifier - non-inverting amplifier and summing. 13. Zener diode – voltage regulations 	75

CO	Course Outcomes
CO1	Students will be able to Understand and demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.
Textbooks:	
1	Srinivasan, K. Practical Physics. 12th ed., S. Chand & Company Ltd.,2012.

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHC63P	Group Project	Core	0	0	0	5	4	5	25	75	100

Preamble

The concept of introducing the project will help the student community to learn and explore the new research avenues. In the course of the project the student will refer books, Journals or collect literature / data by the way of visiting research institutes/ industries. They may even do experimental/theoretical work in her college and submit a dissertation report with a minimum of 20 pages not exceeding 30 pages.

Format for Preparation of Dissertation

The sequence in which the dissertation should be arranged and bound should be as follows

1. Cover Page and title Page
2. Declaration
3. Certificate
4. Abstract (not exceeding one page)
5. Acknowledgement (not exceeding one page)
6. Contents (12 Font size, Times new Roman with double line spacing)
7. List of Figures/Exhibits/Charts
8. List of tables
9. Symbols and notations/abbreviations
10. Chapters
11. References

Distribution of marks for Dissertation: (Internal: 25+External: 75 = 100Marks)

External: 75 Marks -Distribution

- a. For Organization and presentation of Thesis - 40Marks
 - b. For the novelty /Social relevance -10 Marks
- c. Viva voce - Preparation & Presentation of work - 10Marks
 - a. Response to questions -10Marks
- d. Participation / Presentation of paper in the National or State level Seminar/Conference/ Workshop - 5Marks

Internal: 25 Marks –Distribution

- a. Review : 1 – 5Marks
- b. Review: 2 – 10Marks
- c. Review: 3 – 10Marks

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE61	Laser and Fiber Optics	Elective	4	1	0	0	4	5	25	75	100

Learning Objectives

LO1	To understand the basic principles of laser operation.
LO2	To study the principle and classification of lasers based on the active medium and their properties.
LO3	To understand the various applications of lasers in different fields such as science, industry, medicine.
LO4	To learn the basic components of an optical fiber communication system.
LO5	To understand the role of connectors and fiber termination in optical fiber communication systems.

Unit	Contents	No. of Hours
1	Fundamentals of Laser: Basic principles and characteristics of laser-spontaneous and stimulated emission – Einstein’s coefficient – pumping mechanism: optical and electrical pumping – population inversion – quality factor – threshold condition – concept of Q switching–cavity dumping.	15
2	Types of Laser: Two and three level laser system solid state laser: ruby laser, Nd:YAG laser–dye laser–chemical laser: Gas laser: neutral atom gas laser (He-Ne laser), CO ₂ laser.	15
3	Applications of Laser: Application of laser in metrology – optical communication – material processing: laser instrumentation of material processing, powder feeder, laser heating, laser welding, laser melting –medical application – Laser instrumentation for surgeries– laser in astronomy.	15
4	Fiber Optics: Basic components of optical fiber communication – principles of light propagation through fiber–total internal reflection–optical fiber–coherent bundle – numerical aperture and skew mode – phase shift and attenuation during total internal reflection – types of fiber: single mode and multi-mode fiber –step index and graded index fiber – fiber optic sensors – application of fiber optics.	15
5	Characteristics and Fabrication of Optical Fiber: Fiber characteristics: mechanical and transmission characteristics – absorption loss and scattering loss measurements–dispersionanditstypes(interandintradispersion)–connectors and splicers–fiber termination–optical time domain reflectometer (OTDR)and its uses – fiber material – fiber fabrication – fiber optic cables design.	15

COURSE OUTCOMES	
CO1	Analyze the concept of population inversion and distinguish between two-level and three level laser systems, Identify and explain different pumping mechanisms used in lasers,
CO2	Compare different types of lasers and identify their suitable applications in science, industry, and medicine.
CO3	Explain the role of lasers in material processing, including heating, welding, and melting processes
CO4	Describe the principles of light propagation and total internal reflection in optical fibers
CO5	Explain the mechanical and transmission, design and structure of fiber optic cables used in communication systems.

REFERANCE BOOKS

1	A.Sennaroglu, "Photonics and Laser Engineering: Principles, Devices and Applications" Mc Graw-Hill Education, 2010.
2	K.R.Nambiar, "Lasers: Principles, Types and Applications", New Age International, 2004.
3	Optic, A joy Ghatak, McGraw-Hill Education (India) Pvt, Ltd, 6th Edn., 2017.

TEXT BOOKS

1	B.B. Laud - Laser and Non-linear Optics, New Age International Publications Third Edition, New Delhi.
2	An Introduction to laser, theory and applications by Avadhunulu, M.N.S., Chand & Co, New Delhi
3	J.Wilson and J.F.B. Hawkes. 'Introduction to Opto Electronics', Pearson Education, 2018

WEBLINKS

1	https://www.vanderbilt.edu/vbc/bme285/module2.php
2	https://www.physics-and-radio-electronics.com/physics/laser/differenttypesoflasers.html#google_vignette

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	1	1	3	2	1
CO2	3	2	1	1	1	1	1	1	3	2	1
CO3	2	3	2	2	1	2	1	1	3	3	2
CO4	3	2	1	1	1	1	2	1	3	2	1
CO5	2	3	2	3	2	1	1	1	3	3	2
Total	13	12	7	8	6	6	6	5	15	12	7
Average	2.6	2.4	1.4	1.6	1.2	1.2	1.2	1	3	2.4	1.4

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE62	Radiation Safety	Elective	4	1	0	0	4	5	25	75	100

Learning Objectives

LO1	To understand the fundamentals of atomic and nuclear physics, radioactive decay, and nuclear reactions.
LO2	To study the interaction of different types of radiation with matter and their physical effects.
LO3	To acquire knowledge about radiation detection, monitoring devices, and radiation measurement units.
LO4	To understand radiation safety principles, biological effects, and nuclear waste management techniques.
LO5	To explore the applications of nuclear techniques in medicine, industry, archaeology, and other fields.

Unit	Contents	No. of Hours
1	Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron-The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay- Mean life and half-life, -Basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions- Types of nuclear reaction, fusion, fission.	15
2	Interaction of Radiation with Matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, Interaction of Photons - Photoelectric effect, Compton Scattering, Pair Production- Linear and Mass Attenuation Coefficients- Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation- Beta Particles- Collision and Radiation loss (Bremsstrahlung)-Interaction of Neutrons- Collision, slowing down and Moderation.	15
3	Radiation Detection and Monitoring Devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of	15

	Intake(ALI) and derived Air Concentration (DAC)-Radiation detection:Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors (Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimeter.	
4	Radiation Safety Management: Biological effects of ionizing radiations-Operational limits and basics of radiation hazards evaluation and control: radiation protection standards-International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, and introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for wastemanagement.	15
5	Application of Nuclear Techniques: Application in medical science (e.g.,MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil-Industrial Uses: Tracing, Gauging, Material Modification, Sterization, Food preservation.	15
COURSE OUTCOMES		
Students will able to		
CO1	Explain the structure of atoms and nuclei, radioactive decay processes, and nuclear reactions including fission and fusion.	
CO2	Analyze the interaction of charged particles, photons, and neutrons with matter using attenuation and stopping power concepts.	
CO3	Describe the working principles and applications of various radiation detection and monitoring instruments.	
CO4	Apply radiation safety standards and evaluate methods for radiation protection and nuclear waste management.	
CO5	Discuss the applications of nuclear techniques in medical, industrial, scientific, and societal fields	
TEXTBOOKS		
1	R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics, S Chand &Co.NewDelhi,2006.	
2	H. Cember and T. E. Johnson, Introduction to Health Physics, 4th Ed.,McGraw Hill,2008.	
REFERANCEBOOKS		
1	Dr. K. Thayalan, Basic Radiological Physics ,Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi,2003.	
2	K. Thayalan, Handbook of Radiological Safety ,JaypeeBrothers,Medical ,Publishers,2009.	

WEBLINKS

1	https://www.youtube.com/watch?v=9UhmFr2WctU
2	https://www.youtube.com/watch?v=ySnG4JZa7Go

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	1	1	3	2	1
CO2	3	3	1	3	2	1	1	1	3	3	2
CO3	2	2	2	3	3	1	1	1	2	3	3
CO4	2	3	1	2	2	3	3	2	2	2	3
CO5	1	2	2	2	3	2	2	2	2	3	3
Total	11	12	7	12	11	8	8	7	12	12	12
Average	2.2	2.4	1.4	2.4	2.2	1.6	1.6	1.4	2.4	2.4	2.4

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE63	Communication System	Elective	4	1	0	0	4	5	25	75	100

Learning Objectives

LO1	Understand the basic components of communication systems: transmitter and receiver
LO2	Apply the concepts of fiber optics in communication systems.
LO3	Explain key concepts of radar communications
LO4	To learn the basics of satellite communications.
LO5	Understand modern communication technology

Unit	Content	Hours
1	Radio Transmission and Reception: Basic Principals of Transmitter – modulation – amplitude modulation – limitations of amplitude modulation – frequency modulation – comparison of FM and AM –. Receivers: AM radio receivers – FM receiver and its advantages – difference between FM and AM receivers - essential of demodulation	15
2	Fiber Optic Communication: Basic, types and applications of fiber optics – construction of optical fiber – classification based on the refractive index and modes of propagation – losses in optical fibers – attenuation–advantages of fiber optic communication. Systems Transmitter, Receiver couplers encoding and decoding. (Encoder – optical pulse signed- fiber-optical detector-decoder).	15
3	Radar Communication: Basics, Types & Applications-radar–antenna scanning–pulsed radar system–MTI-tracking Radar-Advantages, Limitations, Applications of MTI radar- Doppler effect– CW Doppler radar-CW radar Advantages, Limitations, Applications-Difference between MTI and CW	15
4	Satellite Communication: Elements of orbital mechanics (Kepler’s laws)-Equations of motion- Need of Satellite Communication-Working -Types – Advantage and disadvantages - Application of Satellite Communication- Benefits of Satellite Communication for India	15
5	Modern Communication: Introduction – concept of basic cellular — internet communication – VSAT (very small aperture terminals) modem IPTV (internet protocol television) -Wi-Fi-5G/6G (basic ideas) Wireless communication principles, channel modeling, introduction of IoT – Characteristics of IoT and its applications	15

CO	Course Outcomes
	Students will be able to
CO1	Understand the Radio Transmission and Reception concepts.
CO2	Analysis the Fiber-Optics and to apply the concept in Communication system.
CO3	Know the Radar Communication for signal processing
CO4	Study the orbital trajectory to apply the concepts in Satellite Communication
CO5	Understand the Modern Communication for today's fastest-growing and most impactful engineering domain.
Textbooks:	
1	V.K.Metha, Principles of Electronics, S. Chand & Co Ltd.,2013
2	Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand& Co,2013
ReferenceBooks:	
1	1. J.S. Chitode, Digital Communications, 2020, Unicornpublications
2	Senior John. M, Optical Fiber Communications: Principles and Practice, 2009,Pearson Education.
Webresources:	
1	https://www.etsi.org/deliver/etsi_gts/05/0505/05.02.00_60/gsmts_0505v050200p.pdf
2	https://www.utdallas.edu/~torlak/courses/ee4367/lectures/FIBEROPTICS.pdf
3	https://www.elprocus.com/radar-basics-types-and-applications/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3
Total	15	15	15	15	15	15	10	15	15	15	15
Average	3	3	3	3	3	3	2	3	3	3	3

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHE64	Digital Photography	Elective	4	1	0	0	4	5	25	75	100
Learning Objectives											
LO1	To understand the principles of photography and image formation in conventional and digital systems.										
LO2	To acquire knowledge about photographic lenses, focal length, aperture, and image control techniques.										
LO3	To study the construction and working of film-based cameras and their different types.										
LO4	To learn the principles, components, and classifications of digital cameras and digital imaging techniques.										
LO5	To develop skills in digital image postproduction, image editing, and digital printing technologies.										
Unit	Content									Hours	
1	Photography and Basic Principle of Image Formation: Principle –chemical route and digital route–light, wavelengths, colours–shadows–light intensity and distance – making light form images –pin-hole images – practical limitations to pin-hole images – lens instead of pin-hole – focal length and image size –imaging of closersubjects.									15	
2	Lenses – Controlling the Images: Photographic lens – focal length and angle of view (problems) – focusing movement – aperture and f-numbers (problems) – depth of field– depth of focus – image stabilization – lenses for digital cameras – lens and cameracare.									15	
3	Camera using Films and its Types: Camera and its essential components–shutter –aperture–light measurement–film housing–camera types: view camera–view finder camera – Reflex camera– single lens reflex (SLR)camera.									15	
4	Digital Cameras Principle and Types: Principle of digital image capturing – comparison of digital and analog picture information – megapixel – grain, noise and pixel density – optical and digital zooming – image stabilizer – bit depth – white balance–colour modes–file formats(TIFF,RAW&JPEG)–storage cards and types – digital cameras: camera phones – compact camera – hybrid camera – digital SLR.									15	
5	The Digital Image – Post production: Computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history –crop – rotate – brightness &contrast – colour balance – hue/saturation – dodge/burn – cloning & retouching – removing an element in an image – advanced editing: histogram/levels – curves – selection tools: magic wand – printing digital images: inkjet printer – laser printer – dye sub printer – lambda/light jet printers.									15	

CO	Course Outcomes
	Students will be able to
CO1	Explain the basic principles of photography, image formation, and light interaction in imaging systems.
CO2	Analyze the role of lenses, aperture, focal length, and focusing in controlling photographic images.
CO3	Describe the working and applications of different film-based cameras and their components.
CO4	Compare analog and digital imaging systems and evaluate various types of digital cameras and image formats.
CO5	Apply digital image editing and postproduction techniques using software tools and digital printing methods.

Textbooks:

1	Michel J.Langford , Anna Fox & Richard Sawdon Smith, Basic photography, 9th Edition, , 2010-NL, Focal press,London
2	Henry Carroll, Read this if you want to take great photographs of people, Laurence King Publishing

ReferenceBooks:

1	Mark Galer, Digital Photography in Available Light essential skills, 2006, Focal press,London
2	Paul Harcourt Davies, The Photographer’s practical handbook, 2005, UKPRESS

Webresources:

1	https://www.cambridgeincolour.com/tutorials.htm
2	https://guides.lib.udel.edu/multimedia/photography
3	https://www.youtube.com/watch?v= 2DTGosk45Q

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	1	1	3	2	1
CO2	3	3	1	2	2	1	1	1	3	3	2
CO3	2	2	2	1	2	1	1	1	2	3	2
CO4	2	3	2	2	3	2	1	1	2	3	3
CO5	2	3	2	3	3	1	1	2	2	3	3
Total	12	13	8	10	11	6	5	6	12	14	11
Average	2.4	2.6	1.6	2	2.2	1.2	1	1.2	2.4	2.8	2.2

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHP61	Weather Forecasting	PEC	2	0	0	0	2	2	25	75	100

Learning Objectives

LO1	To learn about the elementary idea of atmosphere, atmospheric pressure etc.
LO2	To study how to measure wind speed, direction, rain fall etc.
LO3	To teach the different weather systems and hurricanes.
LO4	To explain the climate and environmental issues related to climate.
LO5	To give an idea about weather forecasting.

Unit	Contents	No. of Hours
1	Introduction to Atmosphere: Basic and composition of atmosphere structure-temperature and heat atmospheric pressure wind systems humidity and precipitation atmospheric stability and weather phenomena and importance of atmosphere. variation of pressure and temperature with height, measure air temperature, temperature sensors: types atmospheric pressure, its measurement.	6
2	Measuring the Weather: Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.	6
3	Weather Systems: Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: cyclones and anticyclones its characteristics classification;-naming tropical cyclone storm does; hurricanes.	6
4	Climate and Climate Change: Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.	6
5	Basics of Weather Forecasting: Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.	6

Course Outcomes	
Students will be able to	
CO1	The atmosphere and its physical structure and also to know the variation of pressure and temperature with height.
CO2	To describe the measurement of wind speed, direction humidity, rainfall and can state the radiation laws.
CO3	To explain the global wind systems and able to know thunderstorms and cyclones.
CO4	To conceptualize the classification of climate, ozone depletion, acid rain and environmental hazards due to climate change.
CO5	To understand the analysis and historical background of weather forecasting and know the predictability, probability of forecasts.
TEXTBOOKS	
1	Chandrasekar, Basics of Atmospheric Science, PHI Learning Pvt Ltd, New Delhi, 2010.
2	Howard J Critchfield, General Climatology, Prentice Hall of India, Pvt Ltd, New Delhi, 1975.
REFERENCEBOOKS	
1	I.C. Joshi, Aviation Meteorology, Himalayan Books, 2014.
2	Stephen Burt, The weather Observers Hand book, Cambridge University Press, 2012.
3	S.R. Ghadekar, Meteorology, Agromet Publishers, Nagpur, 2001.
WEBLINKS	
1	https://en.wikipedia.org/wiki/Atmosphere
2	https://www.youtube.com/watch?v=6LkmD6B2ncs

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	1	1	3	2	1
CO2	3	3	1	2	2	1	1	1	3	3	1
CO3	2	3	2	2	1	1	1	1	3	3	2
CO4	2	3	1	1	1	2	3	2	3	2	3
CO5	2	3	2	3	3	1	1	1	3	3	2
Total	12	14	7	9	8	6	7	6	15	13	9
Average	2.4	2.8	1.4	1.8	1.6	1.2	1.4	1.2	3	2.6	1.8

3 – Strong, 2- Medium, 1-Low

THIRD YEAR –SEMESTER VI

Subject Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UPHL61	Cell Phone Technology	SLC	0	0	0	3	2	3	25	75	100

Learning Objectives

LO1	To learn the back ground information about cellular system.
LO2	To study the various mobile standards
LO3	To understand the chip level information of mobile phones.
LO4	To expose the idea about trouble shooting of problems in mobile phones.
LO5	To acquire the knowledge about mobile service tools.

Unit	Content	Hours
1	The Cellular System: Background-The cellular concept–interference, capacity, cell splitting, The cellular system-mobile location, in call handover and power control in cell planning. TACS standard. The cellular network - Base stations, MSC, services.	9
2	Mobile Standards: Smart Phones (Android, IOS, Windows), Bluetooth, 1G, 2G, 3G, 4G and 5G standards and applications. Network protocols - TDMA(2G), GSM(2G), cdma one(2G), PDC 2(G), GPRS(2.5G), CDMA 2000 1x(2.5G), EDGE(3G), CDMA 2000 1xEV(3G), WCDMA(G)- WiMax (4G).	9
3	Chip Level Study: Block Diagrams -Schematic Diagrams - Chip Level Information of Mobile-Phones-BGA-SMD Reworking Station-Identification of IC's - Assembling & Disassembling of Smart Phones.	9
4	Problems in a Smart Phone: Causes for various problems in a Smart Phone - Network Problems - Display Problems -Touch Problems - Sim Card Problems - Charging problems - Software Problems -IMEI information - Problems related to mobile phone handsets - replacement of Various components ICs.	9
5	Mobile Service Tools: Ultrasonic Cleaner - Computer Connectors - SIM Card Reader – Memory Card Reader - Mobile Virus - Virus Prevention - Removing Virus – Health Hazards with Mobiles -SAR.	9

CO	Course Outcomes
	Students will be able to
CO1	Understand the cellular communication system
CO2	Study the smart phones and various mobile standards like 1G,2G,etc.
CO3	Learn chip level information and soldering and de-soldering the various components.
CO4	Understand the network problems and SIM card problems and to learn the trouble shooting process.
CO5	Know how to use the ultrasonic cleaner, mobile virus and other service tools.
Textbooks:	
1	Manahar Lotia , Modern Mobile phone Introduction & Servicing, BPB Publications,2017
2	Mobile Telephony, Digit Magazine, Jasubhai Digital Media Publications.
ReferenceBooks:	
1	Manahar Lotia, Modern Mobile Phone Unlocking & Utility Codes For GSM & CDMA Phones, BPB Publications,2017
2	Raj Pandya, Mobile & Personal Communication Systems & Services, PHI Publications
3	Andy Dornan, The Essential Guide to Wireless Communications & Applications, Prentice Hall, New Delhi,2002
Webresources:	
1	https://www.youtube.com/watch?v=whYljse4Abc
2	https://www.youtube.com/watch?v=IvWYk3FAVak
3	https://www.youtube.com/watch?v=eRe_nD2t0Hk

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	1	1	2	1	2
CO2	3	2	1	1	1	2	1	2	3	2	2
CO3	3	3	2	2	2	2	2	2	3	2	2
CO4	3	2	2	1	2	2	2	2	3	3	3
CO5	3	3	2	2	2	2	2	2	3	3	3
Total	15	12	8	7	8	9	8	9	14	9	12
Average	3	2.4	1.6	1.4	1.6	1.8	1.6	1.8	2.8	1.8	2.4

3 – Strong, 2- Medium, 1-Low