



**MARUDHAR KESARI JAIN COLLEGE FOR WOMEN
(AUTONOMOUS)**

Vaniyambadi – 635 751

PG & Research Department of Physics

for

Undergraduate Programme

Bachelor of Physics

From the Academic Year 2025-2026

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LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE AND POSTGRADUATE EDUCATION

1. Preamble

The curriculum for the U.G. Physics for universities and colleges is revised as per Learning Outcomes- based Curriculum Framework (LOCF). The learner centric courses are designed to enable the students to progressively develop a good understanding of the concepts of various domains in physics. Significant modification is the inclusion of the courses to equip students to face challenges in industries and make them employable. Skill development in different spheres and confidence building are given a special focus.

PROGRAMME OUTCOMES (PO)

Programme	B.Sc., Physics
Programme Code	US10
Duration	3Years[UG]
Programme Outcomes	PO1: Acquire knowledge in Physics to apply the knowledge in their day-to-day life for betterment of self and society. PO2: Develop critical, analytical thinking and problem-solving skills PO3: Develop research related skills in defining the problem, formulate and test the hypothesis, analyse, interpret, and draw conclusion from data. PO4: Address and develop solutions for societal and environmental needs of local regional and national development. PO5: Work independently and engage in lifelong learning and enduring proficient progress. PO6: Provoke employability and entrepreneurship among students along with ethics and communication skills. PO7: Understand the importance of ethical behavior in business contexts and be able to recognize and address ethical dilemmas they may encounter in their professional careers. PO8: Prepared for lifelong learning and professional development, including the ability to adapt to changes in technology, business practices, and economic conditions throughout their careers.
Programme Specific Outcomes:	PSO1: Placement: Acquire the ability to critically analyze complex real life problems using the laws of Physics with appropriate mathematical tools and thereby preparing the students to face various state/national level competitive exams. PSO2: Entrepreneur: Acquire employability and entrepreneurial skills through hands-on training in basic as well as advanced areas of Physics and to develop innovative scientific solutions for industrial and societal needs at local, regional, national and global levels. PSO3: Contribution to the Society: Create skills required for identifying socially relevant research problems, collection of data, analyze and interpret data leading to knowledge enhancement in addressing the societal challenges.

Eligibility for Admission:

Candidates for admission to the first year of the Bachelor of Physics course shall be required to have passed the 12th (Mathematics and Physics is the compulsory paper) by the Government of Tamilnadu or any equivalent.

Methods of Evaluation and Assessment

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

Semester - I						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA11/2 4UFUR11	Tamil – I/Urdu-I	4	1	0	0	3
24UFEN11	English - I	4	1	0	0	3
24UPHC11	CC- I Properties of Matter & Acoustics	3	1	2	0	5
24UPHC12P	CC- II Practicals -I Properties of Matter & Acoustics	0	0	4	0	3
24UMAA14	EC-I Mathematics-I	3	1	0	0	3
24UPHS11/ 24UPHS12	SEC- I Home Electrical Installation/ Energy Physics	2	0	0	0	2
24UPHS13/ 24UPHS14	SEC – II Physics for Every Day Life / Astrophysics	1	1	0	0	2
24UPHF11	FC – Introductory Physics	1	1	0	0	2
TOTAL					30	23
Semester - III						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA31	Tamil - 3	4	1	0	0	3
24UFEN31	English - 3	4	1	0	0	3
24UPHC31	CC –5 General and Classical Mechanics	3	1	2	0	5
24UPHC32P	CC – 6 Practical III - Electricity	0	0	4	0	2
24UCHA31	EC - III Chemistry - I	3	1	0	0	4
24UCHA32P	EC – IV Practical Allied Chemistry	0	0	2	0	2
24UPHS31/ 24UPHS32	SEC –IV 1. Nanoscience and Nanotechnology 2. Physics of Medical Instruments	1	0	1	0	2
24UAEC31	AEC – 2 Human Values and Professional Ethics	1	1	0	0	2
TOTAL					30	23

Semester - II						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA21	Tamil – II/Urdu - II	4	1	0	0	3
24UFEN21	English – II	4	1	0	0	3
24UPHC21	CC – III Heat & Thermodynamics and Statistical Physics	3	1	2	0	5
24UPHC22P	CC - IV Practical -II Heat & Thermodynamics and Statistical Physics	0	0	4	0	3
24UPHA21	EC-II Mathematics II	4	2	0	0	5
24UPHS21	SEC – III Elements of Computer Science	1	0	1	0	2
24UAEC21	AEC – I Life Skill for Yoga	1	1	0	0	2
TOTAL					30	23
Semester – IV						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
	Tamil – 4	4	1	0	0	3
	English – 4	4	1	0	0	3
	CC – Optics and Laser Physics	3	1	2	0	5
	CC – 8 Practical IV- Light	0	0	4	0	2
	EC – V Allied Chemistry - II	3	1	0	0	4
	EC – VI Practical- Allied Chemistry	0	0	2	0	2
	SEC –1. Physics Workshop Skills 2.Communication Systems	1	0	1	0	2
	AEC – 3 ENVIRONMENTAL STUDIES	1	1	0	0	2
TOTAL						

Semester - V						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
	CC -Electricity, Magnetism and Electromagnetism	4	1	0	0	4
	CC- 10 Practical – V General Experiments	0	0	4	0	4
	CC – Atomic and Nuclear Physics	2	1	1	0	4
	CC - 12 Practical-VI Electronics	0	0	3	0	2
	EC – 1. Analog and Communication Electronics 2. Basic and Applied Electronics	4	1	0	0	4
	EC –1. Laser and Fiber Optics 2. Digital Photography	4	1	0	0	4
	AEC – 4 SOCIAL RESPONSIBILITIES AND UPLIFTMENT	1	1	0	0	2
	Internship				2	2
TOTAL				30	26	

Semester - VI						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
	CC – Quantum Mechanics and Relativity	4	1	0	0	4
	CC - Practical –VII Microprocessor	0	0	5	0	3
	CC – Group -Project	0	0	0	5	4
	EC – 1. Solid State Physics 2. Materials Science	4	1	0	0	4
	EC – 1. Digital Electronics and Microprocessor 8085 2. Mathematical Physics	4	1	0	0	4
	PEC – 1	1	1	0	0	2
	SLC – 1				3	2
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*.

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 Cavendish'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, 6th revised 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 Wesley.
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
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

CO	Course Outcomes
CO1	Students will be able to 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

CO	Course Outcomes
	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=a1aHR0cHM6Ly96bGliLnB1Yi9ib29rL2hhbmRib29rLW9mLWJpb21lZGljYWwtaW5zdHJ1bWVudGF0aW9uLTJnMWUxNTlhdXBsZw&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

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	Any eight experiments - Calibration of low range and high range voltmeter using potentiometer - Calibration of ammeter using potentiometer. - Measurement of low resistances using potentiometer. - Determination of field along the axis of a current carrying circular coil. - Determination of earth's magnetic field using field along axis of current carrying coil. - Determination of specific resistance of the material of the wire using PO box. - Determination of resistance and specific resistance using Carey Foster's bridge. - Determination of internal resistance of a cell using potentiometer. - Determination of specific conductance of an electrolyte. - Determination of e.m.f of thermo couple using potentiometer - Determination of capacitance using Desauty's bridge and B.G./Spot galvanometer/head phone. - Determination of figure of merit of BG or spot galvanometer. - Comparison of EMF of two cells using BG. - 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