BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI - 620 024.

B.Sc. PHYSICS
CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2026-27 onwards)

Sem.	Part	Course	Title	Credit	Exam Hours	Marks		Total
						Int.	Ext.	
I	I	Language Course – I Tamil $ / Other Languages + #		3	3	25	75	100
	II	English Course - I		3	3	25	75	100
	III	Core Course – I (CC)	Properties of Matter and Acoustics	5	3	25	75	100
		Core Practical – I(CP)	Properties of Matter	4	3	40	60	100
		First Allied Course – I (AC)	Calculus and Fourier Series	4	3	25	75	100
		First Allied Course – II (AC)	Algebra, Analytical Geometry (3D) and Trigonometry	-	-	-	-	-
	IV	Value Education		2	3	25	75	100
	TOTAL			**21**	**-**	**-**	**-**	**600**
II	I	Language Course - II Tamil $ / Other Languages + #		3	3	25	75	100
	II	English Course - II		3	3	25	75	100
	III	Core Course – II (CC)	Mechanics and Theory of Relativity	5	3	25	75	100
		Core Practical – II (CP)	General Physics I	4	3	40	60	100
		First Allied Course – II (AC)	Algebra, Analytical Geometry (3D) and Trigonometry	4	3	25	75	100
		First Allied Course – III (AC)	ODE, PDE, Laplace transforms and Vector Analysis	2	3	25	75	100
	IV	Environmental Studies		2	3	25	75	100
	TOTAL			**23**	**-**	**-**	**-**	**700**

List of Allied Courses

First Allied Course	Second Allied Course
Mathematics	Chemistry / Computer Science

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	Part	Types of the Courses	No. of Courses	No. of Credits	Marks
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.	III	Core Courses	9	45	900
4.		Core Practical	6	24	600
5.		Allied Courses I & II	5	18	500
6.		Allied Practical	1	2	100
7.		Major Based Elective Courses	2	8	200
8.		Project	1	7	100
9.	IV	Non-Major Elective Courses	2	4	200
10.		Soft Skills Development	1	2	100
11.		Value Education	1	2	100
12.		Environmental Studies	1	2	100
13.	V	Gender Studies	1	2	100
	Total		**38**	**140**	**3800**

PROGRAM OBJECTIVES:

- To impart knowledge of basic concepts, laws and principles of various branches of Physics.
- To inculcate appropriate logical skills to translate physical description into mathematical equations and vice versa
- To provide analytical skills to solve problems in physics
- To provide systematic training on experimental methods so as to mould the learners to address the problems encountered during their practical sessions on their own
- To make available all learning methods of physics to enable the students become independent learners and thereby promote them for further studies as well as employment.

PROGRAMME SPECIFIC OUTCOMES:

On successful completion of B.Sc., Physics Programme, the students would have

- learnt the basic concepts and principles of Physics
- understood the meaning of mathematical equations representing physical systems and thereby describe various aspects of physical states through graphs and diagrams
- been trained to apply the understood concepts to solve the problems in physics
- acquired practical, analytical and logical skills to carry out experiments and interpret the observed results `
- discovered the capability to be independent learners so as to become eligible for higher studies as well as employment and cope with the ever- changing societal needs.

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First Year **CORE COURSE I** **Semester I**

PROPERTIES OF MATTER AND ACOUSTICS

(Theory)

COURSE OBJECTIVES:

- To inculcate the knowledge of certain properties of matter namely, elasticity, surface tension and viscosity.
- To enable the students to understand the basic concepts of sound.
- To describe the experimental techniques for the determination of properties so that the learner can do the experiments with better understanding.

UNIT – I ELASTICITY:

Introduction on the elastic and plastic nature of materials - Hooke's law-Stress-Strain diagram – Factors affecting elasticity – Different moduli of elasticity - Relation between the elastic moduli – Poisson's ratio -Twisting couple on a cylinder – Work done in twisting a wire - Torsional oscillations of a body – Torsion pendulum – Determination of rigidity modulus and moment of inertia.

UNIT – II BENDING OF BEAMS:

Bending of beams – Expression for bending moment - Non-uniform bending – Expression for depression – Uniform bending – Expression for elevation – Experimental determination of Young's modulus using pin and microscope method (Non-uniform bending – Uniform bending) –Determination of Young's modulus by Koenig's method.

UNIT – III SURFACE TENSION:

Definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – Work done on increasing the area of a surface - Angle of contact - Excess pressure inside a liquid drop and soap bubble – Experimental determination of surface tension - Drop- weight method – Capillary rise method- Variation of surface tension with temperature.

UNIT – IV VISCOSITY:

Newton's law of viscous flow – streamlined and turbulent motion – Reynold's number - Poiseuille's formula for the flow of a liquid through a horizontal capillary tube – Experimental determination of co-efficient of a liquid by Poiseuille's method– Terminal velocity and Stokes' formula – Viscosity of gases - Meyer's formula -Variation of viscosity with temperature and pressure – Lubrication – Equation of continuity of flow -Bernoulli's theorem.

UNIT – V ACOUSTICS:

Newton's Formula for the velocity of sound – Musical Sound and Noise – Speech – Characteristics of Musical sound – Intensity of sound – Decibel and Phon-Bel – Reverberation– Factors affecting the Acoustics of Buildings – Sound distribution in an Auditorium – Requisites for good acoustics – Ultrasonics – Production of ultrasonic waves – Piezoelectric method– Detection of ultrasonic waves - Quartz crystal method – Applications of Ultrasonic waves.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Modulus of toughness and modulus of elasticity for different types of concrete - Elasticity and Seismic waves – Bending beam load cell – Composite beams - Surface tension and wetting behaviour of nanofluids – Viscosity of nanofluids – Acoustics sensors.

REFERENCES:

1. R. Murugeshan, *Properties of Matte*r, S. Chand & Co. Pvt. Ltd., Revised edition, 2012.
2. D. S. Mathur*, Elements of Properties of Matter*, S. Chand & Co. Pvt. Ltd., Revised edition, 2010
3. Brijlal& N. Subramanyam, *Properties of Matter*, Vikas Publishing. Pvt. Ltd, 2005.
4. Brijlal& N. Subramanyam, *ATextBook of Sound*, Vikas Publishing. Pvt. Ltd, 2008.
5. Feynman,*Lectures on Physics*, Vol.I& II by Richard P. Feynman, The New Millennium Edition, 2012.
6. David Halliday and Robert Resnick, *Fundamentals of Physics* by Wiley Plus, 2013.
7. B. H. Flowers and E. Mendoza, *Properties of matter*, Wiley Plus, 1991.
8. H. R. Gulati*, Fundamentals of General properties of matter*, S. Chand & Co. Pvt. Ltd, 2012.
9. Chatterjee and Sen Gupta, *A treatise on general properties of matter*, New central Books agency (p) Ltd, Kolkata, 2001.
10. R.L.Saihgal, *A Text Book of Sound*, S. Chand & Co. Pvt. Ltd, New Delhi, 1979.

COURSE OUTCOME:

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

- Differentiate the moduli of elasticity of different materials
- Analyze the moduli of elasticity of materials made in the form of beams.
- Understand the practical applications of surface tension in real life.
- Acquire the knowledge of the flow of liquids based on their viscous nature and the variation of viscosity with temperature and pressure
- Understand the various characteristics of sound and their practical implications.

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First Year **CORE PRACTICAL I** **Semester I**

PROPERTIES OF MATTER

(Practical)

(ANY EIGHT EXPERIMENTS)

COURSE OBJECTIVES:

- To impart the skill of using measuring instruments
- To motivate the learner to study some properties of materials by determining the elastic constants, surface tension and viscosity through experiments.
- To make the learner to realize the vibrations of stretched strings.

EXPERIMENTS:

1. Measurement of length (or diameter) using Vernier calipers, Screw gauge and travelling microscope.
2. Determination of Young's modulus - Non-uniform bending using pin and microscope.
3. Determination of Young's modulus - Uniform bending using pin and microscope.
4. Determination of Young's modulus - Cantilever depression usingscale and telescope.
5. Surface tension and interfacial surface tension – Drop weight method.
6. Surface tension by capillary rise method.
7. Coefficient of viscosity of a liquid - Poiseuille's flow method.
8. The viscosity of highly viscous liquid - Stoke's method.
9. Verification of laws of vibration of a stretched string and determination of the frequency of a tuning fork – Sonometer.
10. Determination of frequency of a tuning fork using Melde's string apparatus.
11. Absolute determination of M and H using deflection and vibration magnetometer.
12. Spectrometer - Determination of refractive index of a solid prism.

REFERENCES::

1. Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirappalli, 2009.
2. Dr. S. Somasundaram, *Practical Physics*, Apsara Publications, Tiruchirappalli, 2012.
3. C. C. Ouseph, U.J. Rao and V. Vijayendran, *Practical Physics and Electronics*, Viswanathan Printers and Publishers, PVT Ltd, 2014.
4. S. Srinivasan, *A Text Book of Practical Physics*, S. Sultan Chand

Publications, 2005
5. R. Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Del, 2011.

COURSE OUTCOMES:

Upon completion of this course, the student would be able to

- Use the measuring instruments for accurate measurement of physical quantities required for the experiment.
- Know the elastic properties of structural materials from the experimental results.
- Realize practically the properties of liquids such as surface tension and viscosity.
- Acquire the experimental skill of verifying laws in Physics.
- Understand experimentally the vibrations of stretched strings.

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First Year **CORE COURSE II** **Semester II**

MECHANICS AND THEORY OF RELATIVITY
(Theory)

COURSE OBJECTIVES:

- To provide a better insight into the change of position of any physical object or event and their consequences.
- To inculcate the Newton's law of gravitation and Kepler's laws of planetary motion and their implications
- To impart the knowledge of theory of relativity and its applications.

UNIT – I PROJECTILE, IMPULSE AND IMPACT:

Projectile – Particle projected in any direction – Path of a projectile is a parabola - Range of a projectile on plane inclined to the horizontal - Maximum range on the inclined plane - Impulse of a force - Laws of impact - Direct impact between two smooth spheres - oblique impact between two smooth spheres - Loss of KE due to direct impact and oblique impact.

UNIT – II MOTION ON A PLANE CURVE:

Centripetal and centrifugal forces - Expression for normal acceleration - Motion of a cyclist along a curved path - Motion of a carriage on a banked-up curve - Effect of earth's rotation on the value of the acceleration due to gravity - Variation of 'g' with altitude, latitude and depth.

UNIT – III GRAVITATION:

Newton's law of gravitation - Mass and density of earth - Inertial and Gravitation mass - Determination of G-Boy's experiment -Kepler's Laws of planetary motion -Deduction of Newton's law of gravitation from Kepler's Law - Gravitation - Field - potential -Intensity of Gravitational field- Equipotential surface - Gravitational potential and field due to a solid sphere.

UNIT – IV DYNAMICS OF RIGID BODY AND CENTRE OF GRAVITY:

Moment of Inertia - Kinetic energy and angular momentum of rotating body - Acceleration of a body rolling down on inclined plane without slipping - Compound pendulum - Centre of suspension and centre of oscillation- Centre of gravity of a body - C.G. of a solid cone – Centre of pressure – Centre of pressure of a triangular lamina immersed in a liquid.

UNIT – V THEORY OF RELATIVITY:

Galilean – Newtonian relativity - Galilean transformations – Michelson Morley experiment and its importance –Basic ideas of general theory of relativity - Lorentz transformations and its interpretation – Length contraction, time dilation – relativistic addition of velocities – Mass energy equivalence.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Applied mechanics and growing utilization of theoretical mechanics - Structural Engineering – Hydraulics - External fluid dynamics.

REFERENCES:

1. M. Narayanamurthi and N. Nagarathinam, *Dynamics*, The National Publishing Company 2005, Chennai.
2. M. Narayanamurthi and N. Nagarathinam, *Statics, Hydrostatics and Hydrodynamics* - The National Publishing Company 2005, Chennai.
3. R. Murugesan and KiruthigaSivaprasath - *Modern physics*, 18th Revised edition November - 2017, S.Chand& Company Ltd., New Delhi.
4. D.S. Mathur, *Mechanics*, S. Chand & Company Ltd., New Delhi, 2007.
5. Venkataraman, M K, *Dynamics*, Trichy: Agasthiar Book Deport, 2011
6. R. Murugesan, *Mechanics and Mathematical Physics*, S. Chand & Company Ltd., New Delhi, 2008.
7. I. H. Shames, *Introduction to Solid Mechanics,* 2009.
8. David Tong, *Dynamics and Relativity*, University of Cambridge, 2012.
9. M. Ray and G. C. Sharma, *A text book of Dynamics*, Chand & Company Ltd., New Delhi. 13th revised edition, 2005.
10. D. RajanBabu, E. James Jebaseelan Samuel, P. Ramesh Babu, V. Ramasubramanian and C. AnuRadha, *Modern Physics*, Anuradha Publisher, 2010.
11. P. Duraipandian, LaxmiDuraiPandiyan and MuthamizhJayapragasam, *Mechanics* Chand & Company Ltd., New Delhi. 2000.
12. Agarwal, J P, *Elements of Mechanics*, India: PragatiPrakashan, 2010.
13. Knight W D, Ruderman M A, Helmholz A C and Moyer B J, *Mechanics*, Berkeley Physics Course: Volume 1, 2nd Edition (2011)
14. Kleppner D and Kolenkow R J, *An Introduction To Mechanics* (Special Indian Edition) (2007).
15. *University Physics*. F.W. Sears, M.W. Zemansky and H.D. Young, 13/e, 1986.Addison-Wesley.
16. https://www.mooc-list.com/tags/gravitation
17. https://archive.org/details/NPTEL-Physics
18. https://www.academia.edu/8233163/Basics_of_Mechanics_notes_

COURSE OUTCOMES:

Upon completion of this course, the students would be able to

- Use the principles of projectiles to explain the manner in which gravity affects a projectile motion.
- Gain a deeper knowledge of mechanics and its fundamental concepts.
- Acquire the knowledge of gravitational force between objects and the centre of mass of objects.
- Learn rigid body dynamics in terms of moment of inertia and also analyze the center of gravity of different bodies.
- Analyze the special theory of relativity and its applications.

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First Year **CORE PRACTICAL II** **Semester II**

GENERAL PHYSICS I
(Practical)

(ANY EIGHT EXPERIMENTS)

COURSE OBJECTIVES:

- To enhance the experimental skills of students.
- To develop the knowledge of laws and theorems in Physics through experimental study.
- To make the students realize the optical properties of certain materials by doing experiments.

EXPERIMENTS:

1. Determination of Young's modulus – Uniform bending by Koenig's method.
2. Determination of Rigidity modulus- Static Torsion method.
3. Determination of Rigidity modulus and moment of inertia using Torsional pendulum.
4. Sonometer - AC frequency.
5. Determination of 'g' and 'k' using a compound pendulum.
6. The figure of merit of a mirror Galvanometer.
7. Concave lens – Determination of focal length.
8. Determination of focal length, radius of curvature and refractive index of a long focus convex lens.
9. Air wedge- Determination of thickness of a thin wire.
10. Spectrometer – Determination of Refractive index of a hollow prism
11. Spectrometer– Determination of Refractive index of a liquid using a prism.
12. Spectrometer – Small-angle prism.

REFERENCES:

1. Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirappalli, 2009.
2. Dr.S. Somasundaram, *Practical Physics*, Apsara Publications, Tiruchirappalli, 2012.
3. C.C.Ouseph, U.J.Rao and V.Vijayendran, *Practical Physics and Electronics*, Viswanathan Printers and Publishers, PVT Ltd (www.svprinters.com), Chetpet, Chennai – 2014.
4. S. Srinivasan, *A Text Book of Practical Physics*, S.Sultan Chand Publications. 2005.
5. R. Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi, 2011.

COURSE OUTCOME:

Upon completion of this course, the students would be able to

- Know the techniques of handling laboratory instruments.
- Evaluate a process based on the results obtained from the experiments quantitatively and qualitatively.
- Use the results of an experiment to describe a phenomenon.
- Develop the capacity of experimenting collaboratively and ethically.
- Acquire the skill of analyzing the properties of materials.

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