

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

**(Applicable to the candidates admitted from the academic year 2022-23 onwards)**

**Revised as on 05.01.2023**

Sem	Part	Course	Title	Ins. Hrs	Credit	Exam Hours	Marks		Total	
							Int.	Ext.		
I	I	Language Course – I (Tamil \$/Other Languages + #)		6	3	3	25	75	100	
	II	English Course - I		6	3	3	25	75	100	
	III		Core Course – I (CC)	Properties of Matter and Acoustics	5	5	3	25	75	100
			Core Practical – I(CP)	Properties of Matter	4	4	3	40	60	100
			First Allied Course – I (AC)	Mathematics - I	4	4	3	25	75	100
		First Allied Course – II (AC)	Mathematics - II	3	-	-	-	-	-	
	IV	Value Education		2	2	3	25	75	100	
<b>TOTAL</b>				<b>30</b>	<b>21</b>	-	-	-	<b>600</b>	
II	I	Language Course - II (Tamil \$/Other Languages + #)		6	3	3	25	75	100	
	II	English Course - II		6	3	3	25	75	100	
	III		Core Course – II (CC)	Mechanics and Theory of Relativity	5	5	3	25	75	100
			Core Practical – II (CP)	General Physics I	4	4	3	40	60	100
			First Allied Course – II (AC)	Mathematics - II	3	2	3	25	75	100
		First Allied Course – III (AC)	Mathematics - III	4	4	3	25	75	100	
		Add on Course – I ##	Professional English- I	*6	4	3	25	75	100	
IV	Environmental Studies		2	2	3	25	75	100		
<b>TOTAL</b>				<b>30+6*</b>	<b>27</b>	-	-	-	<b>800</b>	

\$ For those who studied Tamil upto 10<sup>th</sup> +2 (Regular Stream

+ Syllabus for other Languages should be on par with Tamil at degree level

# Those who studied Tamil upto 10<sup>th</sup> +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

**## The Professional English – Four Streams Course is offered in the 2<sup>nd</sup> and 3<sup>rd</sup> Semester (only for 2022-2023 Batch) in all UG Courses. It will be taught apart from the Existing hours of teaching/additional hours of teaching (1 hour /day) as a 4 credit paper as an add on course on par with Major Paper and completion of the paper is must to continue his/her studies further. (As per G.O. No. 76, Higher Education (K2) Department dated: 18.07.2020).**

**\* The Extra 6 hrs./Cycle as per the G.O. 76/2020 will be utilized for the Add on Professional English Course.**

**@ NCC Course is one of the Choices in Non-Major Elective Course. Only the NCC cadets are eligible to choose this course. However, NCC Course is not a Compulsory Course for the NCC Cadets.**

\*\* Extension Activities shall be outside instruction hours.

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	4	16	400	
6.		Allied Practical	2	4	200	
7.		Major Based Elective Courses	2	8	200	
8.		Add –on Course (Professional English I & II)	2	8	200	
9.		Project	1	3	100	
10.		IV	Non-Major Elective Courses	2	4	200
11.			Skill Based Elective Courses	2	4	200
12.	Soft Skills Development		1	2	100	
13.	Value Education		1	2	100	
14.	Environmental Studies		1	2	100	
15.	V	Gender Studies	1	1	100	
16.		Extension Activities	1	1	---	
<b>Total</b>			<b>43</b>	<b>148</b>	<b>4200</b>	

**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  
PROPERTIES OF MATTER AND  
ACOUSTICS**

**Semester I**

**Code:**

**(Theory)**

**Credit: 5**

**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 – Determination of rigidity modulus by static torsion– 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 – Cantilever –Expression for depression of the loaded end of a cantilever – Young's modulus by measuring the tilt in a loaded cantilever – Oscillation of a cantilever - 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 - Neumann's triangle - Excess pressure inside a liquid drop and soap bubble –Force between two plates separated by a thin layer of a liquid – 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 - Ostwald's viscometer – Terminal velocity and Stokes' formula – Viscosity of gases - Meyer's formula - Rankine's method -Variation of viscosity with temperature and pressure – Lubrication – Equation of continuity of flow -Bernoulli'stheorem – Filter pump and Wings of an airplane.

## **UNIT – V ACOUSTICS:**

Newton's Formula for the velocity of sound – Musical Sound and Noise – Speech – Characteristics of Musical sound – Intensity of sound – Measurement of intensity of sound – Decibel and Phon-Bel – Reverberation– Sabine's Reverberation formula– 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. Murugesan, *Properties of Matter*, 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, *A Text Book 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.Saihgale, *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  
PROPERTIES OF MATTER  
(Practical)**

Semester I

Code:

Credit: 4

**(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 using scale 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.

**BOOKS FOR STUDY:**

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.

**REFERENCES:**

1. S. Srinivasan, *A Text Book of Practical Physics*, S. Sultan Chand Publications, 2005
2. 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**  
**MECHANICS AND THEORY OF RELATIVITY**  
**(Theory)**

**Semester II**

**Code:**

**Credit: 5**

**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 - Oblique impact.

**UNIT – II MOTION ON A PLANE CURVE:**

Centripetal and centrifugal forces - Hodograph - Expression for normal acceleration - Motion of a cyclist along a curved path - Motion of a railway carriage round a curved track- 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 - gravitational potential due to a point mass - Equipotential surface - Gravitational potential and field due to a spherical shell and solid sphere.

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

Moment of Inertia - Kinetic energy and angular momentum of rotating body - Perpendicular and parallel axes theorems - Acceleration of a body rolling down on inclined plane without slipping - Compound pendulum - Centre of suspension and centre of oscillation - Minimum period of a compound pendulum. - Centre of gravity of a body - C.G. of a solid hemisphere - 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 – consequence of Lorentz transformation – 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.



**BOOKS FOR STUDY:**

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

**BOOKS FOR REFERENCE:**

1. R. Murugesan, *Mechanics and Mathematical Physics*, S. Chand & Company Ltd., New Delhi, 2008.
2. I. H. Shames, *Introduction to Solid Mechanics*, 2009.
3. David Tong, *Dynamics and Relativity*, University of Cambridge, 2012.
4. M. Ray and G. C. Sharma, *A text book of Dynamics*, Chand & Company Ltd., New Delhi. 13th revised edition, 2005.
5. D. RajanBabu, E. James Jebaseelan Samuel, P. Ramesh Babu, V. Ramasubramanian and C. AnuRadha, *Modern Physics*, Anuradha Publisher, 2010.
6. P. Duraipandian, LaxmiDuraiPandiyan and MuthamizhJayapragasam, *Mechanics* Chand & Company Ltd., New Delhi. 2000.
7. Agarwal, J P, *Elements of Mechanics*, India: PragatiPrakashan, 2010.
8. Knight W D, Ruderman M A, Helmholtz A C and Moyer B J, *Mechanics*, Berkeley Physics Course: Volume 1, 2nd Edition (2011)
9. Kleppner D and Kolenkow R J, *An Introduction To Mechanics* (Special Indian Edition) (2007).
10. *University Physics*. F.W. Sears, M.W. Zemansky and H.D. Young, 13/e, 1986.Addison-Wesley.

**ONLINE WEB-LINK DETAILS:**

1. <https://www.mooc-list.com/tags/gravitation>
2. <https://archive.org/details/NPTEL-Physics>
3. [https://www.academia.edu/8233163/Basics\\_of\\_Mechanics\\_notes](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  
GENERAL PHYSICS I**

**Semester II**

**Code:**

**(Practical)**

**Credit: 4**

**(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.

**BOOKS FOR STUDY:**

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](http://www.svprinters.com)), Chetpet, Chennai - 2014

**BOOKS FOR REFERENCE:**

1. S. Srinivasan, *A Text Book of Practical Physics*, S.Sultan Chand Publications. 2005.
2. R. Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi, 2011.

**COURSE OUTCOME:**

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

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

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