

**B.Sc. Physics**

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs. /Week	CREDIT	MARKS		TOTAL	
							CIA	ESE		
I	20U1LT1/LA1/LF1/LH1/LU1	I	Language – I		6	3	25	75	100	
	20UCN1LE1	II	English - I		6	3	25	75	100	
	20UPH1CC1	III	Core – I	Properties of Matter and Acoustics	5	5	25	75	100	
	20UPH1CC2P		Core – II	Properties of Matter : Practicals	3	2	20	80	100	
	20UCH1AC1:1		Allied –I	Inorganic, organic and Physical Chemistry -I	5	4	25	75	100	
	20UCH1AC2P	IV	Allied –II	Practical - I - Volumetric Estimations	3	2	20	80	100	
	20UCN1AE1		AEC-I	Value Education	2	2	-	100	100	
<b>TOTAL</b>					<b>30</b>	<b>21</b>			<b>700</b>	
II	20U2LT2/LA2/LF2/LH2/LU2	I	Language – II		6	3	25	75	100	
	20UCN2LE2	II	English – II		6	3	25	75	100	
	20UPH2CC3	III	Core – III	Mechanics and Relativity	6	5	25	75	100	
	20UPH2CC4P		Core – IV	Heat and Optics : Practicals	3	2	20	80	100	
	20UCH2AC3:1		Allied – III	Inorganic, organic and Physical Chemistry –II	4	3	25	75	100	
	20UCH2AC4P	IV	Allied –IV	Practical -II - Organic Analysis	3	2	20	80	100	
	20UCN2SE1		Skill Enhancement Course - I @	Soft Skills Development	2	2	-	100	100	
<b>TOTAL</b>					<b>30</b>	<b>20</b>			<b>700</b>	
III	20U3LT3/LA3/LF3/LH3/LU3	I	Language– III		6	3	25	75	100	
	20UCN3LE3	II	English – III		6	3	25	75	100	
	20UPH3CC5	III	Core– V	Thermal Physics	4	4	25	75	100	
	20UPH3CC6P		Core– VI	Thermal and Electricity : Practicals	3	2	20	80	100	
	20UMA3AC5:2		Allied– V	Differential and Integral Calculus	4	3	25	75	100	
	20UMA3AC6:2	IV	Allied–VI	Algebra and Trigonometry	3	2	25	75	100	
	20UPH3GE1		Generic Elective I #		2	2	-	100	100	
	20UCN3AE2		AEC-II	Environmental Studies	2	2	-	100	100	
<b>TOTAL</b>					<b>30</b>	<b>21</b>			<b>800</b>	
IV	20U4LT4/LA4/LF4/LH4/LU4	I	Language–IV		6	3	25	75	100	
	20UCN4LE4	II	English– IV		6	3	25	75	100	
	20UPH4CC7	III	Core– VII	Optics	5	5	25	75	100	
	20UPH4CC8P		Core - VIII	Measurement and Calibration : Practicals	3	2	20	80	100	
	20UMA4AC7:2		Allied– VII	Differential Equations	4	3	25	75	100	
	20UMA4AC8:2	IV	Allied–VIII	Vector Calculus and Fourier series	4	2	25	75	100	
	20UPH4GE2		Generic Elective – II #		2	2	-	100	100	
	20UCN4EA		Extension Activities	NCC, NSS, etc.	-	1	-	-	-	
<b>TOTAL</b>					<b>30</b>	<b>21</b>			<b>700</b>	
V	20UPH5CC9P1	III	Core – IX	Optics and Numerical Programming : Practicals	3	3	10	40	50	
	20UPH5CC9P2			Analog Electronics and Microprocessor:Practicals	3	2	10	40	50	
	20UPH5CC10			Core – X	Electricity, Magnetism and Electromagnetism	5	5	25	75	100
	20UPH5CC11			Core – XI	Spectroscopy	5	5	25	75	100
	20UPH5CC12			Core - XII	Atomic Physics	5	5	25	75	100
	20UPH5DE1A/B	IV	DSE-I **		5	4	25	75	100	
	20UPH5SE2A/B		Skill Enhancement Course II @		2	2	--	100	100	
	20UPH5SE3A/B		Skill Enhancement Course III @		2	2	--	100	100	
	20UPH5EC1		Extra Credit Course – I	General Intelligence for competitive examinations	-	<b>4*</b>	--	<b>100*</b>	<b>100</b>	
<b>TOTAL</b>					<b>30</b>	<b>28</b>			<b>700</b>	
VI	20UPH6CC13P1	III	Core– XIII	General Physics and Scientific Programming : Practicals	3	3	10	40	50	
	20UPH6CC13P2			Digital Electronics and Microprocessor: Practicals	3	3	10	40	50	
	20UPH6CC14			Core– XIV	Wave Mechanics	5	5	25	75	100
	20UPH6CC15			Core - XV	Nuclear Physics	5	5	25	75	100
	20UPH6CC16			Core XVI	Laser and Medical Physics	4	4	25	75	100
	20UPH6DE2A/B			DSE II **		5	4	25	75	100
	20UPH6DE3A/B			DSE III **		4	4	25	75	100
	20UCN6AE3	IV	AEC-III	Gender Studies	1	1	-	100	100	
	20UPH6EC2	Extra Credit Course - II	Physics for Competitive Examination	-	<b>4*</b>	--	<b>100*</b>	<b>100</b>		
20UPHAECA		Extra Credit Course for all	Online Course	-	<b>1*</b>	-	-	-		
<b>TOTAL</b>					<b>30</b>	<b>29</b>			<b>700</b>	
<b>GRAND TOTAL</b>					<b>180</b>	<b>140</b>			<b>430</b>	

\* Not Considered for Grant Total and CGPA

### @ Skill Enhancement Courses

SEMESTER	COURSE CODE	COURSE TITLE
V	20UPH5SE2A	Scientific programming in C
	20UPH5SE2B	Programming in C++
	20UPH5SE3A	Electrical and Electronic Instrumentation
	20UPH5SE3B	Electrical and Electronic Appliances

### \*\* Discipline Specific Electives

SEMESTER	COURSE CODE	COURSE TITLE
V	20UPH5DE1A	Semiconductor Devices and Circuits
	20UPH5DE1B	Fundamentals of Nanoscience
VI	20UPH6DE2A	Digital Electronics and Microprocessor
	20UPH6DE2B	Materials Science
	20UPH6DE3A	Non Conventional Energy Physics
	20UPH6DE3B	Astrophysics

### # Generic Electives for other major departments

Semester	CODE	Course Title
III	20UPH3GE1	Physics for Home Appliances
IV	20UPH4GE2	Medical Physics

Note: ##.....## Self study portion

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UPH1CC1	Core – I	PROPERTIES OF MATTER AND ACOUSTICS	5	5	100	25	75

**Course Outcomes:**

1. Acquired the basic principle of properties of matter and the underlying concepts of bending behaviour of beams.
2. Learned the practical experiments and laboratory skills.
3. familiarized with general terms in acoustics.
4. Understood the theory and practical applications of elasticity in their day to day life.
5. Learned the fundamental ideas for pursuing higher studies.

**Unit – I: Elasticity**

**15 hours**

Types of elasticity – Relation between Elastic moduli– Poisson’s ratio – relation between Poisson’s ratio and Elastic moduli – Experimental determination of Poisson’s ratio of rubber - Expression for torque per unit twist- Rigidity Modulus by Torsion pendulum-Bending moment of a beam – Theory of Young’s modulus: Uniform bending and non-uniform bending.

**Unit – II: Viscosity and Surface Tension**

**15 hours**

Coefficient of viscosity – streamline and turbulent flow - Poiseuille’s equation for the coefficient of viscosity - corrections in the Poiseuille’s equation - viscosity of gases – Meyer’s modifications of Poiseuille’s Formula

Surface tension- molecular theory- pressure difference across a spherical surface – excess pressure inside a curved surface – Jaeger’s experiment to determine the surface tension of a liquid.

**Unit –III: Diffusion and Osmosis**

**15 hours**

Diffusion of liquids – Graham’s laws of diffusion for liquids – Fick’s law of diffusion – #Analogy between liquid diffusion and heat conduction## – Experimental determination of coefficient of diffusion.

Osmosis and Osmotic pressure – Laws of Osmotic pressure -Experimental determination of osmotic pressure (Berkeley and Hartley method) — #elevation of the boiling point# – depression of freezing point.

**UNIT – IV Velocity of Sound**

**15 hours**

Origin of sound - velocity of longitudinal waves in gases – Newton’s formula for velocity of sound in air - effect of temperature - pressure – density of the medium, humidity, wind – velocity of sound in water (experiment) — wave velocity and molecular velocity – Doppler effect – observer at rest and source in motion – #source at rest and observer in motion# – when both the source and the observer are in motion.

**UNIT – V Fundamentals of Acoustics**

**15 hours**

Introduction and terminology - wave equation - Transmission Line equations – one dimensional waves - Acoustics – Reverberation – Reverberation time - Sabine’s reverberation formula — Factors affecting the acoustics of the buildings- Conditions for good acoustics – Ultrasonics- Properties- Production of ultrasonic waves – Piezo electric oscillator – #Applications of ultrasonic waves#.

**#.....# self-study portion**

**Text Books:**

1. R. Murugesan, Properties of Matter, Fifth Edition, S. Chand & Co Pvt. Ltd., New Delhi. 1994, Reprint 2010.

Unit – I: Section 1.1-1.2, 1.7 - 1.8, 1.9, 1.13, 1.14, 1.15, 1.19, 1.20

Unit – II: Section 2.1-2.4, 2.13,3.1,3.2,3.8,3.9,3.11

Unit – III: Section 3.1 – 3.4, 3.6, 3.8 – 3.9, 3.11, 3.12 (Chapter III)

2. N.Subrahmanyam, Brijlal, Waves and Oscillations ,Vikas Publishing House Pvt, Ltd. Second Revised Edition, 1994.

Unit – IV: Section 5.1, 5.3-5.10, 5.13, 9.1-9.4

Unit – V: Section 11.14 – 11.16, 11.20 – 11.24, 11.27

**Books for Reference:**

1. Mathur D.S., Elements of Properties of Matter, Eleventh Edition, Shyam Lal Charitable Trust, New Delhi, 1993

2. www.physicstutorials.org

3. www.sciencelearn.org.nz

4. [https://classcentral.com/course/swayam\\_fundamentals-of-acoustics\\_7927](https://classcentral.com/course/swayam_fundamentals-of-acoustics_7927)

Indian Institutes of Technology Kanpur and NPTEL via Swayam.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
I	20UPH1CC1	PROPERTIES OF MATTER AND ACOUSTICS					5	5				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓		✓	✓	✓	✓	✓		
CO2	✓	✓	✓	✓		✓	✓		✓	✓		
CO3	✓		✓	✓		✓		✓	✓	✓		
CO4	✓	✓	✓	✓	✓	✓	✓		✓			
CO5	✓	✓		✓					✓			
Number of Matches= 36, Relationship : HIGH												

Prepared by:  
Mr. A. Abbas Manthiri

Checked by:  
Mr. J. Umar Malik

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UPH1CC2P	Core – II	PROPERTIES OF MATTER - PRACTICAL	3	2	100	20	80

### Course Outcomes:

1. Acquired the basic principles of properties of matter and underlying the concepts of bending behaviour beams.
2. Learnt the practical skills essential for experimentation.
3. familiarized themselves the concept of heat, optics and acoustics.
4. Understood the theory and practical applications of properties of matter and electronics in their day to daylife.
5. Acquired the basic concepts required for their higher studies.

### List of Experiments:

1. Determination of the Young's Modulus [Y] of a material using non-uniform Bending Method (Pin & Microscope).
2. Determination of Surface Tension [T] by Capillary Rise Method.
3. Determination of the Co-efficient of viscosity [ $\eta$ ] of a Liquid by Burette Method
4. Thermal conductivity of a bad conductor using Lee's Disc.
5. Verification of Laws of Transverse Vibrations [I & II laws] in a stretched string using a sonometer.
6. Determination of the Refractive Index [ $\mu$ ] of glass using a prism and a spectrometer.
7. Determination of Resistance and Specific Resistance [R &  $\rho$ ] using a Meter Bridge.
8. Construct the basic logic (AND,OR, NOT) gates using discrete components.
9. Determination of the frequency of the vibrator using Melde's apparatus.
10. Determination of the temperature coefficient of resistance of the material using post office box.

### Books for Reference:

- 1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.
- 2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

### Online Resources:

[www.physicstutoruials.org](http://www.physicstutoruials.org)  
[www.sciencelearn.org.nz](http://www.sciencelearn.org.nz)

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
I	20UPH1CC2P	PROPERTIES OF MATTER - PRACTICAL					3	2			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓	
CO2	✓	✓	✓	✓			✓	✓	✓		
CO3	✓	✓	✓			✓	✓	✓			
CO4	✓		✓		✓			✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓			✓	✓	
Number of Matches= 36, Relationship : HIGH											

Prepared by  
Dr. Shek Dhavud

Checked by  
Dr. C. Hariharan

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UPH2CC3	Core – III	<b>MECHANICS AND RELATIVITY</b>	6	5	100	25	75

**Course Outcomes:**

1. Assimilate the theoretical knowledge and principle of mechanics which enable the student to become self-reliant on learning advanced level leanings
2. Knowing the concept of mechanics enhanced the laboratory skills and problem solving ability in relevant area and induce the inquisitiveness.
3. Lead to better understanding of the subjects in higher studies by knowing limitation and applications of mechanics
4. Sound knowledge in mechanics provide self-confidence and in turn encourage to foray into self-jobs in area concerned
5. Law's rule the world, inculcated the students behave in a matured way and became more ethical

**Unit-I: Impact of Elastic Bodies and Motion of Projectile** **18 hours**

**Impulse and Impact:** Impulse of a force –collision –elastic and inelastic collision –laws of impact – direct impact of two smooth spheres –loss of kinetic energy due to direct impact –oblique impact of two smooth spheres –loss of kinetic energy due to oblique impact

**Projectile motion:** theory of projectile motion-range, maximum height, time of flight of the projectile particle- motion of a projectile particle down an inclined plane —two body problem – reduced mass

**Unit II: Dynamics of Rigid Bodies and Friction** **18 hours**

Moment of inertia –radius of gyration –perpendicular axes theorem –parallel axes theorem –moment of inertia of a thin circular ring, triangular lamina and uniform rod –theory of compound pendulum – period of oscillation of a compound pendulum

**Friction:** Definition –static, dynamic, rolling and limiting friction and laws of friction

**Unit III: Centre of Gravity, Centre of Pressure and Hydrodynamics** **18 hours**

**Centre of Gravity:** Definition - centre of gravity of a solid cone, solid hemisphere, hollow hemisphere

**Centre of Pressure:** Definition – centre of pressure of a vertical rectangular lamina, vertical triangular lamina

**Hydrodynamics:** Euler's equation for unidirectional fluid flow –Bernoulli's theorem –venturimeter

**Unit IV: Newtonian Mechanics** **18 hours**

Centre of mass –Definition – centre of mass of a two particle system –conservation of linear and angular momenta of a particle - basic ideas of degrees of freedom - generalized co-ordinates and generalized momentum.

Rocket motion –Principle –theory –escape velocity –propulsion system –multistage rocket –shape of the rocket.

**Unit V:Relativity** **18 hours**

Concepts of space, time and mass –frames of reference –Newtonian principle of relativity –Galilean transformation equations –Ether hypothesis – Michelson-Morley experiment –postulates of the Special theory of relativity–Lorentz transformation –length contraction –time dilation – postulates of the general theory of relativity.

**Books for study**

1. R Murugesan, Mechanics and Mathematical Physics, Third Edition, S. Chand Publications  
Unit I: Section 1.1- 2.4  
Unit III: Section 3.1, 3.2, 3.4, 3.5, 3.6, 4.3, 4.4, 4.5, 5.3, 5.4  
Unit IV: Section 19.1, 23.1-23.3, 23.11, 13.8-13.13
2. R Murugesan, Properties of Matter, Revised Edition, S Chand Publications  
Unit II: Section 7.1-7.4, 10.1, 10.2, 22.1-22.3
3. R Murugesan, Modern Physics, 18<sup>th</sup> Edition, S.Chand Publications  
Unit V: Section 1.1-1.10, 1.16

**Books for reference**

1. S L Kakani., C Hermrajam., ShubhraKakani., Mechanics, 1<sup>st</sup> Edition, Viva Books Private Limited, Reprinted 2009
2. Brijlal., N Subramanyam., Mechanics and Electrodynamics, Jivan Seshan., S. Chand publication, Reprint 2008
3. H S Hans and S P Puri., Mechanics, Tata McGraw Hill Publishing Company Limited, Seventh Reprint 2009
4. Daniel Kleppner, Robert Kolenkow., An Introduction to Mechanics, Tata McGraw Hill publishing Company limited, 23<sup>rd</sup> reprint 2017
5. Isaac Newton., The Principia (Mathematical principles of natural philosophy), Snowball publishing company, 2010

**Online Reference:**

1. <https://www.khanacademy.org/science/ap-physics-1/ap-linear-momentum/inelastic-collisions-and-2d-collisions-ap/v/elastic-and-inelastic-collisions>
2. <https://www.khanacademy.org/science/ap-physics-1/ap-linear-momentum/center-of-mass-ap/v/center-of-mass>
3. <https://www.khanacademy.org/science/physics/special-relativity/einstein-velocity-addition/v/time-dilation>
4. <https://www.youtube.com/watch?v=oK8UxWI-85Y>
5. <https://www.khanacademy.org/science/physics/forces-newtons-laws/inclined-planes-friction/v/static-and-kinetic-friction-example>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
II	20UPH2CC3	MECHANICS AND RELATIVITY					6	5			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2		✓	✓	✓			✓	✓	✓	✓	
CO3			✓	✓	✓			✓	✓	✓	
CO4			✓	✓	✓				✓	✓	
CO5					✓					✓	
Number of Matches= 30, Relationship : HIGH											

Prepared by:  
Mr. J. Umar Malik

Checked by:  
Mr. A. Abbas Manthri.



Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UPH2C4P	Core – IV	HEAT AND OPTICS - PRACTICALS	3	2	100	20	80

### Course Outcomes:

1. acquired the basic principles of properties of matter and underlying the concept of bending behaviour beams.
2. learnt the practical skills necessary for experimentation.
3. familiarised the concepts of heat, optics and acoustics and understood the measurements of some physical quantities through heat and optical experiments
4. understood the characteristics of the semiconductor diodes and practical applications of properties of matter and optics in their day to day life.
5. acquired the basic concepts for their higher studies.

### List of Experiments:

1. Determination of the Young's modulus [Y] of a material using Non-uniform bending (Scale&Telescope).
2. Static Torsion: Determination of the Rigidity Modulus [N] of a material.
3. Compound Pendulum: Determination of the Acceleration due to Gravity and Radius of Gyration [g & K].
4. Comparison of the co-efficient of viscosities of two liquids using the Burette method.
5. Determination of the Specific heat capacity [S] of a liquid using Newton's Law of Cooling.
6. Determination of the specific gravity of a solid and liquid using a sonometer.
7. Air wedge: Determination of the thickness of a material by forming interference fringes.
8. Characteristics of a PN Junction Diode and a Zener Diode.
- 9. # Measurement of Dielectric constant for solids and liquids using LCR Meter**
10. Determination of radii of curvature of convex and concave lenses.

### # - New experiments introduced under DBT Star College scheme

### Books for reference:

1. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A text book of Practical Physics, S.Chand and Sons, Reprint 2010.
2. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical Physics and Electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.

### Online Resources:

[www.physicstutorials.org](http://www.physicstutorials.org)  
[www.sciencelearn.org.nz](http://www.sciencelearn.org.nz)

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
II	20UPH2CC4P	HEAT AND OPTICS - PRACTICALS					3	2			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓		✓		
CO2	✓	✓		✓			✓	✓	✓	✓	
CO3	✓	✓	✓			✓	✓	✓			
CO4	✓	✓	✓			✓		✓	✓		
CO5	✓	✓		✓	✓	✓	✓		✓	✓	
Number of Matches= 35, Relationship : HIGH											

Prepared by

Checked by