DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Mathematics/IIChemistry				
Sem.	Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
I/III	Allied–I	20U1PAC1/ 20U3PAC1	ALLIED PHYSICS - I	4	4	25	75	100

Course Objectives:
1. Understand the concept of strength of materials and viscous properties of liquids.
2. Import the concept of heat in doing mechanical work.
3. Understand the basic properties of light such as interference and diffraction.

Unit-I: Properties of Matter

Elasticity- units and dimension – Stress – Strain – Elastic limit- Hooke's law - Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition only) – Relation between the three moduli- Theory of torsional pendulum. Bending of beams – Expression for bending moment –Determination of young's modulus – Non–uniform bending–Theory and experiment– Pin and microscope method only.

Self Study: Experiment to determine the rigidity modulus of a wire and M.I. of a disc without symmetrical mass by torsion pendulum method.

Audit: Uniform bending theory and Experimental determination of young's modulus by scale and telescope method.

Unit-II: Viscosity

Introduction – Co–efficient of viscosity – Units and dimensions –Stream line motion and Turbulent motion - Equation of continuity – Bernoulli's theorem – Statement and proof – Venturimeter – Wings of an aeroplane - Poiseuille's formula for co–efficient of viscosity of a liquid- Determination of coefficient of viscosity using burette method- Stoke's formula (dimension method only) – Experiment to determine viscosity of a highly viscous liquid.

Self Study: Pitot tube .

Audit: Comparison of Viscosities.

Unit-III: Conduction, Convection and Radiation   (12 hrs)

Specific heat capacity of solids and liquids – Dulong and Petit's law – Newton's law of cooling –. Thermal conduction –Coefficient of thermal conductivity by Lee's disc method. Thermal radiation - Black body radiation – Distribution of energy in black body spectrum – Planck's radiation law – Rayleigh Jean's law, Wien's displacement law – Stefan's law of radiation. (No derivations).

Self Study: Convention process – Lapse rate – Green house effect.

Audit: Specific heat capacity of a liquid by cooling.

Unit-IV: Thermodynamics   (12 hrs)

Zeroth and I Law of thermodynamics (Statement only) – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – II law and III law of thermodynamics (Statement only) – Entropy – Change in entropy in reversible and irreversible process – Change in entropy of a perfect gas.

Self Study: Change in entropy when ice is converted into steam.

Audit: Isothermal and Adiabatic process

Unit-V: Optics

Interference – interference due to reflected light – Condition for maxima and minima - Air wedge – thickness of a thin wire – Newton's rings – Determination of wavelength using Newton's rings. Diffraction – Difference between diffraction and interference – Theory of transmission grating – Polarisation – optical activity –Specific rotatory power (Definition only)

Self Study: Determination of wavelength using grating by Normal incidence method.

Audit: Biot's law**,** Laurent's half shade polarimeter

Books for Study

1. **Properties of matter – Brijlal and Subramanyam – Eurasia Publishing co.,New Delhi, III Edition 1983.**
   Unit I – 6.1, 6.2, 6.6(Definition only) – 6.16,6.18, 6.19, 6.22,
   Unit II – 7.2,7.3, 7.5, 7.7(1,6), 7.9, 7.10,7.11.

2. **Heat Thermodynamics and Statistical Physics –Brijlal, Dr. N. Subrahmanyam and P.S. Hemne, S.Chand& Co, 16th Edition 2005**
   Unit III – 14.1, 14.5, 14.17, 15.1, 15.10, 15.11 8.1,8.6, 8.8, 8.12, 8.13, 8.14, 8.15, 8.17,.
   Unit IV – 4.2 (Statement only), 4.7, 4.21, 4.22, 4.23, 4.24, 4.28(Statement only), 5.1, 5.2, 5.4, 5.6, 5.9,5.15(Statement only).

3. **A text book of Optics – Subramanyam and Brijlal, S. Chand and co..NewDelhi, 22nd Edition 2004.**
   Unit V – 14.4, 15.2.1, 15.2.2 , 15.5, 15.5.1, 15.5.2, 15.6, 15.6.1, 15.6.7, 17.1, 17.6, 18.7, 18.7.1, 20.2, 20.27, 20.29.

4. **Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14th edition ,2017, Pearson India Education Services Pvt.Ltd.**

Applications: Unit I: Examples 11.5–11.7   (Pages 371–376).
   Unit II: Examples 12.7–12.10 (Pages 405–409).
   Unit III: Examples 17.5,17.6,17.11 – 17.15 (Pages 581–582, 589–595).
   Unit IV : Examples 19.2 ,19.5, 20.2,20.4 – 20.7,20.10. (Page 648–652, 678– 680,684,686, 689– 691,693.
   Unit V: Examples 35.4–35.6 (Pages 1197–1198)

Books for References

1. Element of properties of matter,D.S.Mathur,2001 S.Chand& Company Ltd,New Delhi,
2. Heat and Thermodynamics,Brijlal& Subramanyam, 16th Edition 2005,S.Chand & Co,
3. Heat and Thermodynamics , D.S. Mathur, 5thEdition 2014,SultanChand & Sons,
4. Optics and Spectroscopy ,R.Murugeshan, 6thEdition 2008,S.Chand and co.,
5. Optics ,Sathyaprakash, 7thEdition 1990,Ratan PrakashanMandhir, New Delhi,
6. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
7. Paul G. Hewitt *CONCEPTUAL PHYSICS*, (tenth edition), Pearson Education, Inc. and Dorling Kindersley Publishing Inc.2015.

Web Resources

1. Applications of Elastic Behaviour of Materials
   https://www.toppr.com/guides/physics/mechanical-properties-of-solids/applications-of-elastic-behaviour-of-materials/

2. Modulus of Elasticity of Concrete
   https://civiltoday.com/civil-engineering-materials/concrete/84-modulus-of-elasticity-of-concrete
3. Beam bending
   https://realizeengineering.files.wordpress.com/2013/09/5eplannos8_beambendingskateboarder1.pdf
4. Draw Bending Moment & Shear Force Diagrams –
   CantileverBeamhttps://www.youtube.com/watch?v=QPgdfWooEDc
5. Viscosity Examples
   https://www.lifepersona.com/the-10-most-known-viscosity-examples
6. Viscosity, Application, Flow and Factors
   https://schoolworkhelper.net/what-is-viscosity-application-flow-factors/
7. Viscosity
   https://sciencing.com/fluid/
8. Dynamics of fluid motion
   https://realizeengineering.files.wordpress.com/2013/10/5eplannof4dynamics-of-fluid-motion1.pdf
9. Conduction:
   http://htv-au.vlabs.ac.in/Heat_Transfer_by_Conduction/experiment.html
10. Examples of Convection
    https://studiousguy.com/examples-convection-everyday-life/
11. Radiation
    http://htv-au.vlabs.ac.in/Heat_Transfer_by_Radiation/experiment.html
    http://htv-au.vlabs.ac.in/Black_Body_Radiation/experiment.html
12. Examples of the First & Second Laws of Thermodynamics
    https://education.seattlepi.com/everyday-examples-first-second-laws-thermodynamics-4740.html
13. 2nd Law of thermodynamics
    https://realizeengineering.files.wordpress.com/2013/10/5eplannot3_second-law.pdf
14. Thermodynamics
    https://sciencing.com/thermodynamics/
15. Entropy
    https://realizeengineering.files.wordpress.com/2013/10/5eplannot4_entropy.pdf
16. Interference
    http://vlab.amrita.edu/?sub=1&brch=189&sim=1520&cnt=1
17. Newton rings
    http://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1
18. Wing scales cause light to diffract and interfere
    https://asknature.org/strategy/wing-scales-cause-light-to-diffract-and-interfere/

Course Designer(s):
1. Mr. V.Meenakshi Sundaram
2. Dr. M.Revathi
3. Mr. M.Megala

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Elasticity, units and dimension , Stress , Strain , Elastic limit, Hooke's law, Young's modulus , Rigidity modulus , Bulk modulus Poisson's ratio	3	**Chalk and talk, Quiz and assignment**
	Relation between the three moduli	2	
	Theory of torsional pendulum,Bending of beams, Expression for bending moment	3	
	Determination of young's modulus , Non–uniform bending , Theory	2	
	Non–uniform bending, experiment, Pin and microscope method and problems	2	
Unit II	Viscosity , Co–efficient of viscosity , Units and dimensions, Stream line motion and Turbulent motion, Equation of continuity	3	**Chalk and talk, quiz, Group discussion**
	Bernoulli's theorem , Statement and proof and applications	2	
	Venturimeter, Wings of an aeroplane and problems	2	
	Poiseuille's formula for co–efficient of viscosity of a liquid, Determination of coefficient of viscosity using burette method and problems	3	
	Stoke's formula (dimension method only), Experiment to determine viscosity of a highly viscous liquid.	2	
Unit III	Specific heat capacity of solids and liquids, Dulong and Petit's law	2	**Chalk and talk, Quiz and assignment**
	Newton's law of cooling	2	
	Thermal conduction ,Coefficient of thermal conductivity by Lee's disc method	2	
	Thermal radiation , Black body radiation , Distribution of energy in black body spectrum	2	
	Planck's radiation law , Rayleigh Jean's law and discussion	2	
	Wien's displacement law , Stefan's law of radiation and problems	2	
Unit IV	Zeroth and I Law of thermodynamics	2	**PPT, Chalk and talk, Quiz and assignment**
	Carnot's engine	2	
	Carnot's cycle ,Efficiency of a Carnot's engine	2	
	II law of thermodynamics	1	
	Entropy , Change in entropy in reversible and irreversible process	2	
	Change in entropy of a perfect gas and problem discussion	3	
Unit V	Interference, interference due to reflected light, conditions for interference maxima and minima	2	**PPT, Chalk and talk, Quiz and assignment**
	Air wedge , thickness of a thin wire	2	
	Newton's rings , Determination of wavelength using Newton's rings	3	
	Diffraction , Difference between diffraction and interference , Theory of transmission grating	3	
	Polarisation , optical activity , Specific rotatory power,	2	

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , interaction and field visit.

Course Learning Outcomes

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

CLO No.	Course Learning Outcomes	Knowledge Level
CLO 1	Connect the principles of elasticity of a body such as tension, compression and shear in construction and allied fields	UptoK3
CLO 2	Use the dynamics of fluid motion to solve the practical applications problems.	UptoK3
CLO 3	Compare the conduction, convection and radiation process to solve the real life problems.	UptoK4
CLO 4	Use the laws of thermodynamics to heat engines.	UptoK3
CLO 5	Apply the wave nature of light to real life situations.	UptoK3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3			2			
CLO2	3			2			
CLO3	3			2			
CLO4	3			2			
CLO5	3			2			

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		2	2
CLO2	3	2	2	2	
CLO3	3	2	2	2	
CLO4	3	2	2	2	2
CLO5	3	1		1	

Advance application −3;Intermediate level −2;   Basic level–1