Semester: I						
Classical Physics for Engineers (Category: Professional Core Course) Mechanical Engineering Stream – (AS, CH, IM&ME) (Theory and Practice)						
Course Code	**:**	22PHY12B		**CIE**	**:**	100+50 Marks
Credits: L:T:P	**:**	3:0:1		**SEE**	**:**	100 Marks
Total Hours	**:**	42 L+30P		**SEE Duration**	**:**	3 Hours

Unit-I	**06 Hrs**
Free, Damped and Forced Vibration: Simple Harmonic motion (SHM), differential equation for SHM (No derivation), Spring mass and its applications. **Theory of damped oscillations** (Derivation), Types of damping (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations (Qualitative), resonance and sharpness of resonance. Numerical problems.	
Unit – II	**09Hrs**
Elastic Properties of Materials: Types of Stress and Strain, Stress, Strain equivalence relations, Relation between Elastic constants, Bending of beams: neutral surface and neutral axis, expression for bending moment of a beam: Single cantilever (derivation). Numerical problems. **Torsion of a Shaft**: Expression for couple per unit twist of a solid shaft, torsion pendulum: expression for time period and rigidity modulus, Numerical problems.	
Unit –III	**09 Hrs**
Fundamentals of Thermodynamics: Introduction to thermodynamics: Quasi – static process. Zeroth law of thermodynamics, Liquid, gas, resistance thermometers. Joule's experiment (equivalence between heat and work), Numerical problems. **First law of thermodynamics**, work done in thermodynamic quasi static processes, Isothermal process, adiabatic process and cyclic process, Application of first law of thermodynamics for both closed system and Steady State System. Numerical problems.	
Unit –IV	**09 Hrs**
Basic concepts of Fluid Mechanics: Definition of Fluid, concept of continuum, classification of fluids, Fluid Properties, Newton's Law of viscosity, Absolute and Kinematic viscosity, No slip condition, Vapour pressure and cavitation, Bulk Modulus and Compressibility, Ultrasonic interferometer. Surface tension and capillarity. Numerical problems. **Fundamentals of Fluid Flows:** Types of Fluid Flows, Stream line, Streak line and Path line. Continuity Equation in Integral form and three-dimension Cartesian coordinates. Numerical problems.	
Unit –V	**09 Hrs**
Material Characterization : Mechanical Characterisation (Tensile and yield strength, Ductility, Toughness and Hardness), Optical Characterisation, current-Voltage (IV) characterisation, Surface characterisation (Roughness & Crystallinity, particle distribution and magnetic properties. **Instrumentation Techniques:** Principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation, Principle, construction, working and applications of Atomic Force Microscopy (AFM), X-ray photoelectron spectroscopy (XPS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM),	

Numerical problems.

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Explain the concepts in oscillations, elasticity, thermodynamics, fluid mechanics & instrumentation techniques.
CO 2	Apply the fundamentals of oscillations, elasticity, thermodynamics, fluid mechanics and material characterization techniques to engineering applications.
CO 3	Develop analytical thinking by solving numerical.
CO 4	Design & develop simulating models and validate with real time experimentation.

Reference Books	
1.	Basic & Applied Thermodynamics, P K Nag, McGraw Hill Education, 2nd Edition, 2017, ISBN 10-0070151318, 13-978-0070151314.
2.	Fluid Mechanics: Fundamentals and Applications, John. M. CimbalaYunus A. Cengel, McGraw-Hill Publications, 4th Edition, 2019, ISBN 10-9353166217, 13-978-9353166212.
3.	A Textbook of Engineering Physics, M. N. Avadhanulu and P G Kshirsagar, S. Chand publications, 2019,ISBN : 978-93-528-3399-3.
4.	Physics for Degree students, C.L. Arora and Dr. P. S. Hemne, S Chand, revised 2010,ISBN: 9788121933506.
5.	Engineering Physics, R K Gaur and S L Gupta, DhanpatRai Publications, 2011, ISBN: 9788189928223.

Laboratory Experiments (ME stream)
1. Spring constant experiment using expEYES17.
2. Moment of Inertia of irregular body and rigidity modulus by Torsion pendulum.
3. Young's modulus by Single cantilever.
4. Young's modulus by Uniform bending.
5. Ultrasonic Interferometer.
6. Wavelength of laser by diffraction.
7. Forced mechanical Oscillations and Resonance.
8. Fermi Energy of copper
9. Four Probe.
10. Newton's rings.
11. Exp Eyes experiment: LCR

CONTINUOUS INTERNAL EVALUATION		
ASSESSMENT AND EVALUATION PATTERN Theory & quizzes questions are to be framed using Bloom's Taxonomy Levels - Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating		
WEIGHTAGE	**CIE (50%)**	**SEE (50%)**
A. QUIZZES: Each quiz is evaluated for 10 marks		
Quiz-I for 10 Marks	**20**	*****
Quiz-II for 10 Marks		
B. TESTS: Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to 40		
Test – I for 50 Marks	**40**	*****
Test – II for 50 Marks		
C. EXPERIENTIAL LEARNING: Experiential Learning comprises of the following components viz Case Study-based Teaching-Learning- **10 Marks;** Sector wise study & consolidation (viz., Engg. Semiconductor Design, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ITeS) – **20 Marks;** and Video based seminar (4-5 minutes per student) – **10 Marks**	**40**	*****
MAXIMUM MARKS FOR THE THRORY (A+B+C)	**100**	**100**
PRACTICALS	**50**	*****
TOTAL MARKS FOR THE COURSE	**150**	**100**