**SEMESTER II**

## PH2B01U - **Mechanics and Properties of Matter**

**Credits – 3 (Theory 2+ Practical 1)**

**No. of contact hours – 36**

**Scope:** This course would empower the student to acquire engineering skills and practical knowledge, which help the student in their everyday life. This syllabus will cater the basic requirements for their higher studies. This course will provide a theoretical basis for doing experiments in related areas.

**Prerequisites:** Basic mechanics, reasoning power, initiative skills and calculus

### Module I

**Motion under gravity : 5 hrs**

Velocity- acceleration- force – acceleration due to gravity- weightlessness- compound pendulum (symmetric and unsymmetric) radius of gyration- kater's pendulum- centripetal acceleration and force- centrifugal force

**Rotational mechanics : 6 hrs**

Angular velocity- angular acceleration- angular momentum- conservation- torque- moment of inertia- Parallel and perpendicular axes theorem - calculation of moment of inertia- (rod, ring, disc, cylinder, sphere) flywheel.

**Fundamentals of Physics – Halliday and Resnik (John Wiley & sons); Principles of Mechanics – John . L. Synge and Byron .A. Griffith (Mc-graw Hills);**

**Mechanics – D.S.Mathur (S.Chand). Advanced Physics–Materials and Mechanics – Tom Duncan (John Murray London); Classical Mechanics – Goldstein ; Classical mechanics – K.SankaraRao (PHI); Refresher course in Physics. Vol. 1 – C.L.Arora**

### Module II

**Oscillation and waves: 9 hrs**

SHM, equation of motion to SHM- theory of damped oscillation (over, under, critical)- theory of forced oscillation- resonance- solution and equation to

progressive wave- energy of progressive wave- superposition of waves-theory of beats- Doppler effect.

**Books of study: Vibration, waves and Acoustics – D. Chattopadhyay (Books and Allied Pvt Ltd, Culcutta); Text book of sound – Brijlal and Subrahmanniam (S.Chand); Classical mechanics – K.SankaraRao (Prentice Hall of India); Refresher course in Physics. Vol. 1 – C.L.Arora**

**Module III**

**Elasticity: 8 hrs**

Stress- strain- Hooke's law- elastic module- Poisson's ratio- bending of beams-bending moment- Young's modulus (cantilever-mirror and telescope)- Young's modulus (uniform and non uniform bending-microscope) torsional oscillations-rigidity modulus- static torsion(mirror and telescope )- I section girder.

**Surface tension: 4 hrs**

Molecular theory of surface tension- surface energy- excess pressure in a liquid drop-transverse waves on the surface of a liquid- effect of gravity- effect of surface tension- factors affecting surface tension- applications.

**Viscosity: 4 hrs**

Streamline and turbulent flow- critical velocity- derivation of Poiseuille's formula-derivation of - Stoke's formula-Lubricants.

**Properties of Matter- Brijlal and N. Subrahmaniam (S. Chand.); Refresher course in Physics. Vol. 1 – C.L.Arora**

**Reference**

**1.** Fundamentals of Physics - Halliday and Resnik (John Wiley)

2. Principles of Mechanics - John. L. Synge and Byron A Griffith (Mc- Graw Hill)

3. Advanced Physics - Materials and Mechanics - Tom Duncan (John Murray London)

4. Mechanics - D.S.Mathur (S.Chand)

5. Classical Mechanics - Goldstein

6. Classical Mechanics - K. SankaraRao (Prentice. Hall of India- N.Delhi)

7. Text Book of Sound - Brijlal and Subramaniam (S.Chand)
8. Refresher Course in Physics - Vol1- C.L.Arora
9. Vibration, Waves and Acoustics - D.Chattopadhyay (Books and Allied Pvt Ltd)
10. Properties of Matter - Brijlal and Subramaniam (S.Chand)
11. Properties of Matter - -D.S.Mathur (S.Chand)
12. Mechanics-H.S.Hans and S.P.Puri. (Tata McGraw-Hill)
13. Properties ofMatter- Brijlal and N. Subrahmanyam(S. Chand and Co.)
14. Mechanics- J.C. Upadhyaya (Ram Prasad and Sons)

*Curriculum and syllabus 2011 admissions onwards*