Approval: 10th Senate Meeting

Course Number: ME311P
Course Name: Design Lab - 1
Credits: 0-0-2-1
Prerequisites: ME206 Mechanics of Solids

Intended for: B-Tech, Mechanical
Distribution: Core
Semester: Odd/Even

Preamble: The basic objective of this lab is to introduce students to different material testing techniques and their utility. The laboratory experience is supposed to enable students to identify necessary tests on materials for different design applications.

List of Experiments:

1. Comparison of the properties of ductile and brittle materials.
2. Effect of heat treatment on the mechanical properties.
3. Tensile test to obtain stress strain curves, young's modulus, 0.2% proof stress, percentage elongation.
4. Compression tests to compare the failure behaviour of the ductile and brittle materials.
5. Shear test.
6. Three point bend test for bending strength.
7. Determination of Young's modulus of a material by bending test.
8. Buckling load for columns with different end conditions.
9. Evaluation of spring index and calculation of proof stress for compression spring.
10. Impact tests and comparison of energies for ductile and brittle materials.
11. Torsion tests to obtain modulus of rigidity and fracture behaviour of materials subjected to torsion.
12. Hardness tests. Empirical relations of hardness and strength.
13. Surface roughness tests to understand the different surface roughness obtained by various manufacturing processes.

Text Books:

1. Timoshenko S. P., and Gere J. M., Mechanics of Materials, 2nd Ed., CBS Publishers, 2002.
2. Crandall S. H., Dahl N. C., and Lardner T. J., An Introduction to the Mechanics of Solids, 2nd Ed., McGraw-Hill, 1999
3. Hearn E. J., Mechanics of Materials, 3rd Ed., Pergamon, 2003.
4. Higdon A., Ohslen E. H., Stiles W. B., Weese J. A., and Riley W. F., Mechanics of Materials, John Wiley & Sons, 1989
5. Popov E. P., Nagarajan S., and Lu Z. A., Mechanics of Materials, 2nd Ed., Prentice-Hall of India, 2002.

Reference:

1. Advanced Mechanics of Materials by Robert Cook
2. Practical Stress Analysis in Engineering Design by Alexander Blake
3. Advanced Strength of Materials by J. P. Den Hartog