

MET 222: Strength and Testing of Materials

(Required)

Course MET 222: Strength and Testing of Materials. LT: 1 LB: 3 CR: 2

Description: This course deals with the analysis of concurrent and non-concurrent forces and stresses and strains resulting from external mechanical loading. It deals with calculations and graphical solutions for simple axial stresses, stresses in beams, stresses in shafts, and combined stresses, different techniques of destructive and non-destructive testing and strength evaluation of metals and alloys. Laboratory experiments cover the area of materials testing; including tension test, shear test, impact test and hardness test.

Prerequisite: PHY 101, MET 101, MET 102, MET 104

Textbook: Yanbu Industrial College Workbooks:
MET 222 Strength and Testing of Materials (Information Sheet)
MET 222 Strength and Testing of Materials (Laboratory Manual)

References:

1. Milton G. Bassin, Static and Strength of Materials, McGraw-Hill, Inc., 1988.
2. Motte R.L., Applied Strength of Materials, Prentice Hall, Inc., 1978.
3. Hibbeler R.C., Mechanics of Materials, Prentice Hall, Inc., 2000.

Objectives:

1. Study behavior of materials under specified conditions.
2. Recognize the concepts of stress and strain.
3. Determine stress levels for loaded members.
4. Evaluate experimentally common mechanical properties under static, impact and repeated loading.

Course Outline:

[I] Modules:

| Module | Topic | Duration |
|---------------|--|-----------------|
| 1. | Mechanical properties of materials. Tension test. | 2 weeks |
| 2. | Basic concepts of strength of materials. | 2 weeks |
| 3. | Simple axial stress. | 1 week |
| 4. | Direct and torsion shears stress. Torsion test | 1 week |
| 5. | Transverse loading. | 1 week |
| 6. | Transformation of stress analytically and graphically. | 2 weeks |
| 7. | Beams and shafts design. | 2 weeks |
| 8. | Deflection of beam by integration | 2 weeks |
| 9. | Columns. | 1 week |

[II] Laboratory Work/Projects:

| Exercise | Topic | Duration |
|----------|---|----------|
| 1. | Introduction to Mechanical Tests – Video Tapes. | 1 week |
| 2. | Tension Tests. | 2 weeks |
| 3. | Hardness Tests. | 2 weeks |
| 4. | Compression Tests. | 1 week |
| 5. | Torsion Tests. | 1 week |
| 6. | Flexure of Beams Tests. | 1 week |
| 7. | Bending Tests. | 1 week |
| 8. | Shear Tests. | 1 week |
| 9. | Impact tests. | 2 weeks |
| 10. | Fatigue Tests. | 1 week |

Evaluation Methods:

1. Major exams and a final exam.
2. Homework and quizzes
3. Lab work, mid and final lab exams.

Course Learning Outcome:

The expected outcome is that the students will be able to:

1. Recognize the behavior of ductile and brittle material.
2. Demonstrate ability to analyze stress-strain diagram for a specific materials.
3. Conduct both of tensile test, compression test and bending test.
4. Calculate stress and strains for axially loaded members.
5. Determine principal stresses for thin pressure vessels.
6. Demonstrate ability to distinguish between direct and indirect shear stress and conducting the torsion and direct shear test.
7. Calculate the maximum bending moment and perform the bending test.
8. Demonstrate ability to determine the column critical (buckling) load using different buckling formulas.
9. Calculate the stress and deflection for a member subjected to impact loading and carrying out impact test.

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