

MET 302: Mechanics of Materials

(Required)

COURSE

MET 302: Mechanics of Materials. LT: 2 LB: 3 CR: 3

DESCRIPTION

This course deals with the analysis of stress and strain; generalized Hooke's law; direct and torsional shear stresses, bending of beams, stress transformation and deflection on of beams, analysis of indeterminate beams, impact loads and buckling of columns. Tutorial sessions cover all modules and laboratory experiments cover the area of mechanical tests; including tension test, torsion test, bending test and fatigue test.

Prerequisite: N/A.

Co-requisite: MATH 301, Calculus III.

Textbook

Hibbeler R.C., Mechanics of Materials, Prentice Hall, SI edition, 2003.

References

Ferdinand P., Beer and Russell Johnston, Jr, Mechanics of Materials, McGraw-Hill, Inc., Fourth edition , 2006.

Objectives

1. Recognize the concepts of stress and strain
2. Determine the internal loadings for different structures
3. Identify both of shear stress and shear strain across the shaft section under twisting moment
4. Determine the shaft diameter under two dimensional loadings
5. Evaluate the principal stresses analytically and by using Mohr's circle
6. Design the thick cylinder based on critical element using maximum shear stress theory
7. Determine the critical load of column buckling

Pre-Requisites

N/A

Course Outline

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| 1. Introduction: Concept of stresses. | 10 hours |
| 2. Stress and strain: Axial loading. | 10 hours |
| 3. Torsion (Twisting moment) | 5 hours |
| 4. Stress and strain on beam under pure bending. | 10 hours |
| 5. Transverse shear stresses for different sections. | 5 hours |
| 6. Transformation of stress and strain. | 5 hours |
| 7. Design of beams and shafts for strength. | 5 hours |
| 8. Deflection of beams by different methods. | 5 hours |
| 9. Thick cylinder and composite tube. | 10 hours |
| 10. Columns | 10 hours |

Design Activities/Projects

N/A

Computer Usage

Using the interface software controlling the testing machines for conducting the required tests.

Evaluation Methods

1. Assignments (Home work)
2. Four Quizzes
3. Two Major Exams
4. Final Exam
5. Lab Assessments
6. Mid Term Lab Exam.
7. Final Lab Exam.

Course Outcomes

Course Objective 1

1. Students will recognize the main difference between different types of stresses and strains
2. Students will be able to determine the axial deformation and the effect of thermal stresses.
3. Students will recognize the stress, strain and the angle of twist in a circular shaft subjected to twisting moment.

Course Objective 2

1. Students will be able to conduct both of tensile test, compression test and torsion test fatigue test and bending test.
2. Students can design a shaft subjected to two dimensional loading.
3. Students will be able to design beams and built-up beams under transverse and bending stresses.

Course Objective 3

1. Students will be able to calculate the principal stresses in two dimensional stresses graphically and analytically.
2. Students can calculate the beam deflection using different methods.

Course Objective 4

1. Students will demonstrate ability to determine the developed stresses for a thick cylinder subjected to internal and external pressure.



2. Students will be able to analyze the stresses and strains of composite tubes.
3. Student can determine the buckling critical load and the effect of end conditions on column strength.

Prepared by:

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