

Course	ME 30400 – Mechanics and Materials Laboratory
Type of Course	Required for ME program
Catalog Description	Experimental determination of mechanical properties of selected engineering materials. Experimental verification of assumptions made in ME 252. Use of strain measuring devices. Design of experiments.
Credits	1
Contact Hours	3
Prerequisite Courses	ME 29300 and ME 30300
Corequisite Courses	None
Prerequisites by Topics	Sensors, devices, experiments, methods for recording, interpretation and presentation of experimental results, design of experiments, Crystal structure, imperfection in solids, mechanical properties of metals, dislocation and strengthening, failure, phase diagrams and transformations, metal alloys
Textbook	N. T. Younis, Mechanics and Materials Laboratory, current edition.
Course Objectives	Teach students with the Design of Experiments (DOE), and introduce the experiments for stress-strain diagrams of different materials, measurement of modulus of elasticity and the Poisson's ratio, relationships of beam deflections with torsional or transverse load and geometries, stress concentration factors, determination of Brinell and Rockwell hardness numbers, fracture resistance of materials, principal strains and stress, constant stress beams, strain hardening, stress distribution in thin cylinder.
Course Outcomes	<p>Students who successfully complete this course will have demonstrated an ability to:</p> <ol style="list-style-type: none">1. Use strain measuring devices to determine mechanical properties of engineering materials. (3)2. Use commercial engineering test equipment to determine mechanical properties of engineering materials. (3)<ol style="list-style-type: none">a. Instron Tensile Test Machineb. Brinell Hardness Testerc. Rockwell Hardness Tester

- d. Charpy Impact Tester
- e. Creep Test Machine
- 3. Experimentally verify the assumptions made in the study of Mechanics of Materials. **(2,3)**
- 4. Write formal technical report and convey engineering message efficiently. **(4)**
- 5. Work in teams to perform experimental tasks. **(4,7)**
- 6. Design experiments to solve engineering problems. **(6)**

Laboratory Topics

- 1. Safety procedures, general instructions, and lectures about labs
- 2. Tensile testing
- 3. Modulus of elasticity-flexural and Poisson's ratio
- 4. Bending test
- 5. Strain hardening
- 6. Torsion test
- 7. Cantilever flexural and Stress and strain concentrations
- 8. Temperature effect on impact toughness
- 9. Constant stress beam and Principle strains and stresses
- 10. Combined loading/pressure vessels
- 11. Design of experiments

Computer Usage

Low

Laboratory Experience

High

Design Experience

Medium

Coordinator

Nashwan Younis, Ph.D.

Date

26 March 2018