1. EM217 Strength of Materials

2. 4 Credit Hours / 5 Contact Hours

3. Course Director: Associate Prof. Samar Malek

4. Text book: *Mechanics of Materials, 5e by Timothy Philpot*, ISBN: 978-1-119-60301-6

5. Specific course information
    a. A first course in mechanics of deformable bodies with emphasis on the engineering approach to the responses of these bodies to various types of loadings. Topics include stress-strain relationships, stress-strain analysis, stress and strain transformation (Mohr's circle), load-deflection, bending, torsion, buckling, and temperature effects.
    b. Prerequisites: Statics (EM211)
    Co-requisites: Differential Equations (SM212)
    c. This course is required for the Mechanical Engineering program.

6. Educational objectives for the course
    a. Calculate how applied forces, pressures, and temperature changes affect the shape of deformable bodies.
    b. Explain the definitions of and relationships between stress and strain.
    c. Calculate stress and strain component transformations using equations and the Mohr's circle construction. Calculate principal stresses, principal strains, maximum shear stress, and maximum shear strain and apply in design context.
    d. Predict stresses and strains in structural elements undergoing axial, torsional, bending and combined loading (including thin-walled pressure vessels).
    e. Determine the elastic curve of elastic beam deflection and resulting beam deflections.
    f. Solve statically indeterminate problems.
    g. Integrate strength as well as deformation considerations in design applications.
    h. Predict the buckling load for cases of long thin columns in compression.
    i. Apply experimental strain measurements to validate the predicted stresses in a structural element or structure.
    j. Write complete and accurate technical reports that describe the experiments conducted, analyze results, and report appropriate conclusions.

7. Specific program outcomes address by this course

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Reinforced	x		x			x	
Mastered							

8. Brief list of topics to be covered
    a. Concept of stress and strain
    b. Mechanical properties of materials
    c. Design concepts and factor of safety

d. Axial deformation of single and multiple bars
e. Torsional deformation
f. Thermal effects
g. Shear and moment diagrams
h. Flexural Strains and normal stress due to bending
i. Bending due to an eccentric load
j. Shear stress in beams due to bending
k. Beam deflection
l. Principal Stresses and Mohr's circle
m. Strain transformations
n. Generalized Hooke's Law
o. Pressure Vessels
p. Combined Loading
q. Buckling