The Hashemite University
Faculty of Engineering
Course Syllabus

Course Title:	Strength of Materials	**Course Number:**	110402212
Department:	Mechanical Engineering	**Designation:**	Compulsory
Prerequisite(s):	110401211		
Instructor:	Dr. Mohammad Gharaibeh	**Instructor's Office:**	E3101
Instructor's e-mail:	mohammada_fa@hu.edu.jo		
Office Hours:	Mon/Wednesday (10:00–11:30am), or by appointment.		

Course description: Types of loads, structures and supports, axial stress and strain, normal and bending moment diagrams, torsion, bending of beams, combined stresses, shearing stress and strain, Mohr's circle of stress and strain, thin-walled pressure vessels, deflection of simple beams, buckling of columns.

Textbook(s): Mechanics of Materials, F. P. Beer et al, Eighth edition, Mc Graw Hill.

Course Outcomes: After completing the Strength of Material course, the student will:

- Recognize the different types of loading and their effects on the mechanical systems (axial loading, transverse loading, bending moments, torsion torques).
- Know the definitions of normal stress, normal strain, shear stress, shear strain,…etc.
- Analyze the stress and strain in order to design mechanical system that can withstand a given set of loading.
- Recognize the different types of deformations and study their relations to stress and strain.
- Be able to analyze statically determinate and statically indeterminate structures under different types of loading (axial loading, torsional torque and transverse loading).
- Construct shear and bending moment diagrams for beams and analyze the resulted stresses.
- Be familiar with the stress transformations and Mohr's circle and find the principal stresses and the maximum shear stress.
- Relate the beam deflection to the internal moment and derive the elastic curve of the beam.

Class schedule: Three class sessions each week; 50 minutes each

Grading Plan:

First Exam	(30 Points)	**TBA**
Second Exam	(30 Points)	**TBA**
Quizzes & others	(- Points)	
Final exam	(40 Points)	

Prepared by: Dr. Mohammad A. Gharaibeh
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Course Contents and Approximate Timeline

Chapter	**1**	**Introduction - Concept of Stress**	
	1.1	Introduction	
	1.2	A short review of the method of statics	**1**
	1.3	Stress in the members of a structure	
	1.4	Analysis and design	
	1.5	Axial loading, Normal stress	
	1.6	Shearing stress	**2**
	1.7	Bearing stress in connections	
	1.8	Application to the analysis and design of simple structures	
	1.11	Stress on an oblique plane under axial loading	
	1.12	Stress under general loading conditions; components of stress	**1**
	1.13	Design consideration	
Chapter	**2**	**Stress and strain – axial loading**	
	2.1	Introduction	
	2.2	Normal strain under axial loading	**1**
	2.3	Stress-strain diagram	
	2.5	hook's law (modulus of elasticity)	
	2.6	Elastic versus plastic behaviour of a material	
	2.7	Repeated loading (fatigue)	**2**
	2.8	Deformation of members under axial loading	
	2.9	Statically indeterminate problems	**2**
	2.10	Problems involving temperature changes	
	2.11	Poisson's ratio	**2**
	2.12	Axial loading- (generalized hook's law)	
	2.14	Shearing strain	
	2.15	Relationship among *v*, E and G	**2**
	2.17	Stress and strain distribution under axial loading	
	2.18	Stress concentration	
Chapter	**3**	**Torsion**	
	3.1	Introduction	
	3.2	Preliminary discussion of the stresses in a shaft	**2**
	3.3	Deformation in a circular shaft	
	3.4	Stresses in the elastic range	
	3.5	Angle of twist in the elastic range	**3**
	3.6	Statically indeterminate shafts	
	3.7	Design of transmission shafts	**1**
	3.8	Stress concentration in circular shafts	
Chapter	**4**	**Pure bending**	
	4.1	Introduction	
	4.2	Symmetric member in pure bending	**2**
	4.3	Deformation in a symmetric member in pure bending	
	4.4	Stresses and deformations in the elastic range	
	4.5	Deformations in a transverse cross-section	**2**
	4.6	Bending of members made of several materials	
Chapter	**5**	**Analysis and design of beams for bending**	
	5.1	Introduction	**2**
	5.2	Shear and bending moment diagrams	
	5.3	Relations among load, shear and bending moment	
Chapter	**6**	**Shearing stresses in beams and thin-walled members**	**2**
	6.1	Introduction	

	6.2	Shear on the horizontal face of a beam element	
	6.3	Determination of the shearing stresses in a beam	
Chapter	**7**	**Transformations of stress and strain**	
	7.1	Introduction	**2**
	7.2	Transformation of plane stress	
	7.3	Principal stresses : Maximum shearing stress	
	7.4	Mohr's circle for plane stress	**2**
	7.9	Stresses in thin-walled pressure vessels	**1**
Chapter	**8**	**Principal stresses under a given loading**	**2**
	8.4	Stresses under combined loading	
Chapter	**9**	**Deflection of beams**	
	9.1	Introduction	**1**
	9.2	Deformation of a beam under transverse loading	
	9.3	Equation of the elastic curve	
Chapter	**10**	**Columns**	
	10.1	Introduction	**1**
	10.2	Stability of Structures	
	10.3	Euler's formula for pin-Ended columns	
	10.4	Extension of Euler's Formula to Columns with Other End Conditions	