The University of Jordan
School of Engineering

Department	Course Name	Course Number	Semester
Mechanical Engineering	Strength of Materials II	0904472	

2019 Course Catalog Description

This course covers the following subjects: Deflection of beams (discontinuity functions, moment-area method, method of superposition, strain energy, principle of virtual work, Castigliano's theorems). Bending of unsymmetrical sections, torsion of non-circular sections, bending and torsion of thin-walled sections, buckling of columns and curved beams, theory of elasticity in 3D, plane stress and plane strain problems, any modern computer-aided application that can be added to the subject like "pipe stresses or tire-design with the aid of a modern commercial program".

Instructors

Name	E-mail	Sec	Office Hours		Lecture Time	

Text Books

	Text book 1	Text book 2
Title	Mechanics of Materials	
Author(s)	R.C. Hibbeler	
Publisher, Year, Edition	Printace Hall, 2010, 8th Edition	

References

Books	1. Mechanics of Materials, by Gere and Timoshenko. 2. Mechanics of Materials, by Beer and Johnson.
Journals	
Internet links	http://www.mae.ncsu.edu/zhu/courses/mae316/

Prerequisites

Prerequisites by topic	-
Prerequisites by course	Strength of Materials (1) 0934372
Co-requisites by course	-
Prerequisite for	-

Topics Covered

Week	Topics	Chapter in Text	Sections
1	Torsion of Non-circular and Non-prismatic Sections	3	
2-3	Design of Beams and Shafts (Failure Theories) -Maximum Shear Stress Theory -Distortion Energy Theory	11	
4-5	Buckling of Columns -Euler's Formula -Secant Formula -Inelastic Buckling -Design of Columns for Concentric and Eccentric Loading	13	
6-8	Deflection of Beams: -By Double Integration -By Moment-Area Method -By Superposition -By Singularity Functions -By Conjugate Beam Method	12	
9-12	Deflection of Beams and Frames Using Energy Method: -By Strain Energy -By Virtual Work -By Castiglione's Theorem	14	

	-Using Impact Loading		
13-14	Statically Indeterminate Beams: -Beams under Axial Loading -Shafts under Torsional Loading -Beams under Transverse Loading -Solution Using Energy Method	4,5,12	
15-16	Stresses and Deflections in Curved Beams & Arches.	6	

Mapping of Course Outcomes to ABET Student Outcomes

SOs	Course Outcomes
1	**1.** Analyze plane stresses using stress transformation equation and Mohr's circle. **2.** Calculate stresses in circular (solid and hollow) shafts. **3.** An ability to calculate material deformation energy. **4.** Apply the fixture and shear stress formula on beams. **5.** Compute the area moment of inertia for different cross sections.
2	**6.** Model and calculate the stresses (normal and shear) due to flexure of beams. **7.** Calculation of beam deflection using various methods. **8.** Determine the buckling load and design of long and intermediate columns **9.** Analyze and design of thin walled pressure vessel. **10.** Ability to apply failure theorems.

Evaluation

Assessment Tools	Expected Due Date	Weight
Project, Homework and Quizzes		20 %
Midterm Exam		30 %
Final Exam		50 %

Contribution of Course to Meet the Professional Components

This course is one of the first opportunities for engineering students to encounter the fundamental principles of design problem solving. The course contributes to build the fundamental basic concepts of design analysis of structures and basic machine components.

Relationship to Student Outcomes

SOs	1	2	3	4	5	6	7
Availability	X	X					

Relationship to Mechanical Engineering Program Objectives (MEPOs)

MEPO1	MEPO2	MEPO3	MEPO4	MEPO5

Student Outcomes (SOs)

1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated by ABET Committee, 2021