Philadelphia University

Faculty of Engineering & Technology

Department of Mechanical Engineering

First Semester 2023/2024

Course Information

Course Title:	**Solid Mechanics** (620213)
Prerequisite:	Statics (620211)
Credit Hours:	3 credit hours (16 weeks per semester, approximately 44 contact hours)
Textbook:	Mechanics of Materials -12th edition by R. C. Hibbeler
References:	Mechanics of Materials -12th edition by R. C. Hibbeler
Website:	http://www.philadelphia.edu.jo/academics/nmusa
Course Description:	Study of stress, and strain relation when loads (axial, torsion, bending, and buckling loads) are applied to static solid bodies such as beams. mechanical properties of materials, pure bending, analysis and design of beam for bending, shear stress in beams, transformation of stress and strain, deflection of beams, columns, and energy methods
Instructors:	**Dr. Nabil Musa** **Email**: nmusa@philadelphia.edu.jo **Office**: Engineering Building, room E61206, ext.:2343 Office hours: Sat, Sun, Mon Tues, 12:00-13:00 Mon
Course Coordinator:	Dr. Nabil Musa **Email**: nmusa@philadelphia.edu.jo **Office**: Engineering Building, room E61206, ext.:2343 Office hours: Sat, Sun, Mon Tues, 12:00-13:00 Mon
Technology Requirements:	• Personal computer, laptop, or mobile phone. • Internet Connection. • Access to Philadelphia University E-Learning Portal (MS Teams and Moodle)
Learning Style:	F2F
Communication:	• Announcement: the announcements will be posted in MS Teams or Moodle on a regular basis. • Email. • MS Teams or Moodle chats.

Course Learning Outcomes (CLO) and Relation to ABET Student Outcomes		
CLOs	**Outcomes**	**ABET PLOs**
K1	Introduction and Basic Concepts of Solid Mechanics, Stress, and Strain.	1
K1, K2	Mechanical properties of materials, Axial loading.	1
K2, S3	Torsion, analysis, and design of beam for bending.	1
K2	shear stress in beams, Transverse shear, and Strain transformation.	1

K2	transformation of stress and strain, Deflection of beams, Columns, energy methods	1

Grading Policy and Assessment Instruments					
Graded Item	**Marks**	**Topic (s)**	**CLO(s)**	**Learning Portal** (Teams/ Moodle/ F2F/ Others)	**Week**
Assignment 1	5	Study of stress, and strain	K1	F2F	5
Assignment 2	5		K1,K2	F2F	14
Quiz 1	5	Elastic deformation of an axially loaded	K1	F2F	4
Quiz 2	5	Poisson's ratio, Shear-stress strain diagram.	K1	F2F	6
Quiz 3	5	Torsion deformation, angle of twist, and statically indeterminate torque-loaded members.	K1,K2	F2F	9
Quiz 4	5	Bending stress	K1	F2F	13
Mid Exam	30%	Weeks 1-8	K1,K2	F2F	8
Final Exam	40%	Week 1-15	K1,K2	F2F	16
Total Marks	**100%**				
Notes:	• Two written exams will be given. • Copying homework is forbidden, any student caught copying the homework or any part of the homework will receive zero marks for that homework. • Quizzes: 10-minute quizzes will be given to the students during the semester. These quizzes will cover material discussed during the previous lecture(s). • Homework: Problem sets will be given to students. Homework should be solved individually and submitted before the due date. • The final exam will cover all the class material.				

Course Content: Learning Resources/ References/ Activities/ Assessment Methods							
Week	**Lecture**	**Topic**	**CLOs**	**Learning Resources/ References/ Activities/ Assessment Method**	**Learning Style** (F2F, Synchronous, Asynchronous)	**Learning & Teaching Methods**	**Assessment Method**
1	**L1**	Introduction to mechanics of materials.	-	Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	Whiteboard notes	-
	L2	Stress equilibrium of a deformable body.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta.,	F2F	Whiteboa	F2F questions

				2002		rd notes, ppp	
2	**L1**	• Average normal stress in the axially loaded bar.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	Whiteboard notes, ppp	F2F questions
	L2	• Average normal stress in the axially loaded bar. • Average shear stress in the axially loaded bar.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	Whiteboard notes, ppt	F2F questions
3	**L1**	Group problem solving (stress).		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	Whiteboard notes, ppp	F2F questions
	L2	● allowable stress ● Design of simple connections.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	Whiteboard notes, ppp	F2F questions
4	**L1**	● Deformation of bodies. ● Strain. ● Quiz 1		Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines by R. L. Norton, 3rd edition,1999	F2F	Whiteboard notes, pp	F2F questions + written quiz
	L2	• Tension and compression. • Stress-strain diagram.		Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines by R. L. Norton, 3rd edition,1999	F2F	Whiteboard notes	F2F questions
5	**L1**	• Stress-strain behavior of ductile materials. • Stress-strain behavior of brittle materials.		Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines by R. L. Norton, 3rd edition,1999	F2F	PPP whiteboard	F2F questions
	L2	• Hooke's Law. • Group problem solving. • Assignment 1		Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines by R. L.	F2F	PPP + whiteboard	F2F questions + students presentation

				Norton, 3rd edition,1999			
6	**L1**	• Poisson's ratio. • Shear-stress strain diagram.		Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines by R. L. Norton, 3rd edition,1999	F2F	PPP + whiteboard	F2F questions + Classwork
	L2	• Elastic deformation of an axially loaded member. • Quiz 2		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	PPP + white board	F2F questions + students presentation
7	**L1**	• Principle of superposition. • Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	PPP + white board	F2F questions + students presentation
	L2	• Statically in determinate axially loaded members. • Force method of analysis.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
8	**L1**	• Thermal stress • Stress concentration.		-	F2F	-	Written exam
	L2	• Estimated Midterm exam		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
9	**L1**	• In elastic deformation. • Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	Classwork
	L2	• Torsion and torsion deformation. • Quiz 3		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions
10	**L1**	• Power transmission. • Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
	L2	• Angle of twist. • Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
	L1	• Torsional formula. • Statically in determinate torque-		Theory of Machine. By: R.S. Khurmi and J. K. Gupta.,	F2F	whiteboa	F2F questions + students

11		loaded members.		2002		rd	presentation
	L2	• Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
12	**L1**	• Solid non-circular shaft. • Thin-walled tubes.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
	L2	• Stress concentration in the shaft. • Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
13	**L1**	• Inelastic torsion. • Residual stress.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
	L2	• Bending stress • Quiz 4		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
14	L1	• Shear and moment diagram. • Group problem solving. • Assignment 2		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
	L2	• Graphical methods for construction shear and moment diagram. • Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentation
15	**L1**	• Bending deformation in straight members. • Flexure formula. • Group problem solving.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whiteboard	F2F questions + students presentati

							on
	L2	• Transverse shear stress. • Moher's circle, and principle stress.		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whit eboa rd	F2F questions + students presentati on
16		• Final exam		Theory of Machine. By: R.S. Khurmi and J. K. Gupta., 2002	F2F	whit eboa rd	F2F questions + students presentati on

Notes:
For Blended and F2F Courses: L1 & L2 each 1 hour.
For Online Course: L1 and L2 each 1.5 hours.

Credit Hours Distribution Report	
Learning Style	**Credit Hours**
F2F	32
Synchronous	0
Asynchronous	16
Total	48

Academic Honesty/ Student Conduct	○ As a student at Philadelphia University, you are expected to follow the university regulations and guidelines for academic honesty/student conduct found in the student handbook. ○ This means that you should not cheat, plagiarize, and let another student use your account in LMS learning portals.
Attendance Policy	Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse, acceptable to and approved by the Dean of the relevant college/faculty, shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

October 2023