Course Specification
(Bachelor)

Course Title:	Solid Mechanics
Course Code:	ME3131
Program:	Mechanical Engineering
Department:	Mechanical Engineering Department
College:	College of Engineering & Architecture
Institution:	Umm Al-Qura University
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (2 Lecture, 1 Lab.)					
2. Course type					
A.	☐ University	☐ College	☐ Department	☐ Track	☐ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (5th level/3rd year)					
4. Course General Description:					
The course explains that the loads (forces/ moments) cause stresses which lead to deformation. It also discusses strain, types of stresses such as axial stress, torsion, bending, transverse shear, combined stresses, stress and strain transformation, design of beams and shafts.					
5. Pre-requirements for this course (if any):					
Static CE1101.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• Able to use knowledge of relationships between various external loads applied to a deformable body and the intensity of internal loads acting within the body. • Able to calculate for dimension and strength of structural members subjected to combined loadings and select the suitable material for a specific engineering application.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100
2	E-learning	Blackboard, Extra	Extra
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	45
5.	**Others (specify)**	Extra
Total		75+

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe the stress-strain relationship in various structural members subjected to a single loading; axial load, torsion, bending, and shear.**	**K1, 1**	• **Lectures: given on topics as class progress, with especial consideration within the class to link the existing topic with students' existing knowledge and further with the general overview.** • **Review: review the content of each lecture and clarify any matters not understood.** • **Tutorials: solving extra problems for each topic individually.** • **Communication between lecturer and students through e-mail is**	**Quizzes. Midterm Exam. Final Exam. Oral Exam. If needed**
1.2	**Analyze and solve problems in various structural members subjected to combined loadings.**	**K1, 1**		
1.3	**Explain knowledge of engineering design for various structural members or machine components subjected to single external load.**	**K1, 1**		
1.4	**Describe stress and strain transformation at a point in two dimensions and determine the principal stress & strain, maximum shear stress &**	**K1, 1**		

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	strain, and their orientation.			
1.4	Design of beams andshafts	K1, 1	also opened for this purpose.	
2.0	**Skills**			
2.1				
2.2				
...				
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	**1. Stress** • Introduction • Equilibrium of a deformable body • Stress • Average normal stress in an axially loaded bar • Average shear stress • Allowable stress	7
2.	**2. Strain** • Deformation • Normal strain • Shear strain	5
3.	**3. Mechanical Properties of Materials** • Tension and Compression Test • Stress-Strain Diagram • Hooke's law • Strain Energy • Poisson's Ratio	7
4.	**4. Axial load** • Saint-Venant's Principle • Elastic Deformation of an Axially Loaded Member • Principle of Superposition • Statically Indeterminate Axially Loaded Member • Thermal Stress • Stress Concentration	10

5.	**5. Torsion** • Torsional Deformation of a Circular Shaft • Torsion Formula • Power Transmission • Angle of Twist • Stress Concentration	10
6.	**6. Bending** • Shear and Moment Diagram • Flexure Formula • Unsymmetrical Bending • Stress Concentration	10
7.	**7. Transverse Shear** • Shear Formula • Shear Stress in Beam and Shaft	7
8.	**8. Combined Loadings** • Thin-Walled Vessels • State of Stress Caused by Combined Loadings	7
9.	**9. Stress/ Strain Transformation** • Plane-Stress/strain Transformation • General Equation • Principal Stress/Strain and maximum In-Plane Shear Stress/Strain • Mohr's Circle	7
10.	**10. Design of Beams and Shafts** • Beam design • Shaft design	5
Total		**75+**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	1-14	25%
2.	Midterm exam	8	25%
3.	Final exam	16-17	50%
4.	Oral exam if needed	15	Bonus

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Mechanics of Materials 10th Edition, by R. C. Hibbeler, PEARSON,

	2017, ISBN 9780134319650
Supportive References	
Electronic Materials	**All the lecture notes**
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**A lecture room with a capacity of 40 students per session is reasonable.**
Technology equipment (projector, smart board, software)	**Laptop and data show.**
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students and Program Leaders	direct and Indirect
Effectiveness of Students assessment	Students and Program Leaders	direct and Indirect
Quality of learning resources	Program Leaders	direct and Indirect
The extent to which CLOs have been achieved		
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DR. HASSAN A. FADAG**
REFERENCE NO.	
DATE	**JANUARY 19TH, 2025**