OSTIM TECHNICAL UNIVERSITY
FACULTY OF ENGINEERING

COURSE SYLLABUS FORM
2020-2021

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MEC 202 Strength of Materials

Course Name	Course Code	Period	Hours	Application	Laboratory	Credit	ECTS
Strength of Materials	MEC 202	1	3	0	0	4	5

Language of Instruction	English
Course Status	Compulsory
Course Level	Bachelor
Learning and Teaching Techniques of the Course	Lecture, Discussion, Question Answer, Practice

Course Objective

1) analyze the stresses and strains in load carrying members due to direct axial tensile and compressive forces
2) determine the torsional shear stress and deformation
3) compute the stresses due to bending in beams
4) calculate the deflection of beams due to a variety of loading and support conditions using double integration
5) moment area and superposition method
6) analyze stresses in beams under combined axial and flexure loads, eccentric loads and unsymmetrical bending
7) analyze stresses in two dimensions and understand the concepts of principal stresses and the use of Mohr circles to solve dimensional stress problems
8) understand the differences between statically determine and indeterminate problems
9) compute thermal stresses and deformation
10) compute the stress in thin-walled pressure vessels due to internal pressure

Learning Outcomes

1. Ability to compute the stress in members carrying axial tensile or compressive loads.
2. Ability to compute strain and deformation in members carrying axial loads.
3. Ability to compute the torsional shear stress and deformation.
4. Ability to apply the principle of torsional shear stress to design shafts.
5. Ability to compute power transmitted by rotating shafts.
6. Ability to plot the shear force, bending moment diagrams.
7. Ability to compute the centroid and moment of inertia of areas having shapes commonly found in beams.
8. Ability to compute flexure and shearing stresses.
9. Ability to draw moment diagrams by parts method.
10. Ability to compute the equation of elastic curve and maximum deflection by using double integration, moment area and superposition methods.
11. Ability to determine normal stresses in beams under combined axial and flexure loads and position of neutral

axis.
12. Ability to determine the normal stresses in beams subjected to eccentric loads.
13. Ability to determine normal stresses in beams subjected to unsymmetrical loading.
14. Ability to perform stress transformation.
15. Ability to construct and interpret Mohr's circle of stresses.
16. Ability to apply the principles of strength of materials to design load carrying members of machines and structures.
17. Ability to obtain the relationship between forces by using statics and determine the relationship between deformations of the stressed members and solve simultaneously to obtain the unknowns.
18. Ability to make an indeterminate beam statically determinate by removing the redundant reactions and to combine the slopes and deflections in such way that their addition will correspond to known conditions of the indeterminate beam.
19. Ability to calculate unknown forces or other related unknowns through the use of equations of statics and thermal expansion equation.
20. Ability to calculate the stresses in thin walled pressure containers due to internal pressure.
21. Ability to calculate the stresses in thin walled pressure containers due to internal pressure and external axial and torsional loads.

Course Outline

Concepts: normal and shear stress, strain. Materials, factor of safety, stress concentration. Pressurized thin walled cylinders. Simple loading tension, torsion and bending. Deflections with simple loadings, superpositio techniques. Statistically indeterminate members, thermal stresses. Combined stresses, Mohr`s circle, combined loadings. Energy methods.

Weekly Topics and Releated Preparation Studies

Weeks	Topics	Preparation Studies
1	Concept of Stress	Chapter 1
2	Stress and Strain- Axial Loading	Chapter 2
3	Stress and Strain- Axial Loading	Chapter 2
4	Torsion	Chapter 3
5	Pure Bending	Chapter 4
6	Analysis and Design of Beams for Bending	Chapter 5

7	Analysis and Design of Beams for Bending	Chapter 5
8	**Midterm Exam**	
9	Shearing Stresses in Beams and Thin-Walled Members	Chapter 6
10	Transformations of Stress and Strain	Chapter 7
11	Principal Stresses Under a Given Loading	Chapter 8
12	Principal Stresses Under a Given Loading	Chapter 8
13	Deflection of Beams	Chapter 9
14	Deflection of Beams	Chapter 9
15	Energy Methods	Chapter 11
16	**Final Exam**	

Textbook(s)/References/Materials:
Mechanics of Materials, in SI Units by BEER, Ferdinand P., JOHNSTON, E. Russell Jr, DeWOLF, John T., MAZUREK, David F., McGrawHill *Mechanics of Materials, SI Edition* by HIBBELER, R. C., Prentice Hall

Assessment		
Studies	**Number**	**Contribution margin (%)**
Attendance	14	10
Lab		
Application		
Field Study		
Course-Specific Internship (if any)		
Quizzes / Studio / Critical	5	20
Homework		
Presentation		
Projects		

Report		
Seminar		
Midterm Exams / Midterm Jury	1	30
General Exam / Final Jury	1	40
	Total	**100**
Success Grade Contribution of Semester Studies		60
Success Grade Contribution of End of Term		40
	Total	**100**

Relationship Between Course Learning Outcomes and Program Competencies							
Nu	**Learning Outcomes**	**Contribution Level**				
		1	**2**	**3**	**4**	**5**
1	An ability to apply knowledge of science, mathematics, and engineering.					x
2	An ability to design static systems, components, or processes to meet industrial needs.					x
3	An ability to work with multi-disciplinary teams.					x
4	An ability to identify, formulate, and solve engineering problems.					x
5	Take responsibility to solve unpredictable and complex problems encountered in applications as an individual and as a member of a team			x		
6	Plan and manage activities in teamwork			x		
7	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.				x	
8	Can do research on interdisciplinary fields.			x		

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Course hours (Including the exam week: 16 x total course hours)	16	3	48
Laboratory			
Application			
Course-Specific Internship			
Field Study			
Study Time Out of Class	14	2	28
Presentation / Seminar Preparation			
Projects			
Reports			
Homeworks			
Quizzes / Studio Review	5	2	10
Preparation Time for Midterm Exams / Midterm Jury	1	15	15
Preparation Period for the Final Exam / General Jury	1	15	15
Total Workload			**116**