AERO 202 STRENGHT OF MATERIALS

Course Code	Course Name		Semester	
AERO 202	Strength of Materials		Fall ☐ Spring ☒ Summer ☐	
Hours			**Credit**	**ECTS**
Theory	**Practice**	**Lab**	3	5
3	0	0		

Course Details	
Department	Aerospace Engineering
Course Language	English
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☒ Elective ☐
Course Objectives	To compute the stress, strain, deformation To draw moment diagrams by parts method. To compute the equation of elastic curve and maximum deflection by using double integration, moment area and superposition methods. To determine normal stresses in beams under combined axial and flexure loads and position of neutral axis. To determine the normal stresses in beams subjected to eccentric loads. To determine normal stresses in beams subjected to unsymmetrical loading. To perform stress transformation. To construct and interpret Mohr's circle of stresses. To apply the principles of strength of materials to design load carrying members of machines and structures. To calculate unknown forces or other related unknowns through the use of equations of statics and thermal expansion equation. To calculate the stresses in thin walled pressure containers due to internal pressure. To calculate the stresses in thin walled pressure containers due to internal pressure and external axial and torsional loads. Understand the strain energy and related methods

Course Content	Analyze the stresses and strains in load carrying members due to direct axial tensile and compressive forces Determine the torsional shear stress and deformation Compute the stresses due to bending in beams Calculate the deflection of beams due to a variety of loading and support conditions using double integration Moment area and superposition method Analyze stresses in beams under combined axial and flexure loads, eccentric loads and unsymmetrical bending Analyze stresses in two dimensions and understand the concepts of principal stresses and the use of Mohr circles to solve dimensional stress problems Understand the differences between statically determine and indeterminate problems Compute thermal stresses and deformation Compute the stress in thin-walled pressure vessels due to internal pressure Energy methoda
Course Method/ Techniques	Lecture ☒ Question & Answer ☒ Presentation ☒ Discussion ☒
Prerequisites/ Corequisites	None
Work Placement(s)	

Textbook/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
- Crandall, Dahl, Lardner, "An Introduction to Mechanics of Solids" Mc Graw-Hill Book Co

Course Category

Mathematics and Basic Sciences	☐		Education	☐
Engineering	☒		Science	☐
Engineering Design	☒		Health	☐
Social Sciences	☐		Profession	☐

Weekly Schedule

No	Topics	Materials/Notes
1	Concept of Stress	
2	Stress and Strain- Axial Loading	
3	Stress and Strain- Axial Loading	
4	Torsion	
5	Pure Bending	
6	Analysis and Design of Beams for Bending	

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

Assessment Methods and Criteria		
In-term studies	**Quantity**	**Percentage**
Attendance	14	
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize		
Homework	4	20%
Presentation / Seminar		
Project		
Report		
Seminar		
Midterm Exam	1	30%
Final Exam	1	50%
	Total	**100%**
Contribution of Midterm and Semester Studies to Success Grade		50%
Contribution of End of Semester Studies to Success Grade		50%
	Total	**100%**

ECTS Allocated Based on Student Workload			
Activities	**Quantity**	**Duration (Hrs)**	**Total Workload**
Course Hours	14	3	42
Lab			
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time			
Quiz/Studio/Criticize			
Homework	4	5	20
Presentation / Seminar			
Project			

Report			
Midterm Exam and Preparation for Midterm	1	25	25
Final Exam and Preparation for Final Exam	1	30	30
Total Workload			**117**
Total Workload / 25			**4.68**
ECTS Credit			**5**

Course Learning Outcomes	
No	**Outcome**
L1	Ability to compute strain and deformation in members carrying axial loads.
L2	Ability to compute the torsional shear stress and deformation.
L3	Ability to apply the principle of torsional shear stress to design shafts.
L4	Ability to compute power transmitted by rotating shafts.
L5	Ability to plot the shear force, bending moment diagrams.
L6	Ability to compute the centroid and moment of inertia of areas having shapes commonly found in beams.
L7	Ability to draw moment diagrams by parts method.
L8	Ability to compute the equation of elastic curve and maximum deflection by using double integration, moment area and superposition methods.
L9	Ability to determine normal stresses in beams under combined axial and flexure loads and position of neutral axis
L10	Ability to determine the normal stresses in beams subjected to eccentric loads.
L11	Ability to determine normal stresses in beams subjected to unsymmetrical loading.
L12	Ability to perform stress transformation.
L13	Ability to construct and interpret Mohr's circle of stresses.
L14	Ability to calculate unknown forces or other related unknowns through the use of equations of statics and thermal expansion equation.
L15	Ability to calculate the stresses in thin walled pressure containers due to internal pressure.

Contribution of Course Learning Outcomes to Program Competencies/Outcomes												
Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant												
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**Total**
L1	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L2	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L3	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L4	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L5	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L6	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45

L7	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L8	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L9	5	5	5	5	2	3	2	2	2	2	3	35/55; %65,45
L10	5	5	5	5	2	3	2	2	2	2	3	35/55; 65,45%
L11	5	5	5	5	2	3	2	2	2	2	3	35/55; 65,45%
L12	5	5	5	5	2	3	2	2	2	2	3	35/55; 65,45%
L13	5	5	5	5	2	3	2	2	2	2	3	35/55; 65,45%
L14	5	5	5	5	2	3	2	2	2	2	3	35/55; 65,45%
L15	5	5	5	5	2	3	2	2	2	2	3	35/55; 65,45%
											Total	525/825; 65,45%