

Course: AE 432 - Structure II (3: 3, 2) – Required Core Course

Course Description: Deflection of statically determinate structures-Load analysis of statically indeterminate structures- Deflection of statically indeterminate structures- matrix method of structural analysis: stiffness equations of spring structures, general stiffness equations of a structural element, matrix analysis of beam, matrix analysis of frames , matrix analysis of thin walled structures-matrix analysis of thin walled structures- structural stability : primary buckling of columns, buckling of thin plates , local buckling of thin walled columns, crippling strength of thin walled columns, buckling of stiffened panels, tension filled web beams.

Prerequisites: AE 331.

Textbooks & required Materials:

1. Curtis, H.D., *Fundamentals of Aircraft Structural Analysis*, McGraw-Hill, 1996.
2. Bruhn, E.F., *Analysis and Design of flight vehicle structure*, Jacobs Publishing, 3rd edition, 1975.
3. Donaldson, B.C. *Analysis of Aircraft Structures*, Cambridge University Press, 2nd edition, 2008.

Course Learning Objectives:

By the completion of the course, the students should be able to:

1. Calculate the deflections of statically determinate structures.
2. Analyze the statically indeterminate structures to find their internal loads
3. Calculate the deflections of statically indeterminate structures.
4. Derive the stiffness equations of spring structures.
5. Derive the stiffness equations of a structural element.
6. Use the stiffness method to calculate the deflections and internal loads of truss structures
7. Apply the matrix method to find the deflections and internal loads of beams
8. Use the matrix method for structural analysis of frames.
9. Apply the stiffness method to find the deflections and internal loads of thin-walled structures
10. Calculate the primary buckling loads of columns.
11. Find the buckling loads of thin plates in compression , shear , bending and under combined systems of loading
12. Predict the local buckling load of a thin-walled column and compare it with the primary buckling load of the column
13. Calculate the crippling strength of thin-walled columns.
14. Design the stiffened panels to avoid buckling and crippling.
15. Design the tension-filled web beams.

Course Topics and their Duration:

Course Topics	Duration in weeks
Deflection of aircraft structures: <ol style="list-style-type: none"> 1. Deflections of statically determinate structures. 2. Load analysis of statically indeterminate structures 3. Deflections of statically indeterminate structures. 	5
Matrix Method of structures analysis <ol style="list-style-type: none"> 4. Stiffness equations of spring structures. 5. General Stiffness equations of a structural element. 6. Matrix analysis of truss structures 7. Matrix analysis of beams 8. Matrix analysis of frames. 9. Matrix analysis of thin-walled structures. 	6
Structural stability <ol style="list-style-type: none"> 10. Column primary buckling. 11. Thin plates Buckling 12. Local buckling load of a thin-walled column. 13. Crippling strength of thin-walled columns. 14. Stiffened panels in compression. 15. Tension-field web beams. 	4

Class Schedule:

- **Lectures:** 3 hours per week
- **Tutorials:** 2.0 hours per week

Course Contribution to Professional Component:

- Engineering science: 80%
- Engineering design: 20%

Course Relationship to Program Outcomes:

Program Outcomes	ABET Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
Highest Attainable Level of Learning*	3	-	-	-	3	-	2	-	-	2	-

*1: Low level (knowledge & Comprehension), 2: Medium (Application & Analysis), 3: High (Synthesis & Evaluation)

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