Course Specifications

Program(s) on which this course is given:	Structural Design of Flight Vehicles (A)
Department offering the program:	Aerospace Engineering
Department offering the course:	Aerospace Engineering
Academic Level:	B.Sc.
Date	April 2015
Semester (based on final exam timing)	■ Fall □ Spring

A- Basic Information

1. Title:	Structural Design of Flight Vehicles (A)			**Code:**		AER403A		
2. Units/Credit hours per week:	Lectures	3	Tutorial	2	Practical	**0**	Total	5

B- Professional Information

1. Coursedescription:

This course introduces long-hand calculation of the structural internal forces due to aerodynamic, inertial and engine thrust loads applied to aircraft structure wing, tail unit, fuselage, undercarriage and engine support structure. Then it applies long hand calculations to stress and strain on the aircraft structure components. The stress and margin of safety in wing and tail unit skin, spars and ribs and in fuselage skin, stringers and rings and rings. The shear lag due to wing and fuselage cutouts is calculated. The internal forces and stresses in fixed and deployable undercarriage structure are considered.

2. Intended Learning Outcomes of Course (ILOs):

a) Knowledge and Understanding

- To know the procedures for calculating the aerodynamic, inertial and thrust loads imposed on aircraft wing, tail unit, fuselage, undercarriage and engine support components.
- To understand the methodology of calculating thin section structural crippling, ultimate failure strength limits.
- To understand the methodology for calculating internal forces, stresses and margin of safety in aircraft

b) Intellectual Skills

- To perform long hand calculations for wing, empennage, fuselage and fixed and deployable undercarriage static structure analysis and perform design modifications.
- To apply finite element methodology using commercial codes to perform aircraft components static structural analysis and perform design modifications.

c) Professional and Practical Skills

- To develop a conceptual structural design to satisfy pre-specified requirements
- To apply aircraft long hand calculations and computerized finite element structural analysis to engineering conceptual designs
- To perform design modifications to have acceptable structural margin of safety
- Use a finite element package to analyze deflections, stresses, and study the static behavior of a structure with application to wing , empennage, fuselage and undercarriage designs

	d) General and Transferable Skills
	▪ To Analyze calculation results and apply them to conceptual designs ▪ To Participate in team work ▪ To prepare and write professional engineering report ▪ To use of internet in search for scientific and engineering information.

3. Contents

Topic	**Total hours**	**Lectures hours**	**Tutorial/ Practicalhours**
Flight vehicles imposed loads	5	3	2
Undercarriage stress analysis	10	6	4
Aircraft materials and crippling strength	10	6	4
Wing , empennage, and fuselage stress analysis	40	24	16
Wing ribs and fuselage rings	5	3	2
Cutouts and Shear lag	5	3	2

4. Teaching and Learning Methods	Lectures (45)	Practical Training/ Laboratory (√)	Seminar/Workshop ()
	Class Activity (30)	Case Study ()	Projects (√)
	E-learning ()	Assignments /Homework (6)	Other:

5. Student Assessment Methods

• **.Assessment Schedule**	**Week**
-Assessment 1;Class test	4,5,6,8,12
-Assessment 2; Project Assignment	
-Assessment 3; Presentations	
-Assessment 3; Midterm Exam	9
-Assessment 4; Final Exam	15
• **Weighting of Assessments**	
-Mid-Term Examination	25
-Final-term Examination	75
-Project	15
-Class Test	10
-Presentation	0
-Total	125

6. List of References

Bruhn, E.F., "Analysis and Design of Flight Vehicle Structures", Tri-State.

Megson, T.H.G., Aircraft Structures for Engineering Students", Edward Arnold

7. Facilities Required for Teaching and Learning

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Course Coordinator:	Prof. Dr. Mohamed Nader M. Abuelfoutouh
Head of Department:	Prof. Dr. Ayman Hamdy Kassem