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:**		AER403B			
2. Units/Credit hours per week:	Lectures	3	Tutorial	2	Practical	**0**	Total	5

B- Professional Information

1. Coursedescription:

This course introduces to basic concepts and matrix calculations in structural dynamics. The student is trained to obtain the structural stiffness matrix, mass matrix and stiffness matrix for truss elements and beam elements using Lagrange method. Then he is trained in simple problems to obtain the structure natural frequencies and to solve the structural response in frequency domain and in time domain by applying Laplace and inverse Laplace transform to the structure equation of motion. The student calculates the vibrating structure stress and predict the structural fatigue life by applying rainfall cycle count to the actual cyclic life obtain the structural dominant cycles. The cyclic and spectral load history is applied to Miner rule to obtain fatigue life.

2. Intended Learning Outcomes of Course (ILOs):

a) Knowledge and Understanding

- To know the basic concepts of structural dynamics and dynamic stress.
- To understand the significance of time domain and frequency domain.
- To know how to estimate structure fatigue life

b) Intellectual Skills

- To derive structural stiffness, mass and damping matrices for dynamic structure analysis.
- To apply finite element methodology using commercial codes to perform aircraft components dynamic structural analysis and perform design modifications.

c) Professional and Practical Skills

- To develop a conceptual structural design to satisfy pre-specified dynamic requirements
- To perform design structure dynamic analysis and apply modifications to have acceptable dynamic structural response.
- Use a finite element package to analyze modal and dynamic 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**
Matrix derivation	10	6	0
Frequency domain solution	15	12	3
Time domain solution	15	12	3
Fatigue analysis	10	9	3
Power spectral density	5	3	3
Rainfall cycle count Miner rule an	5	3	3
4. Teaching and Learning Methods	Lectures (45)	Practical Training/ Laboratory (√)	Seminar/Workshop ()
	Class Activity (15)	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	15
-Final-term Examination	70
-Project	0
-Class Test	15
-Presentation	0
-Total	100

6. List of References
Bruhn, E.F., "Analysis and Design of Flight Vehicle Structures", Tri-State.
Thorby Douglas., Structural Dynamics and vibration in practice"ISBN: 978-0-7506-8002-8

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