Cairo University
Faculty of Engineering

Department of Aerospace Engineering

Course Specifications

Program(s) on which this course is given:	Aerospace Engineering
Department offering the program:	**Department of Aerospace Engineering**
Department offering the course:	**Department of Aerospace Engineering**
Academic Level:	B.Sc.
Date	March 23 2015
Semester (based on final exam timing)	☐x Fall ☐ Spring

A- Basic Information

1. Title:	Analysis And Design Of Missile Structure				**Code:**	AER 641		
2. Units/Credit hours per week:	Lectures	27	Tutorial	15	Practical	**3**	Total	45

B- Professional Information

1. Course description:	This course is intended to introduce the theory and computation methodology to compute the structural impulse, inertial, random vibration , acoustic and aerodynamic loads on a missile at its different flight stages. It also introduces the theory and methodology of computing the missile stress and strain under th applied loads.
2. Intended Learning Outcomes of Course (ILOs):	**a) Knowledge and Understanding**
	To know the basic missile structure terminology, history of missile design and manufacturing of missile components, weight distribution and applied loads as compared to aircraft weights and loads.
	To understand the missile mission requirements, mission analysis, space vehicle specifications, mission constraints including escape from gravity and possibly gravity field reentry corridor
	b) Intellectual Skills
	To learn the existing missile and space vehicle typical structures configurations and applied materials
	To learn the theories and methods for computing the structural design loads that arise from the engine ignition shock load, the accompanying dynamic vibration loads and the acoustic load on payload in its compartment, the aerodynamic shock wave load, and the in space inertia and thermal loads. Most missile loads are random and base excited loads
	c) Professional and Practical Skills
	To Conduct missile random and deterministic load analysis
	To Conduct the missile random and deterministic static and dynamic stress, strain, and deformation analysis. To conduct modal analysis, structural dynamic response in frequency domain and in time domain.
	d) General and Transferable Skills
	To Gain the ability to apply missile structural random load analysis and compare them to deterministic dynamic and static analysis and to compare the results.

3. Contents

Topic	Total hours	Lectures hours	Tutorial/ Practical hours
History, terminology and weight distribution		3	
Propulsion system fundamentals and space missile specifications		3	
Materials for missiles and structural load		3	

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Missile random loads analysis		3	
Missile random load structural stress, strain and deformation analysis		9	9
Missile modes, dynamic response in frequency domain and in time domain		6	9
4. Teaching and Learning Methods	Lectures (27)	Practical Training/ Laboratory (15)	Seminar/Workshop (3)
	Class Activity (4)	Case Study (1)	Projects (1)
	E-learning (2)	Assignments /Homework (5)	Other:

5. Student Assessment Methods

• **Assessment Schedule**	**Week**
-Assessment 1;Class test	4,5,6
-Assessment 2; Project Assignment	7
-Assessment 3; Presentations	10
-Assessment 3; Midterm Exam	9
-Assessment 4; Final Exam	16
• **Weighting of Assessments**	
-Mid-Term Examination	20
-Final-term Examination	40
-Project	20
-Class Test	15
-Presentation	5
-Total	100

6. List of References

Analysis and design of missile structures, Editor: E.F. Bruhn, Library of Congress Card: 67-28959

7. Facilities Required for Teaching and Learning

Computer lab

Course Coordinator:	**Nader M. Abuelfoutouh**
Head of Department:	**Ayman H. Kassem**