ENG ME 307 Flight Structures

2008 - 2009 Catalog Data:
ENG ME 307 Flight Structures Prereq: ENG ME 305 and ENG ME 201. Elementary elasticity, plane stress and plane strain problems, torsion of rods and thin-walled open and closed section beams, unsymmetrical bending, bending shear stress in thin-walled beams, columns and beam-columns, energy theorems and applications, and intro to FEM. Cannot be taken for credit in addition to ENG ME 309 or ENG BE 420. Includes design project. 4 cr.

Class/Lab Schedule: 4 lecture hours per week

Textbook(s) and/or Other Required Material:
T. H. G. Megson, .K. Aircraft Structures for Engineering Students, Elsevier, 4th ed., 2007.

Coordinator:
Raymond J. Nagem, Associate Professor, Mechanical Engineering

Prerequisites by Topic:
1. Introductory course in strength of materials
2. Matrices and linear algebra
3. Ordinary and partial differential equations

Goals:
This course is designed to introduce the junior-level aerospace engineering students to the methods of structural analysis that are used in the design of aerospace structures. Students are expected to model and analyze structural components and systems commonly used in aircraft design. Computational finite element analysis is introduced for simple structural configurations.

Course Learning Outcomes:
As an outcome of completing this course, students will:

i. Understand the definitions and properties of stress and strain in a three-dimensional deformable body.

ii. Be able to apply the equations of linear elasticity to torsion of noncircular shafts, thin-walled tubular structures, thin plates, truss and frame structures.

iii. Understand and be able to apply criteria for high-cycle fatigue failure and for yield of ductile materials.

iv. Be able to apply energy methods to find stresses and deflections in beam, truss and frame structures.

v. Be able to use a commercial finite element program to model and analyze a three-dimensional consisting of spar and thin plate elements.

vi. Be able to write a technical report describing their use of a finite element program in the design and analysis of a three-dimensional wing structure.

Course Learning Outcomes mapped to Program Outcomes:
(For Program Outcomes, please see attached page or Department Web Site)

Program:	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Course:	i-iv	-	vi	-	i-iv	-	v	-	v, vi	-	v,vi	v, vi	-	-
Emphasis:	4	1	2	1	4	1	2	1	2	1	4	4	1	1

Topics (time spent in weeks):
1. Stress components (1)
2. Equilibrium equations, transformation laws (1)
3. Displacement field, strain components (1)
4. Constitutive laws, elasticity, plasticity (1)
5. Energy and co-energy (1)
6. Torsion (2)
7. Thin-walled sections (1)
8. Fatigue failure (1)
9. Yield criteria (1)
10. Energy methods (2)
11. Introduction to finite element method (1)
12. Elastic stability (1)

Contribution of Course to Meeting the Professional Component:
Engineering Topics: 100%

Status of Continuous Improvement Review of this Course:
Date: May 8, 2008 **Reviewed by:** Structure-Dynamics Committee
Prepared by: Raymond J. Nagem **Date:** April 10, 2009