Flight Vehicle Structures I

AEROENG 3542

Description / Conditions

Transcript Abbreviation:
FVS 1

Course Description:
Introduction to aerospace structures: Basic structural components; fundamental elements of linear elastic boundary value problems; composites; bending, torsion and shear of thin-walled sections; laboratory demonstrations.

Course Levels:
Undergraduate (1000-5000 level)

Designation:
Required

General Education Course:
(N/A)

Cross-Listings:
(N/A)

Course Detail

Credit Hours (Minimum if “Range”selected):
3.00

Max Credit Hours:
(N/A)
Select if Repeatable:
Off

Maximum Repeatable Credits:
(N/A)

Total Completions Allowed:
(N/A)

Allow Multiple Enrollments in Term:
No

Course Length:
14 weeks (autumn or spring)
12 weeks (summer only)

Off Campus:
Never

Campus Location:
Columbus

Instruction Modes:
In Person (75-100% campus; 0-24% online)

Prerequisites and Co-requisites:
Prereq: 2200 and MechEng 2030 and 2040, or 2200 and MechEng 2010 and 2020 and 2030; and enrollment as AeroEng-BS student.

Electronically Enforced:
No

Exclusions:
Not open to AeroEng pre-majors.

Course Goals and Learning Objectives

Course Goals / Objectives:
Introduce the concepts of structural mechanics in the context of aerospace vehicles: governing equations of 2-D and 3-D linear elasticity; analysis of thin-walled structures; and an introduction to composite structures and materials

Check if concurrence sought:
No
**Contact Hours**

**Contact Hours:**

<table>
<thead>
<tr>
<th>Topic</th>
<th>LEC</th>
<th>REC out-of-class</th>
<th>REC in-class</th>
<th>Weekly LAB out-of-class</th>
<th>Weekly LAB in-class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Mechanics of Materials and Aircraft Structures. Primer on Mechanics of Materials. Basic Structural Elements of Aerospace Vehicles. Free Body Diagrams: External vs. Internal Forces/Stresses.</td>
<td>1.5</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Introduction to Linear Elasticity (3-D). Analysis of Stress and Strain. Material Behavior. Governing equations of Linear Elastic Boundary Value problems.</td>
<td>9.0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>2-D Linear Elasticity. Plane Stress/Plane Strain/Airy Stress Function. Pure Torsion.</td>
<td>6.0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Torsion and Bending of Aircraft Structures. Pure Torsion of Closed thin-walled tubes. Bi-directional Bending. Closed thin-walled sections under combined bending, shear, and torsion.</td>
<td>14.5</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
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<tr>
<td>Introduction to Composites. Constitutive relations revisited. Classical laminated plate theory.</td>
<td>6.0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Laboratory Experiments/Demonstrations: Constant stress beams; Modulus of Elasticity and Poisson's Ratio (Flexure); Principal Strains and Stresses (Flexure).</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>3.0</td>
<td>0</td>
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<tr>
<td><strong>Total</strong></td>
<td>37</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
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**Grading and Texts**

**Grading Plan:**
Letter Grade
Course Components:
Lecture

Grade Roster Component:
Lecture

Credit by Exam (EM):
No

Grades Breakdown:

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Mid-Term Quiz</td>
<td>30%</td>
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<tr>
<td>Final Exam</td>
<td>40%</td>
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Representative Textbooks and Other Course Materials:

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanics of Aircraft Structures</td>
<td>C.T. Sun</td>
<td></td>
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</tbody>
</table>

ABET Student Learning Outcomes

ABET-CAC Criterion 3 Outcomes:
(N/A)

ABET-ETAC Criterion 3 Outcomes:
(N/A)
### ABET-EAC Criterion 3 Outcomes:

<table>
<thead>
<tr>
<th>Contribution Level</th>
<th>Hours</th>
<th>Outcome Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Significant</strong></td>
<td>7+</td>
<td>an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics</td>
</tr>
<tr>
<td><strong>Some</strong></td>
<td>1-2</td>
<td>an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors</td>
</tr>
<tr>
<td><strong>Some</strong></td>
<td>1-2</td>
<td>an ability to communicate effectively with a range of audiences - pre-2019 EAC SLO (g)</td>
</tr>
<tr>
<td><strong>Substantial</strong></td>
<td>3-6</td>
<td>an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts</td>
</tr>
<tr>
<td><strong>Substantial</strong></td>
<td>3-6</td>
<td>an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions</td>
</tr>
<tr>
<td><strong>Some</strong></td>
<td>1-2</td>
<td>an ability to acquire and apply new knowledge as needed, using appropriate learning strategies</td>
</tr>
</tbody>
</table>

### Embedded Literacies (UG courses only)

**Embedded Literacies Info:**

### Attachments / Additional Notes or Comments

**Attachments:**
(N/A)

**Additional Notes or Comments:**
(N/A)