Course Change Request

Date Submitted: 02/22/18 2:55 pm

Viewing: AERO 214 : Introduction to Aerospace Mechanics of Materials

Last approved: 08/28/17 3:20 am
Last edit: 02/22/18 7:35 pm

Changes proposed by: escamc

Catalog Pages referencing this course
AERO - Aerospace Engineering (AERO)
Department of Aerospace Engineering

Other Courses referencing this course
As A Banner Prerequisite:
AERO 304 : Aerospace Structural Analysis

Faculty Senate Number 68-34-162

Contact(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christina Escamilla</td>
<td><a href="mailto:escamc@tamu.edu">escamc@tamu.edu</a></td>
<td>9798452685</td>
</tr>
</tbody>
</table>

Rationale for Course

The proposed changes are to meet the demand/interest of students.

Course prefix AERO Course number 214

Department Aerospace Engineering
College/School College of Engineering
Academic Level Undergraduate
Undergraduate course level justification (Select One)

Academic Level Graduate (alternate)

Effective term 2018-2019 2017-2018

Complete Course Title Introduction to Aerospace Mechanics of Materials
Abbreviated Course INTRO AERO MECH OF MATLS
Title

Catalog course description

Fundamental concepts for deformable bodies (conservation of linear and angular momentum, kinematics and thermoelasticity); notions of stress and strain and illustrative examples for engineering applications; introduction to experimental methods and reporting, instrumentation and uncertainty analysis; measurement of elastic and thermal material properties.

Prerequisites and Restrictions

Grade of C or better in AERO 201; grade of C or better in MATH 308, or concurrent enrollment.

Concurrent Enrollment No

Approval Path

1. 02/22/18 3:47 pm Rodney Bowersox (bowersox): Approved for AERO Department Head
2. 02/22/18 7:35 pm Sandra Williams (sandra-williams): Approved for Curricular Services Review
3. 02/28/18 1:29 pm Eileen Hoy (ehoy): Approved for EN Committee Preparer UG
4. 03/02/18 9:32 am Prasad Enjeti (enjeti): Approved for EN Committee Chair UG
5. 03/02/18 9:37 am Prasad Enjeti (enjeti): Approved for EN College Dean UG
6. 03/05/18 9:05 am Sandra Williams (sandra-williams): Approved for UCC Preparer
7. 03/09/18 3:28 pm Sandra Williams (sandra-williams): Approved for UCC Chair

History
Enforced Prerequisites / Concurrent Enrollment

<table>
<thead>
<tr>
<th>And/Or</th>
<th>Course Prefix/Number</th>
<th>Min Grade/Score</th>
<th>Academic Level</th>
<th></th>
<th>Concurrency?</th>
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<tbody>
<tr>
<td>And</td>
<td>AERO 201</td>
<td>C</td>
<td>UG</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>And</td>
<td>MATH 308</td>
<td>C</td>
<td>UG</td>
<td></td>
<td>Yes</td>
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</table>

Crosslistings

<table>
<thead>
<tr>
<th>Stacked</th>
<th>Crosslisted With</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Semester 3
Credit Hour(s)

Repeatable for credit?

Three-peat?

CIP/Fund Code 1402010006

Default Grade Mode Letter Grade(G)

Alternate Grade Modes Satisfactory/Unsatisfactory

Method of instruction Lecture and Laboratory

Will sections of this course be taught as non-traditional? (i.e., parts of term, distance education)

Yes

Learning Outcomes

Meets traditional face-to-face learning outcomes.

Describe how learning outcomes are met or provide justification why they are not met.

Assessment methods will be equivalent to the face-to-face sections.

Hours

Meets traditional face-to-face hours.

Describe how hours are met or provide justification why they are not met.

Meets traditional face-to-face hours.

Will this course be taught as a distance education course?

No

Is 100% of this course going to be taught in Texas?

Yes

Will classroom space be needed for this course?

Yes

This will be a required course or an elective course for the following programs:

Required (select program)

Elective (select program)

Program(s)

(BS-AERO) Aerospace Engineering - BS
Course Syllabus

<table>
<thead>
<tr>
<th>Syllabus:</th>
<th>Upload syllabus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upload syllabus</td>
<td><a href="AERO%20214%20Brazil.pdf">AERO 214 Brazil.pdf</a></td>
</tr>
<tr>
<td></td>
<td><a href="AERO%20214.pdf">AERO 214.pdf</a></td>
</tr>
<tr>
<td>Letters of support</td>
<td>No</td>
</tr>
<tr>
<td>or other documentation</td>
<td><a href="Yes">Yes</a></td>
</tr>
<tr>
<td>Additional information</td>
<td></td>
</tr>
<tr>
<td>Reviewer Comments</td>
<td>Sandra Williams (sandra-williams) (03/09/18 3:28 pm): UCC approved March 9 via e-vote.</td>
</tr>
<tr>
<td>Reported to state?</td>
<td>No</td>
</tr>
</tbody>
</table>
Aerospace Engineering AERO-214  
Introduction to Aerospace Mechanics of Materials  
Credit 3: (2-2), Type of course (required)  
Spring 2018

Instructor: Jean-Briac le Graverend (979-845-1703, jblegraverend@tamu.edu, HRBB 743D)

Office Hours: Dr. le Graverend has an "open" office policy, which means that he will meet with AERO 214 students at any time during normal working hours, unless Dr. le Graverend is at scheduled activity. Dr. le Graverend is often in meetings, so it would be best (but not necessary) to schedule an appointment by email. Write your email correspondence to Dr. le Graverend in the form of a professional memo in which you identify yourself and state the purpose of the email.

Laboratory Teaching Assistant: Yijun Chen, andychen27@tamu.edu

Class Location / Time: MWF 1:50 p.m. – 2:40 p.m. RDMC 202

Lab Location / Time: W 4:10 – 6:10 p.m. RDMC 202

Final Exam: May 7th from 3:30 to 5:30 p.m.


Prerequisites: AERO 201; AERO 210 and MATH 308 or registration therein.

Course Description: Fundamental concepts for deformable bodies (conservation of linear and angular momentum, kinematics and thermoelasticity); notions of stress and strain and illustrative examples for engineering applications; introduction to experimental methods and reporting, instrumentation and uncertainty analysis; measurement of elastic and thermal material properties.

Learning Outcomes: At the end of this course students, will be able to:

1) Understand the concepts of stress and strain.
2) Analyze statically determinate and indeterminate axially loaded bars with distributed and no distributed loads.
3) Analyze torsion of statically determinate and indeterminate prismatic bars with distributed and no distributed loads.
4) Be familiar with the following material properties and concepts: stress-strain response, thermal expansion coefficient, thermal conductivity, yield stress, plasticity, ultimate stress, ductility, necking, tensor, and fatigue.
5) Internal forces and moments in beams.
6) Perform uncertainty analysis of experiments.
7) Know the basics of instruments design, i.e. how to convert a measurand into a change in the electrical resistance, capacitance, or inductance of a circuit.

Method of Evaluation:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labs: Reports</td>
<td>10.0</td>
</tr>
<tr>
<td>2 Quizzes</td>
<td>10.0</td>
</tr>
<tr>
<td>2 Homework</td>
<td>20.0</td>
</tr>
<tr>
<td>1 Group Project</td>
<td>20.0</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

Results have to be clearly highlighted with boxes and explained in details. If not, that will be taken into account in the grading, as for the formatting, namely crossing-outs are not allowed.

At the beginning of each classes, a summary of the previous class will be done by the instructor.
Approximate Grading Scale:  
Since I have a tendency to high expectations, I do not use the usual scale in order to be fair to everyone.

Group Project due:  
Monday April 9th, 2018

A group project consists of groups of 4/5 people that will have to provide a typed reports with similar expectations than a company report. The project will deal with measures of stress and strain, statics, axially loaded bars and some concepts of torsion. The level of the problems is higher than the one tackles during classes and requires then to work in group in order to discuss the difficulties, as engineers will do.

It is highly recommended to return the homework on time, otherwise credit will be reduced.

Equipment: Pens, a protractor, a compass and a calculator.

Quizzes:  
Quizzes will be done during the semester in order to verify that the concepts are fully understood. A quiz corresponds to know well the formulae seen during classes as well as the physical concepts associated to them. Quizzes

Homework Policy:  
• Homework is to be placed on the table at the front of the classroom at least 5 minutes prior to the beginning of the lecture.
• Staple the homework pages together.

Major Exams:  
• Closed book and closed notes.
• No makeup exams will be given, except for University approved excused absences.

Attendance Policy:  
• Students are expected to attend class. Only university excused absences will be accepted.
• See http://student-rules.tamu.edu/rule07 regarding attendance and Excused Absences.

Course Topics:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>Measures of Stress and Strain</td>
</tr>
<tr>
<td>4</td>
<td>Review of statics</td>
</tr>
<tr>
<td>5, 6, 7</td>
<td>Axially Loaded Bars</td>
</tr>
<tr>
<td>8, 9</td>
<td>Torsion</td>
</tr>
<tr>
<td>10</td>
<td>Internal Forces and Moments in Beams</td>
</tr>
<tr>
<td>11, 12</td>
<td>States of Stress</td>
</tr>
<tr>
<td>13, 14</td>
<td>States of Strain, Group Project due</td>
</tr>
<tr>
<td>15</td>
<td>Final Exam</td>
</tr>
</tbody>
</table>

Labs:
1. Tensile test and hardness test  
2. Measurement of elastic moduli using bending of beams and torsion of bars  
3. Measurement of thermal expansion coefficient and thermal conductivity

Additional Topics:  
1. Uncertainty analysis of experiments  
2. Stress-strain diagrams as a material response  
3. Thermal expansion coefficient  
4. Know the basics of instruments design, i.e. how to convert a measurand into a change in the electrical resistance, capacitance, and inductance of a circuit.
Aggie Code of Honor:
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Notice:
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ABET Outcomes

Contributions to Professional Component:
1. Required course in mechanics area. Prepares students for junior-level courses.
2. Builds the foundation for core subjects.
3. Part of the required engineering topics portion of the curriculum. Helps prepare students for engineering practice.
4. Prepares student to have basic knowledge of structural modeling and response of aerospace materials and structures.

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>Assessment Method</th>
<th>ABET Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create free body diagrams of rigid body models.</td>
<td>Homework, quiz, and final exam.</td>
<td>3(a), 3(e)</td>
</tr>
<tr>
<td>Understand the concepts of stress and strain</td>
<td>Homework, quiz, and final exam.</td>
<td>3(a), 3(e)</td>
</tr>
<tr>
<td>Analyze statically determinate and indeterminate axially loaded bars with distributed and no distributed loads</td>
<td>Homework, quiz, and final exam.</td>
<td>3(a), 3(e)</td>
</tr>
<tr>
<td>Analyze torsion and bending of statically determinate and indeterminate prismatic bars with distributed and no distributed loads</td>
<td>Homework, quiz, and final exam.</td>
<td>3(a), 3(e)</td>
</tr>
<tr>
<td>Determine the states of stress and strain of structures in order to have access to their maximum value</td>
<td>Homework, quiz, and final exam.</td>
<td>3(a), 3(e)</td>
</tr>
</tbody>
</table>
AERO 214
Aerospace Engineering Principles of Continuum Mechanics
Credit 3: (2-2) Required Course

Instructor: Ramesh Talreja, Professor, Aerospace Engineering Dept., 736A HRBB, (979) 458-3256, talreja@tamu.edu.


Prerequisites(s): AERO 201, and AERO 210.

Course Description: This course builds on Statics covered in AERO 210 Aerospace Engineering Mechanics I and prepares the students for AERO 304 Structural Analysis I. Topics include introduction to the mechanics of deformable bodies; measures of stress and strain; axially-loaded members; torsion of bars; states of stress and strain; stress-strain-temperature relations; forces and moments in beams; stresses due to bending; introduction to experimental methods and reporting; instrumentation and uncertainty analysis; measurement of elastic and thermal material properties.

Learning Objectives: At the end of this course, students will be able to:

1. Understand the difference between rigid bodies and deformable bodies.
2. Understand the concepts of stress and strain and how they characterize the behavior of simple structural elements such as bars and beams.
3. Know the basics of instrument design, e.g., how to convert electric resistance change to strain.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Course Introduction; Review of Statics</td>
<td>1</td>
</tr>
<tr>
<td>2. Measures of Stress and Strain</td>
<td>2</td>
</tr>
<tr>
<td>3. Axially Loaded Bars</td>
<td>4</td>
</tr>
<tr>
<td>4. Torsion of Bars</td>
<td>6</td>
</tr>
<tr>
<td>5. States of Stress</td>
<td>5</td>
</tr>
<tr>
<td>6. States of Strain and Stress-Strain Relationships</td>
<td>4</td>
</tr>
<tr>
<td>7. Internal Forces and Moments in Beams</td>
<td>4</td>
</tr>
<tr>
<td>8. Stresses in Beams</td>
<td>5</td>
</tr>
<tr>
<td>9. Deflection of Beams</td>
<td>2</td>
</tr>
<tr>
<td>10. Labs</td>
<td>6</td>
</tr>
<tr>
<td>11. Quizzes, Tests</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Hours: 42

Method of Evaluation:
- Homework: 30%
- Mid-term Exams (2): 40%
- Final Exam: 30%
- Total: 100%

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