Course Change Request

Date Submitted: 02/22/18 3:11 pm

Viewing: AERO 413 : Aerospace Materials Science

Last approved: 06/17/17 3:23 am
Last edit: 02/22/18 7:37 pm
Changes proposed by: escamc

Catalog Pages referencing this course
- AERO - Aerospace Engineering
- Department of Aerospace Engineering
- Department of Materials Science and Engineering
- MSEN - Materials Science & Enger (MSEN)

Programs referencing this course

Faculty Senate Number F5.24.443

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 413

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

Effective term 2018-2019 2017-2018

Academic Level (alternate) Graduate

Complete Course Title Aerospace Materials Science
Abbreviated Course Title AERO MATERIALS SCIENCE

Catalog course description
- Relationship between aerospace engineering material properties and microstructure; mechanical and thermal properties; environmental degradation; mechanical failure.

Prerequisites and Restrictions
- Grade of C or better in AERO 304.
Concurrent Enrollment No
Should catalog prerequisites / concurrent enrollment be enforced? Yes

Approval Path

1. 02/22/18 3:47 pm
   Rodney Bowersox (bowersox): Approved for AERO Department Head
2. 02/22/18 7:37 pm
   Sandra Williams (sandra-williams): Approved for Curricular Services Review
3. 02/28/18 1:30 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 9:06 am
   Sandra Williams (sandra-williams): Approved for UCC Preparer
7. 03/09/18 3:29 pm
   Sandra Williams (sandra-williams): Approved for UCC Chair

In Workflow

1. AERO Department Head
2. Curricular Services Review
3. EN Committee Preparer UG
4. EN Committee Chair UG
5. EN College Dean UG
6. UCC Preparer
7. UCC Chair
8. Faculty Senate Preparer
9. Faculty Senate
10. Provost II
11. President
12. Curricular Services
13. Banner

History
Enforced Prerequisites / Concurrent Enrollment

<table>
<thead>
<tr>
<th>And/Or</th>
<th>(</th>
<th>Course Prefix/Number</th>
<th>Min Grade/Score</th>
<th>Academic Level</th>
<th>)</th>
<th>Concurrency?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AERO 304</td>
<td>C</td>
<td>UG</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

Crosslistings: No  Crosslisted With: 
Stacked: No  Stacked with: 

<table>
<thead>
<tr>
<th>Semester</th>
<th>Credit</th>
<th>Contact Hour(s) (per week):</th>
<th>Lecture:</th>
<th>Lab:</th>
<th>Other:</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Repeatable for credit? Yes
Three-peat? Yes
CIP/Fund Code: 1402010006
Default Grade Mode: Letter Grade(G)
Alternate Grade Modes: Satisfactory/Unsatisfactory
Method of instruction: Lecture
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.

Meets traditional face-to-face learning outcomes.

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:

<table>
<thead>
<tr>
<th>Required (select program)</th>
<th>Program(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(BS-AERO) Aerospace Engineering - BS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elective (select program)</th>
<th>Has/will this course be(en) submitted for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>
core curriculum consideration?

Has/will this course be(en) submitted for Writing or Communication consideration?

Has/will this course be(en) submitted for ICD consideration?

No

No

Course Syllabus

Syllabus: Upload syllabus

Upload syllabus

AERO 413 Brazil.pdf
AERO 413.pdf

Letters of support or other documentation

No

Yes

Additional information

Reviewer Comments

Sandra Williams (sandra-williams) (03/09/18 3:29 pm): UCC approved March 9 via e-vote.

Reported to state?

No
AERO 413
Aerospace Materials Science
Spring 2018

Instructor: Dr. Zi Jing Wong, office: HRBB 616C, email: zijjing@tamu.edu

Class location: Reed McDonald Building 202

Class time: TR 9:35 am - 10:50 am

Office Hours: “Open” office policy, i.e. Dr. Wong will meet with AERO 413 students at any time during normal working hours, unless Dr. Wong is at a scheduled activity. It would be best to schedule an appointment by email.

Textbook: Fundamentals of Materials Science and Engineering: An Integrated Approach (5th edition), William D. Callister, Jr., John Wiley & Sons, Inc. (The earlier edition can be used, but it has some small differences from the 5th edition. The 4th edition has fewer differences. It is the student’s responsibility to account for these differences.)

Supplementary materials: Introduction to Aerospace Materials, Adrian P. Mouritz, Woodhead Publishing Limited, and occasional handouts

Prerequisite: AERO 304 Aerospace Structural Analysis I

Course description: Study of the relationship between aerospace engineering material properties and microstructures; mechanical and thermal properties; environmental degradation; mechanical failure.

Learning objectives:
- Understand mechanical properties using five fundamentals: atoms and bonds, arrangement of atoms (called structure), defects, diffusion, and phase diagrams.
- Understand how metals and polymers are strengthened.
- Understand mechanical failure due to fracture, fatigue, and creep.
- Understand how composite material properties can be controlled based on the properties of the constituents.
- Understand how materials degrade due to environmental factors.

Rules in the classroom:
- Make sure that your cell phone or other electronics will not make any noise during the lecture
- No meal in the class

Method of evaluation:

<table>
<thead>
<tr>
<th>Test</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm 1 (tentatively 2/13/2018)</td>
<td>20%</td>
</tr>
<tr>
<td>Midterm 2 (tentatively 3/22/2018)</td>
<td>20%</td>
</tr>
<tr>
<td>Midterm 3 (tentatively 4/19/2018)</td>
<td>20%</td>
</tr>
<tr>
<td>Final exam (5/3/2018, 12:30pm - 2:30pm)</td>
<td>40%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Approximate grading scale: A:90–100%, B:80–89%, C:70–79%, D:60–69%, F: <60%

Homework:
- There will be weekly/biweekly homework assignments. However, the homework will NOT be graded.
Exam:
- All exams will be closed book and closed notes.
- No makeup exams will be given, except for university approved excused absences.

Course topics and tentative schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overview of aerospace materials</td>
</tr>
<tr>
<td>2</td>
<td>Stress-strain curves, Atoms and bonds</td>
</tr>
<tr>
<td>3</td>
<td>Crystallography, Defects</td>
</tr>
<tr>
<td>4</td>
<td>Diffusion, Phase diagrams</td>
</tr>
<tr>
<td>5</td>
<td>Midterm 1, Strengthening mechanisms</td>
</tr>
<tr>
<td>6</td>
<td>Strengthening mechanisms</td>
</tr>
<tr>
<td>7</td>
<td>Fracture</td>
</tr>
<tr>
<td>8</td>
<td>Fatigue, Creep</td>
</tr>
<tr>
<td>9</td>
<td>Spring break</td>
</tr>
<tr>
<td>10</td>
<td>Corrosion and degradation, Midterm 2</td>
</tr>
<tr>
<td>11</td>
<td>Aluminum alloys, Titanium alloys</td>
</tr>
<tr>
<td>12</td>
<td>Polymers</td>
</tr>
<tr>
<td>13</td>
<td>Composites</td>
</tr>
<tr>
<td>14</td>
<td>Composites, Midterm 3</td>
</tr>
<tr>
<td>15</td>
<td>Space environment effects, Future materials technology</td>
</tr>
</tbody>
</table>

Aggie Code of Honor:
An Aggie does not lie, cheat, or steal or tolerate those who do. Any form of cheating, plagiarism, and/or academic dishonesty may result in an "F" grade and/or other disciplinary action. [http://aggiehonor.tamu.edu](http://aggiehonor.tamu.edu)

Notes on disability:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit [http://disability.tamu.edu](http://disability.tamu.edu).

Relationship to program outcomes:

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Assessment Method</th>
<th>ABET Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand mechanical properties using five fundamentals: atoms and bonds, arrangement of atoms (called structure), defects, diffusion, and phase diagrams.</td>
<td>Exams</td>
<td>3a, 3e, PC2</td>
</tr>
<tr>
<td>Understand how metals and polymers are strengthened.</td>
<td>Exams</td>
<td>3a, 3e, PC2</td>
</tr>
<tr>
<td>Understand mechanical failure due to fracture, fatigue, and creep.</td>
<td>Exams</td>
<td>3a, 3e, PC2</td>
</tr>
<tr>
<td>Understand how composite material properties can be controlled based on the properties of the constituents.</td>
<td>Exams</td>
<td>3a, 3e, PC2</td>
</tr>
<tr>
<td>Understand how materials degrade due to environmental factors.</td>
<td>Exams</td>
<td>3a, 3e, PC2</td>
</tr>
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</table>
AERO 413 Aerospace Materials Science
Syllabus for Summer 2018, Brazil Study Abroad Program

Instructor: Professor Ramesh Talreja, Department of Aerospace Engineering, 736A HRBB, 458-3256, Talreja@tamu.edu

Textbook: Fundamentals of Materials Science: An Integrated Approach, William D. Callister, Jr., 5th edition, John Wiley & Sons, Inc. (the 2nd edition can be used, but it has some small differences from the 5th edition. The 4th edition has fewer differences.)

Prerequisite: AERO 304

Course Description from the Catalogue: Study of the relationship between aerospace engineering material properties and microstructure; mechanical and thermal properties; environmental degradation; mechanical failure.

Learning Objectives:
1) Understand mechanical properties using five fundamentals: atoms and bonds, arrangement of atoms (called structure), defects, diffusion, and phase diagrams.
2) Understand how metals and polymers are strengthened.
3) Understand mechanical failure due to fracture, fatigue, and creep.
4) Understand how composite material properties can be controlled based on the properties of the constituents.
5) Understand how materials degrade due to environmental factors.

Grading:
Homework: 30%
Midterm: 30%
Final Exam 40%
TOTAL 100%
Approximate grading scale: A:90–100%, B:80–89%, C:70–79%, D:60– 69%, F: <60%

Topics:
GENERAL
Materials for Aerospace Applications
Stress-strain curves
Atoms & Bonds

METALS
Crystallography
Crystalline Defects
Diffusion
Phase Diagrams
Strengthening Mechanisms
Fracture
Fatigue
Creep
Aluminum Alloys
Titanium Alloys
Corrosion and Environmental Degradation

POLYMERS
Polymer Structures
Polymer properties

COMPOSITES
Rationale for Composite Materials
Elastic Properties
Fracture & Fatigue

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Aggie Honor Code: “An Aggie does lie, cheat, or steal, or tolerate those who do.” It is the responsibility of students and instructors to help maintain scholastic integrity at the University by refusing to participate in or tolerate scholastic dishonesty. (Student Rule 20. Scholastic Dishonesty, http://student-rules.tamu.edu) An excerpt from the Philosophy and Rational section states, “Apathy or acquiescence in the presence of academic dishonesty is not a neutral act – failure to confront and deter it will reinforce, perpetuate, and enlarge the scope of such misconduct. Academic dishonesty is the most corrosive force in the academic life of a university.”

ABET Outcomes and Relationship Learning Objectives:

Learning Objectives:

1. Understand mechanical properties using five fundamentals: atoms and bonds, arrangement of atoms (called structure), defects, diffusion, and phase diagrams.
   Assessment methods: Homework, Exams.
   ABET Outcomes: 3a, 3e, PC2

2. Understand how metals and polymers are strengthened.
   Assessment methods: Homework, Exams
   ABET Outcomes: 3a, 3e, PC2
3. Understand mechanical failure due to fracture, fatigue, and creep. Exams 3a, 3e, PC2; Understand how composite material properties can be controlled based on the properties of the constituents.

Assessment methods: Homework, Exams

ABET Outcomes: 3a, 3e, PC2

4. Understand how materials degrade due to environmental factors.

Assessment methods: Homework, Exams

ABET Outcomes: 3a, 3e, PC2