Course Change Request

Date Submitted: 02/22/18 3:10 pm

Viewing: AERO 303 : High Speed Aerodynamics

Last edit: 02/22/18 7:36 pm

Changes proposed by: escamc

Other Courses referencing this course

- AERO 351 : Aerothermodynamics and Propulsion
- AERO 401 : Aerospace Vehicle Design
- AERO 420 : Aeroelasticity
- AERO 435 : Aerothermochemistry
- AERO 452 : Heat Transfer and Viscous Flows
- AERO 472 : Airfoil and Wing Design

Faculty Senate Number

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 part of a routine curriculum review.

Course prefix AERO Course number 303

Department Aerospace Engineering

College/School College of Engineering

Academic Level Undergraduate

Undergraduate course level justification (Select One)

Academic Level Graduate

Effective term 2018-2019

Complete Course Title

High Speed Aerodynamics

Abbreviated Course Title HIGH SPEED AERODYN

Catalog course description

Fundamentals of compressible flow, acoustic waves, shock and expansion waves, shock-expansion theory, supersonic airfoil design, small perturbation theory, conical flow theory, supersonic wing panel methods, supersonic wing design, similarity theory, cone flow, unsteady waves, and theory of characteristics.

Prerequisites and Restrictions

Grade of C or better in AERO 301.

Concurrent Enrollment No

Should catalog prerequisites / concurrent enrollment be enforced? Yes

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

Approval Path

1. 02/22/18 3:47 pm Rodney Bowersox (bowersox): Approved for AERO Department Head
2. 02/22/18 7:36 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 9:06 am Sandra Williams (sandra-williams): Approved for UCC Preparer
7. 03/09/18 3:28 pm Sandra Williams (sandra-williams): Approved for UCC Chair
## 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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</thead>
<tbody>
<tr>
<td></td>
<td>AERO 301</td>
<td>C</td>
<td>UG</td>
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</tr>
<tr>
<td>Crosslistings</td>
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<td>Crosslisted With</td>
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<tr>
<td>Stacked</td>
<td>No</td>
<td>Stacked with</td>
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</table>

<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>
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<td>0</td>
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</table>

Repeatable for credit? No

Three-peat? No

CIP/Fund Code 1402010006

Default Grade Mode Letter Grade(G)

Alternate Grade Mode 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? No

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>

Elective (select program)

Has/will this course be(sub)mitted for core curriculum consideration? No
Has/will this course be(en) submitted for Writing or Communication consideration?  No
Has/will this course be(en) submitted for ICD consideration?  No

## Course Syllabus

<table>
<thead>
<tr>
<th>Syllabus:</th>
<th>Upload syllabus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upload syllabus</td>
<td>AERO 303 Brazil.pdf, AERO 303.pdf</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Letters of support or other documentation</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional information</td>
<td></td>
</tr>
</tbody>
</table>

**Reviewer Comments**

Sandra Williams (sandra-williams) [03/09/18 3:28 pm]: UCC approved March 9 via e-vote.

**Reported to state?**  No
AERO 303-200 and -500 High-Speed Aerodynamics, Spring 2018
M W F, 11:30 am – 12:20 pm in RDMC 202

Course Description and Prerequisites

3 Credits – Fundamentals of compressible flow, acoustic waves, shock and expansion waves, shock-expansion theory, supersonic airfoil design, small perturbation theory, conical flow theory, supersonic wing panel methods, supersonic wing design, similarity theory, cone flow, wind-tunnel design, unsteady waves, and theory of characteristics.

Learning Outcomes or Course Objectives

Learning Objectives:
At the end of this course, a student should be able to:

1. Understand and accurately apply the fundamentals of high-speed compressible fluid flow to solve basic problems and to estimate performance in supersonic flows.
2. Thoughtfully assess and accurately apply aerodynamic theories and models to the prediction of forces and moments in supersonic flows.
3. Understand the fundamentals of choked flow and the basic operation and design of a supersonic wind tunnel.
4. Use methods of characteristics to solve two-dimensional, linear supersonic flow.

Contributions to professional component:

1. Provides fundamentals of high-speed flow;
2. Helps prepare students for engineering practice;
3. Builds on the foundation established in the core subjects;
4. Prepares students for the future career in aerodynamics.

Relationship to program outcomes: Objectives

<table>
<thead>
<tr>
<th>Relationship to program outcomes: Objectives</th>
<th>Assessment Method</th>
<th>ABET Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO 1</td>
<td>Homework, exams</td>
<td>3(a), 3(e), PC 1 – Aerodynamics</td>
</tr>
<tr>
<td>LO 2, 3, and 4</td>
<td>Homework, exams</td>
<td>3(a), 3(e), 3(k), PC 1 – Aerodynamics</td>
</tr>
</tbody>
</table>

Instructor Information

Alexei Poludenko, apoludn@tamu.edu, (979) 845-4891
Office hours: Regular hours: Mondays and Wednesdays 2:00pm – 3:00pm or by appointment (email)
Office location: HRBB 616B
Website: https://engineering.tamu.edu/aerospace/people/poludenko-alexei

Class Outline

1. Definitions and preliminaries
2. One-dimensional gas dynamics
3. Waves and oblique shocks
4. Nozzles
5. Two-dimensional gas dynamics
Class Materials:
- Notes: provided periodically;

Additional Materials:

Class Policies
Students are expected to attend class, and any material missed is the responsibility of the student (see http://student-rules.tamu.edu/rule07). Students are expected to supplement the lectures with reading from the notes, as well as the textbook by J.D. Anderson and NACA 1135. Students are expected to be aware of the information distributed via e-mail through Howdy!

Grading Policy:
Final grades will be the maximum of the two grades calculated based on the following breakdown:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>25%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Exam 1:</td>
<td>25%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Exam 2:</td>
<td>25%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Final Exam:</td>
<td>25%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Due as scheduled (not late)
Thursday 1 March 2018, 7:00 pm – 9 pm; location TBD
Monday 9 April 2018, 7:00 pm – 9 pm; location TBD
Tuesday 8 May 2018, 10:30 am – 12:30 pm

Note: midterm exam dates are subject to change with advanced notice.

Roughly (as a greatest lower bound): A: 90-100; B: 80-89; C: 70-79; D: 60-69; F: ≤ 59

Homework: Homework will be assigned on Wednesdays on eCampus and will be due the following Wednesday at 6 pm as an eCampus submission. Late homework is not accepted without either prior arrangement with the instructor or a valid excuse (see http://student-rules.tamu.edu/rule07). Homework may be discussed in a group. However, it is each student's responsibility to work out and write up the work independently from anyone else. Do not copy the work of others.

Exams: In-class exams will be closed-book except for a 1 letter-size page of notes. You may use a simple, non-programmable, non-storable calculator. All other electronic devices (e.g., cell phones, tablets, laptops, etc.) are not allowed to be used during an exam. A make-up exam will only be considered for an excused absence. See: http://student-rules.tamu.edu/rule07

FINAL EXAM: TUESDAY 8 MAY 2018, 10:30 am – 12:30 pm
Academic Integrity

"An Aggie does not lie, cheat, or steal, or tolerate those who do."
For additional information please visit: http://aggiehonor.tamu.edu

Americans with Disabilities Act (ADA)

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.
Aerospace Engineering 303-500/200 High-speed aerodynamics
Credit 3: (3-0)
Aerospace Study Abroad in Brasil 2018

Instructor: Adonis Karpetis, Associate Prof, Aerospace Engineering, HRBB 607C, phone 458-4301, email karpetis@tamu.edu

Textbook:

Useful references/resources:
Ames Research Staff: Equations, Tables, and Charts for Compressible Flow, NACA 1135, (1953) will be distributed, in class, during the first week.
Class notes will be made available online (eCampus@tamu.edu)

Prerequisite: Aero 212, 301, Math 308

Attendance Policy: Students are expected to attend class

Course Description
Fundamentals of compressible flow, acoustic waves, shock and expansion waves, shock-expansion theory, supersonic airfoil design, small perturbation theory, wind-tunnel design, unsteady waves, and theory of characteristics

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

1. Derive and solve the governing equations for inviscid compressible flows
2. Use compressible-flow concepts, governing equations and tables to calculate nozzle performance and forces/moments on supersonic airfoils
3. Use approximate methods to solve two-dimensional problems for linearized compressible flow

Method of Evaluation:

Homework 20%, Midterm exam 40%, Final exam 40%. Grade curve based on 90/80/65/50% (A/B/C/D)

Quizzes and exams are closed books/notes, open NACA1135 without any further markings.
Programmable calculators, no cellphones, tablets, computers, wi-fi

Students enrolled in the honors section will have additional problems on homework assignments and exam problems

Contributions to Professional Component & Relationship to Program Outcomes:

<table>
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<tr>
<th>Objectives</th>
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<tbody>
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<td>(a,e) AIAA PC1</td>
</tr>
<tr>
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<td>Homework, exams</td>
<td>(a,e,k) AIAA PC1</td>
</tr>
<tr>
<td>Builds on foundation established in core subjects</td>
<td>Homework, exams</td>
<td>(a,e,k) AIAA PC1</td>
</tr>
<tr>
<td>Prepares students for a future in aerodynamics</td>
<td>Homework, exams, quizzes</td>
<td>(a,e,k) AIAA PC3</td>
</tr>
</tbody>
</table>
Course Schedule

**Week 1:** Introductory concepts, thermodynamics of compressible flow
- Fluid properties, mass and momentum conservation
- Isentropic flow relations

**Week 2:** Normal shock
- Oblique shocks
- Expansion waves

**Week 3:** Review/exam 1
- Supersonic airfoils
- Channels and variable-area nozzles
- Potential flow, area rule

**Week 4:** Crocco's theorem/Hodograph transformation
- Method of characteristics
- Review/exam2

**Academic Integrity:** “An Aggie does not lie, cheat, or steal, or tolerate those who do.”
Students and instructors are responsible to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty.” (20. Scholastic Dishonesty, [http://student-rules.tamu.edu](http://student-rules.tamu.edu)). Also refer to Honor Council Rules and Procedures at [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor).

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