

EAS4101 Aerodynamics Section 148B

Lecture Location and Time: Asynchronous Online (access via <https://elearning.ufl.edu/>)
Class Periods: MWF 3 (9:35 am to 10:25 am) (used for exams and synchronous class activities)
Academic Term: Fall 2020

*It may become necessary to modify this syllabus during the semester.
In this event, students will be notified and the revised syllabus will be posted on the course web site.*

Instructor:

Bruce Carroll
Room 218 MAE-A
bfcc@ufl.edu
352-392-4943

Office Hours: The instructor is available to meet with students via zoom MWF 3 period. Students should email instructor questions or to arrange Zoom meetings during office hours or at other times.

Teaching Assistants:

None

Course Description

Incompressible aerodynamics, integral and differential governing equations, potential flow, boundary layers, airfoils, wings, numerical techniques. Credits: 3

Course Pre-Requisites / Co-Requisites

EAS2011 or EAS3020C or EGN3353C and COP2271; EML3100, MAC2313 and MAP2302 with minimum grades of C

Course Objectives

The objective of the course is to introduce students to incompressible aerodynamics. Students will learn underlying theory derived from fundamental engineering science principles and will apply the theory to solve complex engineering problems using knowledge of mathematics and numerical techniques. In addition, students in this course will develop communication skills and continuing education skills. The objective will be achieved through:

- Class lectures and examples
- Interactive activities and projects completed with class partners
- Student completion of homework
- Student preparation for and completion of exams and quizzes

Professional Component (ABET):

This course prepares graduates to have a knowledge of aerodynamics and to have design competence that integrates aeronautical topics.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2) 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	
3) an ability to communicate effectively with a range of audiences	Low
4) 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	
5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Low

*Coverage is given as high, medium, or low. An empty box indicates outcome not significantly addressed by this course.

Materials and Supply Fees

- None

Required Textbooks and Software

- *Basic Aerodynamics: Incompressible Flow*, Gary Flandro, Howard McMahon and Robert Roach, Cambridge, 2012. ISBN 0521805821

Additional Recommended Materials

- *Fundamentals of Aerodynamics*, John D. Anderson, Jr., McGraw-Hill, 2017, Sixth Edition,
- *Low Speed Aerodynamics from Wing Theory to Panel Methods*, Katz and Plotkin, McGraw-Hill, 1991.
- *Aerodynamics for Engineers*, John Bertin, Prentice Hall, 2002.

Course Schedule

- See table at end of syllabus.

Attendance Policy, Class Expectations, and Make-Up Policy

Regular class attendance is expected. This course is being presented in an online, asynchronous format. In this format, class attendance constitutes watching the recorded video lectures and completing any quizzes or other activities assigned for completion prior to the due date for each lecture.

Late HW and makeup exams are only allowed for students with documented circumstances consistent with UF policy. Students must contact the instructor as soon as possible to provide documentation and request a make-up exam. Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation. For more information on UF policies see <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Evaluation of Grades

- Homework will be assigned periodically during the semester. Students must submit HW online by the due date to receive credit. HW will not be explicitly graded but solutions will be posted online after the due date for students to self-check their work.
- Each lecture will have an associated quiz. A due date is specified by which students should watch the lecture and complete the quiz.
- Students will be paired in teams of 2 for collaborative HW projects. The HW projects must be submitted by the due date to receive credit. HW projects will be graded in detail and are a major form of feedback provided from the instructor to students during the course.
- Hour exams will be given during the regular class period. There are two during term hour exams.
- The final exam is given at the time scheduled by the registrar.

Assignment	Percentage of Final Grade
Homework	5%
Quizzes	5%
Projects	15%
First During Term Exam	25%
Second During Term Exam	25%
Final exam	25%
	100%

Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc/>) by providing appropriate documentation. Once registered, students will receive an accommodation letter to present to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. A violation of the honor code will result in academic sanctions (typically a failing grade assigned for the course) and further disciplinary action. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use and Copyrighted Material

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use and the use of copyrighted material. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.

EAS4101 Aerodynamics – Tentative Schedule Fall 2019
(Subject to revision during semester as needed)

Week	Monday	Wed	Friday
1	Aug 31 Lecture 1: Basic Concepts, Fluid, Pressure, Viscosity, Continuum	Sep 2 Lecture 2: Units, dimensional analysis, similarity.	4 Lecture 3: Mathematical description of flow, streamlines, streaklines, pathlines.
2	7 Labor Day	9 Lecture 4: Fluid statics: Pascal law and hydrostatic eqn. Gage and Absolute Pressure.	11 Lecture 5: Standard atmosphere, manometers
3	14 Lecture 6: Conservation laws in Lagrangian form, Reynolds Transport Theorem (RTT)	16 Lecture 7: CV form of continuity	18 Lecture 8: CV form of linear momentum
4	21 Lecture 9: Examples	23 Lecture 10: CV form of energy (1 st law)	25 Lecture 11: Examples
5	28 Lecture 12: Acceleration of fluid particle, total derivative. Differential form of Continuity	30 Lecture 13: Differential form of conservation, momentum & energy	Oct 2 Homecoming
6	5 Exam 1 (3rd Period)	7 Lecture 14: Streamline and stream tube, angular velocity, strain	9 Lecture 15: Circulation, Stream Function
7	12 Lecture 16: Velocity Potential, Bernoulli Equation	14 Lecture 17: Static and Stagnation Pressure Measurements	16 Lecture 18: Elementary Solutions, Uniform flow, source/sink flow, vortex, doublet
8	19 Lecture 19: Superposition of elementary flows, non-lifting flow around a cylinder	21 Lecture 20: lifting flow around a cylinder	23 Lecture 21: Kutta-Joukowski theorem, Kutta condition, starting vortex (Kelvin's theorem)
9	26 Lecture 22: Airfoil shape parameters, general airfoil behavior, Joukowski airfoil	28 Lecture 23: Thin-airfoil theory	30 Lecture 24: Thin-airfoil theory continued
10	Nov 2 Lecture 25: Moment coefficient, aerodynamic center, center of pressure.	4 Lecture 26: 2-D Panel Methods	6 Exam 2 (3rd Period)
11	9 Lecture 27: Biot-Savart law, Prandtl lifting line theory	11 Veterans Day	13 Lecture 28: downwash and induced angle of attack, induced drag
12	16 Lecture 29: Monoplane Equation, spanwise lift distribution	18 Lecture 30: elliptical lift distribution	20 Lecture 31: 3-D Panel Methods
13	23 Lecture 32: 3-D Panel Methods	25 Thanksgiving	27 Thanksgiving
	30 Lecture 33: Viscous flow intro, NS eqn.	Dec 2 Lecture 34: Couette flow	5 Lecture 35: Displacement and momentum thickness
14	7 Lecture 36: Boundary layer equations, Blasius solution for laminar boundary layers	9 Last Class Lecture 37: Turbulent BL	11

Final Exam is Thursday December 17 from 12:30 pm to 2:30 pm