Aerodynamics
EAS4101   Section 148B
Class Periods: MWF 3 (9:35 am to 10:25 am)
Class Location: MAE-A 303
Academic Term: Fall 2019

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
bfc@ufl.edu
352-392-4943
Office Hours: TBD

Teaching Assistants:
TA to be determined

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. The objective will be achieved through:
- In class lectures and examples
- Interactive classroom activities
- Student completion of homework and projects
- 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 and included in the class participation grade. 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.
- Class participation will make use of short quizzes for in class questions. The participation grade will be based on a combination of attendance and responses to in class questions.
- Weekly quizzes will be given on Fridays.
- 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		10%
Class Participation & Quizzes		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.aa.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.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.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

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.
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> **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.
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> **Sexual Assault Recovery Services (SARS)**
> Student Health Care Center, 392-1161.
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> **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.
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> **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 19 Registration – no class	21 Lecture 1: Course overview	23 Lecture 2: Aerodynamic forces, units, dimensional analysis, similarity
2	26 Lecture 3: Mathematical description of flow, streamlines, streaklines, pathlines, fluid statics	28 Lecture 4: Fluid statics	30 Lecture 5: Standard Atmosphere, Examples **Quiz 1**
3	2 Labor Day	4 Lecture 6: Conservation laws in Lagrangian form, Reynolds Transport Theorem (RTT)	6 Lecture 7: CV form of continuity **Quiz 2**
4	9 Lecture 8: CV form of linear momentum	11 Lecture 9: Examples	13 Lecture 10: CV form of energy (1st law) **Quiz 3**
5	16 Lecture 11: Examples	18 Lecture 12: Differential form of conservation laws, continuity, momentum	20 Lecture 13: Acceleration of fluid particle, total derivative **Quiz 4**
6	23 Lecture 14: Differential form of energy	25 Lecture 15: Examples and Review	**27** **Exam1**
7	30 Lecture 16: Streamline and stream tube, angular velocity, strain, and circulation	Oct 2 Lecture 17: Bernoulli Equation, Conservation of Energy	4 Homecoming
8	7 Lecture 18: Pitot tubes and manometers	9 Lecture 19: Laplace equation, superposition, uniform flow	11 Lecture 20: source/sink flow, vortex, doublet **Quiz 5**
9	14 Lecture 21: Superposition of elementary flows, non-lifting flow around a cylinder	16 Lecture 22: lifting flow around a cylinder	18 Lecture 23: Kutta-Joukouski theorem, Kutta condition, starting vortex (Kelvin's theorem) **Quiz 6**
10	21 Lecture 24: Airfoil shape parameters, general airfoil behavior, Joukowski airfoil	23 Lecture 25: Thin-airfoil theory	25 Lecture 26: Thin-airfoil theory continued **Quiz 7**
11	28 Lecture 27: Moment coefficient, aerodynamic center, center of pressure.	30 Lecture 28: Panel Methods	**Nov 1** **Exam 2**
12	4 Lecture 29: Biot-Savart law, Prandtl lifting line theory	6 Lecture 30: downwash and induced angle of attack, induced drag	8 Lecture 31: Monoplane Equation, spanwise lift distribution **Quiz 8**
13	11 Holiday Lecture 32: elliptical lift distribution	13 Lecture 33: Vortex panel methods	15 Lecture 34: Examples **Quiz 9**
14	18 Lecture 35: Viscous flow intro, NS eqn.	20 Lecutre 36: Couette flow	23 Lecture 37: Boundary layer equations **Quiz 10**
14	25 Lecture 38: Laminar boundary layers	27 Thanksgiving Holiday	29 Thanksgiving Holiday

15	Dec 2 Lecture 39: Turbulent BL	4 Lecture 40: Review	6
	9 **Final exam 3-5 pm**	11	13