Aerodynamics
EAS4101 Section#0076, Class ID 11858

Lecture Location and Time: FLG0260
Class Periods: MWF 2 (8:30 am to 9:20 am)
Academic Term: Spring 2024
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)
Office Hours: MW 1:00 to 2:30 pm (held via Zoom.)
You can always contact the instructor to arrange Zoom meetings at other times.

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

Materials and Supply Fees
None

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
- Group project
- Student completion of homework
- Student preparation for and completion of exams

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	Low
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	Low
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	Low
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.

Required Textbooks and Software
Aerodynamics for Engineers, Bertin, J. and Cummings, R., Cambridge University Press, 2022, 6th Edition, ISBN 9781009098625

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

Required Computer:
It is important that you have your own computer. Details are provided on both the department and college websites:
- https://www.eng.ufl.edu/students/resources/computer-requirements/
- https://mae.ufl.edu/academics/prospective/undergraduate/computer-requirements/

Course Schedule
- See table at end of syllabus.

Attendance Policy, Class Expectations, and Make-Up Policy
Regular class attendance is expected as it will improve your performance in the course. 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/UGRD/academic-regulations/attendance-policies/

Evaluation of Grades
- Homework: Homework will be assigned periodically during the semester. Students must submit HW online by the due date to receive credit.
- Project: Students will work individually on the class project. The project must be submitted by the due date to receive credit.
- During Term Exams: Three exams will be given during regular class time.

Assignment	**Total Points**	**Percentage of Final Grade**
Homework	5 pts per problem	10%
Project	100	15%
During Class Exams (3)	100 Each	75%
No Final Exam		
		100%

Grading Policy

Percent	**Grade**	**Grade Points**
94 to 100	A	4.00
<94 to 90	A-	3.67
<90 to 87	B+	3.33
<87 to 84	B	3.00
<84 to 80	B-	2.67
<80 to 77	C+	2.33
<77 to 74	C	2.00
<74 to 70	C-	1.67
<70 to 67	D+	1.33
<67 to 64	D	1.00
<64 to 61	D-	0.67
<61 to 0	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 who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, 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/.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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://sccr.dso.ufl.edu/process/student-conduct-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. If you have any questions or concerns, please consult with the instructor in this class.

A violation of the honor code will result in academic sanctions (typically a failing grade of E assigned for the course) and further disciplinary action.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
- Your academic advisor or Graduate Program Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

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: https://registrar.ufl.edu/ferpa.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.

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

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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 suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints*:* https://distance.ufl.edu/getting-help/; *https://distance.ufl.edu/state-authorization-status/#student-complaint*.

		EAS4101 Aerodynamics -- Tentative Course Schedule Spring 2024
M	1/8	Lecture 1: Intro & Syllabus
W	1/10	Lecture 2: Basic Concepts, Fluid, Pressure, Standard Atmosphere, Viscosity, Speed of Sound, Continuum, Units
F	1/12	Lecture 3: Examples
M	1/15	Lecture 4: Fundamentals of Fluid Mechanics, Frames of Reference, Conservation of Mass (differential and CV forms)
W	1/17	Lecture 5: Substantial Derivative, Conservation of Linear Momentum, Navier-Stokes Equations
F	1/19	Lecture 6: Examples – Linear Momentum Differential Form
M	1/22	Holiday
W	1/24	Lecture 7: Linear Momentum in Control Volume Form
F	1/26	Lecture 8: Examples – Linear Momentum CV Form
M	1/29	Lecture 9: Examples
W	1/31	Lecture 10: The Energy Equation, Euler's Equation and reduction to Bernoulli's Equation
F	2/2	Lecture 11: Flow Kinematics (This material is NOT in the textbook)
M	2/5	Lecture 12: Manometers and Airspeed Measurements
W	2/7	Lecture 13: Examples
F	2/9	Exam 1 (material through section 3.4 in text)
M	2/12	Lecture 14: Circulation, Stream Function, Velocity Potential
W	2/14	Lecture 15: Elementary Solutions to Laplace's Equation
F	2/16	Lecture 16: Elementary Solutions Part 2
M	2/19	Lecture 17: Lifting Flow over Cylinders
W	2/21	Lecture 18: Examples
F	2/23	Lecture 19: Viscous Flow Introduction
M	2/26	Lecture 20: Exact Solutions to NS Equations
W	2/28	Lecture 21: Boundary Layer Blasius Solution
F	3/1	Lecture 22: Boundary Layer Transition
M	3/4	Lecture 23: Incompressible Turbulent Boundary Layers
W	3/6	Lecture 24: Examples
F	3/8	Exam 2 (material through section 4.4)
	3/11	Spring Break
	3/13	Spring Break
	3/15	Spring Break
M	3/18	Lecture 25: Introduction to Airfoils
W	3/20	Lecture 26: Thin Airfoil Theory
F	3/22	Lecture 27: Moment Coefficient, Center of Pressure
M	3/25	Lecture 28: Cambered Airfoil
W	3/27	Lecture 29: Examples and Biot-Savat Law
F	3/29	Lecture 30: Introduction to Wings
M	4/1	Lecture 31: Wings - Lifting Line Theory
W	4/3	Lecture 32: General Lift Distribution
F	4/5	Lecture 33: Elliptic Wings
M	4/8	Lecture 34: Examples
W	4/10	Lecture 35: Delta Wings, Leading Edge Extensions, Flaps
F	4/12	Lecture 36: Examples
M	4/15	Exam 3: (material through Section 7.11)
W	4/17	Lecture 37: Panel Methods and Intro to xflr5
F	4/19	Lecture 38: xflr5 examples
M	4/22	Project
W	4/24	Project
	4/29	**No Final Exam 10:00 AM – Noon**