EAS 3101: Fundamentals of Aerodynamics

Course Information

- **Course Number and Title**: EAS 3101: Fundamentals of Aerodynamics
- **Credit Hours:** 3
- **Current Academic Term**: Spring 2026

Instructor Information

- **Instructor**: Dr. Daren Watson
- **Office**: BARC–1185
- **Office Hours**: MWF: 12:00 PM – 1:00 PM
- **Office Phone**: (863) 874–8550
- **E-mail**: dwatson@floridapoly.edu; All course-related e-mails should be sent to the instructor via the CANVAS course e-mail portal.

Course Details

- **Class Meeting Day, Time & Location**: MWF, 11:00 AM – 11:50 AM, IST-1068
- **Official Catalog Course Description**: This course is an introductory course in aerodynamics, which will apply the fundamental concepts of fluid mechanics to aerodynamic applications with both differential and control volume analysis. Topics covered include inviscid, incompressible flow over airfoils and finite wings, including boundary layer theory and two-dimensional airfoil theory, as well as inviscid compressible flowing including normal, oblique and expansion shock waves.
- **Course Prerequisites:** EGN 4930 Flight Performance Mechanics
- **Co-Requisite:** none
- **Required Texts**: John D. Anderson Jr., *Fundamentals of Aerodynamics*, 6th edition, 2016, McGraw-Hill, ISBN-13: 978-1259129919, ISBN-10: 1259129918.
- **Equipment and Materials**: Canvas, computer, or tablet, Rocketbook or similar, Microsoft Office, LabVIEW, MATLAB, Arduino IDE, calculator, FL Poly email
- **Calculators:** Only use of the following calculator models as used on the Fundamentals of Engineering (FE) Exam will be allowed:
  - **Casio:** All fx-115 and fx-991 models.
  - **Hewlett Packard:** All HP 33s and HP 35s models.
  - **Texas Instruments:** All TI-30X and TI-36X models.
- **Course Objectives:** This course aims to introduce the fundamentals of fluid mechanics and aerodynamics. The topics cover the determination of aerodynamic lift, drag, and pitching moment generation from the pressure and stress distribution on airfoils; applications of potential flow theory for basic and combined flows (source, sink, uniform flow, doublet, etc.), and the prediction of velocity, pressure and force distribution on aerodynamic bodies; thin airfoil theory and incompressible flow over airfoils, induced drag and its magnitude over the

airfoil; lifting-line approach; understanding the compressible flow concept including the normal and oblique shocks as well as expansion waves; introduction to supersonic flows.

- **Course Learning Outcomes**
  Students will be able to demonstrate the ability to do the following:
  - Describe the basic principles that apply to aerodynamics.
  - Describe the fundamentals of inviscid, incompressible flow.
  - Explain the fundamentals of incompressible flow over airfoils.
  - Characterize high-speed flows; subsonic, supersonic, and hypersonic.
- **Alignment with Program Outcomes**:

Course Learning Outcome	**Learning Level (Bloom's / ABET Assessment Example)**	**Program Learning Outcome (ABET, GenEd, Other)**
Describe the basic principles that apply to aerodynamics.	**Knowledge**- Ability to recall previously learned material. **Application**- Ability to use learned material in new situations. **ABET Assessment** – homework, exams	ABET 1 – an ability to identify formulate and solve complex engineering problems by applying principles of engineering, science, and math.
Describe the fundamentals of inviscid, incompressible flow.	**Analysis**- Ability to separate material into component parts and show relationships between parts. **ABET Assessment** – homework, exams	ABET 1 – an ability to identify formulate and solve complex engineering problems by applying principles of engineering, science, and math.
Explain the fundamentals of incompressible flow over airfoils.	**Knowledge**- Ability to recall previously learned material. **Application**- Ability to use learned material in new situations. **Comprehension**- Ability to grasp meaning, explain, and restate ideas. **Evaluation** - Ability to judge the worth of material against stated criteria. **ABET Assessment** – homework, exams	ABET 1 – an ability to identify formulate and solve complex engineering problems by applying principles of engineering, science, and math.
Characterize high-speed flows; subsonic, supersonic, and hypersonic.	**Synthesis:** Combination of prior knowledge for new applications. **Application:** Synthesize knowledge on assessments to solve complex problems **ABET Assessment:** concept evaluations	ABET 7 – An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to Academic Success Center success@floridapoly.edu or by email, library@floridapoly.edu.
- **ASC**: The Academic Success Center, located in the IST and at ASC East, provides a range of services. Students may direct questions to success@floridapoly.edu.

Course Policies:

- **Attendance** see also University Policy, which reads "Students are expected to attend all of their

scheduled University classes and to satisfy all academic objectives as defined by the instructor." Attendance in this environment does not, of course, mean actual physical attendance in the classroom, although it may include that. Attendance at all class meetings is expected whether in-person or live through Microsoft Teams. Absence does not excuse a student from material covered or any activity done on that day, nor does it extend a deadline.

- **Grading Scale**:

Grade	Percentage
A	93-100
A-	90-92
B+	86-89
B	83-85
B-	80-82
C+	76-79
C	70-75
D	60-69
F	0-59

  - Grades for each assignment will be posted to Canvas, and students should make sure they are recorded correctly. All administered assignments count towards the final grade.

- **Assignment/Evaluation Methods**:
  - As per university policy, students are expected to attend their course lectures in-person Make-up in-class concept evaluations will not be accepted, except in the case of a documented university-approved absence.
  - Homework assignments should be submitted electronically as a single pdf file and on time through the CANVAS course website.
  - Exams will be administered during the regular class time. Exams will be closed book and closed notes. Make-up examinations will only be administered if there is a documented approved excused absence (as based upon university policy).

Activity	Percentage
Homework	20%
Concept Evaluations	20%
Examinations	60%

- **Late and Missing Assignments:** Students are encouraged to take note of the following course policies regarding the submission of assignments:
  - **Late assignments will not be accepted.**
  - Students should submit assignments well in advance of the due date and time. Assignments will generally be due the following Sunday at 11:59 PM from the initial posting date.
  - All assignments should be uploaded to CANVAS. Assignments submitted via email will be disregarded.
  - All assignments will count towards final grade. No make-up will be provided for missing or late assignments.

- **Official Email Address**
  Florida Polytechnic University email is the official method of communication for the University.

Students are *required* to check their Florida Poly e-mail frequently.

University Policies

- **Reasonable Accommodations**: Florida Polytechnic University is committed to assisting students with disabilities and offering reasonable accommodations to those with documented eligibility. The Office of Disability Services (ODS) coordinates accommodations for students with disabilities in accordance with the ADA Amendments Act of 2008 (ADAAA), the Americans with Disabilities Act of 1990 (ADA), and Section 504 of the Rehabilitation Act of 1973. Reasonable accommodations are determined on an individual basis through an interactive process between you, ODS, and your instructor(s). If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course and communicate with your instructor about your approved accommodations at your earliest convenience. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible.
  The Office of Disability Services (ODS):
  DisabilityServices@floridapoly.edu
  (863)874-8770
  ASC East building
  ODS website: www.floridapoly.edu > Student Affairs > Health Wellness > Disability Services

- Accommodations for Religious Observances, Practices and Beliefs

- **Title IX**: Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence, and stalking. It is important for you to know that there are resources available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. It is an educational goal that you feel able to share information related to your life experiences in classroom discussions and in one-on-one meetings. However, it is requirement for university employees to share information with the Title IX Coordinator regarding disclosure. However, please know that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment.

- **Academic Integrity** All students must commit to the highest ethical standards in completion of all academic pursuits and endeavors, whether in classroom or online environments: Academic Integrity
  Academic integrity is always expected, and any dishonesty will not be tolerated. The Academic Integrity policy describes the meaning of academic dishonesty:

  "Behaviors of academic dishonesty in violation of this policy are listed below and are not intended to be all inclusive. Violations may result in the imposition of academic sanctions under this regulation and/or disciplinary sanctions under the Student Code of Conduct.
  (a) *Cheating.* Intentionally using or attempting to use unauthorized materials, information, or study aids in any type of academic exercise.
  (b) *Plagiarism.* Intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise.

(c) *Fabrication.* Intentional and unauthorized falsification or invention of any information or citation in an academic exercise.
(d) *Multiple Submission.* Submission of the same or substantially the same work for credit in two or more courses. Multiple submissions shall not include those situations where the instructor gives the student prior written approval to use such prior academic work or endeavor.
(e) *Facilitating Academic Dishonesty.* Intentionally or knowingly assisting or attempting to assist another in violating any provision of this regulation.
(f) *Misconduct in Research and Creative Endeavors.* Deviation from the accepted professional practices within a discipline or from the policies of the University in carrying out, reporting, or exhibiting the results of research or in publishing, exhibiting, or performing creative endeavors. This does not include honest error or honest disagreement about the interpretation of data.
(g) *Misuse of Intellectual Property.* Illegal use of copyright materials, trademarks, trade secrets, or intellectual properties."

Course Schedule – Subject to Change

Week	Topics	Assignments
1	Fundamental Principles	
	Fundamental Principles	
	Fundamental Principles	HW 1
2	Martin Luther King Jr. Day (No Class)	
	Inviscid, Incompressible Flow	
	Inviscid, Incompressible Flow	HW 2 and Concept Evaluation 1
3	Inviscid, Incompressible Flow	
	Inviscid, Incompressible Flow	
	Inviscid, Incompressible Flow	HW 3 and Concept Evaluation 2
4	Inviscid, Incompressible Flow	
	Inviscid, Incompressible Flow	
	Inviscid, Incompressible Flow	HW 4 and Concept Evaluation 3
5	Inviscid, Incompressible Flow	
	Inviscid, Incompressible Flow	
	Inviscid, Incompressible Flow	HW 5 and Concept Evaluation 4
6	Examination 1 (Pre-Exam Review)	
	Examination 1 – Closed Book, Formula Sheet	
	Examination 1 (Post-Exam Review)	
7	Inviscid, Compressible Flow	
	Inviscid, Compressible Flow	
	Inviscid, Compressible Flow	HW 6 and Concept Evaluation 5
8	Inviscid, Compressible Flow	
	Inviscid, Compressible Flow	
	Inviscid, Compressible Flow	HW 7 and Concept Evaluation 6
9	Inviscid, Compressible Flow	
	Inviscid, Compressible Flow	
	Inviscid, Compressible Flow	HW 8 and Concept Evaluation 7
10	Spring Break (No Class)	
	Spring Break (No Class)	
	Spring Break (No Class)	
11	Examination 2 (Pre-Exam Review)	
	Examination 2 – Closed Book, Formula Sheet	

	Examination 2 (Post-Exam Review)	
12	Viscous Flow	
	Viscous Flow	
	Viscous Flow	HW 9 and Concept Evaluation 8
13	Viscous Flow	
	Viscous Flow	
	Viscous Flow	HW 10 and Concept Evaluation 9
14	Viscous Flow	
	Viscous Flow	
	Viscous Flow	Concept Evaluation 10
15	Viscous Flow	
	Viscous Flow	
	Viscous Flow	
16	Viscous Flow	
	Reading Days (No Class)	
	Reading Days (No Class)	
17	Examination 3 – Closed Book, Formula Sheet	