Introduction to Aerospace Engineering
EAS 2011 Section 18CC
Spring 2023, M W F, 7th Period, 1:55 PM – 2:45 PM
FLG 0260

Modifications to this syllabus may be required during the semester. Any changes that are made will be reflected in a posted version of the syllabus and announced in class.

Instructor

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WERT 489
Please contact through the Canvas website https://elearning.ufl.edu
Any emails to ufl email address must include EAS 2011 in the subject line

Office Hours

- M F 3:00 PM – 4:00 PM
- Or via confirmed written appointment

Teaching Assistant (Undergraduate Student)

To Be Announced
Email:
Office Hours:
Location:

Grader (Graduate Student)

To Be Announced
Email:

Course Description

Course Catalog: "Overview of aerospace engineering. Standard atmosphere, basic aerodynamics, airplane performance, stability and control, propulsion, and space flight." (Credits: 3)

Course Pre-Requisites / Co-Requisites

PHY 2048 (Physics with Calculus 1) or PHY 2060 (Enriched Physics with Calculus 1) with a minimum grade of C.

Course Objectives

This course introduces aircraft and spacecraft vehicles. By the end of this course, you will:

- Know the basic principles of flight in the atmosphere: the physics of flight, and steady aircraft flight and performance.
- Know the basic principles of flight in space: the two-body problem, spacecraft orbits, orbital transfers, and orbital analysis of space missions.
- Be able to effectively communicate this technical knowledge while accounting for realistic economic constraints.

Materials and Supply Fees

None.

Professional Component (ABET)

This course contributes to the Aerospace Engineering student's aeronautical knowledge of: aerodynamics, propulsion, flight mechanics, and stability and control. This course contributes to the Aerospace Engineering student's astronautical knowledge of: orbital mechanics, space environment, attitude determination and control, and rocket propulsion. The content of this course is approximately 10% engineering design, 30% mathematics, and 60% engineering science.

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	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	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Coverage is given as high, medium, or low. An empty box indicates that this outcome is not part of the course.

Required Textbooks, Software, and Hardware

- N. Harris McClamroch, "Steady Aircraft Flight and Performance," Princeton University Press, ISBN: 9780691147192, 2011.
- Howard D. Curtis, "Orbital Mechanics for Engineering Students," 4th Ed., Butterworth-Heinemann, ISBN: 9780081021330, 2020.
- MATLAB (MathWorks), any recent release.
- Various handout materials provided digitally on Canvas.
- Scientific calculator (not your phone).
- It is important that you have your own laptop/mobile computer. Details are provided on the college and department websites:
  https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/
  https://mae.ufl.edu/academics/undergraduate/computer-requirements/

Alternate (Reference) Textbooks

- John D. Anderson, Jr., "Introduction to Flight," 8th Ed., 2016.
- Steven A. Brandt, Randall J. Stiles, John J. Bertin, Ray Whitford, "Introduction to Aeronautics: A Design Perspective," 3rd Ed., 2015.
- Roger R. Bate, Donald D. Mueller, Jerry E. White, "Fundamentals of Astrodynamics," Dover Publications, Inc., ISBN: 9780486600611, 1971.
- John E. Prussing, Bruce A. Conway, "Orbital Mechanics," 2nd Ed., 2012.

Important Dates

- Classes Begin: Jan 9 (Monday)
- Holidays/Reading Days: Jan 16 (Monday), Mar 13 – 17 (Monday – Friday), Apr 27, 28 (Thursday, Friday)

- Classes End: Apr 26 (Wednesday)
- Classes Canceled: Mar 20 – 24 (Monday – Friday)
- Homework, quiz, and software tutorial dates stated in this syllabus will be confirmed in class
- Quizzes will be held during the last 15 minutes of lecture
- Project Due: May 1 (Monday) 11:59 PM
- Review for Midterm Exam: Feb 27 (Monday)
- Midterm Exam: Mar 7 (Tuesday) 8:20 PM – 10:10 PM
- Review for Final Exam: Apr 26 (Wednesday)
- Final Exam: May 4 (Thursday) 3:00 PM – 5:00 PM

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Attendance Policy

- The class has no attendance policy. Students are expected to attend.
- Absences may be excused with appropriate documentation.
- **Make-up Policy:** Instructor notifications are required in all circumstances. See https://care.dso.ufl.edu/instructor-notifications. Note that, "Instructors have the right to accept or reject the Instructor Notification."
- **No quiz make-ups are permitted.** If an excused absence occurs on a quiz day, then that quiz will be omitted from the student's total quiz score. Unexcused quizzes receive zero.

Class Expectations

- The student is solely responsible for their education. The instructor is the guide to their understanding of the field.
- Cell phones, laptops, etc.: **under no circumstances will disruptions from electronic devices be tolerated. Students are expected to take either handwritten notes with pen/pencil and paper, or electronic notes with stylus and tablet.**
- **Electronic notes must be printed out if used as reference material on examinations.**
- Respect and disruption: the instructor and students will be respectful at all times. Classroom disruption of any kind will not be tolerated.
- **The principles of the Honor Code must be adhered to at all times.** Individual effort is required on homework assignments, quizzes, and exams. Groups will be treated as individuals for projects. 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, the following statement is either required or implied:

  On my honor, I have neither given nor received unauthorized aid in doing this homework/quiz/report/exam.

  The Conduct 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. You are obligated to report any academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TA.

  Course Zero-Tolerance Policy: *Any* violation or suspected violation of the Honor Code by a student may result in that student receiving a grade of E for the course.

Homework

The purpose of homework is to learn and understand the material. **Students are responsible for performing and understanding the homework problems and solutions on their own.**

Software and Copyrighted Material Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing the use of software 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 UF community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Quizzes and Exams

All quizzes are closed-book, closed-notes, closed-electronic devices. A scientific calculator (that is **not** your cell phone or laptop) will be permitted. **All exams are open-book, open-notes, closed-electronic devices except for a scientific calculator.**

Honorlock: Consistent with UF policy, Honorlock may be used for course assessments and will be confirmed by the instructor in advance. Please see https://distance.ufl.edu/proctoring/ for more information.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center (https://disability.ufl.edu/students/get-started/). Students should share their accommodation letter with their instructor and discuss their access needs as early as possible in the semester.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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 Undergraduate Program Coordinator, advising@mae.ufl.edu
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@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

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

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.

Health and Wellness

U Matter, We Care

Your well-being is important to UF. 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.

COVID-19

- You are expected to follow guidance from the Centers for Disease Control and Prevention (CDC) regarding the wearing of approved face coverings during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

Counseling and Wellness Center

https://counseling.ufl.edu/, and 352-392-1575; and the University Police Department: 352-392-1111 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 (https://titleix.ufl.edu/), 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, 352-392-1161.

University Police Department

352-392-1111 (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 Connections Center

Reitz Union, 352-392-1601. 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, 352-392-2010 or 352-392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/

Writing Studio

302 Tigert Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/

Students Complaints: On-Campus

https://ombuds.ufl.edu/student/

Students Complaints: Distance Learning

https://distance.ufl.edu/state-authorization-status/#student-complaint

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/.

Evaluation of Grades and Grading Policy

Information on the UF grading policy is available at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Evaluation Mechanism on a Percent Basis

Homeworks (7)	12%
Quizzes (4)	8%
Project	10%
Midterm Exam	35%
Final Exam	35%

Homework

Students will submit solutions of the homework problems only via the course website. Students who turn in homework before the due date and time will have their homework graded. Not all homework problems may be graded, and a selection of problems may be randomly chosen for grading after the homework due date and time. Submitted homework that is partially- or fully-missing solutions to these chosen problems will not be eligible for partial or any credit for those problems, respectively, even if other non-chosen homework problems were completed. **Grading will be on completeness, not correctness.** It is the student's responsibility to check their solutions against posted homework solutions.

Exams

All students are expected to take all exams. If a student is unable to take an exam for unforeseeable reasons, then the other exams will count toward the percentage of the grade that makes up the exams if an appropriate DSO instructor notification is accepted.

Final Grade

Final grades may be calculated by the following table. For example, if a student earns 86.60% (Percent Grade Earned %GE = 86.60) then their grade point will be 3.33 (B+). %GE are rounded to the hundredths decimal place. For example, if a student earns 77.995% (Percent Grade Earned %GE = 77.995) it will be rounded up to 78.00%, and their grade point will be 2.67 (B-). Shifts in the grading table are at the discretion of the instructor.

Table 1. Grading Table. *%GE = Percent Grade Earned.*

Percentage Range	Grade Point
$92.00 \leq$ %GE $< 100.00 \Longrightarrow$ A	4.00
$88.00 \leq$ %GE $< 92.00 \Longrightarrow$ A-	3.67
$85.00 \leq$ %GE $< 88.00 \Longrightarrow$ B+	3.33
$81.00 \leq$ %GE $< 85.00 \Longrightarrow$ B	3.00
$78.00 \leq$ %GE $< 81.00 \Longrightarrow$ B-	2.67
$74.00 \leq$ %GE $< 78.00 \Longrightarrow$ C+	2.33
$71.00 \leq$ %GE $< 74.00 \Longrightarrow$ C	2.00
$67.00 \leq$ %GE $< 71.00 \Longrightarrow$ C-	1.67
$64.00 \leq$ %GE $< 67.00 \Longrightarrow$ D+	1.33
$61.00 \leq$ %GE $< 64.00 \Longrightarrow$ D	1.00
$60.00 \leq$ %GE $< 61.00 \Longrightarrow$ D-	0.67
$00.00 \leq$ %GE $< 60.00 \Longrightarrow$ E	0.00

Grade Corrections

Grade corrections should be submitted promptly in writing within three business days of the grade posting. Include a concise statement of why you believe that there has been an error. The instructor has the final determination in the assigned grade; if a grade change is made, the grade may be lower or higher.

Course Schedule, Approximately by Lecture Number

1	Jan 9	Course Introduction, History of Flight	NHM Ch. 1
2	Jan 11	Flight Environment	NHM Ch. 2
3	Jan 13	Flight Environment, Physics of Flight	NHM Ch. 2
4	Jan 18	Physics of Flight	NHM Ch. 2
5	Jan 20	Matrices Review	
6	Jan 23	Coordinate Systems and Rotations	NHM Ch. 3
	Jan 23, 6:15 PM	MATLAB Tutorial (TA-led)	
7	Jan 25	Rotations, Kinematics, Aerodynamic Forces	NHM Ch. 3
8	Jan 27	Aerodynamic Forces	NHM Ch. 3
Homework 1 Due Jan 27 (Friday), 11:59 PM			
9	Jan 30	Aircraft Attitude	NHM Ch. 3
10	Feb 1	Aircraft Attitude and Rotations	NHM Ch. 3
11	Feb 3	Aerodynamic Moments	NHM Ch. 3
Quiz 1 at end of lecture on Feb 3 (Friday)			
12	Feb 6	Propulsion, Steady Flight Lift and Drag	NHM Ch. 4, 5
Homework 2 Due Feb 6 (Monday), 11:59 PM			
13	Feb 8	Performance Optimization Intro, Gliding	NHM Ch. 5, 6
14	Feb 10	Gliding, Level Flight	NHM Ch. 6, 7
15	Feb 13	Level Flight	NHM Ch. 7
16	Feb 15	Level Flight	NHM Ch. 7
Homework 3 Due Feb 15 (Wednesday), 11:59 PM			
17	Feb 17	Climbing and Descending Flight	NHM Ch. 8
18	Feb 20	Climbing and Descending Flight	NHM Ch. 8
Quiz 2 at end of lecture on Feb 20 (Monday)			

19	Feb 22	Take-off, Landing; Range and Endurance	NHM Ch. 11
20	Feb 24	Turning Flight	NHM Ch. 9
End of Coverage for Midterm Exam			
21	Feb 27	Review for Midterm Exam	
22	Mar 1	History of Space Flight	HDC Ch. 1
23	Mar 3	Modern Space Flight	HDC Ch. 1
Homework 4 Due Mar 3 (Friday), 11:59 PM			
24	Mar 6	Gravitation, N-Body Problem	HDC Ch. 2
Midterm Exam Mar 7 (Tuesday), 8:20 PM			
25	Mar 8	2-Body Problem, Constants of Motion	HDC Ch. 2
26	Mar 10	Constants of Motion	HDC Ch. 2
27	Mar 27	Position and Time in Orbit	HDC Ch. 2
28	Mar 29	Trajectory Equation	HDC Ch. 2
29	Mar 31	Conic Section Orbits, Circular Orbits	HDC Ch. 2
30	Apr 3	Circular Orbits	HDC Ch. 2
Quiz 3 at end of lecture on Apr 3 (Monday)			
31	Apr 5	Elliptic Orbits	HDC Ch. 2
Homework 5 Due Apr 5 (Wednesday), 11:59 PM			
32	Apr 7	Burnout	HDC Ch. 2
33	Apr 10	Orbit in 3D	HDC Ch. 4
	Apr 10, 6:15 PM	STK Tutorial (TA-led)	
34	Apr 12	Ground Tracks and Parabolic Orbits	HDC Ch. 4, 2
35	Apr 14	Hyperbolic Orbits	HDC Ch. 2
36	Apr 17	One-Impulse Transfers	HDC Ch. 2, 6
Homework 6 Due Apr 17 (Monday), 11:59 PM			
37	Apr 19	One/Two-Impulse Transfers	HDC Ch. 6
38	Apr 21	Two-Impulse Transfer Extensions	HDC Ch. 6
Quiz 4 at end of lecture on Apr 21 (Friday)			
39	Apr 24	Interplanetary Transfers	HDC Ch. 8
40	Apr 26	Rocket Equation, Review for Final Exam	HDC Ch. 13

End of Coverage for Final Exam
Project Due May 1 (Monday), 11:59 PM
Homework 7 Due May 1 (Monday), 11:59 PM
Final Exam May 4 (Thursday), 3:00 PM