AEROSPACE DESIGN 1

EAS4700 Section 0075

Class Periods: TUE Periods 9-10 (4:05 – 6:00 pm)

Location: **MAEB 211**

THU Period 9 (4:05 – 4:55 pm)

Location: **LAR 0330**

Academic Term: Fall 2025

Instructor:

Mr. Michael Generale
Email: mgenerale@ufl.edu
Campus Phone Number: 352-294-1183
Office Hours: Mondays and Wednesdays 1:00 – 3:00 PM, MAE-C 125, Other times and virtual meetings by appointment.

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website.

Teaching Assistants:

- Aimee Dew
- Tabitha Patrick

Peer Mentor

- Luka Bjellos

Course Description

Applications of the principles of analysis and design to aerospace vehicles. Emphasizes astronautics.
3 credit hours.

Course Pre-Requisites / Co-Requisites

EAS4510 Astrodynamics and EML4312 Control of Mechanical Engineering Systems with at least a D grade. PER THE MAE DEPARTMENT, THIS WILL BE STRICTLY ENFORCED, NO MATTER IF YOU HAVE BEEN ABLE TO REGISTER FOR THE CLASS.

A working knowledge of MATLAB, Simulink, STK, and a CAD program, such as SolidWorks or Autodesk Fusion 360, is required. Students may need to learn tools as they go.

Course Objectives

By the end of this course, you should be able to do the following:

1. Prepare technical documents in the aerospace industry.
2. Give technical presentations and develop communication skills.
3. Work in a team and lead a team.
4. Seek, find, and assimilate the knowledge you need to solve new problems.

Materials and Supply Fees

N/A

Relation to Program Outcomes (ABET):
As of 07 AUG 2024

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,	High - Assessed

as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	High- Assessed
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	High - Assessed
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	High - Assessed
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Aerospace Engineering UF Student Learning Outcomes:

Outcome	Coverage*
1. Apply knowledge of mathematics, science, and engineering principles to aerospace engineering problems (ABET Outcome (1))	High
2. Design and conduct aerospace engineering experiments and analyze and interpret the data (ABET Outcome (6))	High
3. Design an aerospace engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints (ABET Outcome (2))	High - Assessed
4. Communicate technical data and design information effectively in speech and in writing to other aerospace engineers (ABET Outcome (3))	High

Required Textbooks and Software

Textbooks

- **Elements of Spacecraft Design by Charles D. Brown (available free online from UF Library)**
  ISBN (print): 978-1-56347-524-5
  eISBN: 978-1-60086-179-6
  Publication Date: January 1, 2002

- **CubeSat 101 NASA reference guide for designing, building, and planning a CubeSat mission (available free online)**
  https://www.nasa.gov/sites/default/files/atoms/files/nasa_csli_cubesat_101_508.pdf

- **System Engineering Handbook: NASA reference guide for Systems Engineering. (available free online)**
  https://www.nasa.gov/seh/index.html

Recommended Textbooks

- **Space Mission Engineering: The New SMAD by Wertz, Evertt & Puschell**
  Publication Date 2011, 2nd printing 2015
- **Human Spaceflight Mission Analysis and Design 2nd edition by Larson, McQuade & Pranke**

Publication Date 2014

NOTE: Although I made these ***optional*** for this course, I strongly recommend one or the other of these texts (the new SMAD if you're primarily interested in uncrewed satellites, and Human Spaceflight Missions and Design if your interest is in crewed spacecraft). These are relatively expensive texts. However, the wealth of knowledge they contain will serve you well in your Aerospace career, whether you enter human or robotic spaceflight.

Software

You must have access to the following software:

- MATLAB.
- Any CAD program.
  - You may use whatever CAD program you are most comfortable with. However, you will be 3D printing a model of your project, so Fusion 360 is *recommended*.
- Prusa Slicer.
  - Your models will be made using the class's Prusa Mk4 3D printers. Prusa Slicer is guaranteed to be compatible. It is available free online.
- Microsoft Project (available for download from UF).
  - MS Project is a scheduling program. While other software apps do similar things, MS Project has been an industry standard for years.

- Satellite Tool Kit (STK) installed on individual machines, with running license.
  - STK is a tool for simulating orbital mechanics on your computer. It is an industry standard for simulating spaceflight and vehicle performance.
    - NOTE: Free Flyer by a.i. Solutions is an acceptable alternative, but you will have limited in-class technical support with it. It is available free of charge to US citizen students with a valid .edu email address.

STK LICENSE INSTRUCTIONS:

1. Go to the "STK UPLOAD FILES" folder in the class CANVAS site.
2. Open the "AGISTKInstallation.pdf" file and follow the instructions.
3. If you have any issues loading or running STK, first try the UF IT Help Desk. If that doesn't answer your issue, contact either Professor Generale or a Learning Assistant.

Required Computer

Recommended Computer Specifications: https://it.ufl.edu/get-help/student-computer-recommendations/
HWCOE Computer Requirements: https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/
MAE student computing requirement: https://mae.ufl.edu/students/undergraduate/computer-requirements/

NOTE: It is MAE's position that a Windows computer is desired as software packages like *SolidWorks* require Windows to run properly. Macs running a virtual Windows machine have been known to have difficulties running Windows-based engineering software. Please follow the MAE computer requirements link above for details. Also, MAE IT does not support Mac computers.

Required Hardware

To transfer your G-codes to the Prusa Mk4 printers, you must have a USB flash drive (USB Type A; if you only have USB-C, you will need an adapter). One with a metal case is preferred as plastic case USB drives sometimes have difficulty being read by the printers.

Course Schedule

WEEK	DAY/DATE TOPIC
1	TUE 26 AUG
	MODULE 1 PROJECT MANAGEMENT BASICS
	01 Welcome, instructor introduction and about this class
	02 Class Project
	03 CubeSat Review
	04 Starting your design
	05 Introduction to Project Management Principles
	Group assignments
1	THU 28 AUG
	MODULE 1 PROJECT MANAGEMENT BASICS
	06 Requirements Development
	07 CONOPS
2	TUE 02 SEP
	MODULE 1 PROJECT MANAGEMENT BASICS
	08 K-T Problem Analysis / Decision Analysis
	09 Risk Assessment
	10 Technology Readiness Level
	11 Schedules and Open Item Status Reports
2	THU 04 SEP
	12 Budgeting & Cost Estimating
	MODULE 2 SYSTEMS ENGINEERING
	13 Physical Properties Budgets
3	TUE 9 SEP
	MODULE 2 SYSTEMS ENGINEERING
	14 Astrodynamics Review
	15 Designing the Propulsion System
	16 Designing the Vehicle Structure
	17 Designing the Thermal Management System
3	THU 11 SEP
	MODULE 2 SYSTEMS ENGINEERING
	18 Designing the Electrical Power Management System
	19 Designing the Communication System
4	TUE 16 SEP
	MODULE 2 SYSTEMS ENGINEERING
	20 Vibroacoustics
	21 ADCS and GN&C
	22 Test Planning

	23 Rubric Review
	24 SmallSat Paper Format Specifications
WEEK	**DAY/DATE** **TOPIC**
4	THU 18 SEP
	MODULE 3 PRESENTATION GUIDELINES
	25 Effective Presentations
	26 NASA's VADR Program
	Team Project Reviews
5	TUE 21 SEP
	Team Project Reviews
5	THU 23 SEP
	Team Project Reviews
6	TUE 30 SEP
	Team Project Reviews
6	THU 02 OCT
	Team Project Reviews
	FRI 03 OCT
	SDR PRESENTATIONS DUE BY 11:59 PM
7	TUE 07 OCT
	MID TERMS: SDR Presentation
7	WED 08 OCT
	MID TERMS: SDR Presentation -- Location TBD--
7	THU 09 OCT
	MID TERMS: SDR Presentation
8	TUE 14 OCT
	Team Project Reviews/Special Topics
8	THU 16 OCT
	Team Project Reviews/Special Topics
9	TUE 21 OCT
	Team Project Reviews/Special Topics
9	THU 23 OCT
	Team Project Reviews/Special Topics
10	TUE 28 OCT
	Team Project Reviews/Special Topics
10	THU 30 OCT
	Team Project Reviews/Special Topics
11	TUE 04 NOV
	Team Project Reviews/Special Topics
11	THU 06 NOV

	Team Project Reviews/Special Topics
12	TUE 11 NOV - NO CLASS: VETERANS' DAY
12	THU 13 NOV
	Team Project Reviews/Special Topics
WEEK	**DAY/DATE** **TOPIC**
12	FRI 14 NOV
	PDR PRESENTATIONS DUE BY 11:59 PM
13	TUE 18 NOV
	FINAL: PDR Presentation
13	WED 19 NOV
	FINAL: PDR Presentation -- Location TBD --
13	THU 20 NOV
	FINAL: PDR Presentation
14	TUE 24 NOV NO CLASS - WINTER BREAK
14	THU 26 NOV NO CLASS - WINTER BREAK
15	TUE 02 DEC
	PAPERS DUE BY 11:59 PM
15	THU 04-05 DEC: READING DAYS

Important Dates

03 OCT *SDR Presentations due by 11:59 PM*
07,08,09 OCT *SDR Presentations (During class period unless otherwise noted)*
11 OCT *Mid-Term Peer evaluations due by 11:59 PM*
14 NOV *PDR Presentations due by 11:59 PM*
18,19,20 NOV *PDR Presentations / 3D models due (During class period unless otherwise noted)*
22NOV *Final Peer Review due by 11:59 PM*
02 DEC *Papers due by 11:59 PM*

Evaluation of Grades

Assignment	Time Frame	Type	Points	%
System Design Review (SDR)	Mid October	Group	445	25
Individual SDR Grade	Mid-Term	Individual	40	
Preliminary Design Review (PDR)	Mid November	Group	445	25
Individual PDR Grade	End of Term	Individual	40	
SmallSat Paper(SSP)	End of Term	Group	445	25
SmallSat Paper(SSP)	End of Term	Individual	40	
3D printed Model	Late November	Group	30	10
Weekly Activity Report	Weekly	Individual	10	05
Initial Peer Evaluation	Mid-Term	Individual	05	05
Final Peer Review	End of Term	Individual	05	05
				100
Attendance Bonus	Finals	Individual	05	3 (max)
GatorEval Bonus	Finals	Class	05	3

System Design Review (SDR) Group Grade: Each group will present its work to the instructor and customer. SDRs are worth 15% of your grade and serve as your midterm exam. All teammates are expected to participate in the presentation. Submissions are **due 03 OCT by 11:59 PM** to the class CANVAS site. **LATE SUBMISSION WILL RESULT IN THE LOSS OF ONE LETTER GRADE.**

Preliminary Design Review (PDR) Group Grade: Each group will present its work to the instructor and the customer. **PDR is worth 15% of your grade** and serves as your final exam. All teammates are expected to participate in the presentation. Submissions are **due 14NOV by 11:59 PM** to the class CANVAS site. **LATE SUBMISSION WILL RESULT IN THE LOSS OF ONE LETTER GRADE.**

You will also have the opportunity to submit your résumé to the guest evaluators. This is optional, and no points are awarded. It is simply an opportunity for you to market yourself.

SmallSat Paper (SSP) Group Grade: The SmallSat Paper is a research paper on your group's design. The paper is due by **02 DEC 11:59 PM**. This is your opportunity to address shortcomings identified in your PDR presentation. **The SmallSat Paper is worth 20% of your grade**. The format for the SSP can be found on the CANVAS website. **LATE SUBMISSION WILL RESULT IN THE LOSS OF ONE LETTER GRADE.**

I encourage you to consider submitting your work to the annual SmallSat Conference. This long-running (over 40 years), well-attended (over 4,000 attendees) conference in Salt Lake City, Utah, draws university representatives and industry representatives from companies like Lockheed, SpaceX, Rocket Lab, FireFly, and many more. It is an opportunity to market yourselves to potential employers.

3D printed Model Group Grade: A scale model of the most current version of your satellite that demonstrates any unique features of your design (deployable solar panels, antennae, etc.) is **due NO LATER THAN the day of your PDR presentation**. It should illustrate key features of your design.

You must print *at least* one set of models that demonstrate your design. You may print an additional model if it helps tell your story (I.e., a smaller-scale model of the overall design and one larger-scale model of a unique feature). NOTE: Additional models will not guarantee a better grade. The goal is for your 3D print or prints to tell the story of your design.

Large item models should be printed so the main structure fits within the print bed volume of the class's Prusa Mk4 printers (I.e., no more than 210 mm wide x 210 mm deep x 250 mm tall or ~8.25" wide x 8.25" deep x 10" tall). Pick a scale for your model that is easy to hold and pass from one person to another, and still illustrates key design features easily.

Smaller items (articulating mechanisms, etc.) may be printed at a scale to provide sufficient design detail (I.e., 1:1 or larger if necessary). *The goal is to provide a model that is easily handled and may be easily passed from one person to another*. **Your printed model is worth 10% of your grade.** Late submission will result in a loss of one letter grade for this assignment.

Individual Work Grade: Your individual performance in the SDR and PDR is **worth 15% of your grade**. This grade is based on your individual performance in your primary area of responsibility for the group project as defined by the rubric for the project.

Weekly Activity Report: Industry organizations require a weekly activity report from rank-and-file engineers so that managers can keep in touch with the organization's activities. This report facilitates communication between you, the student, and the teaching team so that we may more fairly and accurately grade your progress.. **Your Weekly Activity Report (WAR) is worth 5% of your grade. Late or missing WARs will get zero (0) points for that week.**

Peer evaluation grade: A peer evaluation of each group member is due at mid-term, **11 OCT 2025**, and a final **22 NOV 2025, and each is worth 5% of your grade**. This is a semester-long updateable grade (everyone is given a chance to improve their performance till the end). A standardized form will be used for this evaluation. This is important because your team must function well together for your team to be successful. Periodic feedback on all team members' performance is the only way to keep the group functioning well. **LATE SUBMISSION WILL RESULT IN THE SUBMITTER GETTING A 5% REDUCTION TO THE EVALUATION SCORE. NOT SUBMITTING WILL RESULT IN A 25% REDUCTION TO THE EVALUATION SCORE.**

GatorEval Survey Bonus: A voluntary course and instructor evaluation in GatorEvals is requested and is valued as a **3% bonus** ***if a minimum of 75% of the class participates***. Students are expected to provide honest, professional, and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Students can complete evaluations in three ways:

1. The email they receive from GatorEvals,
2. Their Canvas course menu under GatorEvals, or
3. The central portal at https://my-ufl.bluera.com/

Guidance on how to provide constructive feedback is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Attendance Bonus: A **3% individual bonus** will be awarded to anyone with **90% or better attendance**. Credit for attendance is given for being in class on time for the duration of the class period. Because there are sometimes unavoidable circumstances, excused absences will count as being present. To have an excused absence for things like interviews or attending the job fair, you must notify Professor Generale AND the TA responsible for grading a MINIMUM OF 24 HOURS IN ADVANCE OF YOUR ABSENCE. Any medical issue notification 24 – 8 hours prior to class will be accepted on a case-by-case basis (hangovers don't count).

The course CANVAS website provides the rubric for evaluation of the mid-term and final presentations and the final report.

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
95 to 100	A	4.00
90 to 94.99	A-	3.67
87 to 89.99	B+	3.33
84 to 86.99	B	3.00
80 to 83.99	B-	2.67
77 to 79.99	C+	2.33
74 to 76.99	C	2.00
70 to 73.99	C-	1.67
67 to 69.99	D+	1.33
64 to 66.99	D	1.00
60 to 63.99	D-	0.67
Less Than 59.99	E	0.00

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive 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.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:
- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu