EAS 4530 - SPACE SYSTEMS DESIGN
Spring 2024

Instructor
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Office Hours: TBD (official) – open door policy in effect, make an appointment

Teaching Assistant/Peer Mentor/Supervised Teaching Student

- N/A

Course Description
A discussion of the component systems of a spacecraft and a typical mission's requirements. The operation and character of different spacecraft hardware is presented as well as typical mission timelines from early conception to final operations. Topics include the space environment, guidance/control/navigation systems, spacecraft sensors and actuators, propulsion systems, thermal systems, power systems, launch systems, communication systems, structural systems and mission operations. This course is useful to engineers, scientists, computer scientists and any profession that uses data.

Course Pre-Requisites / Co-Requisites
EAS 4510 (Astrodynamics) or lecturer approval

Course Objectives
To introduce students to the fundamentals of spacecraft design including mission design, subsystem/component analysis and design, and systems engineering. Additionally, the tools utilized in the design process (e.g., Gantt charts, milestone charts, organizational charts, flow diagrams) and the design review cycles (e.g., PDRs, FDRs) will be introduced and utilized. Specific objectives include:

1. Obtaining a fundamental understanding of the spacecraft design process;
2. Understanding/appreciating the multi- & interdisciplinary aspects of design;
3. Working in a team environment while also having individual tasks;
4. Practicing oral and written technical communications skills;
5. An appreciation and understanding of engineering ethics.

Required Textbooks and Software
J. Wertz and W. Larson, eds., <u>Space Mission Analysis and Design, 3rd Ed.,</u> Microcosm Press

Recommended Textbooks
- M. D. Griffin and J. R. French, <u>Space Vehicle Design</u>, AIAA Educational Series.
- V. Pisacane and R. Moore, eds. <u>Fundamentals of Space Systems</u>, Oxford Univ. Press.
- P. Fortescue and J. Stark, eds., <u>Spacecraft System Engineering</u>, John Wiley and Sons.
- J. J. Sellers, <u>Understanding Space, An Introduction to Astrodynamics</u>, McGraw-Hill.
- A. Houston and M. Rycroft, <u>Keys to Space, An Interdisciplinary Approach to Space Studies</u>, McGraw-Hill.

Course Schedule

Concepts
Systems Engineering Process & Requirements: Discuss concepts of systems analysis & design
Spacecraft Mission Design: List and define elements of a space mission concept; list and define the typical design reviews associated with space systems design

Space Environment: Discuss environmental factors which affect S/C operation	
Orbits & Constellation: Discuss orbits and constellations as they affect mission requirements	
Attitude Dynamics & Control: Discuss basics of attitude determination and control, attitude maneuvers and momentum exchange devices – attitude errors and control laws, momentum management, momentum bias	
Other Subsystems: Payload, CD&H, Comms (TT&L), Power, Propulsion	

Homework Assignments

Problems will be assigned regularly and will be periodically collected with an advance notice of two (2) days. Late homework **will not** be accepted. **Quizzes will be administered without warning at the discretion of the instructor.** All assignments and related lecture materials will be posted under the *Announcements* **tab**.

Assignments, documentation, and presentations are group activities; however, exams are individualized activities.

Attendance Policy, Class Expectations, and Make-Up Policy

Class attendance is not mandatory, but students are strongly encouraged to attend all lectures. When in class, however, ALL personal communication devices (cell phones, etc.) must be turned off (or in the silent mode).

Excused absences must be in compliance with university policies in the Undergraduate Catalog and require appropriate documentation (https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/).

Evaluation of Grades

Activity	Percentage of Final Grade
Assignments & Documentation	25%
Presentations	25%
Exam	20%
Peer Evaluations	15%
Other (current/historical events)	15%

Grading Policy

Percent	Grade	Percent	Grade	Percent	Grade
90.0 - 100.0	A	87.0 - 89.9	A-	84.0 - 86.9	B+
81.0 – 83.9	B	78.0 - 80.9	B-	75.0 - 77.9	C+
72.0 – 74.9	C	69.0 - 71.9	C-	66.0 - 68.9	D+
63.0 - 65.9	D	60.0 - 62.9	D-	0 - 59.9	E

More information on UF grading policy may be found at: https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

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 (or TAs in this class).

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 Graduate Program Coordinator
• 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

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. 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

Other Student Resources:
• **University Counseling Center** - (352) 392-1575 - http://www.counsel.ufl.edu/default.asp

• **Mental Health Services** - (352) 392-1171 - http://www.health.ufl.edu/shcc/smhs.htm

• Alachua County Crisis Center - (352) 264-6789

Campus Resources:
Health and Wellness
• **U Matter, We Care**: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.
• **Counseling and Wellness Center**: http://www.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**, 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 Resource Center, Reitz Union: (352) 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/
• Library Support, Various ways to receive assistance with respect to using the libraries or finding resources. http://cms.uflib.ufl.edu/ask
• 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/
• Student Complaints Campus: http://care.dso.ufl.edu, https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/
• On-Line Students Complaints: http://www.distance.ufl.edu/student-complaint-process