

Syllabus AE 443 – Aircraft Systems Design II

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TAs: Wanzheng Zheng (wz10@illinois.edu)
 Office Hours: Thursday 6-8pm
 Location: 330 Talbot Conference Room
 Email or Discord for virtual OH.

 Julia Williams (juliakw2@illinois.edu)
 Office Hours: Monday 1:00 – 3:00 PM
 Tuesday 6:00 – 8:00 PM
 Location: 327 Talbot Desk 77
 Email or [Discord](#) for virtual OH.

 Rodra Hascaryo (hascary2@illinois.edu)
 Office Hours: Fridays 1 – 3 PM
 Location: Online (via email/Zoom) or 327 Talbot Desk 19 (if we need to meet in-person)
 Note: I will be actively monitoring my email at the stated time. If we need to meet over Zoom or in-person, please let me know at least 24 HOURS in advance (by Thursday 3 PM) so I can send you the Zoom link and/or prepare accordingly.

Credit: 3 hours

Class Schedule: Tuesdays and Thursdays 2:00-3:20 PM
Class Location: 144 Loomis Lab

Instructor Office Hours:

Wednesday 11-12:00 AM

In-person Office Hours Location: 306G Talbot Lab

Meeting URL:

<https://illinois.zoom.us/j/86086121047?pwd=I0LXjKWzqRcPl1gvXUO1Dki6cCk0Uw.1>

Meeting ID: 860 8612 1047

Password: 040893

Wednesday 2:00-4:00 PM

In-person Office Hours Location: 306G Talbot Lab

Meeting URL:

<https://illinois.zoom.us/j/81220020086?pwd=M3quQbaGjRItQUEnKbZbac7hpMOBtf.1>

Meeting ID: 812 2002 0086

Password: 676805

Required Text:

Raymer, D., *Aircraft Design: A Conceptual Approach*, 5th Edition, AIAA Inc., Reston, VA, 2012.

Recommended Design Texts:

Nicolai, L. and Carichner, G., *Fundamentals of Aircraft and Airship Design: Volume I-Aircraft Design*, AIAA, Inc., Reston, VA, 2010.

Torenbeek, E., *Synthesis of Subsonic Airplane Design*, Springer, New York, NY, 1982.

Roskam, J., *Airplane Design, Parts I-VIII*, 2nd Edition, DAR Corporation, Lawrence, KS, 2003.

Anderson, J., *Introduction to Flight*, 7th Edition, McGraw-Hill Education, New York, NY, 2011.

Duawalter, C., and Althof, E. (Eds.), *AIAA Design Engineers Guide*, AIAA Inc., Reston, VA, 2012.

Kuchemann, D., *The Aerodynamic Design of Aircraft*, AIAA Inc., Reston, VA, 2012.

Recommended Subject Specific Texts:**Aerodynamics and Flight Mechanics**

Roskam, J. and Lan, C., *Airplane Aerodynamics and Performance*, DAR Corporation, Lawrence, KS, 1997.

Roskam, J., *Airplane Flight Dynamics and Flight Controls Part I*, DAR Corporation, Lawrence, KS, 1995.

McCormick, B., *Aerodynamics, Aeronautics, and Flight Mechanics*, 2nd Edition, John Wiley and Sons, New York, NY, 1995.

Hoerner, S., *Fluid Dynamic Drag, Aerodynamic Drag and Hydrodynamic Resistance*, S. Hoerner, Great Britain, 1992.

Hoerner, S. and Borst H., *Fluid Dynamic Lift, Practical Information on Aerodynamic and Hydrodynamic Lift*, S. Hoerner, Great Britain, 1985.

Keuthe, A. and Chow, C., *Foundations of Aerodynamics*, 5th Edition, John Wiley and Sons, New York, NY, 1998

Katz, J. and Plotkin, A., *Low-Speed Aerodynamics*, 2nd Edition Cambridge University Press, New York, NY, 2001.

Etkin, B., *Dynamics of Atmospheric Flight*, Dover Publications, Inc., Mineola, NY, 2005.
(Original work published 1972)

Abbott, I. and Von Doenhoff, A., *Theory of Wing Sections*, Dover Publications, Inc., New York, NY, 1959. (Original work published 1949)

Anderson, J., *Modern Compressible Flow*, 2nd Edition, McGraw-Hill Publishing Co., New York, NY, 1990.

Anderson, J., *Fundamentals of Aerodynamics*, 5th Edition, McGraw-Hill Publishing Co., New York, NY, 2010.

Propulsion

Oates, G., *Aerothermodynamics of Gas Turbine and Rocket Propulsion*, 3rd Edition, AIAA Inc., Reston, VA, 1997.

Mattingly, J., *Elements of Propulsion; Gas Turbines and Rockets*, 2nd Edition, AIAA Inc., Reston, VA, 2016.

Kurzke, J., and Halliwell, I., *Propulsion and Power*, Springer International Publishing AG, Cham, Switzerland, 2018.

Hill, P., and Peterson, C., *Mechanics And Thermodynamics Of Propulsion*, 2nd Edition, Addison-Wesley Publishing, Reading Ma, 1992.

Structures

Bruhn, E., *Analysis and Design of Flight Vehicle Structures*, Jacobs Publishing Inc., Indianapolis, TX, 1973.

Donaldson B., *Analysis of Aircraft Structures An Introduction*, McGraw-Hill Publishing Co., New York, NY, 1993.

Megson, T. H. G., *Aircraft Structures for Engineering Students*, 6th Edition, Butterworth-Heinemann Is an Imprint of Elsevier, Amsterdam, 2016.

Aircraft Systems

Moir, I., and Seabridge, A., *Aircraft Systems: Mechanical, Electrical, and Avionics Subsystems Integration*, 3rd Edition, John Wiley and Sons, New York, NY, 2011.

Currey, N., *Aircraft Landing Gear Design: Principles and Practices*, AIAA Inc., Reston, VA, 1998.

Course Description:

Continuation of AE 442. Conceptual design project of either an aircraft or spacecraft flight system to satisfy a given set of requirements. Project team organization. Emphasis on sizing, trade studies and design optimization, subsystem integration, and technical communication skills.

To fulfill the Advanced Composition Requirement, credit must be earned for both AE 442 and AE 443. Prerequisite: AE 442.

Course Objectives:

- Apply a holistic, systems approach towards aircraft design.
- Develop technical depth through disciplinary knowledge and breadth through integrative design.
- Develop teamwork and project management skills through team-based design and weekly status reports.
- Develop skills to communicate technical information clearly and concisely in written reports and oral presentations.

Tentative Due Date Schedule:

- **Thursday, February 12:** Design Readiness Report (DRR) is due.
- **Friday, February 6:** AIAA Roster Submission is due.
- **Monday March, 9:** Preliminary Design Report (PDR) is due.
- **Tuesday, March 10:** Preliminary Design Presentation (PDP) is due. Presentations may include external reviewers (similar format to your final presentations for AE 442).
- **Monday, April 27:** Final Design Presentation (FDP) is due. FDP presentations are tentatively scheduled for 4/28, 4/30, and 5/5.
- **Wednesday, May 6:** Final Design Report (FDR) is due.
- **Wednesday May 13:** The final period will be used for overflow and/or lecture.
- **Friday, May 15:** Final Design Report (FDR) is to AIAA.

Class Format:

Classes will alternate between lectures, team meetings and discipline meetings. For the team meetings and discipline meetings (~30 minutes) students are expected to have a small (5 minutes) presentation/notes prepared that will also be submitted on Compass. For the discipline meetings each student is expected to share their methods and inform/teach the other like discipline members. The students are NOT expected to discuss their design specifics for those meetings.

Tentative Class Schedule:

1	Tuesday, January 20, 2026	Lecture
2	Thursday, January 22, 2026	Lecture
3	Tuesday, January 27, 2026	Team Meeting
4	Thursday, January 29, 2026	Discipline I Meeting
5	Tuesday, February 3, 2026	Discipline II Meeting
6	Thursday, February 5, 2026	Team Meeting 2
7	Tuesday, February 10, 2026	Lecture
8	Thursday, February 12, 2026	Discipline I Meeting
9	Tuesday, February 17, 2026	Discipline II Meeting
10	Thursday, February 19, 2026	Lecture
11	Tuesday, February 24, 2026	Team Meeting 3
12	Thursday, February 26, 2026	Team Meeting 4
13	Tuesday, March 3, 2026	Discipline I Meeting
14	Thursday, March 5, 2026	Discipline II Meeting
15	Tuesday, March 10, 2026	Presentations - Extended
16	Thursday, March 12, 2026	Presentations - Extended
	Tuesday, March 17, 2026	Spring Break
	Thursday, March 19, 2026	Spring Break
17	Tuesday, March 24, 2026	Lecture (PDR/PDP)
18	Thursday, March 26, 2026	Team Meeting 5
19	Tuesday, March 31, 2026	Discipline I Meeting
20	Thursday, April 2, 2026	Discipline II Meeting
21	Tuesday, April 7, 2026	Team Meeting 6
22	Thursday, April 9, 2026	Discipline I Meeting
23	Tuesday, April 14, 2026	Discipline II Meeting
24	Thursday, April 16, 2026	Team Meeting 7
25	Tuesday, April 21, 2026	Discipline I Meeting
26	Thursday, April 23, 2026	Team Meeting 8 (Practice)
27	Tuesday, April 28, 2026	Presentations - Extended
28	Thursday, April 30, 2026	Presentations - Extended
29	Tuesday, May 5, 2026	Presentations - Extended
30	Wednesday, May 13, 2026	Final Period

Lecture Outline:

Topics		Classes
1.	Design Process and Gates	0.5
2.	Team Makeup and Dynamics	0.25
3.	Supporting Your Decisions	0.5
4.	Writing and Presentation Style	0.25
5.	Stability and Control	1.0
6.	Landing Gear	0.5
7.	Aircraft Systems	0.5
8.	Additional Topics	0.5
9.	Cost	0.25
10.	Multi-Fidelity Approach	0.25

Grading:

Design Readiness Report	5%
AIAA Letter of Intent Submission	5%
PDR Presentation	10%
PDR Report	15%
FDR Presentation	20%
FDR Report	30%
AIAA Submission	5%
Weekly Status Reports	10%
Peer Reviews	Multiplier on FDR and PDR Grades

The instructor and TAs reserve the right to evaluate the Peer Reviews grades based on feedback from the team and the weekly status reports. Any student that continually fails to contribute to a team may have their peer review portion of the grade zeroed out. A team member will be informed of this potential after the PDR peer review results.

DRR, PDR, and FDR grades will be calculated from individual (70%) and team (30%) grades. Each of those components will themselves be calculated from technical (70%) and composition (30%) grades. PDP and FDP (i.e. presentation) grades will be based on team grades, which will themselves be calculated from technical (70%) and composition (30%) grades. All other grades will be individually determined.

Suspected use of AI or plagiarism will result in a 50% markdown until final determination through the FAIR system.

Each student will keep a logbook that will be reviewed during each weekly status report and will contribute to that grade.

Failure to attend the final period will result in a grade of ABS.

Note: This Syllabus is Subject to Change.

Class Policy on AI:

AI tools, including ChatGPT, Bard, and the like are **not** permitted for any stage or phase of work in this class except those listed below. Inappropriate use of these tools in this course will be considered **academic dishonesty** and a violation of the Grainger College of Engineering's Academic Integrity Policy. (<https://grainger.illinois.edu/academics/online/current-students/academic-integrity>)

Any work written or solutions, developed, created, or inspired by artificial intelligence (AI) is considered plagiarism and **will not be tolerated**. While these new developments will find their place in our workforces and personal lives, this kind of technology does not belong as we are learning. The use of AI robs us all of the opportunity to learn from our experiences and from each other, to learn to synthesize and analyze sources and concepts, and to contribute our ideas in authentic ways. In addition, this class is the time and place to improve our writing and engineering skills. Relying on AI does not accomplish this.

The use of generative AI tools is permitted in this course for the following activities:

- Brainstorming and refining your ideas;
- Fine tuning your research questions;
- **Finding** information or sources on your topic;
- Checking grammar such as periods, commas, capitalization, spelling, ...
(AI may not change the structure, tone, ... of your writing)

The use of generative AI tools is **not** permitted in this course for the following activities:

- Impersonating you in classroom contexts, such as by using the tool to compose discussion board prompts assigned to you or content that you put into a Zoom chat.
- Completing individual or group work that the instructor or your group has assigned to you.
- **Writing a draft of any assignment.**
- **Writing entire sentences, paragraphs or papers to complete class assignments.**

You are responsible for the information you submit based on an AI query (for instance, that it does not violate intellectual property laws, or contain misinformation or unethical content). Your use of AI tools must be properly documented in order to stay within university policies on academic honesty. Any use outside of this permission will be considered academic dishonesty.

During our class, we may use AI tools such as ChatGPT. You will be informed as to when, where, and how these tools are permitted to be used, along with guidance for attribution. Any use outside of this permission will be considered academic dishonesty and a violation of the Grainger College of Engineering's Academic Integrity Policy.

If an instructor or teaching assistant has reasonable grounds to suspect that an assignment violates the AI usage policy stated above, the concern will be documented. The student will be notified in writing and provided the opportunity to complete an alternative assessment, such as an oral examination, to demonstrate their understanding of the relevant material. If the student

successfully demonstrates understanding, no further action will be taken. If the student is unable to demonstrate understanding, the matter will be referred to the university's FAIR process for formal review.

Class Diversity Understanding

We at UIUC are committed to providing equal opportunity for all persons, regardless of race, ethnicity, religion, sex, gender identity or expression, creed, age, ancestry, national origin, handicap, sexual orientation, political affiliation, marital status, developmental disability, or arrest or conviction record. We value diversity in all of its definitions, including who we are, how we think, and what we do. We cultivate an accessible, inclusive, and equitable culture where everyone can pursue their passions and reach their potential in an intellectually stimulating and respectful environment. We will continue to create an inclusive campus culture where different perspectives are respected and individuals feel valued. Please join us in these purposeful efforts to continue to improve our university together. As this is a continuing process, we all have to be aware that mistakes may happen and extend to each other understanding and the ability to learn and grow our respect and regard for each other.

University and Grainger College of Engineering Statements

COVID

Following University policy, all students are required to engage in appropriate behavior to protect the health and safety of the community, including wearing a facial covering properly, maintaining social distance (at least 6 feet from others at all times), disinfecting the immediate seating area, and using hand sanitizer. Students are also required to follow the campus COVID-19 testing protocol.

Students who feel ill must not come to class. In addition, students who test positive for COVID-19 or have had an exposure that requires testing and/or quarantine must not attend class. The University will provide information to the instructor, in a manner that complies with privacy laws, about students in these latter categories. These students are judged to have excused absences for the class period and should contact the instructor via email about making up the work.

Students who fail to abide by these rules will first be asked to comply; if they refuse, they will be required to leave the classroom immediately. If a student is asked to leave the classroom, the non-compliant student will be judged to have an unexcused absence and reported to the Office for Student Conflict Resolution for disciplinary action. Accumulation of non-compliance complaints against a student may result in dismissal from the University.

All students, faculty, staff, and visitors are required to wear face coverings in classrooms and university spaces. This is in accordance with CDC guidance and University policy and expected in this class.

Please refer to the University of Illinois Urbana-Champaign's COVID-19 website for further information on face coverings. Thank you for respecting all of our well-being so we can learn and interact together productively.

In order to implement COVID-19-related guidelines and policies affecting university operations, instructional faculty members may ask students in the classroom to show their Building Access

Status in the Safer Illinois app or the Boarding Pass. Staff members may ask students in university offices to show their Building Access Status in the Safer Illinois app or the Boarding Pass. If the Building Access Status says “Granted,” that means the individual is compliant with the university’s COVID-19 policies—either with a university-approved COVID-19 vaccine or with the on-campus COVID-19 testing program for unvaccinated students.

Students are required to show only the Building Access Screen, which shows compliance without specifying whether it was through COVID-19 vaccination or regular on-campus testing. To protect personal health information, this screen does not say if a person is vaccinated or not. Students are not required to show anyone the screen that displays their vaccination status. No university official, including faculty members, may ask students why they are not vaccinated or any other questions seeking personal health information.

Emergency Response Recommendations

Emergency response recommendations can be found at the following website:
<http://police.illinois.edu/emergency-preparedness/>. I encourage you to review this website and the campus building floor plans website within the first 10 days of class.
<http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/>.

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University’s Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.

Academic Integrity

The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: <http://studentcode.illinois.edu/>.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: <https://studentcode.illinois.edu/article1/part4/1-401/>. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances

Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at <https://odos.illinois.edu/community-of-care/resources/students/religious-observances/> to request appropriate accommodations. This should be done in the first two weeks of classes.

Disability-Related Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail disability@illinois.edu or go to <https://www.disability.illinois.edu>. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting “Request an Academic Screening” at the bottom of the page.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <https://registrar.illinois.edu/academic-records/ferpa/> for more information on FERPA.

Anti-Racism and Inclusivity Statement

The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs. The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community.

The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable. You can also report these behaviors to the Bias Assessment and Response Team (BART) (<https://bart.illinois.edu/>). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action. be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.