

University of Kansas
Department of Aerospace Engineering
AE 721 Aerospace Design I Laboratory
Fall 2024

Nota Bene: This document is subject to change. Check in to aerodoc.tech/AE721 frequently for updates

Instructor:

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Office hours: 12 - 1pm, M - F 1182 Learned Hall



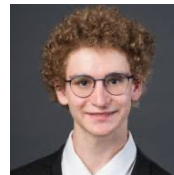
Co-Instructor:

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Phone: (785) 864-2979
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Graduate Teaching Assistant:

Joshua Poznanski
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Class Time and Location:

M & W 1-1:50, F 1-2:50, 1014 & 1018 Eaton Hall

Course Hours and Instructional Methods

This is a 4 hour in-person class with three lecture periods per week (considering the AE 721 as grandfathered in under pre-2025 academic year constraints). This includes 3 yrs of AE 721 plus 1 hour of AE 500 as this is a bridge year between the old curriculum and the new curriculum. Consistent with KU policy and the Federal definition of a credit hour, this means you should expect to spend at least 16 *productive* hours per week on this course over the semester. This number may be higher or lower depending on your level of comfort with prerequisite content. Most weeks, 3.5 hours will be instructional time in the classroom, and the remaining time will involve out of class work. The credits are classified as Engineering hours for ABET. This course is required for students in the Aerospace Engineering program.

Let Dr. Barrett know what name you prefer him to call you, how to pronounce it and if you are comfortable, what pronouns you prefer. Dr. Barrett will make every effort (and practice) to get the pronunciation of your name absolutely right. Let Dr. Barrett know, privately or through proper KU channels if you need accommodation of any kind.

Course Materials:

Fleeman, E. L., "Missile Design and System Engineering," 2022.

<https://arc.aiaa.org/doi/book/10.2514/4.869082>

or

J. G. Leishman, "Principles of Helicopter Aerodynamics," Second Edition, New York, NY: Cambridge University Press, 2005.

<https://www.cambridge.org/us/universitypress/subjects/engineering/aerospace-engineering/principles-helicopter-aerodynamics-2nd-edition-1?format=HB&isbn=9781107013353>

or

Roskam, J., "Airplane Design Parts I - VIII," published by DAR Corporation, Lawrence, Kansas 2005. https://shop.darcorp.com/index.php?route=product/product&path=85_60&product_id=59

Course Description

The purpose of this course is to provide aerospace engineering students with an opportunity to gain more in-depth high speed airplane and missile design education through team design work. This team design work will involve detailed design efforts in such areas as: landing gear design, systems design, propulsion system integration, structures design, and aerodynamic design. Prerequisite: AE 421, AE 508, AE 545, AE 551 and AE 572. Corequisite: AE 521 or permission of instructor.

Course Objectives:

This course is dedicated to facilitating the high speed aircraft and missile design learning process through the *practice* of endoatmospheric design. Accordingly, students will be asked to apply the lessons learned in AE 521 to complete and ultimately optimize their designs for a given set of variables. Widely differing design tasks will be assigned depending on the year and topics under study by the AIAA Missile Design Technical Committee. An ancillary objective of the course is to help prepare students for international competition in multiple international aircraft design competitions including the annual AIAA Graduate Missile Design Competition. Towards that end, they will learn to work as a team, make decisions based not only on economics and utility but ethics as well and ultimately support entry into the competition in the Spring and/or the follow-on course, AE 722 Aircraft Design Laboratory II. Fall graduates can compete in the Spring AIAA Graduate Missile or Graduate Aircraft design competitions the following May.

ABET Learning Outcomes:

Criterion 2 Student Outcomes

- i. Demonstrate an ability to an ability to apply Class I engineering design methods 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
- ii. Demonstrate an understanding of the historical trajectory of engineering design methods that produced solutions that met or did not meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

Criterion 3 Student Outcomes

- i. Demonstrate an ability to communicate effectively with a range of audiences via written reports
- ii. Demonstrate an ability to communicate effectively with a range of audiences via written live oral presentations and recorded virtual presentations

Criterion 5 Student Outcomes

- i. Demonstrate an ability to work in person as a member of a team of individuals whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- ii. Demonstrate an ability to work virtually as a member of a team of individuals whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Course Assignment, Requirements and Evaluation:

The course will be taught mostly in person with live lectures. Special circumstances may require the course be temporarily taught virtually (as during inclement weather or other emergencies). Notice will be given to students as quickly as possible during such occurrences. There will also be labwork wherein student teams will be expected to render their designs in a mock-up form for presentation at the NDIA Air Armament Symposium. Such lab days and times will be determined as appropriate during the semester. Physical attendance is not required.

Report 1 Chosen System (Individual)	50
Report 2 Chosen System Benchmarking (Team)	50
Report 3 Chosen System Benchmarking (Team)	50
Report 4 Chosen System Aerodynamic Properties (Team)	50
Report 5 Chosen System Aerodynamic Properties (Team)	50
Report 6 Chosen System Reverse & Proverse Engineering (Team)	50
Report 7 Armament Museum & NDIA Symposium Presentations (Team)	100
Report 8 Refined System Powerplant Design (Team)	100
Report 9 Refined System Assembly Design (Team)	100
Report 10 Survey Report or Field Trip Report (Individual)	100
Quizzes or Accommodation Quizzes	100
Fabricated System Models (Team)	100
Peer Grade	100
Total:	1000

Quizzes

Each Friday, in-class quizzes will be administered for students without accommodations. Students with an accommodation may choose to take an Accommodation Quiz in place of a normal quiz.

Reports

Reports are due on Mondays by 8pm Central Time and turned in to:

kuaerodesign@gmail.com

Reports must be named as follows:

AE721_Report#_Teamname.doc *example: AE721_Report1_Zappers.doc*
AE721_Report#_Teamname.pdf *example: AE721_Report1_Zappers.pdf*
AE721_Report#_Individual's Last Name.doc *example: AE721_Report1_Barrett.doc*
AE721_Report#_Individual's Last Name.pdf *example: AE721_Report1_Barrett.pdf*

Students must submit their original .doc file (or file from the package that generated the document) along with a .pdf version of the report. The .pdf documents will be graded in detail. The .doc files will be used for plagiarism checking:

Submitted Report File Sizes

Each report must be under 10MB in file size. For each 100k of extra file size beyond the limits above, a penalty of 1% of the report value will be assessed. The limit of this penalty shall be 40% of the report value. The size of the file received by the GTA and Dr. Barrett shall be the size of the file used for this assessment, NOT the size of the file sent. So check your file size by performing a test send to yourself.

Each report must meet the minimum standards of professionalism. Unprofessional reports will be severely downgraded even if the technical contents are correct. Follow AE 521 Guidelines for guidance.

Have a second pair of eyes go over your reports. Asking a classmate who is technically skilled is a good choice as they can catch many technical things. Asking someone outside of engineering to do this is also good as well as they can catch spelling, diction & grammar errors.

You will have multiple opportunities to provide feedback on your experience in this course. Suggestions and constructive criticism are encouraged throughout the course and may be particularly valuable early in the semester. To that end, I will use mid-semester surveys and/or reflection assignments to gather input on what is working well and what could be improved. You will also be asked to complete an end-of-semester, online Student Survey of Teaching, which could inform modifications to this course (and other courses that I teach) in the future.

Grading:

Students' numerical course grades are the sum of various scores. The course grades will be determined from the following scale, using fractional grading (+/- letter grades):

Point Score:	950	900	850	800	750	700	650	<600
Course Grade:	A	A- B+	B	B- C+	C	C- D+	D	D- F

Late Penalties:

A student who submits an assignment after the due date and time must have a valid excuse (medical/emergency) to receive full credit. If no valid excuse is given, the following penalties will be applied:

Late from 0 to 10 minutes: no points deducted

Late 10 minutes to 60 minutes: 1% of assignment per minute

Late from 1 hour to 24 hours: 50%

Late 24 hours to the end of the semester: 100%

Note that the time stamp on the University of Kansas and other computer systems shall count as demonstration of the day and time when submission was made. Take note that many computer and e-mail systems tend to choke at due dates and times. Accordingly, procrastination is not advisable as no allowance will be made for "slow" e-mail systems/servers/computers.

Student Survey of Teaching

At the conclusion of this course, the University will provide an opportunity for you to provide feedback via an anonymous student survey of teaching. I strongly encourage you to take advantage of this opportunity to provide feedback. More generally, please feel free to tell me what is working well, and what is not working as well during the semester. Thanks!

Attendance Policy

Quizzes and tests may not be made up unless prearranged with the instructor or the student has a [University Excused Absence](#) (see linked policy) and/or an accommodation.

Other Policies

Homework is usually due at the beginning of the class period one week after assigned. Late homework will not be accepted unless approved by the instructor or GTA *prior to* the homework due date. Late exams and projects are not accepted without prior approval of the instructor.

Academic integrity is an absolute requirement for enabling an honest assessment of each student's individual readiness for continued professional development up to and including professional practice in structural analysis. Ours is a profession wherein we quite literally hold the lives of the general public in our hands, and thus we must hold high standards for personal accountability. Each of you is expected to independently contribute to all homework and projects, and to work completely independently on exams. No student may share or discuss any information related to course exams with anyone (person or computer) other than the instructor or GTAs until after the exam grades have been published. ***The use of resources including, but not limited to using solutions manuals, Google, Chegg, ChatGPT, Siri, Alexa, roommates, friends, family, etc on work being submitted as your original work, constitutes academic misconduct and will be punished.***

Pursuant to the University of Kansas' [Policy on Commercial Note-Taking Ventures](#), commercial note-taking is not permitted in AE508. Lecture notes and course materials may be taken for personal use, for the purpose of mastering the course material, and may not be sold to any person or entity in any form. In addition, video or audio recording of course and lecture content is also not permitted in AE508. It is important that we develop our professional skills in hearing the requirements of a customer and reacting to those changing requirements. Any student engaged in

or contributing to the commercial exchange of notes or course materials will be subject to discipline, including academic misconduct charges, in accordance with University policy. **Please note:** note-taking provided by a student volunteer for a student with a disability, as a reasonable accommodation under the ADA, is **not the same** as commercial note-taking and is **not** covered under this policy.

Civility and respect for the opinions of others are critical in an academic environment and in professional practice. It is likely you may not agree with everything that is said or discussed in the classroom, or with the contributions of your peers (particularly as deadlines approach in difficult projects). Courteous behavior and responses are expected at all times. When you disagree with someone, be sure that you make a distinction between criticizing an idea or recommended approach and criticizing the person. Expressions or actions that disparage a person's race, ethnicity, nationality, culture, gender, gender identity / expression, religion, sexual orientation, age, disability, or marital, parental, or veteran status are contrary to the mission of this course, this Department and this University, and will not be tolerated.

Academic Success

We want you to succeed and thrive at KU! Additional resources that may be of help to you can be found here: [KU Academic Success Student Resources](#). This website provides links to KU Policies and Resources pertaining to academic misconduct, grading policies, harassment and discrimination, diversity and inclusion, mandatory reporting, equal opportunity and affirmative action, and student rights and responsibilities. Please visit the site to familiarize yourself with these policies and resources. If you have questions or concerns about any of these policies, statements, or resources, please let me know, or contact Student Affairs directly.

AE 521/721 Schedule Fall 2024

Wk	Mon.	Tues.	Wed.	Thurs.	Fri.
	26-Aug	27-Aug	28-Aug	29-Aug	30-Aug
1	AE721-1 1st day of classes	AE521-1/2 AE521 Quiz 1	AE721-2	AE521-3/4 AE521 Quiz 2	AE721-3/4 AE721 Quiz 1
	2-Sep	3-Sep	4-Sep	5-Sep	6-Sep
2	Labor Day No classes	AE521-5/6 AE521 Quiz 3	AE721-5	AE521-7/8 AE521 Quiz 4	AE721-6/7 AE721 Quiz 2
	9-Sep	10-Sep	11-Sep	12-Sep	13-Sep
3	AE721-8 AE721 Homework 1 due	AE521-9/10 AE521 Quiz 5	AE721-9	AE521-11/12 AE521 Quiz 6	AE721-10/11 AE721 Quiz 3
	16-Sep	17-Sep	18-Sep	19-Sep	20-Sep
4	AE721-12 AE721 Homework 2 due	AE521-13/14 AE521 Quiz 7	AE721-13	AE521-15/16 AE521 Quiz 8	AE721-14/15 AE721 Quiz 4
	23-Sep	24-Sep	25-Sep	26-Sep	27-Sep
5	AE721-16 AE721 Homework 3 due	AE521-17/18 AE521 Quiz 9	AE721-17 Team Formation	AE521-19/20 AE521 Quiz 10	AE721-18/19 AE721 Quiz 5
	Dr.B. @ NDIA FFC	Dr.B. @ NDIA FFC	Dr.B. @ NDIA FFC	Dr.B. @ NDIA FFC	Dr.B. @ NDIA FFC
	30-Sep	1-Oct	2-Oct	3-Oct	4-Oct
6	AE721-20 AE721 Homework 4 due	AE521-21/22 AE521 Quiz 11	AE721-21	AE521-23/24 AE521 Quiz 12	AE721-22/23 AE721 Quiz 6
	7-Oct	8-Oct	9-Oct	10-Oct	11-Oct
7	AE721-24 AE721 Homework 5 due	AE521-25/26 AE521 Quiz 13	AE721-25	AE521-27/28 AE521 Quiz 14	AE721-26/27 AE721 Quiz 7
	14-Oct	15-Oct	16-Oct	17-Oct	18-Oct
8	Fall Break	Fall Break	AE721-28	AE521-29/30	AE721-29/30 AE721 Quiz 8
	21-Oct	22-Oct	23-Oct	24-Oct	25-Oct
9	AE721-31 AE721 Fleeman Exam	AE521-31/32 AE521 Report 1	AE721-32	AE521-33/34 AE521 Report 2	AE721-33/34 AE721 Quiz 9
	28-Oct	29-Oct	30-Oct	31-Oct	1-Nov
10	AE721-35 AE721 Homework 6 due	AE521-35/36 AE521 Report 3	AE721-36	AE521-37/38	AE721-37/38 AE721 Quiz 10
	4-Nov	5-Nov	6-Nov	7-Nov	8-Nov
11	AE721-39 AE721 Homework 8 due	AE521-39/40 AE521 Report 5	AE721-40	AE521-41/42	AE721-41/42 AE721 Quiz 11
	11-Nov	12-Nov	13-Nov	14-Nov	15-Nov
12	AE721-43 AE721 Homework 7 due	AE521-43/44 AE521 Report 4	AE721-44	AE521-45/46	Depart for AAS
	18-Nov	19-Nov	20-Nov	21-Nov	22-Nov
13	AAS setup	AE521-47/48 AAS Display	AAS Display	AE521-49/50 AA Museum	Return from AAS
	25-Nov	26-Nov	27-Nov	28-Nov	29-Nov
14	AE721-45 AE721 Homework 9 due	AE521-51/52 AE521 Report 6	Thanksgiving Break	Thanksgiving Break	Thanksgiving Break
	2-Dec	3-Dec	4-Dec	5-Dec	6-Dec
15	AE721-46 AE721 Homework 10 due	AE521-53/54 AE521 Report 7	AE721-47	AE521-55/56	AE721-48/49 AE721 Quiz 12
	9-Dec	10-Dec	11-Dec	12-Dec	13-Dec
16	AE721-50 AE721 Homework 11 due	AE521-57/58	AE721-51 AE721 Quiz 13	AE521-59/60 AE521 Report 8	Stop Day
	16-Dec	17-Dec	18-Dec	19-Dec	20-Dec
17	Finals	Finals	Finals	Finals	AE721 Team Report AE521 Final Report Finals