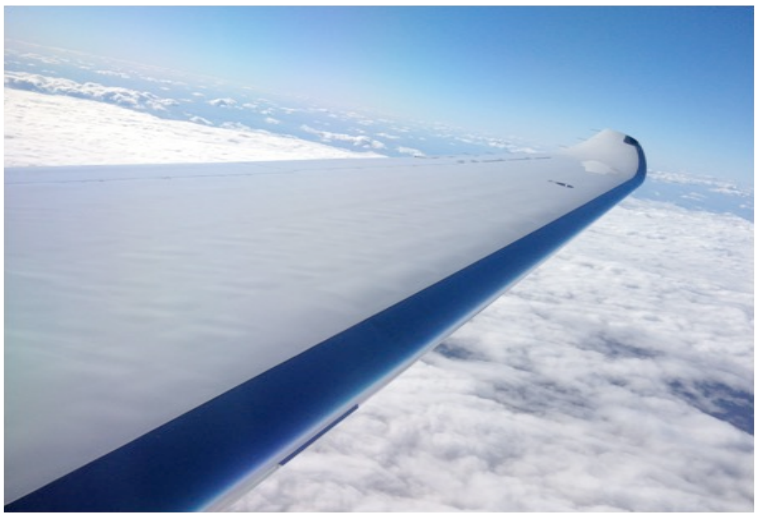
San José State University
Aerospace Engineering
AE 171 B – Aircraft Design II – Spring 2018



Course and Contact Information

Instructor:	Gonzalo Mendoza
Office Location:	Engr.272
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Office Hours:	WF 16:00-18:00 or by arrangement (phone), F 13:00-14:45 (on days we meet in person)
Class Days/Time:	F9:00-11:45 (on days we meet in person), F 9:30-10:45 (online)
Classroom:	Eng.164
Prerequisites:	Grade "C-" or better in: AE164, AE168, AE171A, Engr195A Senior in "Good Academic Standing" Co-requisite: Engr195B
GE/SJSU Studies Category:	V-LO1 through LO3 (in conjunction with Engr195B)
Credit:	3 units

Course Format

Technology Intensive, Hybrid, and Online Courses

AE171B is a hybrid online / traditional course. The students must obtain access to a computer and internet connection. Online lectures will be performed via WebEx, and assignments will be collected via Canvas. The Canvas site will also serve as the platform for graded online discussions and Team messaging.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the Canvas Leaning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking with the messaging system through MySJSU at http://my.sjsu.edu (or other communication system as indicated by the instructor) to learn of any updates. Regular announcements will be sent via Canvas. Please ensure you have set up your account to receive notifications via email or to check the Canvas site daily.

Course Description

This is the second course in a two-semester sequence in which students work in teams to design an airplane.

More specifically, students complete the conceptual and preliminary design of an airplane. This includes mission specification, figures of merit, weight sizing, performance constraint analysis, configuration design, fuselage design, wing and high-lift system design, empennage design, landing gear design, weight and balance analysis, stability and control analysis, drag polar estimation, and resizing, as needed. Students are encouraged to participate in professional society design / build / fly competitions.

Furthermore, students integrate general education (GE) student learning outcomes into their design project. Students are challenged to think about and discuss in class as well as in their reports, the relationship of aerospace engineering to the broader community both in the U.S. and worldwide. These discussions include ethics, safety and liability issues, as well as issues of identity, equality, social actions, and culture in relationship to aerospace engineering practice.

Course Goals

1. To provide senior engineering students a capstone experience in airplane design.
2. To offer an opportunity for going beyond a paper product (design report) into actual manufacturing and flight-testing of model airplanes.
3. To develop students' creative abilities in solving open-ended, airplane design problems.
4. To develop an appreciation of the interrelationships between aerodynamics, propulsion, structures, flight mechanics, stability & control, manufacturing, maintenance, and cost in an integrated airplane design.
5. To develop students' engineering judgment as well as their confidence in making and accepting responsibility for design decisions.
6. To develop students' oral and written communication skills, necessary to describe the assumptions, methods, and results of engineering analysis, synthesis, and decision making associated with airplane design.
7. To make students aware of the importance of teamwork in the design of an airplane and provide them with an opportunity to develop team and leadership skills.
8. To make students aware of their professional and ethical responsibilities as practicing engineers.
9. Discuss the role of culture, civilization, and global understanding in aerospace engineering practice. (Integration of Area V and Engineering.)

GE Learning Outcomes (GELO)

Upon successful completion of this course, students will be able to:

V-LO1: *Compare systematically the ideas, values, images, cultural artifacts, economic structures, technological developments, and / or attitudes of people from more than one culture outside the U.S.*
ABET Outcome G: *Broad education to understand current events, how they relate to aerospace engineering, as well as the impact of engineering solutions in a global and societal context.*
ABET Outcome H: *Recognition of the need for, and ability to engage in life-long learning.*

- Engr195B – Essay 3 (1,000 words): Write an essay that compares the ideas, values, attitudes, and technological developments of people from at least two different countries outside the US. Focus your essay on technological developments relating to aerospace engineering. One of the countries in your essay must be from your article.
- ***AE171B – Reflection Paper 1 (500 – 750 words): Assume that your airplane will go into production. Using the studies provided in Engr195A&B as a background, write about how you will take into account at least two aspects (e.g. ideas, values, images, cultural artifacts, economic structures, or technological developments) while evaluating your decision to manufacture your airplane in two other countries.***

V-LO2: *Identify the historical context of ideas and cultural traditions outside the U.S. and how they have influenced American culture.*
ABET Outcome G: *Broad education to understand current events, how they relate to aerospace engineering, as well as the impact of engineering solutions in a global and societal context.*
ABET Outcome H: *Recognition of the need for, and ability to engage in life-long learning.*

- Engr195B – Essay 1 (500 words): Choose one of the following technological developments that were discussed in the web tutorial: the mechanical clock, gunpowder, the Great or Jersey wheel, printing, or the compass. Write an essay that addresses the following topics. When you respond to these topics, you should be specific and cite specific details either from the web tutorial or your own research. You should cite specific events and/or cultures as you answer these questions.
    - Discuss the history of the technology from its early beginnings to the Renaissance. Please discuss at least three different events in the history of the mechanical clock.
    - Describe one force (e.g., historical, cultural, social, economic, political) that affected the development of the technology?
    - How did the development and use of the technology affect Europe in the Middle Ages?
    - Overall, how did the technology affect the United States?
- ***AE171B – Reflection Paper 2 (250 – 500 words). Consider an aerospace engineering technology invented outside of the U.S. (a) Describe the cultural and social factors that led to the invention of this technology. (b) Describe how this invention has evolved and influenced the culture in the U.S.***

V-LO3: *Explain how a culture outside the U.S. has changed in response to internal and external pressures.*
ABET Outcome G: *Broad education to understand current events, how they relate to aerospace engineering, as well as the impact of engineering solutions in a global and societal context.*
ABET Outcome H: *Recognition of the need for, and ability to engage in life-long learning.*

- Engr195B – Essay 2 (1,000 words): Imagine you are part of a group of engineers to Guatemala at the request of Habitat for Humanity. You have been hired to come up with a plan that will alleviate or at least mitigate the effects of Hurricane Stan on the Mayan communities in the Highlands. When thinking

about your plan, you must consider all angles of the problem (for example, language barriers, culture, disease, landforms, seasonal weather, transportation, building materials, distrust and fear, etc.) .

- ***AE171B – Reflection Paper 3 (250 – 500 words): Using the social and cultural processes introduced in Engr195A&B, describe how non-US farmers have responded to the pressure from US farmers' enhanced ability in growing food using advances in aerospace engineering technology (UAVs, GPS).***
- ***AE171B – Reflection Paper 4 (500 – 750 words): Assume your airplane will go into production in the US. Describe how your product will put pressure on a culture outside the US. (choose a specific country.) Use the social and cultural processes introduced in Engr195A&B to guide your answer.***

Course Learning Outcomes (CLO)

ABET Outcome C: Ability to perform conceptual and preliminary design of aircraft or spacecraft to meet a set of mission requirements within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

1. Procure, fabricate, and assemble the various parts of their airplane (UAV).
2. Evaluate their design through flight-testing and identify any modifications / improvements needed to meet the mission requirements.
3. Evaluate and describe accurately the environmental impact of their airplane.
4. Evaluate and describe accurately any health / safety issues related to their airplane.

ABET Outcome D: Ability to collaborate with people from different cultures, abilities, backgrounds, and disciplines to complete aerospace engineering projects.

5. Work harmoniously and effectively in a team to solve engineering problems related to the design of an airplane and to communicate the results in technical reports and oral briefings.
6. Communicate effectively in a team environment, negotiate and resolve conflicts, motivate and coach others in your team, organize and delegate work as needed, develop a team vision and set team goals, and manage resources.
7. Evaluate your own performance as well as that of your teammates using specific criteria, such as the quality of their work, their commitment to the team / project, leadership skills, responsibility, abilities, communication skills, and personality.

Project Management
8. Develop a milestone schedule (timeline) for an engineering project and follow it.

ABET Outcome F: Understanding of professional and ethical responsibility.

9. Identify possible courses of action, discuss the pros and cons of each one, and decide on the best one, given a job-related scenario that requires a decision with ethical implications.

ABET Outcome E: Ability to communicate effectively through technical reports, memos, and oral presentations as well as in small group settings.

10. Write high quality design reports (i.e., using correct language and terminology, correct technical information, and professionally prepared graphs and tables).
11. Give clear, informative, technically correct oral presentations using professionally prepared visual aids.

ABET Outcome G: Broad education to understand current events, how they relate to aerospace engineering, as well as the impact of engineering solutions in a global and societal context.

ABET Outcome H: Recognition of the need for, and ability to engage in life-long learning.

12. Describe regional, national or global contemporary problems related to aircraft design (ex. transportation, environmental and safety issues, energy conservation, etc.) and identify possible solutions as well as any limitations of these solutions.

COURSE RELATIONSHIP TO BSAE PROGRAM OUTCOMES

	A	B	C	D	E	F	G	H	I
Learning Objectives									
1 – 4			C				C	C	C
5 – 8				C				C	
9						C		C	
10 – 11					C				
12, V – LO1, V – LO2, V – LO3					C		C	C	

NB: The letters inside the table indicate the highest level of skill achieved by the LOs on the left hand side. C refers to levels 5 or 6 in Bloom's Taxonomy.

Required Texts/Readings

Textbook

Daniel P. Raymer, Aircraft Design: A Conceptual Approach. AIAA Education Series.
ISBN 0-930403-51-7

Other Readings

Barnes W. McCormick, Aerodynamics, Aeronautics, and Flight Mechanics. John Wiley & Sons.
ISBN 0-471-03032-5

John D. Anderson, Fundamentals of Aerodynamics. McGraw-Hill.
ISBN 0-07-001679-8

Jan Roskam, Airplane Flight Dynamics and Automatic Flight Controls. DARCorp.
ISBN 1884885179

Jan Roskam, Airplane Design Series. DARCorp.
ISBN 1884885241

Links and fair use texts provided throughout the course as needed.

Other technology requirements / equipment / material

Students must procure access to Matlab (aerospace toolbox), CAD software, MS Excel, and programming tools. This course involves manufacturing of small scale aircraft and/or aircraft components for testing.

Course Requirements and Assignments

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the instructor's web page. You are responsible for regularly checking with the messaging system through MySJSU (or other communication system as indicated by the instructor) to learn of any updates.

Teamwork

- You are required to work in teams for a number of assignments. Please make yourself available to meet and work with your teammates outside of class.
- Instructor has final say in the formation of all teams. The instructor may form the teams.
- At the end of each marked project or team assignment **(see list of assignments below marked with an asterisk)**, each team must submit along with their report each member's peer evaluation of the other members in a separate, sealed envelope. All peer evaluation forms must be included in the team report. If you disagree with the scores you receive from your peers, you may provide an explanation to your instructor in writing and request an individual exam on the assignment. To get full credit on a team assignment, your teammates must give you at least 85% in all areas of peer review (see team member report card). Otherwise, your score for this assignment will be your team's score multiplied by the average peer review score.
- If your name appears on a team paper, you are expected to be able to explain whatever answer / solution / derivation is on the paper. Failure to explain the team's answer by any individual is considered a violation of academic integrity (see Univeristy Policies) and will result in a grade of zero.
- Senior Design Teams must develop and oversee a project for AE20/30 students to complete over the course of the semester. At a minimum, a statement of work, rolling action item list, and overall project schedule must be prepared and reviewed over mandatory weekly meetings with participation of all Team members. The Senior Design Team would then evaluate the contributions of their assigned support Team. Members of the support Teams, to be formed with the assistance of AE 20/30 Instructors, will complete their projects as part of their coursework and will provide feedback for the evaluation of the Senior Team's performance.

Reports and Papers:

Students are expected to submit reports on time following the rubrics provided in the Canvas site. Reports with extensive grammar, spelling, and/or formatting problems will be returned without a grade. The student or students is/are responsible for resubmitting an acceptable report to receive a grade. The report will be considered submitted late and assessed as per the guidelines included in the "Grading Information" section below.

Assignment List:

Team Assignments:	
Initial Test Article Evaluation*	8
Draft Design Report*	10
Final Design Report*	10
Final Test Article Delivery*	10
Support Team Management Tasks	10
Team Presentations:	
Final Design Review	5
Individual Assignments:	
Exam	18
Ethics Paper	5
Participation in Online Discussions	8
Reflection #1 V-L01**	4
Reflection #2 V-L02**	4
Reflection #3 V-L03**	4
Reflection #4 V-L03**	4

***Indicates peer evaluations required**
****Must obtain 70% to approve course**

Final Examination or Evaluation

A final design review (FDR) will take place at the end of the semester. In this review, each Team will be expected to present their completion status and defend the features of their design. The FDR will take place on

May 11, 2018, unless otherwise arranged with fair notice. The grading rubric for the FDR is posted on the class Canvas site.

A single individual comprehensive exam covering configuration design, sizing, and flight mechanics concepts will take place on April 13, 2017.

Grading Information

Team reports and design reviews will be receive a common base grade for all participants. This grade may be multiplied by a factor based on peer evaluations as noted in the "Teamwork" section above. Failure to submit a "peer evaluation" on the day the associated assignment is due **will result on a default score of 40% for the student and 100% for all peers.**

Penalties for late submissions:
1 day – 20%
2 days – 25%
3 or more days – 50%

Determination of Grades

Grade	Minimum Score
A+	95
A	90
A-	85
B+	80
B	76
B-	72
C+	68
C	65
C-	62
F	61 or lower

Grading Information for GE

A minimum grade of 70% must be attained for GE V-LO1 through LO3 assignments (Reflections 1 through 4).

Passage of the Writing Skills Test (WST) or ENGL/LLD 100A with a C or better (C- not accepted), and completion of Core General Education are prerequisite to all SJSU Studies courses. A minimum aggregate GPA of 2.0 in GE Areas R, S, & V shall be required of all students.

Classroom Protocol

Timeliness: Instructor will close the classroom door during class time. Late arrivals are advised to stay outside until first break. Late arrival during design review or exams is considered a no show.

Presentations: Students are expected to remain in class during all design reviews. A student late on arrival or early in departure will be penalized with 20% of the review grade.

Electronics Etiquette: No electronic devices are allowed unless required as part of an assignment or discussion.

Attendance will not be taken during class. Students that miss a class are still responsible for any material discussed or assignments given during that class. All students are expected to participate in class discussions and problem solving. Students who are often absent will find themselves at a disadvantage during discussions and tests.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/

AE-171B Aircraft Design, Spring 2018

List the agenda for the semester including when and where the final exam will be held. Schedule may be modified with fair notice. Changes in the schedule will be posted in the Canvas site.

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/26*	Review of progress over the break. Review class plan. Landing gear design.
2	2/2	Lateral Directional Stability and Control. Project Discussion.
3	2/9*	Lateral Directional Stability and Control (Continued)
4	2/16	Ethics Topics. **Draft Design Report due**
5	2/23	**Reflection 1 due. Ethics paper due.**
	3/1	**Design Report due for SAE Aero Design 11:59pm EST**
6	3/2-3/3*	**Ethics Discussion.** Wind tunnel testing. **Initial test article evaluation (SCCMAS Field)****
7	3/9	Outsourcing discussion: Societal Impact. Aircraft Design Topics
8	3/16	Systems Safety
9	3/23	**Reflection 2 due.** Aircraft Design Topics
	3/30	Cesar Chavez Day. Spring Break. No Class
10	4/6*	**SAE Aero Design West Flyoff, Apollo 11 Field, Encino, CA.** **SAE Teams receive "Draft Design Report" grade from SAE officials**
11	4/13	**Reflection 3 due. Exam**
12	4/20	Aircraft Design Topics: Early Service Issues / Fighter Jet Design Evolution.
13	4/27	Structural Design and Construction **Final Design Report Due**
15	5/4	**Reflection 4 due**
16	5/11-5/12*	**Final Design Review** **Final test article evaluation (SCCMAS Field)****

*In class lecture in E-164.
**Test article evaluation scheduled for Saturdays 3/10 and 5/12. Should weather forecast indicate unsuitable conditions, the evaluation days will be moved to Friday 3/9 or 5/11, respectively, for the initial and final demonstrations. Students are expected to show up promptly at 9:00am for the test article evaluations and participate until field closure (sundown, with reasonable breaks) or until all demonstration requirements are met, whichever occurs first.