

AME 481
Department of Aerospace and Mechanical Engineering
University of Southern California

Course Syllabus

Spring 2020 (2/16/2020)

AME 481 Aircraft Design

Units: 4

Instructor: Marty K. Bradley, Ph.D
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Instructor: David S. Lazzara, Ph.D
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Lecture Room: WPH 106
Lecture Time: Mondays 3:30pm–6:10pm

Lab Room: SAL 127
Lab Time: Wednesdays 5:00pm–8:00pm

Course Description

This course provides a comprehensive overview of principles and analysis related to aircraft design. Various topics are presented to summarize an organized approach to aircraft design problems with a multidisciplinary emphasis. Lectures provide a summary of design principles, aircraft components, specifications, design best-practices, conventional and unconventional vehicles, and information on quantifying aircraft performance at the system and sub-system level. Lab sections will provide practical implementation of lecture material, including in-depth instruction on exercising various analysis and design tools for aerodynamics, structures, configuration layout, CAD and many other topics. Both lectures and labs will enable students to analyze and design existing or new aircraft configurations via a variety of weekly homework assignments and a design project presented at the end of the semester.

Assignments

Homework assignments will be assigned most weeks throughout the semester in lecture and will be due by the start of lab the following week. Lab assignments will be assigned in most labs and will either be due at the end of the lab section or before the start of the next lab

section. Assignments should be submitted electronically in PDF format via the Blackboard class website.

The homework, lab and project assignments are designed for students to practice and demonstrate important skills pertaining to aircraft design. Students will be expected to apply the resources and material taught in lecture, lab and prior engineering course-work when completing assignments for this course.

Most homework assignments are related to the aircraft design project by working you through the process you will need to follow to complete a task in the project. Some homework assignments will not be directly related to the aircraft design project, but nevertheless will provide practice and demonstrate other important skills or information. For the student's convenience, some lectures, labs, and homework material may reference the sections of the project they support.

An aircraft design project will be assigned early in the semester. Students will submit their own formal project report at the end of the semester as well as a group presentation. These will also be submitted electronically in PDF format to the Blackboard website. See the project definition document for further information.

Course Grading

The grading scale for AME 481 is summarized as follows:

Assignment	Weighting
Total Homework	35%
Total Lab Assignments	10%
Network Study Results Presentation	5%
PDR Presentation	5%
Final Project Report	35%
Final Presentation	10%
Total	100%

Each homework assignment is weighted equally in the final grade. Late assignments will not be accepted, except for verified medical reasons.

Grade Definitions

The USC Office of Academic Records and Registrar provides the following grade definitions used in this course (see Grading and Correction of Grades Handbook):

Grade	Definition
A	Work of excellent quality
B	Work of good quality
C	Work of fair quality
D minus	Work of minimal passing quality
F	Work that does not meet minimal standards for passing the course

Course Schedule

Week	Date	Lecture	Material	Homework
1	Jan. 13	1	Course Introduction, Design Principles, Aircraft Survey & Anatomy Project Description	1
2	Jan. 20	–	No Class	
3	Jan. 27	2	Mass Properties & Economics	2
4	Feb. 3	3	Propulsion	3
5	Feb. 10	4	Aerodynamic Performance	4
6	Feb. 17	–	No Class	
7	Feb. 24	5	Configuration Layout, Interiors, Fuselage, Cockpit, & Landing Gear Design	5
8	Mar. 2	6	High-Speed Aerodynamics	6
9	Mar. 9	7	Group Presentations: Network Analysis, High Speed Aero: Drag	
10	Mar. 16	–	Spring Break	
11	Mar. 23	8	High-Lift Aerodynamics Mission Performance	–
12	Mar. 30	9	Stability & Control	–
13	Apr. 6	10	Design Optimization & Trade Studies	–
14	Apr. 13	11	Systems, Safety, Fuels, Environment, Emissions, and Acoustics	–
15	Apr. 20	12	Electric Aircraft Design	–
16	Apr. 27	13	Project Question Session	–
17	May 8	14	Project Reporting (2pm-4:30pm)	

Week	Date	Lab	Material
1	Jan. 15	1	Mission Sizer
2	Jan. 22	2	Aircraft Operations
3	Jan. 29	3	Fuselage Design
4	Feb. 5	4	Propulsion Sizing
5	Feb. 12	5	Aerodynamic Performance
6	Feb. 19	6	Network Analysis and Optimization
7	Feb. 26	7	Configuration Design
8	Mar. 4	8	Project Phase B Start and Structures
9	Mar. 11	9	Finite Element Modeling
10	Mar. 18	–	Spring Break
11	Mar. 25	10	High-Lift System Design
12	Apr. 1	11	Stability & Control
13	Apr. 8	12	Preliminary Design Review (PDR) Group Presentations
14	Apr. 15	13	Unique Trade Studies
15	Apr. 22	14	TBD
16	Apr. 29	15	Final Project Question Session

* Lab Assignments will be complete during lab

Week	Date	Time	Deliverable
9	Mar. 9	3:00 PM	Network Study Group Presentation Slides
13	Apr. 8	4:30 PM	Preliminary Design Review (PDR) Slides
17	May 7	11:59 PM	Individual Project Report Group Presentation Slides

Academic Integrity

Each student is responsible for completing and submitting their own work on assignments. Students are encouraged to discuss the assignments, but must ensure there is no plagiarism involved when creating and submitting their own work. Plagiarized assignments will receive no credit; students will only receive credit for their own work. Before submitting any assignment in AME 481, please ask the instructor to clarify any questions regarding what constitutes plagiarism if ambiguity exists. The following is a non-exhaustive list of examples that will be considered plagiarism:

- Copying codes/scripts programmed by someone else and submitting it without proper reference to the original author.
- Submitting copies of another student's completed assignment, in whole or in part, as one's own.

- Submitting plots or images not generated by the student and without proper reference to the original author.
- Submitting tables of text and/or data not generated by the student and without proper reference to the original author.
- Submitting text not generated by the student and without proper reference to the original author.

In order to minimize the likelihood of committing plagiarism, students shall do the following on AME 481 assignments:

- Program their own code and scripts.
- Create their own plots and images; reference the source of images they did not generate themselves.
- Write their own mathematical derivations.
- Write their own text in response to assignment questions.
- Write their own tables of text and/or data.
- Report data and results as generated by the codes/scripts the student programmed themselves.

AME 481 students suspected of plagiarism will be reported to the USC Student Judicial Affairs and Community Standards (SJACS) office for academic integrity violations. The official USC statement on academic integrity is the following (copied verbatim from http://www.usc.edu/schools/GraduateSchool/academic_conduct.html):

Statement on Academic Conduct and Support Systems

Plagiarism - presenting someone else's ideas as your own, either verbatim or recast in your own words - is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, *Behavior Violating University Standards and Appropriate Sanctions*, accessible here: <http://studentaffairs.usc.edu/scampus/>. Other forms of academic dishonesty are equally unacceptable. See the university policies on scientific misconduct: <http://policy.usc.edu/scientific-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* via either of these forms: <http://dps.usc.edu/contact/report/> or <http://web-app.usc.edu/web/dps/silentWitness/>. *The Center for Women and Men* <http://engemannshc.usc.edu/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu/> describes reporting options and other resources.

Help with scholarly writing is provided by a number of USC's schools. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://ali.usc.edu>, which sponsors courses and workshops specifically for international graduate students.

Help arranging accommodation for students with disabilities is provided by the *Office of Disability Services and Programs* <http://dsp.usc.edu>

Emergency information will be posted at <http://emergency.usc.edu>. If an officially declared emergency makes travel to campus infeasible, this website will provide safety and other updates, including ways in which instruction will be continued by means of Blackboard, teleconferencing, and other technology.