THE UNIVERSITY OF TEXAS AT AUSTIN
Department of Aerospace Engineering and Engineering Mechanics

COE 379L Simulation-based Aerodynamic Design and Analysis
FALL 2021

SYLLABUS

Unique Number: 14675

Instructor: Fabrizio Bisetti
ASE 4.206, 512 471 5696, fbisetti@utexas.edu

Time: Tue & Thu 11:00 - 12:30 pm

Location: PMA 5.126 (lectures)
ASE 1.102 (wind tunnel laboratory)

Teaching Assistant: TBD

Web Page: See Canvas

Catalog Description: Current topics in computational engineering. (https://registrar.utexas.edu/catalogs)

Course Objectives: Gain experience with employing computational methods to solve real-world engineering design problems.

Prerequisites: ASE 320 and COE 347 or consent of instructor.

Knowledge, Skills, and Abilities Students Should Have Before Entering This Course: Basic ability to work with command line operating systems, intermediate skills with MATLAB or similar software, basic understanding of engineering fluid mechanics, familiarity with 3D printing, basic experience with laboratory testing.

Knowledge, Skills, and Abilities Students Gain from this Course (Learning Outcomes): Advanced ability to work with command line operating systems, usage of professional computational fluid dynamics (CFD) software, advanced usage of scientific visualization software (e.g. ParaView), advanced skills in remote computing and supercomputer usage for engineering.

Impact on Subsequent Courses in Curriculum: N/A

Relationship of Course to Program Outcomes: This course contributes to the ABET Criterion 3 student outcomes that took effect with the Fall 2019 semester. For more information, see *Criteria for Accrediting Engineering Programs, 2021 – 2022* at https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2021-2022/

STUDENT OUTCOME	
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	√
2. an ability to apply engineering design 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	√

3.	an ability to communicate effectively with a range of audiences	√
4.	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	√
5.	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	√
6.	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	√
7.	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	√

ABET Program Criteria Achieved: Program criteria are unique to each degree program and are to be compiled from the program criteria given for each degree program and listed in table format below. The faculty should check which of the program criteria are achieved in the course.

Criterion		**Criterion**		**Criterion**	
A. Aerodynamics	√	G. Orbital Mechanics		M. Preliminary/Conceptual Design	√
B. Aerospace Materials		H. Space Environment		N. Other Design Content	
C. Structures		I. Attitude Determination and Control		O. Professionalism	√
D. Propulsion		J. Telecommunications		P. Computer Usage	√
E. Flight Mechanics		K. Space Structures			
F. Stability and Control		L. Rocket Propulsion			

Topics: Wind tunnel usage, 3D printing, meshing, OpenFOAM usage, basic concepts in aerodynamics, comparing experiments and simulations, turbulence models, executing parallel simulations, efficient post-processing on remote resources. See detailed schedule for more details.

Professionalism Topics: Students will prepare 2 reports during the class (5 pages each) and 1 final report (10 pages).

Design Assignments: Students will design simple components for 3D printing.

Laboratory Assignments: Students will perform aerodynamic testing of articles in the ASE wind tunnel. Scheduling of access to wind tunnel and test time need to be coordinated with instructor.

Computer: A laptop is required for the class. Since select lectures feature hands-on tutorials, please bring your laptop to class and be ready to use for the entire lecture duration.

Text: N/A

Class Format: The class features a combination of lectures and laboratory activities. Students will be organized in teams only. All lectures will be broadcasted live on Zoom, recorded, and posted.

Class Schedule: See detailed schedule.

Class Outline: See detailed schedule.

Grading: Grading is based on

- 2 fabrications with 3D printers (5% each)

- 5 assignments (55% total)
- 1 final report (35%)

Student's individual grade will be the same as team's grade.

Homework Policy: The class does not feature regular homework. See "Grading" above and detailed schedule for assignments and due dates. All assignments are to be carried out by the team members, although active exchange of ideas with other teams is allowed and encouraged.

Examinations: There are no formal in-class examinations. There is a final project report due and presentation during final's week. See "Grading" above and detailed schedule for assignments and due dates.

Attendance: Regular attendance is expected. Please communicate absences to instructor.

Office Hours: Via Zoom at times TBD & by appointment scheduled via email or Slack.

Important Dates: See official UT calendar for drop dates and detailed schedule for all due dates.

Special Notes: The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TDD or the Cockrell School of Engineering Director of Students with Disabilities at 471-4321.

Evaluation: The Measurement and Evaluation Center forms for the Cockrell School of Engineering will be used during the last week of class to evaluate the course and the instructor. They will be conducted in an electronic format only.

Sharing of Course Materials is Prohibited: No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

FERPA and Class Recordings: Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

Prepared by: Fabrizio Bisetti **Date:** August 19, 2021