ENAE 672 Unsteady and Inviscid Aerodynamics
Fall 2014

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Prerequisites ENAE 414

Office Hours By appointment

Lectures/Discussions EGR 3111, Tuesday and Thursday 2:00 pm to 3:45 pm

Objectives The purpose of this course is to 1) introduce concepts relevant to the flow-physics of unsteady and inviscid flows and 2) evaluate articles in the scientific literature to become aware of modern research questions and methods.

Topics Covered Review of incompressible flow concepts including potential flow, lift and drag, and the Navier-Stokes equations. Vortex-dominated flows and vortex dynamics. Unsteady flows including the unsteady Bernoulli equation, added mass, and indicial flows.

Learning Outcomes After completing this course, students will be able to analyze simple steady and unsteady flows using complex potential and the vortex equations, and be familiar with modern research questions and methods.

Suggested Books Course material will be given in the notes. The following books may also be a useful reference, but are not required:
Kundu and Cohen, *Fluid Mechanics*, Third Edition
Leishman, *Principles of Helicopter Aerodynamics*, Second Edition

Grading Grades will be based on biweekly article critiques (20%), biweekly homework (20%), 2 exams (30%), an article presentation (20%), and class participation (10%). The grading scale is as follows: A 90-100%, B 80-89%, C 70-79%, D 60-69%, F $<$ 60%. The grading scale for homework and article critiques is: A 5, B 4, C 3, D 2, F 1.

Article Critiques Due at the beginning of class on Thursdays. Critiques should be submitted via ELMS by 9:30am on the due date. Late critiques will not be accepted, but the lowest critique grade will be dropped. You are welcome to discuss the weekly article with your colleagues, but your written critique must be your own. Critiques will be graded on a scale of 1-5 based on writing quality, technical understanding of the topic and methods, and the soundness of your arguments. See the attached Journal Club document for further instructions. **Everyone is expected to bring a copy of the article to class.**

Article Presentations Presentations should be 30-40 minutes long, followed by 20-30 minutes of discussion led by the presenter(s). Presentations will be graded based on quality of the presentation (i.e., overall organization, slide quality, speaking ability, etc.) and ability to lead the class in a discussion.

Class Participation Your class participation grade will be based on attendance in lectures and participation in article critique discussions.

Homework Homework is due at the beginning of class on the due date. Late homework will not be accepted without a prior request for extension (no later than 24 hours before the due date). The lowest homework grade will be dropped. You are welcome to work in small groups, but the work you turn in must be your own and your collaborators must be identified. Homework will be graded on a scale of 1-5 and the full solutions posted on ELMS.

Exams Exams will be closed book and notes. They will focus on lecture material in the form of short answers and simple computations. A formula sheet will be provided as needed.

Missed Classes and Exams There will be no make-up quizzes or assignments. Excused absences (as defined by the University of Maryland) will be dealt with on a case-by-case basis.

Honor Code Keep in mind the University Honor Code: http://www.shc.umd.edu. The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism.

Chesapeake Project As a part of the Chesapeake Project, this course aims to bring the concepts of sustainability into the classroom. To this end, the course is largely paperless. Assignments will be distributed electronically and journal article critiques will be submitted electronically via the course website. Concepts of sustainability will be presented throughout the semester via applications of unsteady aerodynamics to wind and tidal turbines.