MECH 812 – VISCOUS FLOW II SPRING 2017

Intructor	Professor Jae Sung Park
	Email: jaesung.park@unl.edu
	Office: 303D Nebraska Hall
	Phone: 402-472-1671
Lectures	Tuesday, Thursday 12:30pm – 1:45pm, W357 NH
Office Hours	Tuesday, $2:00 \text{pm} - 3:30 \text{pm}$
	Wednesday, $10:30$ am – $12:00$ pm (or by appointment)
Course webpage	http://blackboard.unl.edu
Textbook	Fluid Mechanics
	P. K. Kundu, I. M. Cohen & D. R. Dowling (Academic Press, 6th Edition)
Grading	Homework: 25% Literature Review: 15% Midterm/Final Exams: 25/35%
	The worst homework score will be dropped in the course score calculation.
Prerequisites	Fluid Mechanics (MECH 310 or equivalent)
	Undergraduate Mathematics (MATH 208, MATH 221 or equivalent)
	Basic MATLAB or other programming languages

Tentative Course Outline

- Review of MECH 810 including cartesian tensors
- Inviscid flow: Euler equations, general properties of inviscid flows, Bernoulli's integral
- Potential flow: velocity potential, d'Alembert's paradox, lift, drag
- Vortex dynamics: Helmholtz vorticity transport equation, Kelvin's theorem
- Boundary layers: (Prandtl's) boundary layer equations, Blasius solution, Falkner-Skan solutions, von Kármán momentum integral equation
- Turbulence: definition and its nature, basic average methodology, turbulent heat transfer
- Microhydrodynamics (low Reynolds number flows): Stokes equations, properties of Stokes flows, Stokes flow singularities, the reciprocal theorem
- Special topics: complex fluids, water waves, acoustic streaming, ... (if time)

Literature Review

- The literature review is intended to give you the opportunity to explore a fluid mechanics topic of your interest in greater depth than is possible in the course.
- You should submit a one-page (singe-spaced) proposal for the topic of your choice by February 2, 2017. You are encouraged to stop by my office if you have difficulties to find the topic of your choice.
- The review will not exceed 15 pages (double-spaced; including figures and references) and will include an in-depth discussion of at least 3 seminal references on the chosen subject.
- We will meet one-on-one during the semester (probably March) to see your progress. You will also make a presentation to the class summarizing your review at the end of the semester. The written report is due before your presentation.

Course Policies

- Unless otherwise noted, homework is due on the due date by the start of the lecture. Late turn-in of homework is not accepted unless approved by the instructor ahead of time.
- Discussion of the course material and homework with your classmates is strongly encouraged, but submitted homework solutions should represent your individual efforts (copying someone else's solutions or solutions from a book does NOT qualify).
- You are strongly encouraged to ask questions during the lectures and to stop by my office if you have problems, questions, or complaints. Such feedback is important for gaging the pace or level of the course and adjusting its scope.
- If you are unable to attend an exam, you must contact the instructor as soon as possible and prior to the exam date. Make-up examinations will only be given in case of an emergency.
- If a question about the scoring of an exam arises, you should write out a note describing the discrepancy, attach the note to the exam, and resubmit the exam to the instructor for review. This must be done within one week of return of the exam. After one week, exam scores will not be changed.

Services for Students with Disabilities

• Students with disabilities are encouraged to contact me for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodations to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.