



Course Syllabus: Fluid Mechanics - ME 200B

Division	Physical Science and Engineering Division
Course Number	ME 200B
Course Title	Fluid Mechanics
Academic Semester	Spring
Academic Year	2016/2017
Semester Start Date	01/22/2017
Semester End Date	05/18/2017
Class Schedule (Days & Time)	09:00 AM - 10:30 AM Mon Wed

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
William Lafayette Roberts	William.Roberts@kaust.edu.sa	+966128084909		

Teaching Assistant(s)

Name	Email
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Course Information

Comprehensive Course Description	This course will extend and deepen the students fundamental understanding of fluid mechanics. Topics to be covered include boundary layers, low Reynolds number flows, hydrodynamic stability, and turbulence. Emphasis will be given to analytical solutions to classical problems as well as modern topics.
Course Description from Program Guide	Fundamentals of fluid mechanics. Microscopic and macroscopic properties of liquids and gases; the continuum hypothesis; review of thermodynamics; general equations of motion; kinematics; stresses; constitutive relations; vorticity, circulation; Bernoulli's equation; potential flow; thin-airfoil theory; surface gravity waves; buoyancy- driven flows; rotating flows; viscous creeping flow; viscous boundary layers; introduction to stability and turbulence; quasi onedimensional compressible flow; shock waves; unsteady compressible flow; acoustics.
Goals and Objectives	The student will have an understanding of the derivation of the equations governing fluid flow behavior in both low and high Reynolds number regimes. They will be able to predict the stability of fluid flow, and apply boundary layer theory and concepts to solve many practical flow problems.
Required Knowledge	strong fundamental understanding of inviscid, incompressible fluid mechanics and classical thermodynamics.
Reference Texts	The primary text will be 'Fluid Mechanics' 5th edition by Kundu, Cohen, and Dowling. Supplementary material will be provided as necessary.
Method of evaluation	40.00% - Final exam 10.00% - Homework /Assignments 25.00% - Exam 2 25.00% - Exam 1
Nature of the assignments	Assignments will consist of six written homework problem sets
Course Policies	Students are expected to work independently and attend all lectures. In general, late homework will not be accepted and make-up exams will not be given.

Additional Information

In accordance with University policy and professional standards, the highest levels of academic integrity are expected in this class. The code of student conduct is strictly enforced. Academic dishonesty will result in reductions in grades and/or expulsions from this class and/or the University.

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 01/23/2017 Wed 01/25/2017	introduction and review development of BL equations, application to flat plate
2	Mon 01/30/2017 Wed 02/01/2017	Blassius Solution Falkner-Skan Similary solutions
3	Mon 02/06/2017 Wed 02/08/2017	von Karman Momentum Integral Thwaite's method
4	Mon 02/13/2017 Wed 02/15/2017	transition, pressure gradients, separation flow past cylinder
5	Mon 02/20/2017 Wed 02/22/2017	flow at low Re lubrication theory, Hele-Shaw Cell
6	Mon 02/27/2017 Wed 03/01/2017	Ekman Boundary Layers Taylor-Couette Flow
7	Mon 03/06/2017 Wed 03/08/2017	Exam 1 Thermodynamics review
8	Mon 03/13/2017 Wed 03/15/2017	general concepts of hydrodynamic stability Kelvin-Helmholtz instability
9	Mon 03/20/2017 Wed 03/22/2017	Taylor-Couette Instability Capillary instabiility of Jets and Cylinders
10	Mon 03/27/2017 Wed 03/29/2017	Derivation of jet stability equation stability of a periodic array of point vorticies
11	Mon 04/03/2017 Wed 04/05/2017	Review of vorticity Goertler vortices
12	Mon 04/10/2017 Wed 04/12/2017	Stability of Boundary Layers Exam 2
13	Mon 04/17/2017 Wed 04/19/2017	Stastical description of Turbulence Range of scales
14	Mon 04/24/2017 Wed 04/26/2017	Probability Density Functions Turbulent Boundary-Free Shear Flows
15	Mon 05/01/2017 Wed 05/03/2017	Turbulent Scalar Fields Turbulent Boundary Layers
16	Mon 05/08/2017 Wed 05/10/2017	Turbulence modeling Introduction to compressible flows
17	Mon 05/15/2017 Wed 05/17/2017	basic equations of 1-D flow normal shock waves
18		final exam

Note

The instructor reserves the right to make changes to this syllabus as necessary.