جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

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	2018/2019
Semester Start Date	01/27/2019
Semester End Date	05/23/2019
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		Tuesdays and Thursdays from 8:30 to 9:30, or by appointment

Teaching Assistant(s)

Name	Email

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, one-dimensional compressible flow, 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; Bernoullis 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. The student will have an understanding of acoustic and finite wave propagation and shock waves.
Required Knowledge	The student should have a strong fundamental understanding of invisid, incompressible fluid mechanics and classical thermodynamics. The student should also have sufficient mathematical sophistication to solve PDEs numerically and analytically.
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	**25.00**% - Exam 1 **25.00**% - Exam 2 **10.00**% - Homework /Assignments **40.00**% - Final exam
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 Unversity 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 01/28/2019	introduction and review
1	Wed 01/30/2019	boundary layer on a flat plate
2	Mon 02/04/2019	blassius solution
2	Wed 02/06/2019	karman momentum integral
3	Mon 02/11/2019	Falkner-Skan Similarity Solutions
3	Wed 02/13/2019	Non-similar Boundary Layers
4	Mon 02/18/2019	Jets, wakes, and shear layers
4	Wed 02/20/2019	Unsteady boundary layers, separation
5	Mon 02/25/2019	Stokes Flow
5	Wed 02/27/2019	lubrication theory
6	Mon 03/04/2019	exam 1
6	Wed 03/06/2019	thermodynamics review
7	Mon 03/11/2019	wave equation and sound speed
7	Wed 03/13/2019	1D steady flow
8	Mon 03/18/2019	shock waves, normal shocks
8	Wed 03/20/2019	oblique shocks
9	Mon 03/25/2019	Spring Break
9	Wed 03/27/2019	Spring Break
10	Mon 04/01/2019	weak and strong shock approximations
10	Wed 04/03/2019	continuum shock structure
11	Mon 04/08/2019	1D unsteady flow, lec a
11	Wed 04/10/2019	1D unsteady flow, lec b
12	Mon 04/15/2019	Finite amplitude waves
12	Wed 04/17/2019	shock tubes, expansion tubes
13	Mon 04/22/2019	exam 2
13	Wed 04/24/2019	Hydrodynamic stability
14	Mon 04/29/2019	examples of hydrodynamic stability
14	Wed 05/01/2019	intruduction to turbulence
15	Mon 05/06/2019	length and time scales in turbulent flows
15	Wed 05/08/2019	Universal equilibrium theorem
16	Mon 05/13/2019	jet flow scaling
16	Wed 05/15/2019	review
17	Mon 05/20/2019	Final Exam Week
17	Wed 05/22/2019	Final Exam Week

Note

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