Course: ME 50900 – Intermediate Fluid Mechanics

Type of Course: Elective for ME program (Group 1)  
Required for MSE-ME concentration


Credits: 3

Contact Hours: 3

Prerequisite Courses: ME 31800 or CE 31800

Corequisite Courses: None

Prerequisites by Topics: A first course in fluid mechanics or aerodynamics.


Course Objectives: To review fundamental concepts of fluid mechanics thoroughly and extend them in the first part of the course; to introduce advanced topics and solution techniques in the second part. To strengthen and unify the diligent student’s background in fluid mechanics; and to prepare him/her to read the current literature in fluid mechanics and to pursue advanced studies in the subject.

Course Outcomes: Students who successfully complete this course will have demonstrated an ability to:

1. Define and look up fluid properties and other preliminary concepts. (a, e, k)
2. State basic laws for a control volume in different coordinate systems. (a, e, k)
3. Derive the kinematics of fluid flow in problem solving. (a, e, k)
4. Derive the equations for frictionless and incompressible flows. (a, e, k)
5. Derive the basic equations of motion of viscous flows. (a, e, k)
6. Find standard exact solutions of viscous-flow equations and apply them. (a, e, k)
7. Derive and solve some basic equations of boundary-layer theory. (a, e, k)
8. Find lift and drag forces on immersed bodies with simple shapes. (a, e, k)
9. Understand concepts of incompressible turbulent flows and wall turbulence. (a, e, k)
10. Read some published works on topics covered in the course. (a, e, k, i)

Lecture Topics
1. Fluid properties and other preliminary concepts
2. Basic laws for a control volume
3. Kinematics of fluid flow
4. Dynamics of frictionless and incompressible flow
5. Basic hydrodynamics and equations of motion of viscous flow
6. Exact solutions of viscous-flow equations and their applications
7. Boundary-layer theory
8. Lift and drag on immersed bodies
9. Incompressible turbulent flows and wall turbulence

Computer Usage
High

Laboratory Experience
Low

Design Experience
Low

Coordinator
Josué Njock Libii, Ph.D.

Date
30 September 2015