Semester: Spring 2017
Course: MEC 393, Advanced Fluid Mechanics

Instructor:

Professor Juldeh Sesay, 226 Heavy Engineering Bldg., (631)632-8493
Email: Juldeh.sessay@stonybrook.edu
Office hours: Mondays and Wednesdays: 02:00 – 03:00 PM.

Teaching Assistants:
Name:
Contact Information:

Lectures: Tuesdays, Thursdays.01:00 – 02:20 PM,
Frey Hall Room 226

Credit: Three (3) credits

Prerequisite: Fluid Mechanics 1 MEC 364

Textbook: Mechanics of Materials by Ferdinard P.Beer. R. Russell Johnson. Jr., John T. Dewolf. McGraw. Hill, 4th, ISBN:007365935-5

Course Description:
Flow around immersed bodies; drag and lift. Introduction to boundary layer theory. Compressible flow; one-dimensional isentropic flow, normal and oblique shocks; Prandtl-Meyer flow; Rayleigh and Fanno flow. Two lectures. Two credits. Prerequisite: MECH 318. (Cr.2)

Course Learning Outcomes:
By the end of the course students will be able to:

- compute boundary layer thicknesses and associated properties using Blasius and momentum integral methods
- determine lift and drag of simple bodies
- analyze one-dimensional compressible fluid flow systems

analyze simple two-dimensional shock waves

Course Description:

Syllabus

Topics: (numbers of class lectures are approximates and might change as class progresses)

CHAPTER 8 INTERNAL INCOMPRESSIBLE VISCOUS FLOW

8.1 Introduction
- Laminar versus Turbulent Flow
- The Entrance Region

PART A. FULLY DEVELOPED LAMINAR FLOW

8.2 Fully Developed Laminar Flow between Infinite Parallel Plates
- Both Plates Stationary
- Upper Plate Moving with Constant Speed, U

8.3 Fully Developed Laminar Flow in a Pipe

PART B. FLOW IN PIPES AND DUCTS

8.4 Shear Stress Distribution in Fully Developed Pipe Flow

8.5 Turbulent Velocity Profiles in Fully Developed Pipe Flow
- Energy Considerations in Pipe Flow
- Kinetic Energy Coefficient
- Head Loss

8.7 Calculation of Head Loss
- Major Losses: Friction Factor
- Minor Losses
- Pumps, Fans, and Blowers in Fluid Systems
- Noncircular Ducts

8.8 Solution of Pipe Flow Problems
- Single-Path Systems
- *Multiple-Path Systems

PART C. FLOW MEASUREMENT

8.9 Direct Methods

8.10 Restriction Flow Meters for Internal Flows
- The Orifice Plate
- The Flow Nozzle
- The Venturi
- The Laminar Flow Element

8.11 Linear Flow Meters

8.12 Traversing Methods

CHAPTER 9 EXTERNAL INCOMPRESSIBLE VISCOUS FLOW

PART A. BOUNDARY LAYERS

9.1 The Boundary-Layer Concept

9.2 Boundary-Layer Thicknesses

13.5 Flow in a Constant-Area Duct with Friction

- Basic Equations for Adiabatic Flow
- Adiabatic Flow: The Fanno Line
- Fanno-Line Flow Functions for One-Dimensional Flow of an Ideal Gas
- Isothermal Flow (on the Web)

13.6 Frictionless Flow in a Constant-Area Duct with Heat Exchange

- Basic Equations for Flow with Heat Exchange
- The Rayleigh Line
- Rayleigh-Line Flow Functions for One-Dimensional Flow of an Ideal Gas

13.7 Oblique Shocks and Expansion Waves

- Oblique Shocks
- Isentropic Expansion Waves

Guidelines

Attendance Policy: Attendance is mandatory, and it is highly recommended.

Announcements: Each student will be responsible for knowledge of all scheduling and announcements with regards to this course. Each student is adviced to check course web pages regularly.

Homework: Homework will be assigned approximately every Wednesday during lectures. Typically five problems will be assigned every Wednesdays, these are due within one week of assignment and should be submitted **at the beginning of the lecture during class and not after class**. No late homework will be accepted. Please adhere to the following guidelines. They will be strictly enforced:

- Homework will be accepted only on any **paper** and written in **pen**
- Staple neatly in top left corner
- Write your name, course number, homework number and ID on a cover page for every homework.
- Late homework will NOT be accepted under any circumstances
- Homework will be accepted only during class, at the beginning of the lecture and not immediately after the lecture.

Graded homework should be collected from my office and not during lectures or recitations.

Typically, five problems will be assigned each week on Thursdays. The solutions to the homework problems will be posted on the blackboard immediately after the homeworks have been collected in class.

The homework should be viewed as a tool to help you understand the material. In that sense, your success in this course will depend highly upon your completing homework assignment. If you feel you need additional practice, you should try to solve additional

problems in the textbook. Collaboration on homework is allowed. A lot of valuable insight can be gained from interaction with your classmate. However, blndly copying homework will be treated as academic dishonesty.

Exams: The **Exams** will be held in class. All exams will be closed book and closed notes and the material needed to be covered for each exam will be posted in the web. Make-up exams will be scheduled only in emergencies, as per university guidelines. A written permission is required: for example, if you were ill, we will need a letter from a doctor attesting to this fact. The letter should have the doctor's phone number, and we will call the doctor's office for confirmation.

Grading : Grades will be determined using :

Attendance	10%
Homework	15%
5/6 Quizzes	15%
Two exams	60% (30% each)

Instructor expectation:

- Be regular in class attendance
- Arrive on time
- Be attentive and participate in classroom discussions
- Come prepared to lectures/recitations
- Be up to date on previously cover material
- Allocate sufficient time every week to study for this course
- Be prepared to work hard and learn

Pet Peeves:

- Being distracted or distracting others in class
- Not willing to work hard or put an honest effort into learning
- Coming to me late in the semester for grade changes, extra credit, etc.
- Arguing over partial credit on homework/test grades
- Doing other tasks during lectures (including sleeping)
- Cellular phones ringing during lectures

America with Disabilities Act:

If you have a physical, psychological, medical or learning disability that may impact you course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, Room 128,(631) 632- 6748. They will be determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Student requiring emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services.