UNIVERSITY OF SOUTH FLORIDA
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
EGN 3353 Basic Fluid Mechanics (Spring 2015)

CLASS MEETINGS: TTh 2:00-3:15pm in CHE 303
HELP SESSIONS: F 2:15-4:05pm in CHE 303
INSTRUCTOR: Dr. Jie (Jay) Zhang
Office: IDR 107, Office hours: F 9:30-11:30am or by appointment, E-mail: jiez@usf.edu
Phone number: **(**813) 666-7260

TEACHING ASSISTANT: Lorena Sanchez, Office hours: Tuesday: 5-6 pm, Thursday: 5-6 pm, in the student success center in the first floor of ENG 1, E-mail: lorenas@mail.usf.edu

CATALOG DESCRIPTION: EGN 3353 Basic Fluid Mechanics
Fundamental and experimental concepts in ideal and viscous fluid theory; momentum and energy consideration, introduction to hydraulics, pipe flow.

TEXTBOOKS and/or OTHER REQUIRED MATERIAL
Primary textbook: ***Fluid Mechanics***, by Russell C. Hibbeler, published by Pearson
Other fluid mechanics textbooks may be helpful as well but the homework will be assigned based on the primary textbook.

CANVAS AND E-MAIL: Course material will also be provided by instructor and posted on Canvas. Announcements regarding, for example, quizzes, exams, homework, etc. will be sent via e-mail.

COURSE OBJECTIVES:
The overarching objective of this course is preparation to set up and work elementary problems in engineering fluid mechanics. At the end of this course the students should have adequate preparation to pass the fluids portion of the EI examination and be well prepared to pursue course work in hydraulics or other specialized topics in fluid dynamics. Detailed course learning objectives are to have students:

1. acquire a working knowledge of density, specific weight/gravity and viscosity of fluids
2. understand and apply the concepts of compressibility of fluids, vapor pressure and surface tension
3. understand pressure distribution in static systems and concepts of absolute and gage pressure
4. become competent with methods of pressure measurement, such as the use of manometers

5. become competent in computing hydrostatic forces due to pressure on curved/planar surfaces in fluid at rest
6. understand and apply concepts of buoyancy and stability
7. become competent in working with Bernoulli's theorem and energy considerations involving various fluid head losses and head gains associated with friction and machines.
8. understand cavitation and apply Bernoulli's theorem for problems involving cavitation
9. apply Bernoulli's theorem for problems involving hydraulic and energy grade lines
10. understand and apply momentum and continuity principles using control volumes
11. acquire a working knowledge of the differences between laminar and turbulent flows
12. become competent in flows through pipelines with pumps and turbines
13. understand and apply concepts involving the Darcy-Weisbach equation and head losses
14. understand and apply the Moody diagram
15. become competent in working with minor losses
16. perform good engineering calculations including drawing good free body diagrams
17. prepare written work in engineering format

TOPICS COVERED

I. Properties of Fluids

1. Density, Specific Weight, Specific Gravity
2. Compressibility of Fluids
3. Viscosity
4. Vapor Pressure and Surface Tension

II. Fluid Statics

1. Pressure Distribution in a Static System
2. Absolute and Gage Pressure
3. Pressure Measurements
4. Pressure Forces on Surfaces
5. Buoyancy and Stability

III. Fluid Dynamics

1. Energy Equations and the Bernoulli's Theorem
2. Conservation of Mass (Continuity Equation)
3. Control Volume and Reynolds Transport Theorem
4. Momentum Equations (Navier-Stokes Equations)
5. Momentum Forces in Fluid Flow
6. Frictional head losses
7. Pump head gains and turbine head losses
8. Cavitation
9. Hydraulic and Energy Grade Lines

IV. Viscous Flow through Pressure Conduits

1. Laminar and Turbulent Flow

2. Buckingham Pi-Theorem
3. Head Loss and the Darcy-Weisbach Equation
4. Moody Diagram
5. Minor Losses
6. Pipeline with Pump or Turbine

V. Introduction to Fluid Experimental and Numerical Techniques

1. Fluid Experimental Techniques
2. Computational Fluid Dynamics

GRADING POLICY: Final Exam 40%, Midterm 30%, Homework 14%, Quizzes 16%

The grading scale will be assigned based on the total weighted grade:

Grading Scale (%)	
95-100	A+
90-94	A
85-89	A-
80-84	B+
75-79	B
70-74	B-
65-69	C
60-64	D
0 - 59	F

POLICY ON HOMEWORK: On most weeks, you will be assigned homework problems covering principles previously discussed in class. Solutions to these homework problems should be submitted to the TA on or before the specified deadline. Homework can be turned in person to the TA or placed in his mailbox in the office of the Department of Civil and Environmental Engineering. Late homework will not be accepted. Homework will not be collected in class or during instructor office hours. All homework must be neatly handwritten. I suggest you solve the problems first on scratch paper and then re-write them in a neat and organized fashion for submission. All dimensional quantities (in the given information and solution) must have the appropriate units following the numbers through the solution steps. Final answers must be clearly marked (e.g. underlined, boxed). **DO NOT COPY SOLUTIONS FROM SOLUTIONS MANUAL**. Failure to follow these guidelines will result in loss of points. *Re-visiting homework problems*: In order to encourage you to learn from mistakes, you may regain up to 50% of the points deducted from a homework problem by re-submitting a newly written version of the problem solution along with the previous graded solution. This is to be done within one week after the graded assignments are returned. You only need to re-work those problems for which you want to recover credit.

POLICY ON EXAMS: There will be one exam during the semester and a second exam during finals week. The first exam will cover material related to topics I, II and part of III above. The second exam will primarily cover material from topics III, IV and V above. Exams will be closed notes and closed books. For the first exam, you may bring two pages of 8.5" x 11" paper written on both sides. For the second exam, you may bring three pages of paper written on both sides. These sheets must be submitted with the exam and will be returned along with the corrected exam. Quizzes are open notes. Medical illness or a family emergency will be the sole excuses for missing an exam. A letter from a medical doctor or from a University of South Florida school official must be procured stating the reason why the exam was missed.

POLICY ON ATTENDANCE: Attendance will be checked randomly at the beginning of lectures and help sessions.