UNIVERSITY OF SOUTH FLORIDA
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
EGN 3353 Basic Fluid Mechanics (Spring 2016)

CLASS MEETINGS: TTh 2:00-3:15pm in CHE 303
HELP SESSIONS: F 3:30-4:20pm in CHE 303
INSTRUCTOR: Dr. Jie (Jay) Zhang
Office: ENG 308, Office hours: F 2:00-3:30pm or by appointment, E-mail: jiez@usf.edu
Phone number: 813-974-5902

TEACHING ASSISTANT: Phillip Dixon, Office: IDR 107, Office hours: T 3:30-4:30pm, E-mail: phillipdixon@mail.usf.edu, Phone number: 508-728-6125

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 With Engineering Applications*, 10th Edition, by E. John Finnemore, Joseph Franzini (Publisher: McGraw-Hill Education)
Other fluid mechanics textbooks may be helpful as well.

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. 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: Grades will be assigned based on tests, homework and final project using the following weighting (The points corresponding to homework and quizzes will be distributed evenly to each homework and quiz):

Homework	20%
Quizzes	20%
In-Class Tests (2)	30%
Final Exam	25%
Course essay	5%
Explore & Discover (Extra)	5%

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

Grading Scale (%)	
95-100	A+
90-95	A
85-90	A-
80-85	B+
75-80	B
70-75	B-
65-70	C
60-65	D
0 - 60	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 can only receive partial credits. 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.

POLICY ON EXAMS: There will be two exams during the semester and a third exam during finals week. Exams will be closed notes and closed books. For the first two exams, 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.

All students must review the syllabus and the requirements including the online terms and video testing requirements to determine if they wish to remain in the course. Enrollment in the course is an agreement to abide by and accept all terms. Any student may elect to drop or withdraw from this course before the end of the drop/add period.

Online exams and quizzes within this course may require online proctoring. Therefore, students will be required to have a webcam (USB or internal) with a microphone when taking an exam or quiz. Students understand that this remote recording device is purchased and controlled by the student and that recordings from any private residence must be done with the permission of any person residing in the residence. To avoid any concerns in this regard, students should select private spaces for the testing. The University library and other academic sites at the University offer secure private settings for recordings and students with concerns may discuss location of an appropriate space for the recordings with their instructor or advisor. Students must ensure that any recordings do not invade any third party privacy rights and accept all responsibility and liability for violations of any third party privacy concerns. Setup information will be provided prior to taking the proctored exam. For additional information about online proctoring you can visit the online proctoring student FAQ.

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