Course Description (catalog): 4 sem. hrs. (3:3). Fluid properties, fluid statics, dynamics, and kinematics, conservation of energy and momentum, incompressible, laminar and turbulent flow. Similitude and dimensional analysis, and viscous flow. Prerequisites: ENGR 2326 – Dynamics

Course Description (narrative): This is a first course in fluid mechanics and fluid power. The course introduces students to basic concepts in fluid statics, kinematics and dynamics. Control-volume, differential equation and dimensional analysis methods are used. Applications of basic concepts and analysis methods to simple internal and external flows are emphasized in this course to determine flow variables of interest, such as pressure, forces, shear stresses, flow rates, energy losses, and power requirements.

Course Learning Objectives: Upon completing this course, students will

1. Have a basic understanding of fluid statics, kinematics and dynamics
2. Be able to perform engineering calculations of forces in hydrostatic systems
3. Be able to perform engineering calculations of momentum and energy changes using control-volume methods
4. Be able to perform engineering calculations of volumetric flow rates and friction losses of pipe flow
5. Be able to perform engineering calculation of drag of external flows
6. Have a basic understanding of pump and turbine characteristics and perform power calculations
7. Have a basic understanding of analysis and interpretation of data or results obtained from experiments or CFD (computational fluid dynamics) calculations

Course Outline/Schedule (tentative, subject to change):

7 lectures: Introduction: dimensions, fluid properties
Fluid statics: pressure, hydrostatic force, rigid body motion
(Textbook sections 1.1-1.10, 2.1-2.12)
Test #1 On or about 25 Sept 2014

8 lectures: Elementary fluid dynamics; Bernoulli equation
Fluid kinematics, velocity field
Reynolds transport theorem
Finite control volume analysis; equations of continuity, momentum, and energy
(Textbook sections 3.1-3.6, 4.4-4.4; 5.1-5.3)
Test #2 On or about 23 Oct 2014

7 lectures: Dimensional analysis and similitude
Fully-developed pipe flows
(Textbook sections 7.1-7.7, 8.1-8.6)
Test #3 On or about 20 Nov 2014

2 lectures: External flows, boundary layers
Calculations of drag
Pump performance (as time allows)

Final 8:00 am, Thursday, 4 Dec 2014

Homework Quizzes: Suggested homework problems will be assigned in class, but no homework problems will be collected and graded. A 15-minute quiz will be given once per week during each week that does not have an hour test (which means approximately 11 quizzes). The lowest two quiz scores will be dropped; no make-up quizzes will be given. These will be based on the homework problems assigned for that week. A weekly hour-long problem session will be scheduled; attendance will be optional and the instructor will work problems about which there are questions.
Preparatory assignments for control volume problems:  A significant portion of the class will be spent covering the control volume method for solving certain fluid mechanics problems. This method relies upon a number of concepts you have covered in previous classes, particularly integration from calculus and vector analysis from statics. Three assignments that review basic concepts of calculus, unit vectors, and dot products will be posted on Blackboard. Each student must complete all three prior to the discussion of the control volume method in class. The exercises must be submitted by the due date given on each assignment, and they will be graded for completion (but not correctness; solution sets will be posted on Blackboard). The completion of all three exercises by the corresponding due dates will count as two quiz grades (i.e., only 9 quizzes will actually be given in class; the completed exercises will count as the additional two quizzes, which will not be dropped). Due dates: 9 Sept, 16 Sept, 23 Sept.

Labs (tentative, subject to change)
1. Viscosity measurement
2. Pressure measurements
3. Forces on submerged planes
4. Center of pressure
5. Verification of Bernoulli’s equation
6. Laminar and turbulent flow
7. Pressure drop measurement using a venturi meter
8. Pipe network
9. Pump performance map and cavitation

Lab procedures and reports:  Labs will take approximately one week each to complete. Generally the labs are short enough that the data may be acquired in one lab period, with a second lab period available to complete data acquisition if not enough time was available during the first period. Students will work as a single team to acquire data, then each student should write his or her own report (report format details to be provided separately). Students will have to complete a lab safety course provided by the MEEN lab coordinators at the beginning of the class.

Grading:  Three one-hour tests will be given on dates announced at least two class periods in advance. These tests will make up 50% of the final course grade. Weekly homework quizzes will make up 10% of the final course grade, the lab reports will make up 20% of the final course grade, and a three-hour comprehensive final will make up 20% of the course grade. Grades will be assigned on a 10-point scale:  90-100=A, 80-89=B, 70-79=C, 60-69=D, below 60=F.

Absences:  Tests missed as a result of unexcused absences will result in a score of zero. Under most circumstances, the final exam grade will be substituted for tests missed due to excused absences. The absence must be excused in advance except in case of extreme emergency. No makeup exams will be given, except under unusual circumstances and entirely at the discretion of the instructor.

Communications:  All outside-of-class communications will be conducted through the message and e-mail functions of the Blackboard site for the class. Announcements will be posted to Blackboard and e-mailed to your Islander account. Homework assignments, solutions, handouts, and other course materials will be posted to Blackboard. Grades will not be posted to Blackboard. For any e-mails from students to instructor, please enter ENTC 3406 in the email’s subject field. Each student should make sure his or her preferred e-mail address is the one in the Blackboard system, and each student should check e-mail and the Blackboard message site regularly.

Academic Honesty:  Academic honesty is expected at all times. Occurrences of cheating will be dealt with according to university regulations regarding academic misconduct.

Grade Appeals:  A student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is on the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details on the process, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, consult Texas A&M University-Corpus Christi University Procedure 13.02.99.C2.01 Student Grade Appeal Procedures (http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage (http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school or the College of Science and Engineering Dean’s Office.
Disabilities Accommodations: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

Drop Day: The last day to drop a class without a grade is Friday, 7 Nov 2014.