CE 309
Course Syllabus

Fall 2012
Part I Course Organization
CE 309: Fluid Mechanics  
SGM 601, MWF 11:00-11:50

Instructor  
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Topics  
Fluid statics; relative velocity field; total acceleration; divergence theorem; conservation of mass, energy, and momentum applied to engineering problems in laminar and turbulent flow.

Prerequisites: Math 126, Pre- or Co-requisite: CE 325


Topics Covered:  
1. Introduction and Properties of Fluid  
2. The Basic Equations: Continuity equation, Equation of motion with or without viscosity, Hydro &Aerostatics, Boundary conditions.  
3. The Bernoulli Equation and Its Application to Fluid Flow problems  
4. Momentum Theorems  
5. Dimensional Analysis and Similitude  
6. Element of Potential Flow and Boundary Layer Concepts  
7. Analysis of Flows in Pipes  
8. Analysis of Flow in Channels  
9. Compressible Flow  
10. Experimental and Computational Fluid Mechanics, Demonstrations of flows in flume

Home Work: 6-8 problems each week, due one week from the assigned date. Posted on Wednesday afternoon, due the following Wednesday by 5 pm in KAP 224D.

Grading  
Quizzes (15%), Exam 1 (15%), Exam 2 (20%), Homework (15%), Final Exam (35%)

Statement for Students with Disabilities  
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity  
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review,
should there be any suspicion of academic dishonesty. The Review process can be found at:
http://www.usc.edu/student-affairs/SJACS/.
Part II  Detailed Course Objectives
Course Information, Textbook, and Supplementary Materials

Course Description:
Fluid statics, relative velocity field, total acceleration, divergence theorem, conservation of mass, energy and momentum applied to engineering problems in laminar and turbulent flows.

Required for all BSCE degrees: BSCE, BSCE Structural, BSCE Building Science, BSCE Environmental

Prerequisite: Math 226 Calculus III

Co-Requisite: CE 325 Dynamics

Required Textbook:

Reference: None

Topics Covered | Learning Outcomes
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Analyze fluid problems in static condition | Students will be able to accomplish the following:
1. Determine the pressure at any point in the fluid domain
2. Determine the static forces on any surface or body
3. Analyze the stability of a floating body

Analyze fluid problems in motion | 4. Understand the role of fluid mechanics in sustainable development
5. Use the continuity principles to analyze fluid flow problems
6. Use momentum principles to analyze fluid flow problems
7. Use energy principles to analyze fluid flow problems
8. Distinguish flow behavior between laminar and turbulent flows and use the correct principles for analysis

Apply the governing principles and equations to different fluid flow problems involving real fluids | 9. Compute and analyze flow in conduits with piping problems in series, in parallel and in closed loops
10. Compute and analyze flow in channels involving uniform and non-uniform flows
11. Analyze compressible fluid flow

Lecture and Lab Schedule

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Lab</th>
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<tbody>
<tr>
<td>Sessions per Week</td>
<td>Duration per Session</td>
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<tr>
<td>3</td>
<td>1 hour</td>
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Contribution of Course to Meeting the Professional Component

Engineering Topics

This course provides the basic concepts of viscosity, fluid statics, relative velocity field, total acceleration, divergence theorem, conservation of mass, energy, and momentum applied to engineering problems in laminar and turbulent flow.

The students will analyze fluid problems in static condition and in motion; and then apply the governing principles and equations to different fluid flow problems involving real fluids.

Relation of Course Objectives to Program Outcomes

The Civil Engineering program is designed to teach beyond the technical content of the curriculum and prepare the students to utilize what they learn in a professional setting.

This course contributes to the program outcomes as outlined in the adjacent table.

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<thead>
<tr>
<th>Course Contribution to Program Outcomes (a-k)</th>
<th>Key</th>
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<tbody>
<tr>
<td>a. An ability to apply knowledge of mathematics, science, and engineering.</td>
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<td>e. An ability to identify, formulate and solve engineering problems.</td>
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<td>i. Recognition of the need for, and an ability to engage in life-long learning.</td>
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<td>j. Knowledge of contemporary issues.</td>
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<tr>
<td>k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</td>
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Prepared by: Dr. Patrick J. Lynett
Professor of Civil and Environmental Engineering

Date: Fall 2012