CE 309: Fluid Mechanics
KAP 166, MWF 10:00-10:50

Instructor
Patrick J. Lynett, Associate Professor, Department of Civil & Environmental Engineering
Office: KAP 224D
E-mail: plynett@usc.edu
Telephone: 213-740-3133
Skype: patrick_lynett
URL: http://coastal.usc.edu/plynett

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

Text Book: Engineering Fluid Mechanics, Tenth Edition, 2012, by Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John A. Roberson. John Wiley & Sons, Inc.

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 (20%), Exam 1 (15%), Exam 2 (20%), Homework (10%), 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/.

WEEK #	WEEK of:	TOPIC	READING
1	25-Aug	Introduction	
		Dimensions, Units, Gas Law	1.1-1.6
		Viscosity	2.1-2.9
2	1-Sept	**NO CLASS Monday, Sept 1st – Labor Day**	
		Fluid Statics	3.1-3.3
		Gages, Manometers	
3	8-Sept	Force on Plane Surfaces	3.4
		Force on Curved Surfaces	3.5
4	15-Sept	Buoyancy	3.6
		Fluid Kinematics **[25 minute Quiz #1 on Wed, Sept 17th]**	4.1-4.4
5	22-Sept	Bernoulli Equation	4.5-4.7
		Pressure Variation Normal to Streamline	
		Stagnation and Dynamic Pressure, Examples	
6	29-Sept	Control Volumes and Reynolds Transport Equation	5.1-5.2
		Examination I on Wed, Oct 1rd IN CLASS (50 min)	
		Conservation of Mass	5.3-5.5
7	6-Oct	Principles of Linear Momentum	6.1-6.6
		Examples	
		Energy Equation	7.1-7.3
8	13-Oct	Examples	
		Energy Line, Hydraulic Grade Line, Restrictions **[25 minute Quiz #2 on Wed, Oct 15th]**	7.6, 7.8
		Dimensional Analysis	8.1-8.4
9	20-Oct	Similitude, Modeling	8.5-8.8
		Practical Model Studies	
10	27-Oct	Pipe Flow Characteristics, Laminar Pipe Flow	10.1-10.5
		Turbulent Pipe Flow, Friction Factor	10.6
11	3-Nov	Moody Diagram	10.7
		Examination II on Wed, Nov 5th IN CLASS (50 min)	
12	10-Nov	Minor Losses	10.8-10.10
		Turbulent Pipe Flow Examples	
13	17-Nov	External flow, Lift & Drag, Boundary Layer	11.1-11.4
		Friction and Pressure Drag, Drag Coefficients	11.8-11.10
14	24-Nov	Open Channel Flow **[25 minute Quiz #3 on Mon, Nov 24th]**	15.1-15.3
		NO CLASS Nov 26th and 28th – Thanksgiving	
15	1-Dec	Hydraulic Jumps, Open Channel Flow Examples	15.4-15.5
		Compressible Flow	12.1-12.2
		Computational Fluid Dynamics Modeling, Review	16.1-16.7
	15-Dec	**Final Examination (8:00 a.m. - 10:00 a.m.)**	