CWR 3201 HYDRODYNAMICS

CLASS MEETING: Tue 5th-6th Period (11:45 a.m. - 1:40 p.m.); FLG 260
Thu 5th-6th Period (11:45 a.m. - 1:40 p.m.); FLG 280

INSTRUCTOR INFORMATION:
Dr. Mark Newman: Department of Civil & Coastal Engineering
Office: 370C Weil Hall
Office Hours: See below regarding in-person and online appointments.
E-Mail: mark.newman@essie.ufl.edu

To schedule an appointment please use: Dr. Newman's Bookings Page
(Note: This link takes you to our Civil Engineering academic advising scheduling site—you are in the right place—this is where I schedule all my appointments. You can choose either in-person or Zoom meetings).

Office hours for teaching assistants (TAs) will be posted in Canvas.

COURSE GOALS:
The goal of this course is to have students master the fundamental principles of fluid statics, fluid kinematics, the dynamic equations for fluid mass, momentum and energy conservation, and the method of dimensional analysis. Students will then be able to apply these principles to solve basic engineering problems in incompressible pipe, open channel, and viscous flows.

COURSE OBJECTIVES:
The specific objectives of the course include the ability to:

1) Identify and explain each of the general properties of fluids and demonstrate how each is significant in various fluid flow applications.
2) Calculate pressure distributions in a static fluid, evaluate the resulting forces on solid surfaces, and determine the effects of those forces in a given system.
3) Identify the key components of mechanical energy in flowing fluid and examine their variation along typical incompressible pipe and channel flows.
4) Apply mass and momentum conservation equations to solve for velocity, elevation, pressure and forces in pipe and channel flows.
5) Apply theoretical solutions to solve basic practical laminar flow problems.
6) Employ dimensional analysis methods to design a scale model to replicate a given prototype flow system.
7) Formulate a complete empirical solution for resistance in turbulent, incompressible pipe flow.
8) Select and size pipes to design a single pipe system to meet head and flow constraints.
9) Evaluate and optimize simple pipe system designs including pumps and turbines.
10) Perform laboratory experiments to reinforce physical principles and develop and refine the student's physical intuition.

OUTCOMES:
This course requires students to apply knowledge of math, science and engineering in order to enhance their ability to identify, formulate and solve engineering fluid mechanics problems. The laboratory addresses their ability to work in teams to design and conduct experiments, and also to analyze and interpret data and communicate their findings effectively in written reports. Students will also develop the ability to perform a basic design of a single pipe system.

TEXTBOOK:
Young, Munson and Okiishi's A Brief Introduction to Fluid Mechanics by Hochstein and Gerhart, 6th Edition, John Wiley and Sons, Inc, 2021. (this book is available through the UF All Access Program).

CLASS NOTES:
Formal class notes for the entire course (in "framework" style, with important equations, words, diagrams, etc. omitted) will be provided through Canvas and will be needed after the first day of class. These will be very useful for reviewing the recorded lectures.

PREREQUISITES:
Course prerequisites are statics (EGM 2511) and elementary differential equations (MAP 2302). Civil engineering students must have received a grade of C or better in both prerequisite courses.

COURSE OUTLINE

Module	Content	Notes/Text Section
1	Fluid Properties	1.1-2.1
2	Fluid Statics	2.2-3.1
3	Bernoulli Equation	3.2-3.8
	EXAM 1 (October 1-3)	
4	Fluid Kinematics	4.1-4.4
5	Mass, Momentum & Energy Equations	5.1-5.3
6	Viscous Flow & Potential Flow Theory	6.9
7	Viscous Flow & Potential Flow Theory	6.2-6.6.5
	EXAM 2 (October 29-31)	
8	Dimensional Analysis & Scale Model Design	7.1-7.8
9	Flow in Pipes	8.1-8.5
10	Pumps	9.1-9.4
	EXAM 3 (December 3-8)	

LABORATORY:
The Laboratory Manual will be posted in Canvas and will provide detailed expectations for each lab report. Lab reports are due at the beginning of the next lab (i.e. normally one week after your assigned lab time). Failure to appear for a scheduled lab will result in a zero for that lab, unless documentation for the absence is provided and approved by the instructor and the lab can be made up by attending another scheduled session. **You must submit all laboratory reports to earn a passing grade in this class**.

LABORATORY SCHEDULE:

Sections: M, T, W, R 8th- 9th Period (3:00 PM – 4:55PM); 254 Weil Hall

Lab	Week of	Topic
	08/18/25	* * NO LABS * *
	08/25/25	* * NO LABS * *
	09/01/25	* * NO LABS (Labor Day) * *
1	09/08/25	Forces on a Plane Surface
2	09/15/25	Orifice Coefficients
3	09/22/25	Venturi Meter
4	09/29/25	Jet Impact
5	10/06/25	Friction Loss in a Pipe
	10/13/25	* * NO LABS (Homecoming) * *
6	10/20/25	Flow Over a Step
7	10/27/25	Hydraulic Jump
8	11/03/25	Drag Measurements
	11/10/25	* * NO LABS (Veteran's Day) * *
9	11/17/25	**Lab Final**
	12/01/25	* * NO LABS * * **Hand in Final Lab Reports at Beginning of Your Usual Lab Period**

LABORATORY SAFETY:
Participation in the laboratory experiments **requires** the following:

- Long pants
- Closed-toed shoes

GRADE DISTRIBUTION:

Exam 1	15%
Exam 2	15%
Exam 3	15%
Laboratory	25%
In-Class Assignments	30%
	100%

GRADING SCALE:

Percent	Grade	Grade Points
94 - 100	A	4.00
90 - 93	A-	3.67
87 - 89	B+	3.33
84 - 86	B	3.00
80 - 83	B-	2.67
77 - 79	C+	2.33
74 - 76	C	2.00
70 - 73	C-	1.67
67 - 69	D+	1.33
64 - 66	D	1.00
60 - 63	D-	0.67
0 - 59	E	0.00

UF GRADING POLICIES:

The UF policies for passing grades and assignment of grade points can be found at the following URL: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

MAKE-UP POLICY:

Make-up examinations will be provided in the case of a documented illness, emergency or other extenuating circumstances, in accordance with university policy.

CLASS FORMAT AND ATTENDANCE:

This class will be presented in a "flipped" format as opposed to a standard lecture-style class. In this approach, the expectation is that students will watch video lectures in preparation for attending the class meetings. Traditional homework will not be assigned in favor of in-class problems, case studies, and other practical examples of fluid mechanics in both engineering applications and in everyday life. In this manner there are three steps for reinforcement of important concepts to aid in long-term understanding:

1) Review of recorded lectures and completing "framework" notes.
2) Completion of class activities and problem sets.
3) Review for examinations.

As such, attendance in class is reasonably essential to success in this course. In-class activities will review material from the course videos, assigned reading and framework notes. **Attendance in laboratory sections is mandatory**.

HOMEWORK

There will be no homework assignments or homework grades. The only out of class assignments will be to watch the recorded lectures and complete your lab reports.

Academic Policies and University Resources: https://go.ufl.edu/syllabuspolicies