Syllabus for
ME 441—Fluid Mechanics
3 Credit Hours
Spring 2012

I. COURSE DESCRIPTION

Analysis of the behavior of stationary and flowing fluids. Topics include fluid statics, control volumes, differential analysis, incompressible inviscid flow, dimensional analysis, and incompressible viscous flows, and compressible flows. Students conduct water table experiments. Introduces computational fluid dynamics.
Prerequisite: ME 331.
Course fee: $65.

II. COURSE GOALS

The purpose of this course is to enable the student to become familiar with the methods of analysis of fluid mechanics and gain the knowledge to design systems that have low energy loss due to fluid friction.

III. STUDENT LEARNING OUTCOMES FOR THIS COURSE

As a result of successfully completing this course, the student will be able to do the following:

A. Demonstrate fundamental concepts of fluids and the forces present in fluids at rest.

B. Derive and use the basic equations governing fluid dynamics to calculate various properties of fluids in motion.

C. Demonstrate dimensional analysis and dimensionless ratios in order to predict actual fluid flow characteristics from measurements made on scale models.

D. Use the governing equations to calculate the properties of fluid flow in closed conduits, over immersed bodies, and in open channels.

IV. TEXTBOOKS AND OTHER LEARNING RESOURCES

A. Required Materials

1. Textbooks

Cengel, Yunus A., and John M. Cimbala *Fluid Mechanics*. 2nd ed. New York: McGraw-Hill, 2010. ISBN-13: 9780077295462

Matsson, John E. *An Introduction to SolidWorks Flow Simulation 2011*. Mission, KS: SDC, 2011. ISBN-13: 9781585035892

2. Other

None

B. Optional Materials

1. Textbooks

   None

2. Other

   None

V. POLICIES AND PROCEDURES

A. University Policies and Procedures

1. Attendance at each class or laboratory is mandatory at Oral Roberts University. Excessive absences can reduce a student's grade or deny credit for the course.
2. Students taking a late exam because of an unauthorized absence are charged a late exam fee.
3. Students and faculty at Oral Roberts University must adhere to all laws addressing the ethical use of other's materials, whether it is in the form of print, electronic, video, multimedia, or computer software. Plagiarism and other forms of cheating involve both lying and stealing and are violations of ORU's Honor Code: "I will not cheat or plagiarize; I will do my own academic work and will not inappropriately collaborate with other students on assignments." Plagiarism is usually defined as copying someone else's ideas, words, or sentence structure and submitting them as one's own. Other forms of academic dishonesty include (but are not limited to) the following:
   a. Submitting another's work as one's own or colluding with someone else and submitting that work as though it were his or hers;
   b. Failing to meet group assignment or project requirements while claiming to have done so;
   c. Failing to cite sources used in a paper;
   d. Creating results for experiments, observations, interviews, or projects that were not done;
   e. Receiving or giving unauthorized help on assignments.

   By submitting an assignment in any form, the student gives permission for the assignment to be checked for plagiarism, either by submitting the work for electronic verification or by other means. Penalties for any of the above infractions may result in disciplinary action including failing the assignment or failing the course or expulsion from the University, as determined by department and University guidelines.
4. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.
5. Students are to be in compliance with University, school, and departmental policies regarding Whole Person Assessment (WPA) requirements. Students should consult the WPA handbooks for requirements regarding general education and the students' majors.
   a. The penalty for not submitting electronically or for incorrectly submitting an artifact is a zero for that assignment.
   b. By submitting an assignment, the student gives permission for the assignment to be assessed electronically.

B. Department Policies and Procedures

1. A fee of $15.00 is assessed for all late exams. This policy applies to all exams taken without notifying the professor prior to the regularly scheduled exam time and to all exams taken late without an administrative excuse.
2. Any student whose unexcused absences total 33% or more of the total number of class sessions receives an F for the course grade.

C. Course Policies and Procedures

1. Evaluation Procedures

D2L Quizzes	10%
Homework Problems	10%
Project	10%
Exam I	15%
Exam II	15%
Exam III	15%
Laboratory Reports	10%
Final Exam	15%
Total	100%

2. Whole Person Assessment Requirements

   None

3. Other Policies and/or Procedures
   a. The first three absences (excused or unexcused) do not result in a grade reduction. Each absence thereafter results in a 1% reduction in the final score (100% maximum), which determines the grade. Perfect attendance increases the final score by 1%. The number of absences allowed prior to grade reduction is designed to accommodate emergencies, illnesses, and so on, and not for indiscriminate use.
   b. Students are expected to be prompt for classes. Two tardies equal one absence.
   c. Homework problems are assigned in each class.

VI. COURSE CALENDAR

Session	Topic	Chapter Reading Assignment
1	Introduction	1 (Cengel)
2	Fluid Properties	2 (Cengel)
3	Pressure and Fluid Statics	3.1-3.3 (Cengel)
4	Pressure and Fluid Statics	3.4-4.8 (Cengel)
5	Fluid Kinematics	4.1-4.3 (Cengel)
6	Fluid Kinematics	4.4-4.5 (Cengel)
7	Analysis of the Flow Past a Sphere and a Cylinder	3 (Matsson)
8	Mass, Bernoulli, and Energy Equations	5.1-5.3 (Cengel)
9	Mass, Bernoulli, and Energy Equations	5.4-5.7 (Cengel)
10	Review	
11	Exam I	
12	Lab 1	6.1-6.4 (Cengel)
13	Momentum Analysis of Flow Systems	6.5-6.6 (Cengel)
14	Momentum Analysis of Flow Systems	
15	Dimensional Analysis and Modeling	7.1-7.2 (Cengel)
16	Dimensional Analysis and Modeling	7.3-7.5 (Cengel)
17	Pipe Flow	8.1-8.5 (Cengel)
18	Pipe Flow	8.6-8.8 (Cengel)
19	Pipe Flow	6 (Matsson)
20	Ball Valve	9 (Matsson)
21	Orifice Plate and Flow Nozzle	10 (Matsson)
22	Lab II	
23	Review	
24	**Exam I**	
25	Differential Analysis of Fluid Flow	9.1-9.3 (Cengel)
26	Differential Analysis of Fluid Flow	9.4-9.5 (Cengel)
27	Differential Analysis of Fluid Flow	9.6 (Cengel)
28	Taylor-Couette Flow	5 (Matsson)
29	Approximate Solutions of the Navier-Stokes Eq.	10.1-10.3 (Cengel)
30	Approximate Solutions of the Navier-Stokes Eq.	10.4-10.5 (Cengel)
31	Approximate Solutions of the Navier-Stokes Eq.	10.6 (Cengel)
32	Flat Plate Boundary Layer Flow	2 (Matsson)
33	External Flows	11.1-11.3 (Cengel)
34	External Flows	11.4-11.5 (Cengel)
35	External Flows	11.6-11.7 (Cengel)
36	Analysis of the Flow Past an Airfoil	4 (Matsson)
37	Open-Channel Flow	13.1-13.6 (Cengel)
38	Open-Channel Flow	13.7-13.9 (Cengel)
39	Review	
40	**Exam III**	
41	Lab III	
42	Review for Final	None
	FINAL EXAM	

Course Inventory for ORU's Student Learning Outcomes
ME 441—Fluid Mechanics
Spring 2012

This course contributes to the ORU student learning outcomes as indicated below:
Significant Contribution – Addresses the outcome directly and includes targeted assessment.
Moderate Contribution – Addresses the outcome directly or indirectly and includes some assessment.
Minimal Contribution – Addresses the outcome indirectly and includes little or no assessment.
No Contribution – Does not address the outcome.

The Student Learning Glossary at http://ir.oru.edu/doc/glossary.pdf defines each outcome and each of the proficiencies/capacities.

OUTCOMES & Proficiencies/Capacities	Significant Contribution	Moderate Contribution	Minimal Contribution	No Contribution
1	**Outcome #1 – Spiritually Alive** Proficiencies/Capacities				
1A	Biblical knowledge				X
1B	Sensitivity to the Holy Spirit				X
1C	Evangelistic capability				X
1D	Ethical behavior				X
2	**Outcome #2 – Intellectually Alert** Proficiencies/Capacities				
2A	Critical thinking	X			
2B	Information literacy		X		
2C	Global & historical perspectives			X	
2D	Aesthetic appreciation				X
2E	Intellectual creativity	X			
3	**Outcome #3 – Physically Disciplined** Proficiencies/Capacities				
3A	Healthy lifestyle				X
3B	Physically disciplined lifestyle				X
4	**Outcome #4 – Socially Adept** Proficiencies/Capacities				
4A	Communication skills		X		
4B	Interpersonal skills				X
4C	Appreciation of cultural & linguistic differences				X
4D	Responsible citizenship				X
4E	Leadership capacity				X