AEM 311
Fluid Mechanics

Instructor: Dr. James P. Hubner
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Office Hours: 9:00 – 10:00 am MW; 9:30 – 10:30 am TTh, or by appt.

Lecture Hours: 11:00 – 11:50 am MWF, 240 HM Comer Hall

Credit Hours: 3

Requisites: Pre: AEM 201, MATH 227

Texts: Required: Elger, Williams, Crowe & Roberson, *Engineering Fluid Mechanics*, 10th ed., ISBN-10 1-118-16429-6, ISBN-13 978-1-118-16429-7

e-Text version available at a substantially reduced priced:
http://www.coursesmart.com/IR/1699052/9781118164297?__hdv=6.8

Web Page: Log in to http://ualearn.blackboard.com with your myBama account information and select **201240-AEM-311-001.** Course documents, HW assignments, lecture material and other material will be posted at this site.

For technical questions regarding Blackboard Learn, contact the Office of Information Technology at 348-3532.

Other Resources: http://www.efluids.com/efluids/gallery_videos/gallery_pages/1NCFMF_page.jsp
This website has videos that will help you understand and visualize various course concepts. Additionally, there are several fluid mechanics text books and on-line resources that provide further explanation and sample problems.

Grader: Eric McVay

Objective: To develop a fundamental understanding of fluid mechanics. Upon successful completion of the course, the student should be able to understand and derive basic theory as well as to solve applied problems relating to:

- fluid properties
- fluid statics
- conservation of mass, momentum and energy (integral and differential forms)
- flow similarity
- viscous flow (internal and external)

This course will provide the foundation for upper level undergraduate courses such as Energy Systems Design (ME), Water Resources Engineering (CE), and Aerodynamics (AEM).

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Class Policy:

Lecture: Attendance and on-time arrival is expected. **Students are responsible for all scheduling and policy announcements made in class.** Reading assignments are to be completed **prior** to class. Power-off or silence electronic items that can disturb the lecture or distract your attention.

Homework: Chapter homework assignments will be announced in lecture and posted on the course Blackboard Learn. **HW is due at 5:00 pm on days designated in the syllabus.**

Turn in the assignment to the instructor's office or you may turn in the assignment early in class. HW assignments will consist of problems from the text and other sources. **Late HW will not be accepted; however, one free HW drop is provided**. If you turn in all HWs, then the lowest score will be counted as bonus points towards the overall HW grade.

HW solutions must be **neat and orderly:**

- **use one-side of the page only,**
- state the given quantities/conditions as well as the items to calculate,
- sketch necessary diagrams,
- show a logical progression of work,
- **eliminate scratched-off work (those that use pen)—rewrite,**
- **mark (box or underline) final solutions**,
- assume all values given (unless otherwise stated) are accurate to 3-4 significant figures; thus, retain 3-4 significant digits in the final answer (exception: values carefully obtained from graphs are generally good to 2 sig figs),
- draw a dividing line across the width of the page when starting a new problem on the same page, and
- **staple.**

One or two problems will be marked and graded (10 pts each), and the remaining problems will be checked for reasonable effort and procedure (1 pt correct or partially correct; 0 pts little, off-base or no effort).

Points will be deducted for not following the required format. Multiple infractions will result in the HW not being accepted.

Discussion among students regarding HW solution techniques is fine; **copying HW solutions from other students or other sources is not acceptable and will result in a zero grade for that HW assignment. Two offenses will result in a ZERO for the entire semester's HW grade**.

Exams: Four in-class exams and one final comprehensive exam will be administered as scheduled on the syllabus. All exams are closed book; a formula/equation sheet and tables (as needed) will be provided. Exams will cover both text and lecture material.

If you have a scheduled event which prevents you from taking any exam, contact the instructor during the first two weeks of the semester to resolve the conflict. Make-up exams, if given, require instructor notification prior to the examination and supporting documentation.

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Grades: Grades will be based on HW and exams using the following breakdown:

HW:	10%
Hourly Exams (highest three):	60%
Final Exam:	30%

90% will earn at least an	A-
80% will earn at least a	B-
70% will earn at least a	C-
60% will earn at least a	D-
< 60% is failing	F

All regrade requests must be submitted in writing with a thorough and clear explanation of the issue and a suggested amount of points to be credited within one week after the return of the graded assignment. If requested, the entire assignment in addition to the specific points in question can be reviewed. The resulting grade may be higher, lower or no change.

Services: Students requiring disability services must follow the ODS (http://ods.ua.edu) guidelines.

University counseling services are available at http://sa.ua.edu/counseling.

Honor Pledge: I promise or affirm that I will not at any time be involved with cheating, plagiarism, fabrication, or misrepresentation while enrolled as a student at The University of Alabama. I have read the Academic Honor Code, which explains disciplinary procedures that will result from the aforementioned. I understand that violation of this code will result in penalties as severe as indefinite suspension from the University.

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Schedule

Date			Topic	Reading Assign.	HW Due
Jan	9	1	Course Policies and Road Map; Introduction	1.1 – 1.8	
	11	2	Fluid Properties	2.1 – 2.4	
	14	3	Viscosity	2.5 – 2.7	
	16	4	Fluid Properties	2.8 – 2.10	
	18	5	Hydrostatic Equation and Pressure Measurement	3.1 – 3.3	**#1**
	21		***MLK HOLIDAY: No Class***		
	23	6	Hydrostatic Forces	3.4 – 3.5	
	25	7	Buoyancy, Stability	3.6 – 3.7	
	28	8	Flow Descriptions	4.1 – 4.3, **16.1**	**#2**
	30	9	Acceleration and Euler's Equation	4.4 – 4.5	
Feb	1		**TEST 1: Chps 1 – 3**	Summaries 1.9, 2.11, 3.8	
	4	10	Bernoulli's Equation	4.6 – 4.9	
	6	11	Cylinder and Rotating Flow	4.10 – 4.11	
	8	12	Rate of Flow	5.1	**#3**
	11	13	Control Volumes, Reynolds Transport Equation	5.2	
	13	14	Continuity Equation: Integral Form	5.3 – 5.4	
	15	15	Continuity Equation: Differential Form	**16.2** – **16.3**	
	18	16	Cavitation	5.5	
	20	17	Momentum Equation: Integral Form	6.1 – 6.2	**#4**
	22	18	Momentum Equation: Stationary CV	6.3 – 6.4	
	25	19	Momentum Equation: Moving CV	6.5	
	27		**TEST 2: Chps 4 – 5**	Summaries 4.12, 5.6	
Mar	1	20	Navier-Stokes Equations	**16.4**	
	4	21	Energy Equation	7.1 – 7.3, 7.6	**#5**
	6	22	Power and Efficiency	7.4 – 7.5	
	8	23	Transitions; Hydraulic and Energy Grade Lines	7.7 – 7.8	
	11	24	Dimensionless Analysis and Numbers	8.1 – 8.4	**#6**
	13	25	Applications of Similitude	8.5 – 8.7	
	15		**TEST 3: Chps 6 – 7**	Summaries 6.7, 7.9	
	18	26	Applications of Similitude	8.8 – 8.9	
	20	27	Laminar Parallel Plate Flow	9.1	**#7**
	22	28	Laminar Boundary Layer	9.2 – 9.3	
	25				
	27		***SPRING BREAK: No Class***		
	29				
Apr	1	29	Turbulent Boundary Layer	9.4 – 9.5	
	3	30	Separation	9.6	
	5		***HONORS DAY: No class***		
	8	31	Pipe Flow Introduction	10.1 – 10.3	**#8**
	10	32	Laminar Pipe Flow	10.4 – 10.5	
	12		**TEST 4: Chap 8 – 9**	Summaries 8.10, 9.7	
	15	33	Turbulent Pipe Flow	10.6 – 10.7	
	17	34	Minor Losses	10.8	**#9**
	19	35	Noncircular Ducts and Pipe Systems	10.9 – 10.10	
	22	36	Drag: 2D Bodies	11.1 – 11.2	
	24	37	Drag: 3D Bodies	11.3 – 11.6	**#10**
	26	38	Cumulative Review	Summaries 10.11, 11.11	
	29		**Final Exam** (Monday 8:00 – 10:30 am)	**Cumulative**	