TENTATIVE COURSE OUTLINE AND SCHEDULE

MAE 103, Elementary Fluid Mechanics

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Lecture (No.)	Topics (general)	References (Munson, et al.)
1	**INTRODUCTION:**	
	Fluid definitions, characteristics	1.1
	Fluid properties, measures, compressibility	1.4, 1.7
	Pressure	2.1
2	Viscosity, surface tension	1.6, 1.9
	FLUID STATICS:	
	Pressure specifications	2.5
	Hydrostatic pressure distributions	2.2, 2.3
3	Standard atmosphere concepts	2.4
	Applications to manometry	2.6
	Hydrostatic forces on plane surfaces	2.8, 2.9
4	Hydrostatic forces on curved surfaces	2.10
	Buoyancy and stability	2.11
5	Pressure variation with rigid body motion	2.12
	PRESSURE VARIATION IN FLOWING FLUIDS:	
	Bernoulli's equation	3.1, 3.2, 3.3
6	Applications, pressure concepts	3.4, 3.5, 3.6
	Energy and hydraulic grade lines	3.7
	Compressibility effects	3.8
	FLOW KINEMATICS:	
	Velocity, acceleration	4.1, 4.2
7	Eulerian, Lagrangian reference frames	4.1.1
	Streamlines, streaklines, pathlines	4.1.4, 4.2.4
8	Convective, unsteady effects	4.2.2, 4.2.3
	Volume and mass rates of flow, averages	5.1.1
	Reynolds' transport theorem	4.4
9	**FIRST MIDTERM EXAM (1 hour)**	
	Reynolds' transport theorem (cont.)	4.4
	RTT for moving control volumes	4.4.6
10	**CONSERVATION OF MASS:**	
	Derivation	5.1.1
	Fixed, moving, and deforming CVs	5.1.2 - 5.1.4
	Applications: mass cons.	5.1

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11	Differential form of continuity	6.2.1 - 6.2.2
	CONSERVATION OF MOMENTUM:	
	Derivation	5.2.1
	Applications: mom. cons.	5.2.2
12	Applications: mom. cons. (cont.)	5.2.2
	Differential form (Euler eqns.)	6.4.1
	Re-examination of Bernoulli eqn.	6.4.2
13	Intro. to Navier-Stokes eqns.	6.8.2
	Simple exact solns. to the N-S eqns.	6.9
	CONSERVATION OF ENERGY:	
	Derivation	5.3.1
14	Characteristics of loss terms	5.3.2-5.2.3
	Applications, comparison with Bernoulli eqn.	5.3.2-5.2.3
	VISCOUS PIPE FLOW:	
	Background, laminar flow	8.1, 8.2
15	**SECOND MIDTERM EXAM (1 hour)**	
	Laminar pipe flow (cont.)	8.2
	Turbulent pipe flow	8.3.1
16	Moody diagram	8.4.1
	Pipe flow applications	8.4.2, 8.5.1
	COMPRESSIBLE FLOW:	
	Thermodynamic concepts, ideal gases	11.1
17	Mach number, speed of sound, sound propagation	11.2, 11.3
	1D Euler flow in ducts	11.4.1
18	Stagnation and static conditions	11.4.2
	Flows in nozzles/diffusers	11.4.2
	Normal shock waves	11.5.3
19	**DIMENSIONAL ANALYSIS, DYNAMIC SIMILITUDE**	
	Non-dimensional parameters	7.1
	Buckingham Pi Theorem	7.2, 7.3
20	Dynamic similitude, dimensionless groups	7.6
	Review Material	