

TENTATIVE COURSE OUTLINE AND SCHEDULE

MAE 150R, Rocket Propulsion Systems

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(Reference Key: Mu = Munson, et al., HP = Hill and Peterson,
HHL = Humble, Henry, and Larson, CN = ASUCLA Course Notes)

Lecture (No.)	Topics (general)	References			
		Mu	HP	HHL	CN
1	<p>Introduction: Classification of rocket prop. systems History, applications of rocket systems</p> <p>Review topics: Mass conservation w/ applic.</p>		Ch. 1 "	Ch. 1 "	X
2	<p>Momentum conservation w/ applic. Rocket equation Energy conservation w/ applic. Thermodynamic relations</p>	4.4, 5.1 5.2 5.3, 5.4 11.1	2.2 10.3 2.2 2.2, 2.3	3.1 3.3 1.1 3.2 3.2	X X X
3	<p>1D compressible flow: Euler flow Rayleigh and Fanno flow Shock waves Nozzle flows</p>	11.1-11.4 11.5 11.5.3 11.4	3.1-3 3.5,3.6 3.7 11.3	3.2 3.4	X X X X
4	<p>Characteristic propulsive parameters: Thrust, char. velocity, impulse Nozzle efficiency Non-axial exhaust nozzles</p>		10.2,10.3,11.2 11.3 11.3	1.1,3.3 3.3	X X
5	<p>Combustion and thermochemistry: Chemical thermodynamics Chemical equilibrium concepts Adiabatic flame temperature Combustion reaction rates</p>		2.3,2.4 2.4 2.4 2.4	4.1-2 4.3 4.4 4.5	X X
6	<p>Mission & trajectory analysis: Launch vehicles Upper stage/ OTVs Ballistic missiles, interceptors Vertical trajectories Multistage rockets</p>		10.6 10.6 10.4	2.1, 2.6 2.3 2.1,2.2	X X X
7	<p>Liquid propellant systems: Introduction, operation Monopropellants, bipropellants</p>		12.2 12.2	5.0	X X
8	FIRST MIDTERM EXAM				

Lecture (No.)	Topics (general)	References			
		Mu	HP	HHL	CN
9	Components Centrifugal pumps Nozzle chemistry, injectors		12.5 13.2,13.3 12.5	5.1 5.3, 5.4	 X
10	Solid propellant systems: Introduction, burn rates, Isp Components		12.6 12.6,12.7	6.4, 6.5 6.3	X X
11	Thrust vector control, sizing Chamber pressure variation SRM stability, erosive burning		12.6,12.7 12.6,12.7	6.3	
12	Hybrid rocket systems: Review: Heat transfer mech. Introduction, models, burning rates Components		4.5,11.4	3.5 7.2 7.3	X
13	Electric rocket systems: Background material Electrostatic (ion) propulsion		14.2-14.4	9.4.2	X
14	Electromagnetic propulsion (plasma thrusters) Electrothermal propulsion (arcjets)		14.5 14.6	9.4.1 9.4.1	
15	SECOND MIDTERM EXAM				
16	Nuclear rocket systems: Background, fission, binding energies Nuclear thermal rockets			8.1, 8.4	X X
17	HOLIDAY				
18	Advanced propulsion systems: Air-augmented systems, ram rockets, HEDF Current technical issues: EELVs vs. RLVs SSTO vs TSTO Guest lecture: The Bridge to Space			11.1	 X X
19	Guest lectures: Kelly Astroliner Concept Satellite Propulsion Systems				
20	Guest lectures: X-33 Linear Aerospike engine Propellant management				