AAE 539 Advanced Rocket Propulsion
Course Organization and Information
Spring Semester, 2002

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Text: Humble, Henry, & Larson, *Space Propulsion Analysis and Design* McGraw Hill, 1995.
AAE 439 Course Pack also available at Copymat Printing (Chauncey Village)

Prerequisites: AAE 439 or Undergraduate background in compressible flows and thermodynamics.

Homework: All assignments will be due at the beginning of class. No late assignments will be accepted for any reason. There will be three major homework projects; each of which will count for 5% of the course grade. The remainder of the assignments will account for 15% of the course grade.

Exams: A two hour midterm will be scheduled during the evening. The final exam will be given during the university allocated time period.

Homework Projects: A total of three homework projects will be assigned during the course of the semester. One project will involve liquid rocket engine technology, one will involve solid rocket motor technology, and the third will be a paper on some topic not covered in class. More information will be provided when projects are formally assigned.

Grading: Homework - 15%
Homework Projects - 15%
Midterm Exam - 30%
Final Exam - 40%

AAE 539 Course Outline

1. Introduction
   - — Brief review of rocket fundamentals and thermochemistry

2. Steady, One-Dimensional Duct Flows
   - — Generalized 1-D compressible flow
   - — 1-D incompressible flow

3. Heat Transfer
   - — The energy equation, dimensionless parameters
   - — Rocket cooling techniques
   - — Nozzle heat transfer
   - — Application to nuclear rocket

4. Liquid Rocket Engines
   - — LRE Cycles and Power Balance
   - — Pump design and analysis
   - — Tank design and analysis
   - — Thrust chambers
   - — Pressurization systems
   - — Combustion and Combustion Stability

5. Solid Rocket Motors
   - — Unsteady Ballistics Analysis (lumped parameter)
   - — Burning rate theory, erosive burning
   - — Treatment of ballistic anomalies and variations
   - — Nozzle design

6. Hybrid Rocket Motors
   - — Performance Characterization
   - — Combustion Theory

7. Electric Propulsion (Time Permitting)
   - — Classification
   - — Analysis and Design