ENAE 683: High Temperature Gas Dynamics

Course Description

This course will address aspects of physical chemistry and statistical thermodynamics necessary for the analysis of high-temperature equilibrium and non-equilibrium gas dynamic processes. Techniques will be addressed covering the calculation of gas properties at high temperatures, including rate limited processes and transport properties. The resulting flow characteristics for shock waves, nozzle flows, blunt body flows, and chemically reacting boundary layers will be addressed. An introduction to radiative gas dynamics will be provided.

Schedule

The subject is taught in two lectures per week, Tuesday and Thursday at 3:30-4:45 p.m. Additional lecture hours may be scheduled for recitation, quiz reviews, or makeup classes.

Assessment

Grading will be based on one in-class exam and a final exam, plus 5-6 problem sets. The in-class exam and the final exam will each count for 40% of the grade, and the average of all problem *sets* will count for 20%, though we reserve the right to exercise judgment in this matter.

Instructor

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Text

Primary text is Hypersonics and High Temperature Gas Dynamics, 2nd Edition, J. D. Anderson, Jr., AIAA Education Series, 2006.

Topics Covered

Week 1	Introduction to High-Temperature Gas Dynamics
Week 2	Thermodynamics of Chemically Reacting Gases
Weeks 3-4	Statistical Thermodynamics
Week 5	Kinetic Theory of Gases
Weeks 6-7	Non-equilibrium Processes
Weeks 8-9	Inviscid High Temperature Flows
Weeks 10-11	Transport Properties
Week 12	Viscous High Temperature Flows
Weeks 13-14	Radiative Gas Dynamics