

ENAE683 – High-Temperature Gas Dynamics

- Description:** This course deals with flows in which the local temperature becomes sufficiently high that the perfect-gas approximation no longer holds. Topics to be covered include:
- Introductory kinetic theory, chemical thermodynamics and statistical mechanics
 - The ideal dissociating gas (IDG): equilibrium and nonequilibrium
 - Vibrational nonequilibrium
 - Normal and oblique shocks, expansions
 - Propagation of sound waves
 - Nozzle flows
 - Curved shocks/blunt-body flows
 - Viscous flows/chemically reacting boundary layers
 - Radiative gas dynamics
 - Facilities for simulating high-temperature flows
- Instructor:** Dr. Stuart Laurence, Glenn L. Martin Hall 3184
stuartl@umd.edu, Office: 301 405 2422
- Class Schedule:** Tuesdays and Thursdays, 12:30 – 1:45, EGR 3102
- Office hours:** Wednesdays, 1pm or by appointment
- Prerequisites:** Graduate or advanced undergraduate course in compressible flow (ENAE674 or equivalent)
- Coursework:** Coursework will consist of biweekly homework assignments (~65% of grade) and one final project/exam (35%)
- Textbooks:** None required. The following may be helpful:
1. J. Anderson, Hypersonic and High-Temperature Gas Dynamics: modern text, conversational in style; covers numerical techniques but not all the theoretical aspects we will be considering (e.g., IDG).
 2. W. G. Vincenti & C. H. Kruger, Introduction to Physical Gas Dynamics: classic text on subject, doesn't cover modern numerical techniques
 3. J. F. Clarke & M. McChesney, The Dynamics of Real Gases
 4. W. H. Dorrance, Viscous Hypersonic Flow: covers reacting boundary-layer theory