1. ME 5462, Gas Turbines

2. 4 credits, 4 contact hours

3. Instructors: T. Simon, D. Kittelson, S. Yang


5. Specific course information:
   b. Prerequisites: ME 3331, ME 3332, ME 3333, CSE upper division or grad student.
   c. Elective for ME students.

6. Course outcomes (related ABET student outcomes indicated in square brackets):
   a. An ability to apply mass, momentum, energy and entropy balance principles to ideal gas systems with constant and variable specific heats. [1]
   b. An ability to analyze gas turbine cycles, beginning with the basic Brayton cycle and incorporating intercooling, reheat, regeneration, afterburning, etc. [1]
   c. An ability to apply compressible gas dynamics to subsonic and supersonic nozzle design relevant for gas turbine exhaust systems. [1,2]
   d. An ability to apply thermochemistry of complete and incomplete reactions, as well as principles of choking due to heat addition, to design basic gas turbine combustors. [1,2]
   e. An ability to apply conservation of angular momentum to analyze velocity-vector diagrams of compressors and turbines, and to represent stage and system performance in the T-s property plane. [1]
   f. An understanding of the importance of and limitations to gas turbine engine performance imposed by system irreversibility. [1,2]
   g. An ability to apply thermodynamic and fluid mechanics principles to the matching of turbine and compressor components. [1,2]
   h. An understanding of gas turbine emissions and their environmental impact. [4]

7. Course topics:
   a. Review of thermodynamics & fluid mechanics.
   b. Balance principles of mass, momentum, energy and entropy for gas systems.
   c. Introduce compressible flow concepts: sound speed and Mach number.
d. Introduce concept of stagnation state of a fluid.
e. Develop basic thermodynamic cycle analysis for gas turbine engines.
f. Evaluate the role of regeneration, reheat, and intercooling on cycle performance.
g. Develop thrust equation; examine the performance of turbojet, turbofan, turboprop and ramjet engines.
h. Fluid mechanics of rotating machinery; velocity-vector diagrams — related work and energy expressions.
i. Stage calculations for compressors and turbines.
j. Performance of compressors, combustors, turbines, nozzles & diffusers.
k. Off design performance considerations.
l. Component matching.
m. Film cooling, secondary flow, pumping losses; system integration issues.
n. Gaseous particulate and noise emissions.