PROPULSION: COURSE INTRODUCTION:

Course Learning Objectives:

Given the basic geometry and idealized component performance, to be able to estimate the thrust and specific impulse of a gas turbine and a rocket engine from fluid and thermodynamic principles.

Measurable outcomes (assessment method):

1. To be able to explain at a level understandable by a high school senior or non-technical person what the various terms are in the integral momentum equation and how jet propulsion works. (quiz, self-assessment)
2. To be able to apply control volume analysis and the integral momentum equation to estimate the forces produced by aerospace propulsion systems (homework, quiz, self-assessment)
3. To be able to describe the principal figures of merit for aircraft engine and rocket motor performance and explain how they are related to vehicle performance. (quiz, self-assessment)
4. Given weight, geometry, and aerodynamic and propulsion system performance information, to be able to estimate the power required for flight, the range, the endurance, and the time-to-climb for an aircraft. (homework, quiz, self-assessment)
5. Given mass fractions, and propulsion system performance information, to be able to estimate the range and velocity of single-stage rockets. (homework and quiz, self-assessment)
6. To be able to describe the principal design parameters and constraints that set the performance of gas turbine engines, and to apply ideal-cycle analysis to a gas turbine engine to relate thrust and fuel burn to component-level performance parameters and flight conditions. (homework, quiz, self-assessment)
7. To be able to explain at a level understandable by a high school senior or non-technical person the energy exchange processes that underlie the workings of multistage compressor or turbine, and to be able to use velocity triangles and the Euler Turbine Equation to estimate the performance of a compressor or turbine stage. (homework, quiz, self-assessment)