THERMODYNAMICS: COURSE INTRODUCTION

Course Learning Objectives:

> To be able to use the First Law of
> Thermodynamics to estimate the potential
> for thermo-mechanical energy conversion in
> aerospace power and propulsion systems.

Measurable outcomes (assessment method):

1. To be able to state the First Law and to define heat, work, thermal efficiency and the difference between various forms of energy. (quiz, self-assessment, PRS)
2. To be able to identify and describe energy exchange processes (in terms of various forms of energy, heat and work) in aerospace systems. (quiz, homework, self-assessment, PRS)
3. To be able to explain at a level understandable by a high school senior or non-technical person how various heat engines work (e.g. a refrigerator, an IC engine, a jet engine). (quiz, homework, self-assessment, PRS)
4. To be able to apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (heaters, coolers, pumps, turbines, pistons, etc.) to estimate required balances of heat, work and energy flow. (homework, quiz, self-assessment, PRS)
5. To be able to explain at a level understandable by a high school senior or non-technical person the concepts of path dependence/independence and reversibility/irreversibility of various thermodynamic processes, to represent these in terms of changes in thermodynamic state, and to cite examples of how these would impact the performance of aerospace power and propulsion systems. (homework, quiz, self-assessment, PRS)
6. To be able to apply ideal cycle analysis to simple heat engine cycles to estimate thermal efficiency and work as a function of pressures and temperatures at various points in the cycle. (homework, self-assessment, PRS)

Teaching & Learning Methods

1. Detailed lecture notes are available on the web (for viewing and/or downloading). You should download a copy of these and bring them with you to lecture.
2. Preparation and participation will be important for learning the material. You will be responsible for studying the notes prior to each lecture. Several reading assignments will be

given to help promote this activity (1/3 of participation grade).

3. Several active learning techniques will be applied on a regular basis (turn-to-your-partner exercises, muddiest part of the lecture, and ungraded concept quizzes). We will make extensive use of the PRS system (2/3 of participation grade).

4. Homework problems will be assigned (approximately one hour of homework per lecture hour). The Unified Engineering collaboration rules apply.