AE 8813 – Aerospace Propulsion Lab

HOURS: 1-0-4-3

CATALOG DESCRIPTION (25 words or fewer):

Theory and application of common experimental and data analysis methods used in propulsion and combustion research; written and oral dissemination of experimental results.

PREREQUISITES:

None

TEXTBOOKS:

None: course notes will be provided.

COURSE OBJECTIVES:

To provide students understanding and experience with fundamental experimentation and data analysis techniques used in propulsion and combustion research.

LEARNING OUTCOMES:

Students successfully completing this course will be able to:

1. perform experiments in a safe manner;
2. use and create basic data acquisition tools in LabView to interact with experimental hardware (input/output systems), including capturing time-resolved data;
3. select appropriate hardware for experimental tasks related to flow metering, imaging, dynamic pressure systems, low-pressure plasmas, and pulsed lasers;
4. setup, operate, and calibrate common experimental systems and measurement devices;
5. properly document experimental conditions and acquired data;
6. analyze experimental data, conduct appropriate error analysis;
7. effectively report experimental findings in both written and oral forms;
8. work efficiently in teams to conduct experiments and report findings.

GRADING:

Lecture Attendance and Participation	10%
Assignments:	5%
Written Lab Reports:	75%
Oral Presentation:	10%

TOPICAL OUTLINE:

Introduction/Syllabus Presentation

Lab Safety and Laser Safety

Lab Best-Practices

A. Documenting lab activities
B. Using metadata in data acquisition and storage

Data Acquisition Systems and Software (Labview)

Experimental Uncertainty Analysis

Flow Metering and Control

A. Orifice based devices (critical and subcritical(
B. Coriolis meters

Imaging Systems

A. Signal quantification and noise sources
B. Spatial resolution and transfer functions

Dynamic Pressure Measurements

A. Acquisition of time-resolved signals and frequency considerations
B. Acoustic considerations and wave guides

Low-Pressure Plasmas and Spectroscopy

A. Vacuum and high voltage systems
B. Glow discharges
C. Langmuir probes
D. Spectrometers

Pulsed Lasers

A. Laser operation
B. Laser beam characteristics and beam forming optics
C. Laser sheet formation and imaging of laser scattering