

# THE DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

## AA461 ADVANCED AIR BREATHING PROPULSION

### AUTUMN QUARTER

#### CREDITS AND

**CONTACT HOURS:** 3 credits, Three 50-minute lectures per week.

**COORDINATORS:** M. Kurosaka, J. Hermanson

**TEXTBOOK:** None

#### SUPPLEMENTAL

**MATERIALS:** Aerothermodynamics of Gas Turbines and Rocket Propulsion: Revised and Enlarged, G. C. Oates, AIAA Educational Series, 1988.

Aerothermodynamics of Aircraft Engine Components, G. C. Oates, AIAA Educational Series, 1985.

Mechanics and Thermodynamics of Propulsion, P. Hill and C. Peterson, Addison-Wesley, 1992.

Elements of Propulsion: Gas Turbines and Rockets, J. Mattingly, AIAA Educational Series, 2006.

**CATALOG DATA:** ADVANCED AIR BREATHING PROPULSION, Selective Elective  
Examines gas turbine engine design methodology. Covers aerodynamics or gas dynamics of air breathing engine components; inlets, compressors, turbines, and nozzles. Studies the on-design and off-design performance of gas turbine engines. Includes combustion, emissions, noise and advanced air breathing propulsion systems. Prerequisite: A A 360. Offered: A.

**PREREQUISITES BY TOPICS:**

- 1) Thermodynamics
- 2) One -dimensional compressible flow
- 3) Propulsion

**OUTCOMES:**

1. Students will understand the aerothermodynamics of air breathing engines.
2. Students will understand the fundamentals of compressor aerodynamics and performance.
3. Students will understand the fundamentals of turbine aerodynamics and performance.
4. Students will understand the fundamentals of the on-design and off-design performance of turbine engines and engine components.
5. Students will understand the fundamentals of inlet and exhaust nozzle performance.
6. Students will understand the basics of gas turbine emissions and noise.

#### RELATIONSHIP TO STUDENT OUTCOMES:

a) An ability to apply knowledge of mathematics, science, and engineering.

## **THE DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS**

- c) An ability to design a system, component, or process to meet desired needs.
- e) An ability to identify, formulate, and solve engineering problems.
- i) A recognition of the need for, and an ability to engage in life-long learning.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### **TOPICS:**

1. Elementary theory of compressor aerodynamics
2. Elementary theory of turbine aerodynamics
3. On and off-design performance of aircraft gas turbines
4. Inlet and exhaust nozzle aerodynamics
5. Combustion, emissions, and noise
6. Ramjets and scramjets