THE DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

AA 360 PROPULSION I

SPRING QUARTER

CREDITS AND CONTACT HOURS: 4 credits, Four 50-minute lectures per week.

COORDINATOR: Mitsuru Kurosaka, Professor of Aeronautics and Astronautics

TEXTBOOK: Elements of Propulsion, J.D. Mattingly, AIAA, 2006.

SUPPLEMENTAL MATERIALS:
Aerothermodynamics of Gas Turbine and Rocket Propulsion, G.C. Oates, (Engr. Library) AIAA, 1997.
Rocket Propulsion Elements, G.P. Sutton and O. Biblarz, Wiley, 2001.
Mechanics and Thermodynamics of Propulsion, P.C. Hill and C.R. Peterson, 2nd Ed., Addison-Wesley, 1992.
An Introduction to Combustion, S.R. Turns, McGraw-Hill, 2000.

CATALOG DATA: PROPULSION, Required
Study of the aero- and thermodynamics of jet and rocket engines. Air-breathing engines as propulsion systems. Turbojets, turbofans, turboprops, ramjets. Aerodynamics of gas-turbine engine components. Rocket vehicle performance. Introduction to space propulsion. Prerequisite: minimum grade of 1.7 in A A 301.

PREREQUISITES BY TOPIC:
1) Thermodynamics
2) Compressible flow

OUTCOMES:
1) Students will understand the aero- and thermodynamics of jet and rocket engines.
2) Students will understand the fundamentals of turbojets, turbofans, turboprops, ramjets, scramjets, and hybrid engines.

Commented [j1]: This looks more like an AA461 objective

RELATIONSHIP TO STUDENT OUTCOMES:
a) An ability to apply knowledge of mathematics, science, and engineering.
e) An ability to identify, formulate, and solve engineering problems.
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

TOPICS:
1) Overview
2) Review of thermodynamics/one-dimensional compressible flow
3) Thrust equation for air breathing engines
4) Thermal and propulsive efficiencies
5) Air breathing propulsion cycles: ideal performance of turbojets, turbofans, turboprops, ramjets, advanced engine cycles
6) Effects of losses and component efficiencies
7) Rocket equation; velocity increment, specific impulse
8) Staging; series and parallel

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9) Nozzle flow fundamentals
10) Chemical/non-chemical rockets