

MECH3660 Gas Turbines and Jet Propulsion

Course Code: MECH3660	Course Title: Gas Turbines and Jet Propulsion
Required Course Or Elective Course: Elective for BEng(MECH)/Required for Aero Major	Terms Offered (Credits): Spring (3 credits)
Faculty In Charge: Xin ZHANG	Pre/Co-Requisites: Prerequisite(s): (MATH2111 OR MATH2350 OR MATH2351) AND MECH3640
Course Structure: 2 classes (1.5 hours) per week; Tutorial: 1 hour per week	
Textbook/Required Material: <ol style="list-style-type: none"> 1. "Jet Propulsion" by Nicholas Cumpsty and Andrew Heyes, 3rd ed., Cambridge University Press, 2015 2. Class notes 	
Bulletin Course Description: Jet propulsion, gas turbine, engine types, performance, turbojet, turboprop, E-propulsion engines, designs of compressor, combustor, and turbines, and environmental considerations. For science and engineering students in their third year of study or above.	
Course Topics: <ol style="list-style-type: none"> 1. Introduction to jet propulsion and engine classification 2. Aerodynamics 3. Performance metrics 4. A case study 5. Numbering and certification 6. Intake 7. Nozzle 8. Ramjet 9. Turbojet 10. Turbofan 11. Bypass ratio 12. Dynamic scaling and non-dimensional analysis 13. Compressor 14. Combustion 15. Turbine 16. Turboprop 17. Rocket 18. E-propulsion 19. Environmental Consideration: aircraft/ engine noise 	
Course Objectives: (correlated program objectives)	<ol style="list-style-type: none"> 1. Students will establish understanding of propulsion systems in aircraft that are essential to graduate engineers who are intended to work in aircraft system/component manufacturing/maintenance environments. [P-01, P-02] 2. Students should be able to describe and appreciate the key aeronautical engineering features of the context in which the relevant industry operates. [P-03, P-04]
Course Outcomes:	A. Students will gain skills in problem solving for aircraft propulsion

(correlated course objectives and program outcomes)	<p>systems, in particular gas turbine engines. [POC1, POC3, POC5, POC7]</p> <p>B. Students will gain ability to carry out a cyclic analysis of a gas turbine engine, including turbofan engines. [POC1, POC3, POC6]</p> <p>C. Students will be able to determine the applicability of a given propeller system for a given aircraft. [POC1]</p> <p>D. Students will understand the working of various components of gas turbines. [POC1, POC4, POC5]</p> <p>E. Students should gain an appreciation of design constraints and environmental impact of aero-engine. [POC9, POC10, POC11, POC12]</p>
Assessment Tools: (correlated course outcomes)	<p>(1) Mid-term – 30%</p> <p>(2) Attendance – 10 %</p> <p>(3) Final Exam – 60%</p>

BEng in Aerospace Engineering (4-year program)

Program Objectives:

- P-O1. Be able to communicate and perform as an effective engineering professional in both individual and team-based project environments,
- P-O2. Have an international outlook with clear perspectives on the Pearl river Delta and Greater China,
- P-O3. Be able to research, design, develop, test, evaluate and implement engineering solutions to problems that are of complexity encountered in professional practice and leadership,
- P-O4. Clearly Consider the ethical implications and societal impacts of engineering solutions,
- P-O5. Continuously improve through lifelong learning.

Program Outcomes:

- POC1. Ability to identify and formulate problems in multidisciplinary environment with an understanding of engineering issues and constraints
- POC2. Ability to design and conduct experiments as well as analyze and interpret data
- POC3. Ability to apply knowledge of mathematics, science, and engineering for problem solving in aerospace engineering and related sectors or for further education in a research career
- POC4. Ability to develop specification and to design system, component, or process to meet needs
- POC5. Ability to understand the design, operation, and maintenance of aircraft components and systems
- POC6. Ability to use modern engineering tools, techniques, and skills in engineering practice
- POC7. Ability to communicate effectively
- POC8. Ability to function in multi-disciplinary teams and provide leadership
- POC9. Broadly educated with an understanding of the impact of engineering solutions on issues such as economics, business, politics, environment, health and safety, sustainability, and societal context
- POC10. Clear understanding of professional and ethical responsibilities
- POC11. Recognition of the need for life-long learning and continuing education
- POC12. International outlook with knowledge of contemporary issues