# MECH3660 Gas Turbines and Jet Propulsion

<table>
<thead>
<tr>
<th>Course Code: MECH3660</th>
<th>Course Title: Gas Turbines and Jet Propulsion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Course Or Elective Course:</strong></td>
<td><strong>Terms Offered (Credits):</strong> Spring (3 credits)</td>
</tr>
<tr>
<td>Elective for BEng(MECH)/Required for Aero Major</td>
<td></td>
</tr>
<tr>
<td><strong>Faculty In Charge:</strong> Xin ZHANG</td>
<td><strong>Pre/Co-Requisites:</strong></td>
</tr>
<tr>
<td></td>
<td>Prerequisite(s): (MATH2111 OR MATH2350 OR MATH2351) AND MECH3640</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Course Structure:</strong></th>
<th>2 classes (1.5 hours) per week; Tutorial: 1 hour per week</th>
</tr>
</thead>
</table>

**Textbook/Required Material:**
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:
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. Turboprop
11. Bypass ratio
12. Dynamic scaling and non-dimensional analysis
13. Compressor
14. Combustion
15. Turbine
16. Turbojet
17. Rocket
18. E-propulsion
19. Environmental Consideration: aircraft/ engine noise

## Course Objectives:
(correlated program objectives)
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)

- systems, in particular gas turbine engines. [POC1, POC3, POC5, POC7]
- B. Students will gain ability to carry out a cyclic analysis of a gas turbine engine, including turbofan engines. [POC1, POC3, POC6]
- C. Students will be able to determine the applicability of a given propeller system for a given aircraft. [POC1]
- D. Students will understand the working of various components of gas turbines. [POC1, POC4, POC5]
- E. Students should gain an appreciation of design constraints and environmental impact of aero-engine. [POC9, POC10, POC11, POC12]

### Assessment Tools:

<table>
<thead>
<tr>
<th>(correlated course outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Homework assignments – 30%</td>
</tr>
<tr>
<td>(2) Attendance – 10%</td>
</tr>
<tr>
<td>(3) Final Exam – 60%</td>
</tr>
</tbody>
</table>

---

**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