

1. *Course number and name*
MEE 448: Fixed Wing Aircraft Design
2. *Credits and contact hours*
3 credits; 3 hours per week
3. *Instructor's or course coordinator's name*
Course coordinator: Wilhelm Alex Friess, Associate Professor, Mechanical Engineering
4. *Text book, title, author, and year*
Snorri Gudmundsson, General Aviation Aircraft Design, Applied Methods and Procedures, Elsevier, 2013

a. other supplemental materials

XFLR5 Software (<http://www.xflr5.com/xflr5.htm>)
MatLAB, MathCAD or Excel

5. *Specific course information*

a. brief description of the content of the course (catalog description)

The conceptual design of a fixed-wing aircraft to satisfy given specifications, including elements of initial sizing, geometry selection (or vehicle configuration), aerodynamics, propulsion integration, stability and control, loads, structures, manufacturability, and cost analysis. Students will apply design skills in a semester long design project.

b. prerequisites or co-requisites

Prerequisite: MEE 120, MEE 251, MEE 270, and MEE 360

c. indicate whether a required, elective, or selected elective course in the program

Technical Elective for Mechanical Engineering Majors

6. *Specific goals for the course*

a. specific outcomes of instruction.

By the end of this course, students will demonstrate an ability to:

- Present an overview of aircraft types and development criteria (ABET Student Outcomes c, d, f, g, j).
- Understand the tradeoffs in aircraft configurations due to mission and performance requirements (ABET Student Outcomes a, c, f).
- Define the design space of fixed wing aircraft based on mission requirements, and carry out appropriate trade studies (ABET Student Outcomes a, c, j, k).
- Perform basic airframe sizing (ABET Student Outcomes a, c).
- Perform basic 2D and 3D aerodynamic analysis, and apply software and experimental tools (ABET Student Outcomes a, d, g, k).
- Perform basic stability analysis (ABET Student Outcomes a, k).
- Perform basic cost analysis (ABET Student Outcomes a, c, f).

- Generate basic design documentation including 3view drawing package (ABET Student Outcomes c, k).

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

Course addresses ABET Student Outcomes: [a] an ability to apply knowledge of mathematics, science, and engineering, [c] an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability, [d] an ability to function on multidisciplinary teams, [f] an understanding of professional and ethical responsibility, [g] an ability to communicate effectively, [j] a knowledge of contemporary issues, [k] an ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

7. *Brief list of topics to be covered*

Dates	Topics (Tentative)	Covers
Week 1	Introduction to fixed wing aircraft	Ch 1
Week 2	Costing	Ch 2
Week 3	Aircraft conceptual design	Ch 3 and 4
Week 4	Structures and initial weight estimation	Ch 5 and 6
Week 5	Weight estimation	Ch 6
Week 6	Powerplants	Ch 7
Week 7	2 D aerodynamics	Ch 8
Weeks 8	2D aerodynamics	Ch 8
Week 9	XFLR5	Lab
Week 10	Anatomy of a wing	Ch 9
Week 11	AOTW 3 and lift enhancement and drag	various
Week 12	Stability and team semester project	various
Week 13	Aircraft performance and team semester project	various
Week 14	Semester project and final presentations	