

- Course Number and Title: A E 451. Aircraft Design
- Catalog Description: Conceptual design of aircraft based on existing designs, empirical relationships, and theory. Dimensioning, structural design, and performance analysis of major sub-components such as fuselage, wing, and propulsion system. Static stability and control analysis.
- Credit Hours: 3 Credits (3)
- Prerequisite(s) / Corequisite(s): Prerequisite(s): A E 363 and A E 339
Corequisite(s): None
- Required: Elective for BSAE Degree
- Course Availability: Fall Semester
- Instructor (Usual): Dr. Andreas Gross (See <https://mae.nmsu.edu/people/faculty.html>)
- Textbook:
 - 1) Design of Aircraft by Thomas C. Corke, Prentice Hall, ISBN 0-13-089234-3
 - 2) Aerodynamics, Aeronautics, and Flight Mechanics by Barnes W. McCormick, John Wiley & Sons, ISBN 0-471-57506-2
 - 3) Aircraft Design: A Conceptual Approach by Daniel P. Raymer, AIAA Education Series, ISBN 9781624104909
- Course Learning Objectives: After completing this course, a student should be able to:
 - 1) Design aircraft for specific mission and to carry out all necessary analyses.
 - 2) Get familiar with different design options for various aircraft components.
 - 3) Develop understanding of multi-disciplinary nature of conceptual aircraft design.
 - 4) Develop understanding of tradeoffs in airplane design and how contradicting design requirements will lead to design compromises.
 - 5) Work as part of a team to accomplish the stated objectives of a design project.
 - 6) Learn how to use spreadsheets for conceptual aircraft design.
 - 7) Learn engineering analysis methods for conceptual aircraft design.
 - 8) Carry out airfoil aerodynamic analysis using XFLR5 and to create a visual representation of an aircraft using OpenVSP.
- Topics Covered:
 - Takeoff weight estimate
 - Drag breakdown
 - Wing loading selection and aircraft performance

- Main wing, fuselage, and horizontal/vertical tail design, lifting line theory
- Engine selection
- Blade element momentum theory
- Take-off and landing analysis
- Enhanced lift design
- Loading analysis and operating limitations
- Structural design and material selection
- Static stability and control
- Electric Aircraft and Vertical Lift