

# Aerodynamics

- 1. Course number and name:** 020ARDES3 Aerodynamics
- 2. Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours per week
- 3. Name(s) of instructor(s) or course coordinator(s):** Bassam Riachi
- 4. Instructional Materials:** Fundamentals of Aerodynamics, J. Anderson, 2017

Textbooks/References:

- Aircraft performance and design, J. Anderson, 2010.
- Introduction to Flight, J. Anderson, 2005.
- FAA Aviation Series, 2018.

## 5. Specific course information

### a. Catalog description:

A course on theoretical and empirical methods for calculating the loads on airfoils and finite wings by application of classical potential theory, thin airfoil approximations, lifting line and lifting surface theory, and panel methods; wings and airplanes; application of linearized supersonic flow to supersonic airfoils; performance and constraint analysis; longitudinal stability and control.

**b. Prerequisite:** Fluid Mechanics 1 (020MF1ES1) or Fluid Mechanics (020MEFES1).

**c. Selected Elective** for ME students.

## 6. Educational objectives for the course

### a. Specific outcomes of instruction:

By the end of the course, the students will be able to:

- Identify and explain basic inviscid and incompressible aerodynamic concepts.
- Identify and explain aircraft structures: wings, wing tails, control surfaces.
- Identify wind tunnels and aerodynamic measurements and instruments.
- Perform calculations of wind tunnels
- Apply airfoil theory to solve problems and predict airfoil performance.
- Analyze and optimize wing performance.
- Analyze airfoils at subsonic, transonic and supersonic flight conditions.
- Apply and analyze basic compressible gas dynamics concepts and equations to wind tunnels, nozzles, wings and airplanes.

**b. PI addressed by the course:**

PI	1.1	1.2	1.3	3.2
Covered	x	x	x	
Assessed	x	x	x	x

**7. Brief list of topics to be covered**

- Aerodynamics: Introduction.
- Aerodynamics: Fundamental Principles and Equations.
- Fundamentals of Inviscid, Incompressible Flow.
- Incompressible Flow over Airfoils.
- Incompressible Flow over Finite Wings.
- Three-Dimensional Incompressible Flow.
- Inviscid Compressible Flow – Introduction to Shock Waves.
- Introduction to Subsonic/Supersonic Compressible Flow over Airfoils.