

AIRCRAFT DESIGN

SSD	CFU	Anno (I o II)		Semestre (I o II)		Lingua	
		I	II	I	II	Italiano	Inglese
ING-IND/03	9		✓		✓		✓

Insegnamenti propedeutici previsti: Aerodinamica degli Aeromobili, Dinamica e Simulazione di Volo

Classi				
Docenti				

OBIETTIVI FORMATIVI

The course will show a complete and organic methodology for the preliminary design of transport aircraft. Starting from the design requirements, all problems concerning design of airplane component's and the design of the complete aircraft will be shown. A software tool for preliminary sizing of aircraft is demonstrated. Application, methods and data to enable case studies of subsonic aircraft design are provided and students will develop in group the preliminary design of a transport aircraft also enhancing their soft skill and team-working capabilities.

PROGRAMMA

Aircraft design process and phases. Certification rules and impact on the design. Overall configuration. Design requirements. Preliminary design and optimization. Different configurations and arrangements. Propulsion and engine position. Preliminary sizing (aircraft weights, wing area and installed thrust).
 Wing Design. Flight performances, cruise speed. Drag divergence and buffeting.
 High-lift system design. Stall speed. Take-off and Landing.
 Fuselage design. Drag polar estimation. Flight performances calculation.
 Range(propeller and jet). Block speed. Pay-load Range diagram. Direct Operative Costs (DOC). Optimal range and speed. Transport efficiency. Aileron efficiency and design. Aircraft weight estimation. Weight and balance.
 Landing gear design. Tail design for stability and control. Longitudinal stability and control. Horizontal plane design. Stick fixed and stick free stability (neutral point). Stick force. Maneuvering stability.
 Directional stability and control. Vertical tailplane design. Minimum control speed (VMC). Adverse yaw. Lateral stability and dihedral effect. Aircraft cost, safety and environmental issues

MODALITA' DIDATTICHE

Lectures on theory and exercises and applied examples focused on the development of a conceptual/preliminary design of an airplane.

MATERIALE DIDATTICO

Slides and course notes. The students will be also working with a specific software called ADAS for aircraft preliminary design.

MODALITA' DI ESAME

L'esame si articola in prova	Scritta e orale	✓	Solo scritta		Solo orale	
In caso di prova scritta i quesiti sono	A risposta multipla		A risposta libera	✓	Esercizi numerici	
Altro	Examination consists on a written essay on two assigned topics (i.e. design of the wing, design of the vertical tail). Evaluation of student's capabilities concerning synthesis, link among different topics and design procedures. The development of the group design project gives an additional score (it is not mandatory).					