



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	
ACADEMIC YEAR	
ANNO ACCADEMICO EROGAZIONE	
SUBJECT	
CODE	
SCIENTIFIC SECTOR(S)	
HEAD PROFESSOR(S)	BENEDETTI IVANO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	
TERM (SEMESTER)	
ATTENDANCE	
EVALUATION	
TEACHER OFFICE HOURS	BENEDETTI IVANO Monday 14:30 16:30 Ufficio Docente Tuesday 14:30 16:30 Ufficio Docente

<p>PREREQUISITES</p>	<p>Basic mathematical concepts and methods: exponential, logarithmic and trigonometric functions, study of functions, limits, derivatives and integrals, vector algebra. Basic concepts and methods of general physics: Newton's laws, law of state of gases.</p>
<p>LEARNING OUTCOMES</p>	<p>Knowledge and Understanding Students will acquire knowledge and understanding in relation to:</p> <ul style="list-style-type: none"> • Classification of aircraft and space vehicles; • Relationship between objectives and mission requirements and aircraft/vehicle design; • Classification of aircraft systems and spacecraft subsystems; • Standard description of the operating environment (typical air, elementary models of planetary atmosphere); • Basic elements of aerodynamics and analysis of load-bearing surfaces; • Aeronautical and aerospace propulsion elements; • Elements of aircraft performance analysis in certain flight conditions; • Elements of construction and aerospace materials; • Elements of aeronautical regulations. <p>Ability to apply knowledge and understanding Students will learn to:</p> <ul style="list-style-type: none"> • Identify the salient elements of an aerospace vehicle in relation to mission objectives and requirements; • Describe the characteristics of the operating environment; • Calculate the aerodynamic characteristics of the main load-bearing surfaces; • Distinguish and describe the main characteristics of the propulsion systems of an aerospace vehicle; • Understand the role of structural components and the choice of materials and construction solutions and of an aerospace vehicle; • Evaluate balances of forces and moments on an aerospace vehicle in certain mission segments; • Know the main regulations in force in relation to the technical aspects of the aeronautical sector and the standards in the space field. <p>Autonomy of judgement Students will acquire sufficient knowledge to independently understand and evaluate the main technical and regulatory aspects of the aerospace sector, especially in relation to the knowledge and understanding acquired.</p> <p>Communication skills Students will acquire the basic technical language to describe the main technical and regulatory aspects of the aerospace sector, especially in relation to the knowledge and understanding acquired.</p> <p>Learning ability Students will acquire the ability to orient themselves within the main disciplines that contribute to forming the figure of the aerospace engineer (flight mechanics, materials, structures, systems, aerodynamics, propulsion), acquiring the awareness to further deepen their studies based on their educational interests.</p>
<p>ASSESSMENT METHODS</p>	<p>Assessment will be based on a written test consisting of:</p> <ul style="list-style-type: none"> • Questions on problems requiring analytical/numerical resolution based on the contents and methods developed during the teaching; • Theoretical/practical open-ended questions on the topics developed during the teaching, including aspects that may be explored in depth in supplementary teaching activities (e.g. technical/didactic visits). <p>The questions in the two groups contribute 50% to the final assessment for each group.</p> <p>The answers to the numerical/analytical questions are assessed according to:</p> <ul style="list-style-type: none"> • Understanding of the problem (30% of the assessment) • Correctness of the solution procedure (50%) • Appropriateness of formal notation (10%) • Correctness of calculations (10%) <p>Answers to open-ended questions are assessed according to:</p> <ul style="list-style-type: none"> • Correctness of the answer (50%) • Completeness of the answer (30%) • Quality of technical exposition (clarity and appropriate use of specific language) (20%). <p>Each of the criteria outlined above is assessed qualitatively on a scale that includes the following 5 levels of judgement insufficient, sufficient, fair, good, excellent.</p>

	<p>Students who obtain a mark of at least sufficient in the written test may request to take an optional oral test, which contributes to determining the final mark.</p> <p>The oral test consists of questions on theoretical/practical aspects and/or the resolution of exercises at the teacher's discretion, on all the course topics, aimed at deepening the students' understanding.</p> <p>Compensatory tools and dispensatory measures will be guaranteed by the Disability and Neurodiversity Center - University of Palermo (Ce.N.Dis.) to students with disabilities and neurodiversity, based on specific needs and in implementation of current legislation.</p>
EDUCATIONAL OBJECTIVES	<p>The course provides the students with the fundamental knowledge and skills to understand the physical, technical, design and regulatory principles relating to the functioning and operation of aircraft and aerospace vehicles, also in relation to the operating environment, and to carry out simple technical assessments on essential aspects of the operation of the vehicles/systems considered.</p> <p>The proposed contents and methods provide the students with the distinctive cultural elements of the aerospace engineer, making them aware of the high level of interdisciplinarity and the safety and cost-effectiveness needs typical of the sector.</p>
TEACHING METHODS	Class lectures, class practicals, seminars, technical visits.
SUGGESTED BIBLIOGRAPHY	<p>Materiale didattico</p> <ul style="list-style-type: none"> • J. Anderson, M.L. Bowden - Introduction to flight - McGraw Hill Education - ISBN-10 : 0078027675 -- ISBN-13 : 978-0078027673 • Note del corso (a cura del docente).

SYLLABUS

Hrs	Frontal teaching
3	Aircraft and spacecraft classification and description/designation of their components
3	Elements of fluids mechanics
3	International standard atmosphere and exponential planetary atmosphere
6	Basic Aerodynamics: governing equations; compressible and incompressible flows; viscosity; laminar and turbulent flows.
9	Airfoils, wings and aircraft basic aerodynamics.
3	Aircraft and spacecraft typical structural configurations
3	Basic aeronautics and space propulsion: propeller, turbojet and rocket propulsion.
6	Elements of space flights / astronautics
Hrs	Practice
3	Exercises on the International Standard Atmosphere
6	Exercises on basic aerodynamics and on the aerodynamics of airfoils, wings and aircraft.
3	Exercises on aerospace structures
6	Exercises on elementary space trajectories