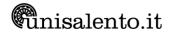
AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Teaching AEROSPACE S	TRUCTURES	Teaching in italian AEROSPACE	Course year 2
		Teaching AEROSPACE STRUCTURES	Language INGLESE
GenCod A003315		SSD code ING-IND/04	Curriculum Percorso comune
Owner professor Gennaro SCARSELLI		Reference course AEROSPACE ENGINEERING	
		Course type Laurea Magistrale	Location Brindisi
		Credits 9.0	Semester Primo-Semestre
		Teaching hours Ore-Attivita-frontale: 81.0	Exam type Orale
		For enrolled in 2020/2021	Assessment Voto-Finale
		Taught in 2021/2022	Course timetable https://easyroom.unisalento.it/Orario
BRIEF COURSE DESCRIPTION	This is a course on the architecture definition and preliminary design of aerospace structures. It is aimed at providing principles and tools to solve structural problems concerning the main parts of aerospace vehicles under the action of typical mission loads. Elements of Aeroelasticity and Fatigue are also provided		
REQUIREMENTS	Knowledge of ca	lculus, geometry and linear algebra, struc	ctural analysis.
COURSE AIMS	At the end of the course the student is expected to: 1) understand the criteria of choosing aerospace architecture and materials; 2) understand the design rules for aircraft of different size; 3) elaborate a lumped parameters structural equivalent model for preliminary computations; 4) understand the numbers coming out from the computation; 5) have a global view on the overall structural issues of a typical flying vehicle.		
TEACHING METHODOLOGY	Two basic appraoches are followed: - standard class lectures, where the teacher presents methods and models; students are encouraged to participate by discussing validity of the assumptions at the basis of the models and physical meanings of the results derived from the analysis performed. Example: derive the structural model of a typical wing; - tutorial classes, during which problems are stated, where the students refine their understanding, by numerically solving the structural problems; the teacher supports the class by recalling relevant models and highlighting the procedure; some calculations (e.g. for a different set of parameters) can be proposed to the students as homework. Example: evaluate stress and displacement filed for a typical wing subjected to operating loads.		



ASSESSMENT TYPE	The exam consists of two separate parts:			
	the first part is written and is based on the solution of three typical structural schemes of aerospace interest;			
	the second part is oral and is based on all the topics presented and discussed by the teacher in the classroom. The student must be able to talk about these topics demonstrating to know in detail the associated structural issues.			
ASSESSMENT SESSIONS	Exams are performed according to current University regulations (3 exams at the end of each semester, 1 exam in September, 2 extraordinaty exams for students who finished the regular course). Exact dates are provided on the University website, as soon as they are available.			
OTHER USEFUL INFORMATION	By appointment; contact the instructor by email or at the end of class meetings.			
FULL SYLLABUS	Architectural elements of the aircraft. The primary structures. The secondary structures. Wings: the wing box, the spars, the stiffeners, the ribs. The frames. The tail. Solutions used for the different categories of aircraft. (3 hours). The loads. The regulatory framework. Load factors. Speed characteristics. Symmetrical maneuvers. Diagram of maneuver. Diagram of load balancing. Gust loads. Diagram of gust loads. Not symmetrical maneuvers. Controlled and uncontrolled maneuvers. Ground handling. Landing loads. The pressurization. (8 hours). Mechanical behavior of materials. Fatigue problems in aircraft structures. Allowable mechanical stress. Criterion for the selection of materials for aerospace structures. Stress-strain relations for linear elastic materials. (4 hours). Principles of construction of aircraft structures. The materials commonly used in the construction of the aircraft. The materials associated with the various parts of the airplane. The function of the structural elements. The implementation of structural analysis of combined open and closed sections. Structural analysis of combined open and closed sections. Structural structures to lumped parameters. Effect of idealization on the analysis of beam sections, open and closed. Analysis of the displacements of open and closed beam sections. Structural structures and wing ribs. Effects of the openings in wings and fuselages. (38 hours). Solution of asigned problems (10 hours). Structural instability. Euler buckling load for the beams under axial compression. Inelastic buckling. Buckling of the plates. Inelastic buckling of plates. Experimental determination of the critical load for a plate. Local buckling of the plates. Instability of stiffened panels. Evaluation of the critical load for a plate. Local buckling of the plates. Instability of stiffened panels. Static and dynamic aeroelastic phenomena. The divergence. Control effectiveness and reversal. Methods for the prevention of structures. (7 hours) Elements of Aeroelasticity. The Aeroelasticity:			



REFERENCE TEXT BOOKS

[1] Handouts (in progress).

[2] "Aircraft structures for engineering students", T.H.G. Megson.

