AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Teaching DESIGN AND TESTING OF POWER CONVERTERS AND ELECTRICAL MACHINES C.I.

GenCod A005151

Owner professor Francesco CUPERTINO

Teaching in italian DESIGN AND TESTING OF POWER CONVERTERS AND

Teaching DESIGN AND TESTING OF POWER CONVERTERS AND ELECTRICAL

SSD code ING-IND/32

Reference course AEROSPACE ENGINEERING

Course type Laurea Magistrale

Credits 5.0

Teaching hours Front activity hours: 50.0

For enrolled in 2017/2018

Taught in 2018/2019

Course year 2

Language ENGLISH

Curriculum AEROSPACE ENGINEERING SYSTEMS

Location Brindisi

Semester Second Semester

Exam type Oral

Assessment

Course timetable https://easyroom.unisalento.it/Orario

BRIEF COURSE DESCRIPTION	The course introduces the main aeronautical electrical systems for electrical energy generation and distribution focusing on the procedures adopted to test and certify electrical machines and power electronic devices.
REQUIREMENTS	Basic priciples of electrical machines and power electronics. Fundamentals of electric measurements theory.
COURSE AIMS	*At the end of the course the student will know the main aeronautical electrical systems used to generate, distribute and consume the electric energy on board the aircraft.* *The student will also be able to follow the procedures to perform the tests aimed at the certification of electrical components.* *The autonomy of judgment will be developed both by deepening the design of the experiments and by the critical analysis of experimental data.* *The part of the course dedicated to the exercises includes group work. Communication skills and learning abilities will also be verified during the oral examination.*
TEACHING METHODOLOGY	Lectures, computer exercises and laboratory work group.
ASSESSMENT TYPE	*The exam consists of an oral test during which the theoretical topics are discussed and a report on the activity related to the exercises is presente.. This procedure allows to verify the preparation level of the student allowing him to critically discuss the exam topics.*

FULL SYLLABUS	1. Introduction, electric power evolution in aircraft electrical systems. (2h) 2. Power generation and control: (10h) AC and DC electrical machines; Generator control unit. 3. Primary power distribution: (6h) Power conversion and energy storage (Inverters, Transformer Rectifier Units, Auto Transformers, Batteries, Battery chargers). 4. Secondary power distribution: (4h) Power switching, load protection (circuit breakers, solid state power controllers). Typical aircraft electrical systems and electrical loads 5. Fundamentals of electromagnetic compatibility, types of interference, coupling mechanisms, grounding and shielding, emissions suppression. Design of experiments. (4h) 6. Standards for testing aeronautical electrical and electronic components and documentation for the qualification of an aeronautical devices. (4h) 7. Tests on aeronautical power converters and electrical machines: (4h) Functional tests (steady-state voltage regulation, transients due to load change, harmonic distortion, voltage ripple, overload); Environmental tests (vibrations, temperature, humidity, salt fog); Electromagnetic compatibility testing (emissions testing, susceptibility testing) 8. Simulation of electrical system components using Matlab/Simulink. Laboratory experience with electrical machines and power converters. (16h)
REFERENCE TEXT BOOKS	Ian Moir and Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration", Wiley, 2008. E.H.J. Pallett, "Aircraft Electrical Systems", Pearson, 3rd Edition 1988. USA Department of Transportation, Federal Aviation Administration, "Aviation Maintenance Technician Handbook", 2018, available on-line. MIL-STD-704F, USA Department of Defense "Interface standard: aircraft electric power characteristics" (12 Mar 2004) MIL-STD-810G, USA Department of Defense "Test method standard: environmental engineering considerations and laboratory tests" (31 Oct 2008) MIL-STD-461G, USA Department of Defense "Interface standard: requirements for the control of electromagnetic interference characteristics of subsystems and equipment" (11-Dec-2015) MIL-STD-202H, USA Department of Defense "Test method standard: electronic and electrical component parts (18-Apr-2015) RTCA document DO-160 "Environmental conditions and test procedures for airborne equipment" (22-Jun-2011)