AEROSPACE ENGINEERING (LM52)
(Brindisi - Università degli Studi)

Insegnamento AIRCRAFT POWERPLANT DESIGN AND MAINTENANCE
GenCod A005140

Insegnamento AIRCRAFT POWERPLANT DESIGN AND MAINTENANCE
Anno di corso 2
Insegnamento in inglese AIRCRAFT POWERPLANT DESIGN AND
Lingua INGLESE
Settore disciplinare ING-IND/09
Percorso PERCORSO COMUNE
Corso di studi di riferimento AEROSPACE ENGINEERING
Docente Antonio FICARELLA
Tipo corso di studi Laurea Magistrale
Sede Brindisi
Crediti 9.0
Periodo Primo Semestre
Ripartizione oraria Ore Attività frontale: 81.0
Per immatricolati nel 2017/2018
Valutazione Voto Finale
Erogato nel 2018/2019
Orario dell’insegnamento https://easyroom.unisalento.it/Orario

BREVE DESCRIZIONE DEL CORSO
AIRWORTHINESS AND ENVIRONMENTAL CERTIFICATION; The Design Process; Engine Selection: Parametric Cycle Analysis; Engine Selection: Performance Cycle Analysis; Engine Component Design: Rotating Turbomachinery, Concept, Design Tools; Engine Component Design: Combustion Systems, Concept, Main Burner, Afterburners; Aircraft Engine Controls - Engine Modeling and

PREREQUISITI
Course Requirements
Knowledge of the operating principles of fluid machinery and fluid dynamics. Basic elements of design and technology of fluid machines. Knowledge of aircraft propulsion and the basic principles of flight mechanics.

OBIETTIVI FORMATIVI
Aims of the course
(knowledge and understanding)
- Specialist knowledge of propulsion, advanced elements of mechanical design of aircraft engines.
- Knowledge of the internal fluid dynamics.
- Insights on design and technological features and performance of different types of engines.
- Knowledge of advanced propulsion systems.
- Knowledge of specific technical terms in English.
(applying knowledge and understanding)
- Understanding of the main features of a project of the engine.
- Ability to perform sketches and preliminary dimensioning of the components of an aircraft engine.
- Ability to take action in the main stages the project of an aircraft engine.
- Advanced capabilities for the analysis of systems and control techniques.
- Ability to see the product in the form of system integrated complex.
(making judgements)
- Ability to analyze the mission requirements of the aircraft and to evaluate the necessary engine performance.
- Ability to understand the technological issues and system integration for the engine.
- Ability to understand the problems of research and development of an aircraft engine or of an aviation system.
(communication skills)
- Ability to communicate with experts in other fields of engineering for the integrated design of the engine.
(learning skills)
- Development of learning skills that enable to continue to study for the most part autonomously.
METODI DIDATTICI

Lectures; practical experiences in laboratories; homework (design project).

**Laboratory**

Engine performance Lab, Engine Monitoring Lab.
https://sites.google.com/site/greenenginelab2/home

**Homework (design project)**

Software applications for the design of aircraft engines and systems. Application examples and design of aircraft engines and systems. Turbofan, turbofans with high bypass ratio, turboprop propeller design. Systems for Civil and military aircraft, helicopters, light aircraft. Fluid-dynamics numerical simulations applied to engines and systems design.
http://www.aircraftenginedesign.com/index.html (free software)
http://www.aircraftenginedesign.com/custom3.html
http://www.grc.nasa.gov/WWW/K-12/freesoftware_page.htm

MODALITA’ D’ESAME

**Exam procedures**

The exam consists in the preparation of a Homework (design project) and an oral interview. A design project related to aircraft engines or systems will be conducted. Homework assignments will be due at least one month before the examination. The deliverables are a written report (in digital format, with any files used for calculations and the relevant bibliography) and the discussion of the work. You must acknowledge all references (both literature and people) used; all the deliverables will be sent by email to the instructor at least 10 days before the oral examination. The oral examination consists of the discussion of the work of the year and a series of questions on the matters stated in the course program for the evaluation of acquired knowledge on the principles of operation of engines and aircraft systems, their performance and the principles of

OTHER REFERENCES

An Introduction to Combustion, McGrawHill.
PPSG Volume 1 - Piston Engines & Supercharging, http://shop.pilotwarehouse.co.uk/product222023catno0.html.

INTERNET RESOURCES

http://www.aircraftenginedesign.com/index.html
PROGRAMMA ESTESO

TOPIC: AIRWORTHINESS AND ENVIRONMENTAL CERTIFICATION, Aircraft Certification and Production Standards, Type Certificates, Rules for Initial Airworthiness, Certification Specification (CS); COURSE BOOK: ; LECTURE NOTES: propDESIGNPR02.

TOPIC: Constraint Analysis, Mission Analysis; COURSE BOOK: Aircraft Engine Design, chap. 2 (no par. 2.2, 2.2.3, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.2.12); Aircraft Engine Design, chap. 3 (no par. 3.2.1, 3.2.2, 3.2.3, 3.2.6, 3.2.7, 3.2.8, 3.2.9, 3.2.10, 3.2.11); LECTURE NOTES: propCONSTRAINTTRA01, propMISSIONR02, propEXAMPLE-CONSTRAINTR00, for in-depth analysis: constraintSTRALCIO2, constraintEXAMPLESTRALCIO, missionSTRALCIO, missionEXAMPLESTRALCIO.


TOPIC: Fan and Compressor Airfoils, Turbine Blade and Vane; COURSE BOOK: Turbo-Machinery Dynamics, chap. 6. (no 6.12, 6.18), Turbo-Machinery Dynamics, chap. 8; LECTURE NOTES: propTMDfecairfoilsR01, propTMDTurbinebR00, for in-depth analysis: Turbomachinery_DynamicsCh06, propTMDImpellerbR01, Turbomachinery_DynamicsCh08.

TOPIC: Engine Control Systems; COURSE BOOK: Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration, Chap. 2; LECTURE NOTES: propASEngineControlR00.

TOPIC: Engine Controls; COURSE BOOK: Aircraft Engine Design, chap. 2; LECTURE NOTES: propAECmodelingR03, for in-depth analysis: AIRCRAFT ENGINE CONTROLSch02, AIRCRAFT ENGINE CONTROLSapp.

TOPIC: Advanced Systems; COURSE BOOK: Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration, Chap. 10; LECTURE NOTES: propASadvancedR00.

TOPIC: System Design and Development; COURSE BOOK: Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration, Chap. 10; LECTURE NOTES: propASadvancedR00.
COURSE BOOKS


