AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Teaching AERONAUTIC PROPULSION MOD. 1

GenCod A003309

Owner professor Maria Grazia DE GIORGI

Teaching in italian AERONAUTIC PROPULSION MOD. 1 C.I.

Teaching AERONAUTIC PROPULSION MOD. 1

SSD code ING-IND/07

Reference course AEROSPACE ENGINEERING

Course type Laurea Magistrale

Credits 6.0

Teaching hours Front activity hours: 54.0

For enrolled in 2024/2025

Taught in 2024/2025

Course year 1

Language

Curriculum AEROSPACE DESIGN

Location Brindisi

Semester Second Semester

Exam type Oral

Assessment

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

BRIEF COURSE DESCRIPTION	This course offers a comprehensive overview of airbreathing engine technologies used in aircraft. It covers a wide array of topics including different types of engines, thermodynamics, flow dynamics in inlets, turbomachinery, combustors, and nozzles. The course also examines piston engines and explores novel propulsion architectures like electric and hybrid systems. Designed for both students and professionals, the course combines theoretical learning with practical insights to enhance understanding of aircraft propulsion requirements, engine performance, and emerging technologies. This curriculum prepares participants for advanced roles in aerospace engineering and development.
REQUIREMENTS	-Fluid dynamic and fluid machinery
COURSE AIMS	1 Gain knowledge of different types of aero-engines (turbojets, turbofans, ramjets) and to understand the aerodynamic and thermodynamic characteristics of major engine components. 2 Develop the knowledge and skills to analytically and numerically solve problems related to aerospace propulsion systems. 3 Develop skills in working independently. 4 Develop skills in critical evaluation of scientific literature. 5 Develop skills in planning and presentation of scientific talks and reports.
TEACHING METHODOLOGY	Theory and practical activities (Tutorials devoted to discussion and problem solving referred to the aeroengine.)
ASSESSMENT TYPE	The final exam consist of two part: 1)Written and oral examination covering all material covered in course 2)assignments and individual project

OTHER USEFUL INFORMATION

Educational materials, resources, and additional information are available on the official course webpage at https://elearning.unisalento.it/

FULL SYLLABUS

- **Types of Airbreathing Engines and Aircraft Propulsion Requirements**: This introductory module discusses different types of airbreathing engines such as turbojets, turbofans, turboprops, and ramjets. It covers the basic propulsion requirements for aircraft, including thrust generation, efficiency, and environmental considerations.
- **Elements of Thermodynamics for Aero Propulsion & Engine Cycle Analysis**: This section introduces fundamental concepts of thermodynamics relevant to aero propulsion. It explores both ideal and real engine cycles, providing insights into the performance characteristics of airbreathing engines through parametric cycle analysis.
- **Flow Dynamics in Subsonic & Supersonic Inlets**: Focuses on the design and function of engine inlets for subsonic and supersonic aircraft. This module examines the challenges and solutions in managing air flow at different speeds, emphasizing the critical role of inlets in engine efficiency and performance.
- **Turbomachinery: Axial Flow Compressors and Axial Flow Turbines**: Detailed examination of the components critical to the operation of most airbreathing engines. This includes the design, function, and performance characteristics of axial flow compressors and turbines, highlighting their interdependencies and impact on overall engine efficiency.
- **Combustors**: An in-depth look at the heart of the engine where fuel is burned to produce high-pressure, high-temperature gas. This module covers different types of combustors, their design considerations, and technologies used to maximize efficiency and minimize emissions.
- **Nozzles**: Discusses the types and functions of nozzles in airbreathing engines, including convergent, divergent, and convergent-divergent nozzles. The module explores how nozzles convert thermal energy into kinetic energy, significantly impacting the thrust and overall performance of the engine.
- **Airbreathing Engine System Considerations**: This module integrates the components discussed in previous sections, focusing on system-level considerations such as integration challenges, operational efficiency, and maintenance requirements. It also covers the impact of engine design choices on aircraft performance and mission capability.
- **Piston Engine**: Covers the principles and operations of piston engines, which are used primarily in smaller aircraft. This section discusses the mechanical components, operation cycles, and characteristics of piston engines compared to jet engines.
- **Novel Propulsive Architecture**: Explores innovative and emerging propulsion technologies that could redefine future aircraft engines. This includes advancements in electric propulsion, hybrid systems, and other cutting-edge developments that aim to increase efficiency, reduce emissions, and expand the operational capabilities of aircraft.

REFERENCE TEXT BOOKS

- Aerothermodynamics of Gas Turbine and Rocket Propulsion Gordon C. Oates eISBN: 978-1-60086-134-5 print ISBN: 978-1-56347-241-1 DOI: 10.2514/4.861345
- Hill, P., and Peterson, C., Mechanics and Thermodynamics of Propulsion, Addison-Wesley Publishing Co., 1992,
- Course notes