# 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** 2020/2021

**Taught in** 2020/2021

**Course year** 1

**Language** ENGLISH

**Curriculum** Percorso comune

**Location** Brindisi

**Semester** Second Semester

**Exam type** Oral

**Assessment**

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

BRIEF COURSE DESCRIPTION

Aircraft turbine engines are discussed, both those primarily suitable for military aircraft and commercial transport. The aim is to foster an understanding of the characteristics of these diverse propulsion systems from the basic principles, showing how each uses sources of propulsive mass and energy to produce thrust.
The main topics will be: Introduction to air-breathing (gas turbines, ramjets, ducted rockets, scramjets) jet propulsion systems. Prediction of thrust, combustion reactions, specific fuel consumption and operating performance. Aerothermodynamics of inlets, combustors, nozzles, compressors, turbines. Review of space propulsion systems. Introduction to alternative future space propulsion systems. Chemical rocket and jet engine combustion including thermochemistry, chemical kinetics and the combustion chamber and instabilities. Jet engine noise and emissions. Overview of jet engine systems such as thrust reversal, internal air, starting and ignition, controls and instrumentation, power plant testing and installation, maintenance.

REQUIREMENTS

-Fluid dynamic and fluid machinery

COURSE AIMS

A goal is to introduce you to the methods of mathematical modeling of propulsion systems and then to use these modeling techniques to develop an understanding of the characteristics of the several types of propulsion systems treated.
The modeling uses thermodynamic arguments based on the First and Second Laws, and fluid mechanical principles that enable the linking of the thermodynamic behavior to the geometry of the propulsion devices.
Mail goals are:
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.

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| 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:<br>1)Written and oral examination covering all material covered in course<br>2)assignments and individual project |
| FULL SYLLABUS | 1) Review of thermodynamics and Introduction of Propulsion: Review, Mixtures of gases, Thermodynamic cycles, Combustion thermodynamics<br>2)Types of Airbreathing Engines. Aircraft Propulsion Requirements. Turbojet systems, turbofan systems, turboprops/propfans systems, ramjet systems, scramjet systems<br>3)Elements of Thermodynamics for Aero Propulsion ; Ideal & Real Engine Cycle Analysis. Parametric Cycle Analysis.<br>4) Subsonic & Supersonic Inlets.<br>5) Turbomachiney: Axial Flow Compressors and Axial Flow Turbines.<br>6) Combustors.<br>7) Nozzles.<br>8) Airbreathing Engine System Considerations. |
| 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<br>▪ Hill, P., and Peterson, C., Mechanics and Thermodynamics of Propulsion, Addison-Wesley Publishing Co., 1992,<br>▪ Course notes |