

Course guide

300322 - PA-OA - Aeronautical Propulsion

Last modified: 19/05/2025

Unit in charge: Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 748 - FIS - Department of Physics.

Degree: BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:**

LECTURER

Coordinating lecturer: Definit a la infoweb de l'assignatura.

Others: Definit a la infoweb de l'assignatura.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Hours large group	66,0	44.00
Self study	84,0	56.00

Total learning time: 150 h

CONTENTS

Introduction to Aeronautical Propulsion Systems

Description:

Aeronautical propulsion system types, basic working principles, uses and limitations.

Full-or-part-time: 11h

Theory classes: 5h

Self study : 6h

Performances and thermodynamical cycle

Description:

Gas turbine engine performance parameters. Fundamentals of aerothermodynamics, the ideal gas generator, sources of losses, component efficiencies and impact on engine performances.

Full-or-part-time: 22h

Theory classes: 5h

Practical classes: 5h

Self study : 12h

Components

Description:

Description, analysis, design overview and implementation details of ducting (intake/diffuser, nozzle, mixer), turbomachinery (compressor, fan, turbine) and heating components (combustion chamber, afterburner, heat exchangers)

Full-or-part-time: 53h

Theory classes: 10h

Practical classes: 10h

Laboratory classes: 3h

Self study : 30h

Subsystems

Description:

Accessory components and systems: structural (shafts/spools, casing, bearings...), thermal (bleeds, cooling system), fuel, lubrication, ignition and start, monitoring...

Full-or-part-time: 33h

Theory classes: 10h

Practical classes: 5h

Self study : 18h

Applications

Description:

Details of implementation for the application of the gas generator to turbojet, turbofan, turboprop, turboshaft...

Full-or-part-time: 24h

Theory classes: 5h

Practical classes: 2h

Laboratory classes: 3h

Self study : 14h

Maintenance and handling

Description:

Introduction to engine operation, handling and maintenance.

Full-or-part-time: 7h

Theory classes: 3h

Self study : 4h

ACTIVITIES

THEORETICAL FUNDAMENTALS OF AERONAUTICAL PROPULSION

Description:

Theory lectures, problem statement and numerical resolution of practical exercises.

Full-or-part-time: 68h

Theory classes: 14h

Practical classes: 12h

Self study: 42h

PRACTICAL FUNDAMENTALS OF AERONAUTICAL PROPULSION

Description:

Theory lectures, practical descriptions and components and subsystems dissection.

Specific objectives:

Acquisition of a series of practical knowledge related to aeronautical propulsion.

Material:

Slides, class notes, basic and advanced bibliography.

Delivery:

Occasional delivery of practical session reports and oral presentations preparation.

Full-or-part-time: 82h

Theory classes: 24h

Practical classes: 10h

Laboratory classes: 6h

Self study: 42h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

- Kerrebrock, Jack L. Aircraft engines and gas turbines [on line]. 2nd ed. Cambridge: Ed. MIT Press, 1992 [Consultation: 05/10/2023]. Available on:

<https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6243327>. ISBN 0262111624.

- Saravanamuttoo, H.I.H. Gas turbine theory [on line]. 6th ed. England: Ed. Pearson Prentice Hall, 2009 [Consultation: 20/10/2022]. Available on:

<https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5175062>. ISBN 9780132224376.

Complementary:

- Walsh, Philip P.; Fletcher, Paul. Gas turbine performance. 2nd ed. Malden: Ed. Blackwell Science, 2004. ISBN 9780632064342.

- Oates, Gordon C. Aircraft propulsion systems technology and design. Washington: Ed. American Institute of Aeronautics and Astronautics, 1989. ISBN 093040324X.

- Mattingly, Jack D. Elements of propulsion: gas turbines and rockets. Reston: Ed. American Institute of Aeronautics and Astronautics, 2006. ISBN 1563477793.

- Dixon, S.L. Fluid mechanics, thermodynamics of turbomachinery. 5th ed. Oxford: Ed. Butterworth-Heinemann, 2005. ISBN 0750678704.