

Academic Year: ( 2017 / 2018 )

Review date: 27-07-2017

Department assigned to the subject: Department of Bioengineering and Aerospace Engineering

Coordinating teacher: IANIRO , ANDREA

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 1

**STUDENTS ARE EXPECTED TO HAVE COMPLETED**

Fluid Mechanics  
 Thermal Engineering  
 Aerodynamics  
 Aerospace Propulsion

**COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.**

The goal of this course is that the student acquires a basic knowledge of aircraft propellers, reciprocating engines, turbo-prop engines and rotordynamics.

**DESCRIPTION OF CONTENTS: PROGRAMME**

Introduction to propulsion systems  
 -Some selected aircraft engines

The Propeller  
 -Geometry and characteristics of propellers  
 -Momentum and blade element theory  
 -Propeller propulsive efficiency  
 -Propeller noise  
 -Propeller testing  
 -Design of optimum propellers

Reciprocating Engines  
 -Spark-Ignition engines  
 -Compression-Ignition engines  
 -Rotary engines  
 -Turbosupercharging  
 -Combustion in Reciprocating Engines  
 -Engine balance  
 -Design of Reciprocating Engines

Turboprop and Turboshift Engines  
 -Cycle analysis of conventional-free-turbine turboprop engine  
 -Installation issues  
 -The impact on regional aviation  
 -The Unducted Fan

Rotordynamics  
 -Forced Vibration  
 -Self-Excited Vibration  
 -Analytical prediction of rotordynamic response  
 -Rotor balancing  
 - Disk Design

**LEARNING ACTIVITIES AND METHODOLOGY**

Theory sessions.  
 Problem sessions working individually and in groups.  
 Computer sessions.  
 Lab-sessions.

## ASSESSMENT SYSTEM

In order to pass the subject, two requirements need to be met:

- 1) To have a MINIMUM mark of 4.0/10 in the end-of-term exam;
- 2) To have a MINIMUM overall mark of 5.0/10 (weighing 25% the end-of-term exam mark and 75% the mark of the continuous evaluation).

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|---|----|
| <b>% end-of-term-examination:</b>   | 25 |
| <b>% of continuous assessment (assignments, laboratory, practicals...):</b> | 75 |

## BASIC BIBLIOGRAPHY

- C.F. Taylor The internal combustion engine in theory and practice, MIT Press, 1985
- D.R. Greatrix Powered Flight, The engineering of Aerospace Propulsion, Springer, 2012
- F.F. Ehrich Handbook of rotordynamics, Krieger Publishing Co., 1999
- R. Von Mises Theory of flight, Courier Dover Publications, 2012