Advanced Flight Mechanics

Academic Year: (2023 / 2024) **Review date: 07/09/2023 13:26:33**

Department assigned to the subject: Aerospace Engineering Department

Coordinating teacher: Zhou Zhu, Jiewei

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

OBJECTIVES

Students at the end of the course should be able to:
- Become familiar with the dynamical description of aerospace vehicles as rigid bodies.
- Solve and analyse the motion of an aerospace vehicle after being disturbed.
- Understand the effect of the actuators in the motion of the vehicle.
- Design control algorithms to get the desired response of an aerospace vehicle in certain conditions
- Have the required knowledge and understanding to provide a basis for original development, often within a research context
- Apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study
- Integrate knowledge and handle complexity, and formulate judgments based on information that was incomplete or limited.
- Communicate their conclusions and the knowledge and rationale underpinning to specialists and non- specialists in a clear and unambiguous way.
- Acquire the learning skills to allow them to continue studying in a self-directed or autonomous way.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction
2.- General equations of non-stationary motion
    2.1 - Derivatives of stability
    2.2.- Longitudinal stability of uncontrolled motion
    2.3.- Lateral-directional stability of uncontrolled motion
    2.4.- Response to the action of controls. Open loop.
3.- Aerospace navigation elements.
4.- Closed loop control
5.- Handling qualities

LEARNING ACTIVITIES AND METHODOLOGY

FORMATION ACTIVITIES
AF1 - Theoretical class
AF2 - Practical class
AF3 - Practice in computer room
AF5 - Individual student work
AF6 - Tutorials
AF7 - Midterm and final exams

TEACHING METHODOLOGIES
MD1 - Lectures in the teacher's class supported by computer and audiovisual media, in which the main concepts of the subject are developed and the bibliography is provided to complement student learning.
About 60% of the AF1 theoretical classes respond to the MD1 description.

MD2 - Critical reading of texts recommended by the professor of the subject: Press articles, reports,

manuals and/or academic articles, either for subsequent discussion in class, or to expand and consolidate knowledge of the subject.
Additional material is available to students in Aula Global: scientific articles, and specialised press articles related to the subject.

MD3 - Resolution of practical cases, problems, etc. raised by the teacher individually or in groups.
The practical classes AF2 and AF3 correspond to the MD3 description. Associated with this work, continuous evaluation is carried out.

MD4 - Presentation and discussion in class, under the teacher's moderation, of topics related to the content of the subject, as well as practical cases.
For continuous evaluation it is based on the presentation of the results obtained in the assigned work.

MD5 - Preparation of work and reports individually or in groups.

The tutorials are carried out during the schedule published in Aula Global, making an appointment in advance by email.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	25
% of continuous assessment (assigments, laboratory, practicals…):	75

There is a modular assignment through the semester. The overall assignment represents 30 % of the total mark. There is a computer Exam related to the assignment with a weight of 30 % of the total mark. There are also five homework and tests on the moodle platform that accounts for 15 % of the total mark. The continuous evaluation is composed by the mark of the assignment, computer exam and homework.
The End-of -Term Exam accounts for the remaining 25% of the total mark. A mark of 4/10 is required to pass the exam.

BASIC BIBLIOGRAPHY

- Ashish Tewari Atmospheric and Space Flight Dynamics, Birkhäuser, 2007

- Bernard Etkin and Lloyd Duff Reid Dynamics of Flight: Stability and Control (Third Edition), Wiley, 1996

ADDITIONAL BIBLIOGRAPHY

- H. Schaub, J. Junkins Analytical Mechanics of Space Systems, AIAA; 2 edition , October 1, 2009

- Michael V. Cook Flight Dynamic Principles (Third Edition), Butterworth-Heinemann, 2012