Aircraft Design

Academic Year: (2017 / 2018) **Review date: 28-04-2017**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: HILARIO MONTES, JAVIER

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Aerodynamics
Flight Mechanics
Aerospace Structures

OBJECTIVES

Applied knowledge of aircraft engineering.
Adequate knowledge applied to engineering of:
- Calculation methods for aircraft design and project;
- Cetification basis and aircraft maintenance;
- Operational use of aircrafts.

Knowledge of concurrent engineering methods and manufacturing processes.
Knowledge of operating environment and aircraft design envelopes.
Knowledge of design variables related to flight and ground performance.
Application of preliminary design methods to establish the main aircraft design variables:
- maximum weight;
- thrust-to-weight ratio;
- wing loading.

Knowledge of methods to determine payload-range diagrams.
Knowledge of aircraft configuration and design constraints for its components: wing, fuselage, tails, etc.
Knowledge of main structural loads conditions, in accordance with certification rules.
Knowledge of specific characteristics of supersonic and fighter aircrafts.

DESCRIPTION OF CONTENTS: PROGRAMME

Generalities and Operating Environment.
--> Systems of units. ISA. Airspeeds. Wind and ground speed. Flight envelopes.
Cruise Performance.
--> Flight performance. Steady level flight. Range and loiter optimization.
Climb and Ground Performance.
--> Climb performance. Take-off analysis. Landing analysis.
Design Process and Quick Sizing.
--> Phases of aircraft design. Airworthiness. Quick mass sizing.
Thrust-to-Weight Ratio and Wing Loading.
--> Definition of T/W and W/S and typical values. Design criteria for T/W and W/S. Drag model. Propulsive model.
Design Weights and Range.
--> Mass subdivision. Design weights. Payload-Range diagram.
Aircraft Configuration.
--> Wing geometry. Additional surfaces on wing. Fuselage layout. Tail layout.
Structural Loads.
--> General loads concepts. Flight and mass envelopes. Balanced NZ conditions. Discrete gusts.
Combat Aircrafts.
--> Supersonic flight. Fighters configuration and specific design criteria.

LEARNING ACTIVITIES AND METHODOLOGY

Theory sessions.
Problem sessions working individually and in groups.
Practical sessions.

ASSESSMENT SYSTEM

Regular call:
End-of-term exam (60%)
Continuous evaluation (40%)
In order to pass the subject two conditions are required:
1) To obtain a minimum of 5.0/10 in the global mark (End-of-term + continuous evaluation)
2) To obtain a minimum mark of 4.0/10 in the end-of-term exam separately

Extra call:
Only the end-of-term mark is taken into account.
Continuous evaluation is considered in case of improving the mark (under the rules of the regular call).

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- D.P. Raymer Aircraft Design: A Conceptual Approach, AIAA Educational Series, 2012
- E. Torenbeek Synthesis of Subsonic Airplane Design, Springer , 1982
- L.M. Nicolai & G.E. Carichner Fundamentals of Aircraft and Airship Design. Volume I - Aircraft Design, AIAA Education Series, 2010
- L.R. Jenkinson, P. Simpkin, D. Rhodes Civil Jet Aircraft Design, AIAA Education Series, 1999

ADDITIONAL BIBLIOGRAPHY

- A.K. Kundu Aircraft Design, Cambridge University Press, 2010
- D. Howe Aircraft Conceptual Design Synthesis, Wiley, 2005
- S.A. Brantdl, R.J. Stiles, J.J. Bertin, R. Whitford Introduction to Aeronautics: A Design Perspective, AIAA Educational Series, 2004