Elements of critical software

Academic Year: (2022 / 2023) **Review date: 16-11-2022**

Department assigned to the subject: Aerospace Engineering Department

Coordinating teacher: GARCIA-HERAS CARRETERO, JAVIER

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Basic knowledge in Computers and Programming Languages.

OBJECTIVES

This course aims to understand the complete cycle of the development process of Onboard Critical Software (Operational concept, requirements and architecture, Detailed design, Implementation, Validation and Verification). Likewise, knowledge of the specific Certification and Safety requirements applicable to such kind of Software.

The course is developed with an important practical component, where the student puts the theoretical concepts to the test by carrying out activities dedicated to each phase of the development of onboard Critical Software.

DESCRIPTION OF CONTENTS: PROGRAMME

Block I: Elements of Critical Software Introduction:
- Elements of Critical Software
- RTCA DO-178B
- RTCA DO-178C

Block II: Software Architectures:
- Software Architectures description
- Low-Level Programming
- Real-Time Operating Systems

Block III: Software Requirements:
- Critical Software Requirement process theoretical concepts
- Critical Software Requirement process practice

Block IV: Software Design
- Critical Software Design process theoretical concepts
- Critical Software Design process practice

Block V: Software Implementation
- Critical Software Implementation process theoretical concepts
- Critical Software Implementation process practice

Block VI: Software Verification
- Critical Software Verification process theoretical concepts
- Critical Software Verification process practice

LEARNING ACTIVITIES AND METHODOLOGY

TRAINING ACTIVITIES
AF1 (Theoretical classes) and AF2 (Practical classes),
AF3 (Practices in computer classroom) and AF4 (Laboratory practices),
AF5 (Individual student work) as well as group work
AF6 (Office Hour) 1 hour/week as Office Hour by the professor.

TEACHING METHODOLOGIES

MD1 (Presentations in the teacher's class with the support of computer and audiovisual media).
MD3 (Resolution of practical cases raised by the teacher individually or in groups)
MD5 (Preparation of papers and reports individually or in groups)

ASSESSMENT SYSTEM

End-of-term exam: 25%.
Class Exercises and Practices: 75% (with Class Exercise + Lab Exercises + Theory Partial Exam + Practical Implementation Partial Exam).

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):

% end-of-term-examination: 25
% of continuous assessment (assignments, laboratory, practicals...): 75

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

BASIC BIBLIOGRAPHY

- ARINC Avionics Software Standard Interface. ARINC Specification 653. , ARINC, 2003

- Grady Booch, Ivar Jacobson & Jim Rumbaugh OMG Unified Modeling Language Specification, Version 1.3, OMG, 2008

- RTCA DO-178C, ¿Software Considerations in Airborne Systems and Equipment Certification, RTCA, 2011

- RTCA DO-178B, Software Considerations in Airborne Systems and Equipment Certification, RTCA, 1992

- SAE ARP4754: Certification Considerations for Highly Integrated or Complex Aircraft Systems, SAE, 1996