Course guide
205274 - RAMS - Fundamentals of Rams Engineering in the Certification of Aerospace Products

Last modified: 18/06/2024

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 715 - EIO - Department of Statistics and Operations Research.

Degree: BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2024 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: Algaba Joaquin, Inés Maria

Others: Dario di Martino (col·laboració d'empresa)

TEACHING METHODOLOGY

This course is highly practical and features the collaboration of personnel from a specialised company in RAMS certification for the lectures.
The teaching methodology is divided into the following parts:
Theory Classes: In theory classes, the instructor will introduce the theoretical foundations of concepts, methods, and results and illustrate them with appropriate examples to facilitate understanding.
Practical Classes in the Classroom: In these classes, instructors will guide students in applying theoretical concepts to RAMS, always using critical reasoning.
Self-learning through Activities: Students need to independently work with the educational materials provided by the instructor and the results of practical sessions to solidify and assimilate concepts.
The instructor provides planning and monitoring of activities through ATENEA.

LEARNING OBJECTIVES OF THE SUBJECT

The objective of this course is to provide students with a comprehensive understanding of Reliability, Availability, Maintainability, and Safety (RAMS) principles and their application throughout the life-cycle of an aircraft. Students will learn to perform critical safety assessments and analyses, such as Functional Hazard Assessment (FHA), Preliminary System Safety Assessment (PSSA), System Safety Assessment (SSA), and Common Cause Analysis (CCA). The course will equip students with the skills to identify, evaluate, and report on potential hazards and failure conditions in aircraft systems, ensuring compliance with safety requirements and supporting the certification process. By the end of the course, students will be able to contribute effectively to the development and certification of safe and reliable aircraft systems

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	40.00
Self study	45,0	60.00

Total learning time: 75 h

CONTENTS

Module I: Introduction to RAMS

Description:
1.1. What is RAMS?
1.2. Why do we need RAMS?
1.3. Where is RAMS in the life-cycle of an aircraft?
1.4. V-Diagram
1.5. Phases of the project for Type Certification

Full-or-part-time: 11h 15m
Theory classes: 4h 30m
Self study : 6h 45m

Module II: Development of Functional Hazard Assessment (FHA)

Description:
2.1. Definition of functions
2.2. Failure Conditions
i. Severity Assessment
ii. Safety Objectives
2.3. Report

Full-or-part-time: 18h 45m
Theory classes: 7h 30m
Self study : 11h 15m

Module III: Development of Preliminary System Safety Assessment (PSSA)

Description:
3.1. Inputs
3.2. Safety Analysis to support PSSA
i. Reliability Prediction Analysis (RPA)
ii. Failure Mode, Effects and Criticality Analysis (FMECA)
3.3. Fault Tree Analysis
i. Types of Gates
ii. Types of Events
iii. Single Point of Failure
iv. Dormant Failures
3.4. Common Mode Analysis (CMA)
i. Independence Requirements
3.5. Safety Requirements
3.6. Report

Full-or-part-time: 18h 45m
Theory classes: 7h 30m
Self study : 11h 15m

Module IV: System Safety Assessment (SSA)

Description:
4.1. Inputs
4.2. SSA Failure Conditions Evaluation
i. Confirm Safety Requirements
ii. Confirm Independence Requirements
iii. Confirm Quantitative Requirements
iv. Confirm Safety Objectives
4.3. Report

Full-or-part-time: 15h
Theory classes: 6h
Self study : 9h

Module V: Common Cause Analysis

Description:
5.1. Particular Risk Assessment (PRA)
i. Uncontained Engine Rotor Failure (UERF)
ii. Wheel & Tire Failure (W&TF)
iii. Bird Strike
5.2. Zonal Safety Analysis (ZSA)

Full-or-part-time: 11h 15m
Theory classes: 4h 30m
Self study : 6h 45m

GRADING SYSTEM

- Class participation: 30% - To evaluate class participation, mandatory attendance of at least 50% of classes is required (6 out of 12).
- Final activity: 40% - Individual project on the developmetnt of an FHA and its corresponding FTA: The student will receive a system, along with its description and architecture, and will have to develop an FHA and its respective FTA to be submitted to the professor at the end of the course. The purpose of the project is to assess if the "safety objectives" are met, and if not, how the system could be improved to meet the objectives.
- Final exam: 30% - Multiple-choice test.

All students who cannot attend the written exam (final exam), or who want to improve their grade, will have the option to recover it by taking a global test that will be held on the day scheduled in the final exam period calendar. The grade for this second chance test will be between 0 and 10 and will replace the grade of the test as long as it is higher.

RESOURCES

Other resources:
Material available in ATENEA