

Course guide 220302 - 220302 - Production and Design Aerospace

Academic year: 2024	ECTS Credits: 5.0	Languages: Spanish
Degree:	MASTER'S DEGREE IN	AERONAUTICAL ENGINEERING (Syllabus 2014). (Compulsory subject).
Unit in charge: Teaching unit:	Terrassa School of Ind 712 - EM - Departmen	ustrial, Aerospace and Audiovisual Engineering t of Mechanical Engineering.

Coordinating lecturer:	Xavier Salueña									
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Others: Xavier Salueña - José Antonio Ortiz

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CG04-MUEA. (ENG) Capacitat d'integrar sistemes aeroespacials complexos i equips de treball multidisciplinaris.

CG09-MUEA. (ENG) Competència en totes aquelles àrees relacionades amb les tecnologies aeroportuàries, aeronàutiques o espacials que, per la seva naturalesa, no siguin exclusives d'altres branques de l'enginyeria.

CE06. MUEA/MASE: Sufficient knowledge of the metal and composite materials used in the manufacture of aerospace vehicles.

CE07. MUEA/MASE: Knowledge and skills that enable the manufacture of aerospace vehicles to be understood and executed.

CE15. MUEA/MASE: Sufficient knowledge of the materials and manufacturing processes used in propulsion systems.

CE17. MUEA/MASE: The ability to carry out the mechanical design of a propulsion system's components.

Basic:

CB06. Manage original concepts in research projects.

CB08. Generate decision from incomplete information assuming its social and ethical responsibilities.

CB09. Improve technical communication of results.

CB10. Improve self-learning capacity

TEACHING METHODOLOGY

Teaching methodology is divided into three parts:

- In-person presentation sessions participation of the contents and completion of exercises.
- In-person workshop work sessions.
- Independent study work and carrying out exercises and activities

LEARNING OBJECTIVES OF THE SUBJECT

The main objective of the subject is for Aeronautical Engineers to have the tools and knowledge necessary to successfully address any issue related to the design, quality and production of aircraft and space vehicles, from the manufacturing point of view.

STUDY LOAD

Туре	Hours	Percentage			
Hours large group	30,0	24.00			
Hours small group	15,0	12.00			
Self study	80,0	64.00			

Total learning time: 125 h



CONTENTS

Module 1: Analysis of the sector and aerospace production.

Description:

Characteristics of the aerospace sector.

- Product analysis and production engineering.
- Concurrent engineering and reengineering.
- Manufacturing and assembly of aircraft.

Related activities: 1,2,3,4

Full-or-part-time: 24h

Theory classes: 6h Laboratory classes: 2h Self study : 16h

Module 2: Quality control in the aerospace sector.

Description:

Metrology

- Dimensional, geometric and surface tolerances depending on manufacturing.
- Verification and measurement instruments.
- Calibration and uncertainty.
- MMC measurement
- Laser-traker
- Control and Inspection Plan. Quality records.

Related activities:

1,2,3,4

Full-or-part-time: 18h Theory classes: 4h Laboratory classes: 4h Self study : 10h

Module 3: Basic productive technologies

Description:

Molding: Disposable and permanent molds. Hot metal deformation: Rolling, extrusion, stretching and forging. Cold metal deformation: Die-cutting, bending, drawing. Machining technologies: Chip and particle removal. Turning, milling and drilling. Machining centers.

Related activities:

1,2,3,4

Full-or-part-time: 68h Theory classes: 16h Laboratory classes: 8h Self study : 44h



Module 4: New Productive Technologies in the Aerospace sector

Description:

Additive manufacturing technologies. Rapid prototyping and rapid tooling. 3D Printing/Manufacturing. CNC and CAD-CAM machining.

Full-or-part-time: 15h Theory classes: 4h Laboratory classes: 1h Self study : 10h

ACTIVITIES

Activity 1: LARGE GROUP SESSIONS/THEORY

Description:

In-person theory and problem-solving sessions.

Specific objectives:

At the end of this activity, the student must be able to master the knowledge acquired, consolidate it and apply it correctly to technical problems that involve real situations.

Material:

Notes on the Atenea platform Webconferences General bibliography of the subject

Delivery:

Presentation of the different topics with slides and videos. During some of the sessions, exercises will be performed.

Full-or-part-time: 43h Self study: 25h Theory classes: 18h

Activity 2: SMALL GROUP/PRACTICAL SESSIONS

Description:

Carrying out in-person workshop practices and machine programming.

Specific objectives:

Acquire the necessary skills for a correct interpretation of the subject, as well as a satisfactory resolution of these.

Material:

Notes and webconferences on the Atenea platform

Delivery:

During these sessions, practical exercises would be carried out by the students in person in the laboratory or virtually, individually or in small groups.

Full-or-part-time: 35h Self study: 20h Laboratory classes: 15h



Activity 3: FIRST PARTIAL EXAM

Description:

Individual written test on the contents of modules 1 and 2. It represents 30% of the final grade. This test can be retaken for those students who get a grade between 0 and 5. The retake will be evaluated in the final exam. Of the two notes, the higher one will be taken.

Specific objectives:

The test must demonstrate that the student has acquired and assimilated the basic concepts, principles and foundations related to modules 1 and 2.

Material: Statement of the partial test.

Delivery:

The deliverable will be the resolution of the test.

Full-or-part-time: 14h

Self study: 12h Theory classes: 2h

Activity 4: FINAL EXAM

Description:

Prove individually and in writing on the continguts of modules 3 and 4. It represents 40% of the final grade.

Students who have a grade for activity 3 (FIRST PARTIAL EXAM) between 0 and 5 and decide to repeat the grade for the first partial, will be examined in a single exam of modules 1,2 for a band of 3 and 4 per l'altra. Of the first part corresponding to the first partial (modules 1,2), which represents 30%, the highest mark between that exam and that of activity 3 will be awarded. The second part of the exam (modules 3,4) represents 40%. In total it will be 70% of the final grade.

Specific objectives:

The test must demonstrate that the student has acquired and assimilated the basic concepts, principles and foundations related to modules.

Material: Final test statement

Delivery:

The deliverable will be the resolution of the test.

Full-or-part-time: 16h Self study: 14h Theory classes: 2h



Activity 5: Problems

Description:

A collection of problems related to the modules of the subject will be proposed and each student will have to solve and deliver the solution individually through ATENEA. The resolution will be done by hand and scanned.

Specific objectives:

Correctly apply the principles introduced in modules 1, 2, 3 and 4 Generic competencies: Analysis and synthesis. Efficient use of information. autonomous learning and written communication.

Material:

Statement and work guidelines (ATENEA) Course notes Recommended textbooks in the subject bibliography

Delivery:

Problems must be delivered in digital format through ATENEA. The delivery date is associated with the task.

Full-or-part-time: 17h Self study: 9h Theory classes: 8h

GRADING SYSTEM

The final grade of the course depends on five evaluation acts:

- 1st activity (practice attendance + MMC report), weight: 5%
- 2nd activity (Manual workshop report and CAM project), weight: 15%
- 3rd activity (partial exam), pes: 30%
- 4th activity (final exam), weight: 40%
- 5th activity (problems proposed), weight: 10%

All those students who cannot attend the second activity (partial exam). or who have unsatisfactory results (less than 5), they will be able to retrain their grade on the same day that the fourth activity (final exam) is carried out.

Attendance at practices is mandatory to pass the subject.

Generic competencies are only overcome by actively participating in the directed activities.

EXAMINATION RULES.

On the day of the exam you can only bring: Exam booklets and catalogs (hanging in Atenea), draft sheets, writing material and nonprogrammable calculator.

It is not allowed to carry a mobile phone.



BIBLIOGRAPHY

Basic:

- Campbell F.C. Manufacturing technology for aerospace structural materials [on line]. Amsterdam: Elsevier, 2006 [Consultation: 03/05/2022]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9781856174954/manufacturing-technology-for-aerospace-structural -materials. ISBN 1856174956. - Kalpakjian S.; Schmid, S. R. Manufactura, ingeniería y tecnología [on line]. 7ª ed. México [etc.]: Pearson Educación, 2014 [Consultation: 03/05/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB BooksVis?cod primaria=1000187&codigo libro=5323. - Norma UNE-EN 9100. AENOR M 40138:2003. - Osiander, R.; Garrison, M. A.; Champion, J. L. MEMS and microstructures in aerospace applications [on line]. Boca Raton: Taylor & Francis, 2006 [Consultation: 28/05/2024]. Available on:

https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/9781420027747/. ISBN 9781315220970.

Complementary:

- Ciurana, Q.; Fernández, A.; Monzón, M. Guía de tecnologías de rapid manufacturing. 2ª ed. rev. y ampl. Girona: Documenta Universitaria, 2008. ISBN 9788496742185.