1. BASIC INFORMATION

Course	Navigation Systems II
Degree program	Aerospace Engineering in Aircrafts
School	Architecture, Engineering and Design
Year	Second Year
ECTS	6 ECTS
Credit type	Mandatory
Language(s)	English
Delivery mode	Face to face
Semester	Second Semester
Academic year	2024/2025
Coordinating professor	Víctor Manuel Padrón Nápoles
Professor	Víctor Manuel Padrón Nápoles

2. PRESENTATION

This course belongs to the "Aerospace systems and infrastructures" module:

1. Aerospace Technology 6 ECTS (first academic year)
2. Navigation Systems I 6 ECTS (first academic year)
3. Navigation Systems II 6 ECTS (second academic year)
4. Air Transport 6 ECTS (second academic year)

The course includes the next topics: Navigation Systems, their main components and subsystems. Avionics.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CB2. Students can professionally apply their knowledge to their work or vocation and have competencies typically demonstrated through devising and sustaining arguments and solving problems within their field of study.
- CB3: Students can gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.
- CB5: Students have developed the learning skills necessary to undertake further studies with a high degree of autonomy.

Cross-curricular competencies:

- CT1: Ability to design, develop and manage in the field of aeronautical engineering aimed, according to the knowledge acquired as provided in paragraph 5 of the Decree CIN/308/2009, aerospace vehicles.

- CT12. Knowledge of basic subjects and technologies, which will enable students to learn new methods, theories and technologies, as well as to give students great versatility to adapt to new situations (autonomous learning).
- CT19. Work in interdisciplinary teams, providing the greatest effectiveness on the basis of cooperation, assuming their role within the team, establishing good relationships and exchanging information, and practicing the culture of peace and solidarity (Teamwork).

Specific competencies:

- CE17. Adequate knowledge and applied to the engineering of: the fundamental elements of the various types of aircraft; the functional elements of the air navigation system and associated electrical and electronic installations; the fundamentals of the design and construction of airports and its various elements.
- CE18. Adequate knowledge and application to the Engineering of the fundamentals of fluid mechanics; the basic principles of flight control and automation; the main characteristics and physical and mechanical properties of the materials.
- CE19. Applied knowledge of: the science and technology of materials; mechanics and thermodynamics; fluid mechanics; aerodynamics and flight mechanics; navigation and air circulation systems; aerospace technology; structure theory; air Transport; economy and production; Projects; environmental impact.

Learning outcomes:

- LO1: Develop software for the control of the various elements of aircraft, and for the various instruments.
- LO2: To conduct studies by integrating the technologies and engineering procedures that are developed in the competencies of these modules
- LO3. From a series of requirements and prior information, conceptualize an engineering problem, propose an approach to solve it, and obtain a better solution. All this related to the competencies of this module.
- LO4: To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB2, CB3, CB5, CT1, CT12, CT18, CT19, CE17, CE18, CE19	**LO1.** Develop software for the control of the various elements of aircraft, and for the various instruments.
CB2, CB3, CB5, CT12, CT18, CT19, CE17, CE18, CE19	**LO2.** To conduct studies by integrating the technologies and engineering procedures that are developed in the competencies of these modules.
CB2, CB3, CB5, CT12, CT18, CE18, CE17, CE19	**LO3.** From a series of requirements and prior information, conceptualize an engineering problem, propose an approach to solve it, and obtain a better solution. All this related to the competencies of this module.
CB2, CB3, CB4, CB5, CT12, CT18, CT19, CE17, CE18, CE19	**LO4.** To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.

4. CONTENT

The course covers the content stated in the official description of the Degree:

- Fundamentals of digital electronics and microprocessors
- Sensors and actuators
- Automatic digital control
- Avionics
- Air navigation systems

In order to do that, the course material is organized in eight learning units as shown below:

- Unit 1. Introduction to Digital Circuits
- Unit 2. Combinational Circuits
- Unit 3. Sequential Circuits
- Unit 4. Introduction to Digital Systems
- Unit 5. Introduction to Control Theory
- Unit 6. Introduction to Flight Management and Guidance Systems
- Unit 7. Introduction to Radio and its use in Aviation
- Unit 8. Introduction to Aeronautical Navigation Systems

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Lecture-based class
- Integration of teamwork
- Self-study
- Mentoring, academic monitoring and assessment

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Lecture-based class	40
Lab Exercises	20
Integration of teamwork	50
Self-study	60
Mentoring, academic monitoring and assessment	20
TOTAL	**150**

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Exams, tests and other knowledge tests	40-50%
Elaboration of articles, reports or reports	15-30%
Alternative evaluation techniques	15-30%
Field experiences, conferences and visits	10%
Transversal competences (rubrics)	10-15%

When you access the course on *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the ordinary call you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average) of the subject.

In addition to that, it will be necessary for you to obtain a grade greater than or equal to 5.0 in all assessments: the final exam, the integrating project activities and, the average grade of the lab exercises and the rest of the evaluation activities.

When the minimum required to perform the weighted average of the assessable activities is not met (the minimum is not reached in any of the previous points), the final grade will be:

- the weighted average if its value is less than or equal to 4
- 4 if the value of the weighted average is greater than 4

The grade in the ordinary call will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of those that are part of the weighted average.

7.2. Second exam period

To pass the course in the extraordinary call you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average) of the subject.

In addition to that, it will be necessary for you to obtain a grade greater than or equal to 5.0 in all assessments: the final exam, the integrating project activities and, the average grade of the lab exercises and the rest of the evaluation activities.

When the minimum required to perform the weighted average of the assessable activities is not met (the minimum is not reached in any of the previous points), the final grade will be:

- the weighted average if its value is less than or equal to 4
- 4 if the value of the weighted average is greater than 4

The failed activities in ordinary call must be delivered, after having received the corresponding corrections from the teacher. Also, undelivered or unrealized activities, should be realized/delivered.

The grade in the extraordinary call will be considered as NP (Not Submitted/No Attendance/Not show up) when the student has not delivered or done any new activity with respect to what was presented in the ordinary call.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Lab Exercise 1. Introduction to Quartus and PLD	Weeks 1-3
Lab Exercise 2. Standard combinational circuits.	Weeks 2-4
Lab Exercise 3. Standard sequential circuits.	Weeks 3-5
Lab Exercise 4. Finite State Machines	Weeks 5-8
Lab Exercise 5. Digital systems	Weeks 7-9
Lab Exercise 6. Introduction to Control Theory	Weeks 8-10
First Exam	Weeks 7-10
Final Exam	Weeks 16-18

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAFÍA

The main reference work for this subject is:

- T. L. FLOYD. “Digital Fundamentals”, 11th edition. Ed. Pearson, 2014.
- ANDREW S. TANENBAUM. “Structured computer organization”, 6th edition. Ed. Pearson, 2012.
- WILLIAM STALLINGS. “Computer Organization and Architecture”, Global Edition, 11th edition. Pearson, 2022.
- KATSUIKO OGATA. “Modern Control Engineering”, 5th Edition. Pearson, 2009.
- RICHARD C. DORF, ROBERT H. BISHOP. “Modern Control Systems”, Global Edition, 14th edition. Pearson, 2022.
- M. KAYTON and W. R. FRIED. “Avionics Navigation Systems”, 2nd Edition. John Wiley and Sons, 1997.
- J. GONZÁLEZ BERNALDO DE QUIRÓS. “Localización Aeronáutica: radioayudas, radar y GPS”. Ed. Bellisco, 2010.
- M. T. WYATT. “Aircraft Communication and Navigation Systems: Principles, Operation and Maintenance”. Routledge, 2011.
- P. Z. PEEBLES. “Radar Principles”. Wiley-Interscience, 1998.
- M. SKOLNIK. “Introduction to Radar Systems”, 3rd Edition. Mc-Graw-Hill Education, 2002.
- D. H. TITTERTON and J. L. WESTON. “Strapdown Inertial Navigation Technology”, 2nd Edition. Institution Electrical Engineers, 2004.
- B. L. STEVENS, F. L. LEWIS and E. N. JOHNSON. “Aircraft Control and Simulation: Dynamics, Controls Design, and Autonomous Systems”, 3rd Edition. Wiley-Blackwell, 2015.

The recommended Bibliography is:

- Manuals and documentation of aircrafts, simulation tools and aviation professional organizations.

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.