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	2025 - 2026
Coordinating 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. KNOWLEDGE, SKILLS, AND COMPETENCES

Knowledge

- **CON19** - Identify the knowledge of basic subjects and technologies, enabling the student to learn new methods, theories and technologies, and endowed it with great versatility to adapt to new situations (autonomous learning).
  Specific knowledge of the subject:
  - Acquire knowledge of software for controlling various elements of aircraft and diverse instruments.
  - Describe the fundamentals of digital electronics and microprocessors.
  - Identify the fundamentals of avionics.
  - Describe the basic concepts of air navigation systems.

Skills

- **HAB04** Use computer tools to search for bibliographic or information resources (Information Search). Specific skills of the subject:

- Based on a set of requirements and previous information, conceptualize an engineering problem, outline the approach to solving it, and find the optimal solution. All of this is relative to the competencies of this module.

Competencies

- **CP01 CO11.** Appropriate knowledge applied to engineering of: fundamental components of different types of aircraft; functional elements of air navigation system and electrical installation and associated electronics; fundamentals of airport design and construction and its diverse elements.
- **CP03 CO13.** Applied knowledge of: the science and technology of materials, mechanics and thermodynamics, fluid mechanics, aerodynamics and flight mechanics, navigation and air traffic, aerospace technology, theory of structures, air transport, economy and production projects; impact on environment.
- **CP12.** Generate new ideas and concepts from known ideas and concepts, reaching conclusions or solving problems, challenges, and situations in an original way in the academic and professional environment.
- **CP13.** Convey messages (ideas, concepts, feelings, arguments), both orally and in writing, strategically aligning the interests of the various parties involved in communication in the academic and professional environment in the field of aerospace engineering.
- **CP14.** Employ information and communication technologies for data search and analysis, research, communication, and learning in the field of aerospace engineering.
- **CP15.** Influence others to guide and lead them towards specific objectives and goals, taking into consideration their viewpoints, especially in professional situations arising from the volatile, uncertain, complex, and ambiguous (VUCA) environments of the current world.
- **CP16.** Collaborate with others in achieving a shared academic or professional objective, actively participating, demonstrating empathy, and practicing active listening and respect for all team members.
- **CP17.** Integrate analysis with critical thinking in an evaluation process of different ideas or professional possibilities and their potential for error, relying on evidence and objective data that lead to effective and valid decision-making.
- **CP18.** Adapt to adverse, unexpected situations that cause stress, whether personal or professional, overcoming them and even turning them into opportunities for positive change.
- **CP19.** Demonstrate ethical behavior and social commitment in the performance of professional activities, as well as sensitivity to inequality and diversity.

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 seven learning units as shown below:

- Unit 1. Introduction to digital circuits
- Unit 2. Combinational and sequential circuit blocks
- Unit 3. Introduction to digital systems

- Unit 4. Introduction to Control Theory
- Unit 5. Introduction to Flight Management and Guidance Systems
- Unit 6. Introduction to Radio and its use in Aviation
- Unit 7. 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

The following table shows, for each learning activity: i) the total time the student will spend, ii) the time distribution between in-class and off-class time, and iii) the course policy about the use of artificial intelligence (AI) in that activity.

Learning activity	Number of hours	In-class time	Use of AI
Lecture-based class	25	25 (100%)	Not allowed
Laboratory and/or problem-solving session	12	12 (100%)	Not allowed
Integrative teamwork	43	23 (53%)	Suggested
Self-Study	70	60	Suggested
TOTAL	**150**		

Further details about the AI-use policy will be published through the virtual campus platform once the course has started.

7. ASSESSMENT

Listed below are the assessment systems used, and the weights each one carries towards the course grade:

Assessment system	Weight
SE01 – Exams and objective tests	35%
SE02 – Articles, essays and reports	25%
SE03 – Peer-evaluation, auto-evaluation, portfolio production and other alternative assessment procedures	20%
SE04 – Off-class events, conferences and seminars (*)	10%
SE05 – Core/cross-curricular competences (performance)	10%

(*) If these activities could not be carried out, the corresponding weight would split evenly between systems SE02 and SE03.

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you must 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. And comply with the minimum attendance regulations stablished by the STEAM School, whenever applicable.

If any of the above requirements were not met, the final grade may not exceed 4.0 in a scale up to 10, failure.

7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

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 final work, the integrating project activities and, the average grade of the lab exercises and the rest of evaluation activities.

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

If any of the above requirements were not met, the final grade may not exceed 4.0 in a scale up to 10, failure.

8. SCHEDULE

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

Assessable activities	Deadline
AE1. Lab Exercise 1. Introduction to Quartus and PLD	Weeks 1-3
AE2. Lab Exercise 2. Standard combinational and sequential circuits blocks.	Weeks 2-4
AE3. Lab Exercise 3. Finite State Machines	Weeks 3-5
AE4. Lab Exercise 4. Digital systems. Sensors and actuators	Weeks 5-8
AE5. Lab Exercise 5. Introduction to Control Theory	Weeks 7-9
AE6. Integrating project	Weeks 8-10
AE7. First Exam	Weeks 7-10
AE8. 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 based on manuals and documentation of aircraft, 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.