Intelligent Instrumentation Systems

Code: 102724
ECTS Credits: 6

2025/2026

Degree	Type	Year
Electronic Engineering for Telecommunication	OT	4

Contact

Name: Javier Martin Martinez

Email: javier.martin.martinez@uab.cat

Teachers

Javier Martin Martinez

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

It is recommended to have taken the subjects of Instrumentation I and II.

Objectives and Contextualisation

The main objective of the subject is to understand how the use of artificial intelligence can improve the instrumentation systems that the student already knows about the instrumentation subjects I and II

Competences

- Apply the necessary legislation in the exercise of the telecommunications engineer's profession and use the compulsory specifications, regulations and standards
- Communication
- Conceive, design, implement and operate electronic instrumentation and control equipment and systems.
- Develop ethics and professionalism.
- Develop personal attitude.
- Develop personal work habits.
- Develop thinking habits.

- Learn new methods and technologies, building on basic technological knowledge, to be able to adapt to new situations.
- Manage activities involved in projects in the field of telecommunications.
- Work in a multidisciplinary group and in a multilingual environment, and communicate, both in writing and orally, knowledge, procedures, results and ideas related with telecommunications and electronics
- Work in a team.

Learning Outcomes

1. Analyse and specify the fundamental parameters of a communications system, in terms of instrumentation.
2. Analyse and troubleshoot electromagnetic interference and compatibility.
3. Autonomously apply new knowledge and proper techniques for the design, development or operation of electronic systems.
4. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
5. Develop critical thinking and reasoning.
6. Develop curiosity and creativity.
7. Develop independent learning strategies.
8. Develop the capacity for analysis and synthesis.
9. Document the instrumentation systems designed, based on current standards.
10. Evaluate the advantages and disadvantages of different technological alternatives for the deployment or implementation of electronic systems, in terms of disturbance and noise.
11. Identify the standards and regulations for telecommunications in the national, European and international areas in the field of electromagnetic compatibility
12. Perform the specification, implementation, documentation and fine-tuning of electronic instrumentation and control equipment and systems , considering technical aspects and the relevant regulatory requirements.
13. Prevent and solve problems.
14. Respect diversity in ideas, people and situations.
15. Work autonomously.
16. Work cooperatively.

Content

1) Modeling non-linear sensors.

2) Introduction to aritficial neural networks.

2.1) The perceptron.

2.2) Multilayer networks

2.3) Training of neural networks.

2.4) General applications.

3) Optimization of instrumentation systems through the use of neural networks.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes

Type: Directed			
Classes	30	1.2	1, 2, 3, 10, 8, 5, 11
Problems and cases seminaris	10	0.4	1, 3, 10, 4, 7, 8, 6, 5, 11, 13, 16, 15
Type: Supervised			
Discussion of the proposed problems	15	0.6	2, 3, 7, 9, 11, 13, 12, 16, 15
Guidance	7	0.28	1, 2, 3, 10, 9, 11, 12
Type: Autonomous			
report writing	20	0.8	4
Study	20	0.8	2, 3, 10, 11
Work oriented to learning based in problems	35	1.4	1, 2, 3, 10, 8, 6, 5, 11, 12

The teaching methodology will combine, in addition to independent work, guided and supervised activities. The guided activities will combine master classes, problem and case seminars and laboratory sessions.

Through the Virtual Campus, students will have access to teaching materials that complement the concepts covered in the classroom. The Virtual Campus will also be used to submit assessable activities.

It is recommended that students attend class with a laptop.
During the course, lectures will alternate with practical cases that students must solve in class using MATLAB. The use of AI is restricted to solving practical cases. Students must explain the purpose of using AI and obtain the instructor's approval.

This subject does not provide for the single evaluation system.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final report	30%	2	0.08	1, 2, 3, 10, 4, 7, 8, 5, 9, 11, 13, 12, 16, 15
Resolution of problems	40%	10	0.4	1, 2, 3, 10, 4, 7, 8, 6, 5, 9, 11, 13, 14, 16, 15
Short oral exams	30%	1	0.04	1, 2, 3, 10, 4, 7, 8, 6, 5, 9, 11, 13, 12, 14, 16, 15

Throughout the course, problems will be proposed for students to solve during and outside of class.

The resolution of these problems will account for 40% of the total grade.

Throughout the course, several oral assessments will be given on the exercises being completed. These assessments account for 30% of the grade.

Finally, the student must submit a report on a free-theme project related to the course content, which will account for 30% of the grade.

If the student does not pass the course, the student will be entitled to a make-up exam according to the schedule established by the School.

A grade of Not Assessable will be obtained if the report on the free-theme project is not submitted and less than 15% of the proposed projects are submitted.

The MH classification will be obtained in accordance with the criteria established in the current UAB regulations.

Without prejudice to other disciplinary measures deemed appropriate, and in accordance with current academic regulations, any irregularities committed by the student that may lead to a change in the grade for an assessment will be graded with a zero.

Bibliography

J.C. Alvarez et al., "Instrumentación electrónica", Thomson-Paraninfo, 2006

P.H. Sydenham, N.H. Hancok and R. Thorn, "Introduction to Measurement Science and Engineering", John Wiley & Sons, 1989.

Ripley, Brian D. (1996) Pattern Recognition and Neural Networks, Cambridge

Bishop, C.M. (1995) Neural Networks for Pattern Recognition, Oxford: Oxford University Press.

Software

Matlab

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	321	Spanish	second semester	afternoon
(PLAB) Practical laboratories	321	Spanish	second semester	morning-mixed
(TE) Theory	320	Spanish	second semester	afternoon