Universitat Autònoma de Barcelona

2021/2022

Intelligent Instrumentation Systems

Code: 102724
ECTS Credits: 6

Degree	Type	Year	Semester
2500895 Electronic Engineering for Telecommunication	OT	4	0

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Javier Martin Martinez

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 engineers 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.

Methodology

During the course the teacher will propose problems that students must solve in class. The resolution of these problems will correspond to the total 40% of the grade. In addition, the teacher throughout the course will make various oral evaluations on the exercises that the student is doing at that time. Assuming 30% of the note. Finally, the student must submit a report of the work done during the course, which will be 30% of the grade. In case of not passing the subject, the student will have the right to a recovery exam to the calendar set by the School.

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.

Activities

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

Assessment

During the course the teacher will propose problems that the students must solve in class. The resolution of these problems will correspond to the total 40% of the grade. Thus, the teacher in the course of the course will perform several oral evaluations on the exercises that the student is doing in those and those moments. Assuming 30% of the note. Finally, the student must submit a report of the work done during the course, which will be 30% of the grade. In case of not passing the subject, the student will have the right to a recovery exam to the calendar set by the School.

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

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