

Instrumentation and Sensors

Code: 104529
ECTS Credits: 6

Degree	Type	Year	Semester
2503743 Management of Smart and Sustainable Cities	OB	1	2

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: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Pau Aguila Moliner

Prerequisites

The knowledge required to carry out the subject are basically mathematics and physical intermediate level of baccalaureate. Although it is advisable to have passed the baccalaureates of technology or science. You can also do the subject having done math during the baccalaureate. This is extended to students from vocational training.

It is also recommended to have basic electronic and computer skills. In spite of this, a review will be done at the beginning of the subject to ensure the minimum level of the prerequisites. Additional material will also be provided for students with a deficit of these subjects, or for students who want to reaffirm their previous knowledge.

Objectives and Contextualisation

The subject focuses on the sensors and the process of collecting information obtained from the physical world to be incorporated into the digital domain.

Competences

- Design platforms of management, integration of public and government services applying technologies and systems of sensorization, acquisition, processing and communication of data.
- Measure the technological infrastructure necessary to respond to the needs of cities, understanding the interactions between technological, social and operational aspects of cities.
- Prevent and solve problems, adapt to unforeseen situations and take decisions.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.

- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.

Learning Outcomes

1. Be aware of existing sensors and understand the concept of detection in the broadest sense.
2. Be aware of the technology and systems /sensors offered by the market.
3. Describe the characteristics of instrumentation and detection systems, both analogue and digital.
4. Prevent and solve problems, adapt to unforeseen situations and take decisions.
5. Read and interpret technical documents, circuits and component-specification sheets.
6. Recognize current urban information-recruitment infrastructures.
7. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
8. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
9. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
10. Understand the scope of information gathering and its possibilities.

Content

- Review of electronics fundamentals.
- Review of basic programming fundamentals.
- Concepts of instrumentation systems: Input / output, gain, filtering, sensitivity, resolution, quantification, coding, transduction, linearity.
- Sensors and transducers. Principles of operation, types and characteristics.
- Actuators and interaction with the environment.
- Control systems for electronic instrumentation systems. Loops and decision making.
- Integration of instrumentation, consumption and connectivity systems.

Methodology

The teaching methodology to follow is oriented to the learning of the subject by the student on a continuous basis. This process is based on the realization of three types of activities that will be developed throughout the course: classes of theory, classes of problems and practices of laboratory.

The teaching methodology and the evaluation may suffer some modifications depending on the restrictions imposed by health authorities.

Theory classes: The teacher will provide information about the knowledge of the subject and about strategies to acquire, expand and organize this knowledge. Active participation of students during these sessions will be encouraged, for example by discussing discussions at those points that have a higher conceptual load.

Problem classes: Students must participate actively to consolidate the acquired knowledge by solving, presenting and debating problems that are related to them.

Laboratory practices: Students will have to work in teams of two people to perform electronic assemblies, answer the questions related and solve the problems posed, putting into practice the knowledge worked in theory classes and problems. Then they will have to present them by means of written reports, where the use of English will be valued, the capacity for synthesis, and the reasonings and explanations requested.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practices	12	0.48	1, 2, 3, 10, 5, 4, 7
Problemes	11	0.44	3, 10, 4, 8
Theory	22	0.88	1, 2, 3, 10, 8, 6
Type: Supervised			
Delivery of problems	4	0.16	1, 2, 3, 4, 6
Team activities	12	0.48	5, 9, 7, 8
Type: Autonomous			
Preparation of laboratory practices	8	0.32	5, 7
Preparation of reports	12	0.48	3, 9, 7, 8
Problem resolution	17	0.68	3, 10, 5, 4, 8
Study of the contents	22	0.88	1, 2, 3, 10, 6

Assessment

The teaching methodology and the evaluation may suffer some modifications depending on the restrictions imposed by health authorities.

Continued evaluation

There will be two partial exams throughout the semester. The average of these exams will constitute 50% of the mark of the subject.

Requirement: Minimum mark of 5 on average of the two partial ones.

Minimum mark of 3 in each of the two partials.

In the event that the average mark of the two partials is less than 5, the student must submit the final synthesis exam to be able to pass the subject.

Throughout the semester, questions, problems and / or cases will be proposed in the form of activities that the student will have to solve autonomously or in a group, in or outside the classroom. The average of the marks obtained in these activities will constitute 20% of the final mark of the subject, and will only be taken into account for the continuous evaluation, and not if the student has to go to the final examination of synthesis

Requirement: Have all the proposed activities delivered (those not submitted will qualify as a Non-Presented, NP)

Minimum mark of 5 on average of these activities.

Completion of all the practices is mandatory. The mark obtained in the laboratory sessions will constitute 30% of the final mark of the subject. Non-attendance to a practice will entail the non-evaluation of these, and therefore, the student will be suspended from the subject. Only in case of proven justification, such as a visit or medical treatment that is impossible to change, the death of relatives, etc., the student can recover the practice not performed presenting the corresponding justification. The method to recover it will depend on the availability of the practice lecturer and the issue in question.

Requirement: Minimum mark of 5 on average for all practices.

Assistance to all practices.

Recovery

In the case that the student does not pass the partial exams of the continuous assessment, the student can present themselves to the synthesis exam that will be done at the end of the semester and that will include all the contents of the subject. In this case, the note of the synthesis exam (70%) and practice (30%) will only be taken into account. Therefore, the activities will not be taken into account if the student does not pass the continuous evaluation.

In case the student does not exceed only the part of the activities, he can do an activity to recover this part of the continuous evaluation. The activity will be proposed by the teacher in charge of the activities.

In the event that the student does not pass the internship, the student will be permanently suspended. And he will have to study it again next year.

Final examination of synthesis

It will be an exam in which all the contents of the subject will be assessed (regardless of whether one of the partial exams is approved). In order to pass the subject, a minimum final exam score of 5 is required.

In order to obtain the final mark of the subject, the note of the synthesis exam will be weighted with the practical note, with a weight of 70% and 30%, respectively.

In the event that a student does not pass the continuous assessment or the synthesis examination, the student will be suspended and will have to repeat the subject next year. If the student has passed the part of practices, the note will be saved for the next year. This will be the only note that will be kept for one year for the other.

Not evaluable

In the event that no delivery is made, it will not be included in any laboratory session and no exam will be carried out, the corresponding note will be a "Non-Valuable". In any other case, "unanswered" counts as a 0 for calculating the weighted average, which will be a maximum of 4.5. That is, participation in an assessable activity implies that "nopresentats" are taken into account in other activities such as zeros. For example, an absence in a laboratory session implies a zero note for that activity. And the failure to do so will involve suspending the laboratory practices, and therefore, the subject.

Suspended

The maximum grade that will appear in the file in case of not passing the subject for not meeting any of the minimum requirements demanded in the previous points, will be 4.5 maximum.

Exam reviews and activities

All the activities carried out that compute for the grade of the subject can be reviewed to verify their score. The review will take place on a specific day and hour with the teachers corresponding to the activities reviewed, and that these will be indicated in advance through the virtual campus. After passing the review, these notes can not be reviewed again. If a revision can not be attended, the student must notify him in advance and another date will be found to be agreed between student and teacher / s. Only in case of a justified cause can the review be carried out after the announced date.

Repeaters

The students that repeat the subject will be able to validate the practices of laboratory, and the note of the previous year will be conserved to them. In order to validate the practices, the student will have to contact the professor responsible for the practices and request the validation. The practices will not be validated two years in a row, therefore, a student who attends this subject for the third time will have to carry out the practices again.

The rest of the marks of the subject can not be validated, and the student will have to repeat all the works and exams of the assessment, as a first-degree student.

Honor license plates

Honor matriculations will be awarded to those who obtain a grade greater than or equal to 9 in each part, up to 5% of those enrolled in descending order of final grade. At the discretion of the teaching staff, they may also be granted in other cases.

Copies and plagiarism

The copies refer to the evidence that the work or the examination has been done in part or in full without the author's intellectual contribution. This definition also includes tried attempts of copying in exams and deliveries of work and violations of the norms that ensure intellectual authorship.

The plagiarisms refer to the works and texts of other authors that make them happen as their own. They are a crime against intellectual property. To avoid plagiarism, quote the sources you use when writing the report for a job.

In accordance with the UAB regulations, copies or plagiarism or any attempt to alter the result of the assessment, either by themselves or by others - requiring copy, for example, implies a note of the corresponding part (theory, problems or practices) of 0 and, in this case, a suspension of the subject, without this limiting the right to take action against those who have participated, both in the academic field and in the criminal.

Treatment of transversal spectacles

T04 (Transverse) - Prevent and solve problems, adapt to unforeseen situations and make decisions.

T04.00 - Preventing and solving problems, adapting to unforeseen situations and making decisions.

T05 (Transverse) - Critically evaluate the work done and demonstrate a spirit of overcoming.

T05.00 - Evaluate critically the work done and show a spirit of overcoming.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exams	50 %	6	0.24	1, 2, 3, 10, 5, 9, 7, 8, 6
Laboratori reports	20%	8	0.32	9, 7
Pre-laboratory activities	10 %	4	0.16	3, 5
Team activities	20 %	12	0.48	1, 2, 3, 10, 5, 4, 9, 8, 6

Bibliography

- 'Instrumentación Electrónica', Pérez, Álvaro, Campo, Ferrero, Grillo. Editorial Thomson.
- 'Sensores y acondicionamiento de señal', Ramón Pallás Areny. Editorial Marcombo - Boixareu