UAB
Universitat Autònoma de Barcelona

Instrumentation and Sensors

Code: 106931
ECTS Credits: 6

2024/2025

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

Contact

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Teaching groups languages

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

Prerequisites

The knowledge required to complete the subject is basically the basic skills of mathematics and physics at the mi
It is also recommended to have passed, or at least taken, the subjects of

Objectives and Contextualisation

The subject focuses on sensors and the process of collecting information obtained from the physical world to be i
The specific objectives of the subject are:
- To know the characteristics and key aspects of conventional instrument
- Understand the operation of sensors and electronic conditioning.
- Understand the operation of the Analog-Digital and Digital-Analog conv
- To study how ICT technologies are involved in the application of instrun

Learning Outcomes

1. KM22 (Knowledge) Describe the technologies of data capture and transmission, as well as actuators and robotic systems and the problems associated with their integration into the urban fabric.
2. SM20 (Skill) Use data acquisition systems (e.g. sensors and RFID tags) and their processing as a tool for control (e.g. of instrumentation and robots) and decision-making.

Content

- Review of electronics fundamentals and programming.

- 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.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems	12	0.48	
Theory	26	1.04	
Type: Supervised			
Practices	12	0.48	
Type: Autonomous			
Group activities	12	0.48	
Individual Deliveries	12	0.48	
Problem resolution	8	0.32	
Study of the contents	30	1.2	

The teaching methodology to be followed is aimed at the student's continuous learning of the subject. This process is based on three types of activities that will take place throughout the course: theory classes, problem classes and laboratory practices.

The proposed teaching methodology and assessment may undergo some modification depending on the restrictions on attendance imposed by the health authorities.

Theory classes: The teacher will provide information on the knowledge of the subject and on strategies to acquire, extend and organize this knowledge. Students' active participation will be encouraged during these sessions, for example by raising discussions on those points that have a higher conceptual load.

Problem classes: Students will have to participate actively to consolidate the knowledge acquired by solving, presenting and debating related problems.

Laboratory practices: The students will have to work in teams of two people to make electronic assemblies, answer the related questions and solve the problems raised, putting into practice the knowledge worked on in the theory and problem classes. They will then have to present them through written reports, where the use of English, the ability to synthesize, and the reasoning and explanations requested will be assessed.

Undirected activities: Students will have to do 4 undirected activities, two individually and two in groups, to demonstrate the skills and knowledge acquired.

Note: 15 minutes of a class will be set aside, within the calendar established by the center/degree, for students to fill in the teacher performance and subject evaluation surveys /module.

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
2 Exams	30%	6	0.24	KM22
Group Activitities	20%	10	0.4	SM20
Individual Deliveries	20%	10	0.4	KM22, SM20
Lab practices	30%	12	0.48	SM20

Continued avaluation

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

Requirement: Minimum grade of 5 on average of the two partials.

Minimum grade of 3 in each of the two partials.

In the event that the average mark of the two parts is less than 5, the student must take the final synthesis exam in order to pass the course.

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

Requirement: Have delivered all the proposed activities and deliveries (those not delivered will be marked with a Not Presented, NP)

A minimum grade point average of 5 for these activities, and also for the deliveries.

Completion of all internships is mandatory. The mark obtained in the laboratory sessions will constitute 30% of the final mark of the subject. Failure to attend an internship will result in non-assessment 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 impossible to change, death of relatives, etc .. the student will be able to recover the practice not realized presenting the corresponding justification. The method for retrieving it will depend on the availability of the internship teacher and the student in question.

Requirement: Minimum grade of 5 on average of all practices.

Attendance at all internships.

Recovery

In the event that the student does not pass the partial exams of the continuous assessment, the student may take the synthesis exam that will be held at the end of the semester and which will include all the contents of the subject. In this case, only the mark of the synthesis exam (30%), the practices (30%), indiviodual deliviries (20%) and grupal activities (20%) will be taken into account.

In the event that the student passes only the part of the group activities or the individual deliveries, he / she will be able to do an activity and / or delivery to recover this part of the continuous assessment. The activity and / or delivery will be proposed by the teacher in charge of them.

In the event that the student does not pass the internship, he / she will be permanently suspended from the subject. And he will have to take it again next year.

Final synthesis exam

It will be an exam in which all the contents of the subject will be evaluated. In order to pass the subject, a minimum final exam mark of 5 is required.
In order to obtain the final grade of the subject, the mark of the synthesis exam will be weighted with the mark of practices, individual deliveries and grupal activities, with weights of 30%, 30%, 20% and 20%, respectively.
In the event that a student does not pass the continuous assessment or the synthesis exam, he / she will be suspended and will have to repeat the subject. If the student has passed the internship part, the grade will be saved for the next year. This will be the only note that will be kept from one year to the next.

Not evaluable

In the event that no delivery is made, no laboratory session is attended and no examination is taken, the corresponding grade will be a "Not Evaluable". In any other case, the "not presented" count as a 0 forthe calculation of the weightedaverage, which will be a maximum of 4.5. That is, participation in some evaluable activityimplies taking into account those "not presented" in other activities as zeros. For example, an absence in a lab session implies a grade of zero for that activity. And not doing so will mean suspending laboratory practices, and therefore the subject.

Suspended

The maximum mark that will appear in the file in case of not passing the subject for not fulfilling any of the minimum requirements demanded in the previous points, will be of 4,5 at the most.

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 willhave 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) of0 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.

Bibliography

- 'Instrumentación Electrónica', Pérez, Álvaro, Campo, Ferrero, Grillo. Editorial Thomson.

- 'Sensores y acondicionamiento de señal', Ramón Pallás Areny. Editorial Marcombo - Boixareu

Software

The free access program of the Arduino platform will be used during the laboratory sessions.

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	611	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	612	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	611	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	612	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	613	Catalan	second semester	morning-mixed
(TE) Theory	61	Catalan	second semester	morning-mixed