UAB
Universitat Autònoma de Barcelona

Communication Systems

Code: 104537
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500001 Management of Smart and Sustainable Cities	OB	2

Contact

Name: Maria Angeles Vazquez Castro

Email: angeles.vazquez@uab.cat

Teachers

David Megias Jimenez

Teaching groups languages

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

Prerequisites

The subject is selfcontained.

Objectives and Contextualisation

Smart cities require a large amount of data to improve city services and the quality of life of their citizens in general while ensuring sustainability.

For such data sets to be accessible and usable by any type of solution of a smarty city, it is required that high-capacity and high-performance communicaiton systems are in place. These systems will utilize up-to-date transmission protocols that guarantee the data flow to be fast, reliable and secure.

The fundamental objective of this subject is to provide the student with a good basis about underlying principles of communication systems with special enphasis on the interconnectivity

Competences

- Design platforms of management, integration of public and government services applying technologies and systems of sensorization, acquisition, processing and communication of data.
- Generate innovative and competitive proposals in professional activity.
- 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 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.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.

Learning Outcomes

1. Analyse and evaluate distinct network technologies for the various communicative needs among the elements in a smart city.
2. Choose the most suitable wireless communications standard for each application.
3. Conceive communication systems for intelligent cities capable of connecting all components.
4. Design and develop computer solutions that allow citizens access to distributed-management platforms and integrated services.
5. Generate innovative and competitive proposals in professional activity.
6. Prevent and solve problems, adapt to unforeseen situations and take decisions.
7. 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.
8. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
9. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
10. Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.

Content

1. Introduction to communication systems and networks

2. Part A. Fundamentals of communication systems

- Introduction to Information Theory

- Elements of a communication system

- Taxonomies of communication systems

- Examples of relevant standards of communications

3. Part B. Fundamentals of network protocols

- Networking protocols

- End-to-end protocolos

- Application protocols

- Advanced networking protocols

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical sessions	12.5	0.5	
Weekly lecturing sessions	25	1	
Weekly practical sessions	12.5	0.5	
Type: Supervised			
Reports	12.5	0.5	
Team work	12.5	0.5	
Type: Autonomous			
Solving practical exercises	23	0.92	
Study of contents	25	1	

The teaching methodology will be scheduled as follows:

1) Weekly sessions of two hours for theoretical content.

2) Weekly sessions of one hour for applied exercises

3) Laboratory sessions for monitored practical (project-based/hands-on) work.

There will also be team activities that students will do on their own as part of continuous evaluation.

The UAB virtual platform (Campus Virtual, https://cv.uab.cat/) and TEAMs will be used for communication between teachers and students.

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
Reports	Reports	2	0.08	2, 3, 4, 5, 6, 9, 10
Tests	Tests	25	1	1, 2, 3, 4, 5, 6, 7, 8, 10

The evaluation of the subject will be by continuous evaluation as follows

A. Comprehension questionnaire on the theoretical content of the networking part.

B. Comprehension questionnaire on the theoretical content of the systems part.

C. Delivery of reports on the execution of practical sessions of the networking part.

D. Delivery of reports on the execution of practical sessions of the systems part.

The numerical grade evaluation will be weighted as follows: A 25%, B 25%, C 25%, D 25%. For this evaluation, a minimum grade of 3 will be required in all parts. The parts with less than a 3 must be recovered in order to have a final grade.

Students who have been evaluated for a minimum of 2/3 of the evaluation of the subject will be able to opt for the recovery process.

In the case of recovery of the practical exercise (delivery after the deadline), there will be a 30% penalty.

The recovery process will consist of an additional questionnaire for points A and B, and a second delivery period for points C and D.

There will no be differentiated treatment for students who repeat the subject.

The final grade will appear as "Not Evaluable" only when the student has not participated in the evaluation process.

Fnal grade with honors according to UAB policy (free matriculation fee) will be granted to those students who, having obtained a final grade equal or superior to nine (9), have shown active participation throughout the course.

Notwithstanding other disciplinary measures deemed appropriate, and in accordance with the academic regulations in force, assessment activities will receive a zero (0) whenever a student commits academic irregularities that may alter such assessment. Assessment activities graded in this way and by this procedure will notbe re-assessable. If passing the assessment activuty or activities in question is required to pass the subject, the awarding of a zero (0) for disciplinary measures will also entail a direct fail for the subject, with no opportunity to re-assess this in the same acadeimc year. Irregularities contemplated in this procedure include, among others:

- the total or partial copying of a practical exercice, report, or any other evaluation activity;
- allowing others to copy;
- presenting group work that has not been done entirely by the members of the group;
- presenting anymaterials prepared by a third party as one's own work, even if these materials are translations or adaptations, including work that is not original or exclusively that of the student;
- having communication devices (such as mobile phones, smart watches, etc.) accessible during theoretical-practical assessment tests (individual exams).
- talk to other student during the individual practical or theoretical tests.
- copying or trying to copy from other students during the individual practical or theoretical tests.
- using or trying to use writen material related to the subject during the individual practical or theoretical tests when they have not been explicitly allowed.

When a student is involved in any evaluation irregularity, the final mark of the course will be the lowest value considering 3,0 and the weighted average of the grades (and no compensation is thus possible).

Bibliography

Class notes.

Basic references:

D.E. Comer (2005). Internetworking with TCP/IP, 5th Edition. Prentice Hall.

Managing the Internet of Things : architectures, theories and applications edited by Jun Huang and Kun Hua (online UAB library).

Supplementary references:

Joel J. P. C. Rodrigues, Parul Agarwal, Kavita Khanna (2022). IoT for Sustainable Smart Cities and Society. Springer.

D.E. Comer (2005). Internetworking with TCP/IP, 5th Edition. Prentice Hall.

G. Tomsho (2011). Guide to Networking Essentials, 6th Edition. Cengage.

W. R. Stevens (1993). TCP/IP Illustrated, Volume I. Addison-Wesley.

A.S. Tanenbaum (2002). Computer Networks, 4th Edition. Prentice Hall.

N. Barcia, C. Fernández, S. Frutos, G. López, L. Mengual, F.J. Soriano, F.J. Yágüez (2005). Redes de computadores y arquitecturas de comunicaciones. Supuestos prácticos. Pearson Prentice Hall.

Software

Docker, Linux and Virtual Box.

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	611	English	first semester	afternoon
(PAUL) Classroom practices	612	Catalan	first semester	afternoon
(PLAB) Practical laboratories	611	English	first semester	afternoon
(PLAB) Practical laboratories	612	English	second semester	afternoon
(PLAB) Practical laboratories	613	Catalan	second semester	afternoon
(TE) Theory	61	English	first semester	afternoon