UAB
Universitat Autònoma de Barcelona

Communication Systems

Code: 106940
ECTS Credits: 6

2025/2026

Degree	Type	Year
Management of Smart and Sustainable Cities	OB	2

Contact

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Teachers

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Teaching groups languages

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

Prerequisites

No prior requirements are needed to take this course.

Objectives and Contextualisation

Smart cities require a large amount of data to improve services and thus the quality of life for their citizens. For this data to be accessible and used for any type of improvement in the management of the smart city, high-performance communication systems are needed. These systems will use transmission protocols that ensure the data flow is transmitted quickly, reliably, and securely.

The fundamental objective of this course is to provide students with a foundation in the principles of operation of the systems that enable communication, with special emphasis on interconnection mechanisms and scalability.

Learning Outcomes

1. CM18 (Competence) Provide innovative responses to the management needs of cities by means of information transmission, storage and processing technology.
2. KM24 (Knowledge) Describe the technological infrastructure necessary to respond to the needs of cities in an open way, understanding the interactions between technological, social and operational aspects of cities.

3. SM24 (Skill) Develop management platforms, integration of citizen services and governance by applying communication, data processing and storage technologies and systems.

Content

Introduction to Communication Systems and Networks

Part 1. Basic Fundamentals of Communication Systems

Parts of a Communication System
Introduction to Information Theory
Link Balance Calculations
Examples of Relevant Communication Standards

Part 2. Basic Fundamentals of Network Protocols

Network Interconnection Protocols
End-to-End Protocols
Application Protocols
Advanced Network Interconnection Protocols

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems	12.5	0.5	
Theory	25	1	
Treball pràctic	12.5	0.5	
Type: Supervised			
Group activities	12.5	0.5	
Submission of assignments	12.5	0.5	
Type: Autonomous			
Preparación y resolución de problemas prácticos	23	0.92	
Study of contents	25	1	

The teaching methodology of this course will consist of:

Weekly sessions of two hours of theory

Weekly sessions of one hour of practical content

Practical learning sessions through projects or laboratory practices.

Group activities outside the classroom will also be part of the continuous assessment.

The UAB Virtual Campus (https://cv.uab.cat/) will be used as the virtual platform for communication with students.

The use of artificial intelligence is allowed and encouraged in this course, as long as its use is clearly explained: how it was used, why, and for what purpose. Justifying its application within the context of the project is mandatory.

One of the lab sessions may include a field trip to a nearby town or city to carry out fieldwork for data collection.

For some lab sessions, each team must bring at least one personal laptop, as none will be provided.

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
Evaluation of submitted assignments	50	25	1	CM18, KM24, SM24
Evaluation of Test	50	2	0.08	CM18, KM24, SM24

This subject does not provide for a single assessment system.

The evaluation of the course will be continuous and will consist of three evaluation mechanisms:

A. Comprehension questionnaire on the theoretical part of networks

B. Comprehension questionnaire on the theoretical part of systems

C. Submission of reports on the execution of practical sessions on the networks part

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

The numerical grade will be weighted as follows: A 25%, B 25%, C 25%, D 25%.

This weighting will be applied as long as each of the four grades is at least 3.0.

Therefore, if none of the four grades A, B, C, and D is below 3.0, this formula will not be applied and the course grade will be calculated accordingly.

Exams are individual, while classroom activities and practicals are done in groups.

In case of submission of the practical part of networks in the second call, a 20% penalty will be applied to the practical grade.

The penalty will be applied in such a way that the grade with the penalty does not drop below 3.0 due to the penalty, using the following scheme:

If Grade C < 3.0, there is no penalty.

If 3.0 ≤ Grade C ≤ 3.75 --> Grade C with penalty = 3.0

If Grade C > 3.75 --> Grade C with penalty = 0.8 x Grade C

Students who have been assessed for at least 2/3 of the course evaluation may opt for the recovery process if the final minimum grade of the course is higher than 3.5.

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

No differentiated treatment is contemplated for students repeating the course.

The final grade will be recorded as "Not Assessable" only when there has been no participation in the assessment process.

Consideration will be given to awarding Honorsto students who, having obtained a final grade equal to or higher than nine (9), have actively participated in the development of the course.

Note on copying, plagiarism, and other irregularities Without prejudice to other disciplinary measures that may be deemed appropriate, and in accordance with the current academic regulations, irregularities committed by a student that may lead to a variation in the grade of an evaluable activity will be graded with a zero (0). Evaluation activities graded in this way and by this procedure will not be recoverable. If it is necessary to pass any of these evaluation activities to pass the course, this course will be directly failed, with no opportunity to recover it in the same term.

These irregularities include, among others:

- total or partial copying of a practice, report, or any other evaluable activity;
- letting others copy;
- presenting a group work not entirely done by the group members (applied to all members, not just those who did not work);
- presenting as own materials produced by a third party, even if they are translations or adaptations, and in general works with non-original and exclusive elements of the student;
- having communication devices (such as mobile phones, smartwatches, pens with cameras, etc.) accessible during individual theoretical-practical evaluation tests (exams);
- talking to classmates during individual theoretical-practical evaluation tests (exams);
- copying or attempting to copy from other students during theoretical-practical evaluation tests (exams);
- using or attempting to use writings related to the subject during the theoretical-practical evaluation tests (exams), when these have not been explicitly permitted.

The numerical grade in the record will be the lower value between 3.0 and the weighted average of the grades in case the student has committed irregularities in an evaluation activity (and therefore passing by compensation will not be possible). In future editions of this course, a student who has committed irregularities in an evaluation activity will not be granted any of the evaluation activities completed.

In summary: copying, letting others copy, or plagiarizing (or attempting to) in any of the evaluation activities equals a FAIL, not compensable and without validations.

Bibliography

Notes given in class.

Midgley, G., & Lindhult, E. (2021). A systems perspective on systemic innovation. Systems Research and Behavioral Science, 38(5), 635-670. https://doi.org/10.1002/sres.2819

Available at: https://onlinelibrary.wiley.com/doi/pdf/10.1002/sres.2819

"The Changing World of Mobile Communications: 5G, 6G, and the Future of Digital Services" (Springer, 2023).

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

Complementary:

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.

W. Stallings (2004). Comunicaciones y redes de computadores, 7a Edición. Pearson 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

The software used in this course includes MATLAB, Python, Linux and Virtual Box.

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	611	English	second semester	afternoon
(PLAB) Practical laboratories	611	English	second semester	afternoon
(PLAB) Practical laboratories	612	Catalan	second semester	afternoon
(TE) Theory	61	English	second semester	afternoon