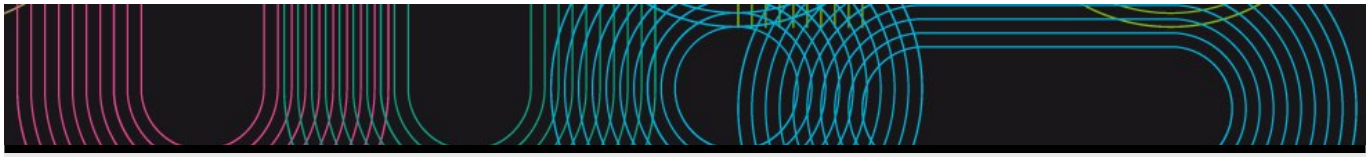

| IDENTIFYING DATA | | | | |
|---|---|---|---|---|
| **Wireless Networks and Ubiquitous Computation** | | | | |
| Subject | Wireless Networks and Ubiquitous Computation | | | |
| Code | V05M145V01211 | | | |
| Study programme | Máster Universitario en Ingeniería de Telecomunicación | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 5 | Optional | 1st | 2nd |
| Teaching language | Spanish<br>Galician | | | |
| Department | | | | |
| Coordinator | Gil Castiñeira, Felipe José | | | |
| Lecturers | Gil Castiñeira, Felipe José<br>Rodríguez Pérez, Miguel | | | |
| E-mail | xil@gti.uvigo.es | | | |
| Web | http://moovi.uvigo.gal/ | | | |
| General description | The subject "Wireless Networks and Ubiquitous Computing" examines mobile communications, the new services that they enable, and the technologies that support them. That is, this subject studies the different wireless communication systems, the more renowned protocols, the predominant architectures, and the new services enabled by the ubiquitous computing paradigm.<br><br>The subject is taught in Galician and Spanish, but the documentation is written in English.<br><br>English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. | | | |

| Training and Learning Results | |
|---|---|
| Code | |
| A1 | CB1 Knowledge and understanding needed to provide a basis or opportunity for being original in developing and/or applying ideas, often within a research context. |
| A5 | CB5 Students must have learning skills to allow themselves to continue studying in largely self-directed or autonomous way |
| B3 | CG3 Ability to lead, plan and monitor multidisciplinary teams. |
| B8 | CG8 Ability to apply acquired knowledge and to solve problems in new or unfamiliar environments within broader and multidiscipline contexts, being able to integrate knowledge. |
| B12 | CG12 Skills for lifelong, self-directed and autonomous learning. |
| C4 | CE4 Ability to design and plan networks for transporting, broadcasting and distribution of multimedia signals. |
| C6 | CE6 Ability to model, design, implement, manage, operate, and maintain networks, services and contents. |
| C7 | CE7 Capacity for planning, decision making and packaging of networks, services and applications, taking into account the quality of service, direct and operating costs, plan implementation, monitoring, safety procedures, scaling and maintenance, as well as managing and ensuring quality in the development process. |
| C9 | CE9 Ability to solve convergence, interoperability and design of heterogeneous networks with local, access and trunk networks; as well as the integration of telephonic, data, television and interactive services. |
| C24 | CE24/TE1 Ability to understand the fundamentals of distributed systems and distributed computing paradigms, and its application in the design, development and management in grid, ubiquitous computing scenarios and cloud systems. |

| Expected results from this subject | |
|---|---|
| Expected results from this subject | Training and Learning Results |

| | |
|---|---|
| To understand the basic concepts for wireless communications. | A1<br>A5 |
| To understand the basic concepts behind mobile communications. | B3<br>B8 |
| To know the main protocols and architectures used in wireless and mobile networks. | B12<br>C4 |
| Knowledge of the basis and main concepts of ubiquitous/pervasive computing. | C6<br>C7 |
| To understand the relationship/dependence between ubiquitous computing and context information (context-aware computing). To know different pervasive computing systems. Knowledge of recent advances and trends related to ubiquitous computing. | C9<br>C24 |

## Contents

| Topic | |
|---|---|
| Principles of wireless networks. | Channel characteristics; medium access control; mobility management; routing and discovery; etc. |
| Architectures and standards. | Wireless access/local/personal area networks; wireless sensor networks; cellular networks.<br>Networking issues related with the connectivity/communication of wireless/mobile devices. |
| Basis of ubiquitous computing. | Context-aware computing; service architecture; data dissemination and management; sinchronization and consistency; service discovery. |

## Planning

| | Class hours | Hours outside the classroom | Total hours |
|---|---|---|---|
| Lecturing | 13 | 24 | 37 |
| Laboratory practical | 10 | 10 | 20 |
| Project based learning | 4 | 59 | 63 |
| Essay questions exam | 2 | 0 | 2 |
| Report of practices, practicum and external practices | 0 | 2 | 2 |
| Essay | 1 | 0 | 1 |

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

| | Description |
|---|---|
| Lecturing | Professors will present the main theoretical contents related with wireless networks and ubiquitous computing. This methodology will contribute to develop competences CE4, CE6, CE7, CE9, CE24. |
| Laboratory practical | Realization by part of the students of practices guided and supervised. With this methodology will work the competitions CE4, CE6 and CE24.<br><br>The following software will be used:<br>- Bare metal or virtual Linux environment.<br>- OMNET++<br>- VMware Player with the Instant Contiki environment. |
| Project based learning | Students will work in group in the design, implementation and validation of a protocol, system, application or service. With this methodology students will work in the development of competences CB1, CB5, CG8, CG3, CG12, CE7 and CE9. |

## Personalized assistance

| Methodologies | Description |
|---|---|
| Lecturing | The professors of the course will provide individual attention to the students during the course, solving their doubts and questions. Questions will be answered during the master sessions or during tutorial sessions. Teachers will establish timetables for this purpose at the beginning of the course. Tutorial sessions can be checked or requested on the subject website (https://moovi.uvigo.gal). |
| Laboratory practical | The professors of the course will provide individual attention to the students during the course, solving their doubts and questions. Te professors will guide and help the students to complete the assigned laboratory practises. Questions will be answered during the lab sessions or during tutorial sessions. Teachers will establish timetables for this purpose at the beginning of the course. Tutorial sessions can be checked or requested on the subject website (https://moovi.uvigo.gal). |

| | |
|---|---|
| Project based learning | The professors of the course will provide individual attention to the students during the course, solving their doubts and questions. The professors will guide and help the students to complete the assigned project. Questions will be answered during the supervising sessions, group supervising sessions, or during tutorial sessions. Teachers will establish timetables for this purpose at the beginning of the course. Tutorial sessions can be checked or requested on the subject website (https://moovi.uvigo.gal). |

## Assessment

| | Description | Qualification | Training and Learning Results |
|---|---|---|---|
| Lecturing | Students will complete one or several exams to asses what they have learned in master sessions. In case there is more than one exam, the result will be the arithmetic mean of the different tests. | 40 | A1 C4 C6 C7 C9 C24 |
| Laboratory practical | The students will fill questionnaires and/or reports to asses the correct completion and understanding of the laboratory tasks.<br><br>The concepts studied in the laboratory can be also part of the final exam. | 20 | A1 A5 C4 C6 C7 C9 C24 |
| Project based learning | The students will work in groups in the design, implementation and proof of a protocol, system, application or service. The result will be evaluated after the delivery, having into account key aspects such as the correction, the quality, the performance and the functionalities. In addition, during the implementation of the project, the design and the evolution of the development will be evaluated. If the intermediate results are not satisfactory, a penalization of the 20% of the grade could be applied. The evaluation will be by group and by person: each one of the members of a team must document his/her tasks and answer the questions related to them. | 40 | A1 A5 B3 B8 B12 C4 C6 C7 C9 C24 |

## Other comments on the Evaluation

In order to pass the course it is necessary to complete the different parts of the subject (master sessions, practices in labs, and projects). The final grade will be the **weighted geometric mean** of the grades of the different parts. If "x" is the grade obtained for the master sessions, "y" for the practices in labs, and "z" for the project, the final grade will be:

**grade = x^0.4 × y^0.2 × z^0.4**

During the first month, students must provide a written declaration to opt for global assessment. In other case, it will be considered that they opt for continuous assessment. Students who select continuous assessment and submit the first task or questionnaire may not be listed as "Absent".

Students who opt for the global assessment procedure must pass the short answer test (40%), submit a project (40%) and submit the laboratory practises (20%). These parts will be evaluated as indicated in the tests description section. The final grade will be the **weighted geometric mean** of the grades of the different parts. Besides, they must submit an additional dossier that must be defended in front of the professors, with detailed information about the events and issues that arose during the execution of the different tasks, and especially the project. In addition, during the first month of the course, professors will notify students who opted for final assessment if they have to do the tutored work individually.

Although the project will be developed in groups, the ongoing activities of each student in a group will be monitored individually. In case a student's performance is below his or her group mates, he or she could be expelled from the group or graded on an individual basis.

Intermediate milestones could be required for the project. In case they are not satisfied, a penalization of the 20% of the grade could be applied.

**Extraordinary call to pass the course**

Students can opt to the extraordinary call only if they didn't pass the ordinary call.

In order to pass the course, it is necessary to complete the different parts of the subject: pass the short answer test (40%), submit a project (40%) and submit the laboratory practises (20%). These parts will be evaluated as indicated in the tests description section. The final grade will be the **weighted geometric mean** of the grades of the different parts. Besides, it will be necessary to submit an additional dossier that must be defended in front of the professors, with detailed information about the events and issues that arose during the execution of the different tasks, and especially the project.

Students that have opted by the continuous assessment procedure, can decide to maintain the grades of the different parts of the subject obtained in the first call or discard them.

**Other comments**

The grades obtained are only valid for the current academic year.

Although the tutored work will be completed (if possible) in groups, each student should keep a record of his or her activities. In the case in which the performance of a member of the group wouldn't be adequate compared with the performance of his or her team mates, he or she could be excluded from the group and/or qualified individually.

The use of any material during the tests will have to be explicitly authorized.

In case of detection of plagiarism or unethical behavior in any of the tasks/tests done, the final grade will be "failed (0)" and the professors will communicate the incident to the academic authorities to take the appropriate measures.

## Sources of information

### Basic Bibliography


Cory Beard, William Stallings, **Wireless Communication Networks and Systems**, 1, Pearson, 2016

Christopher Cox, **An Introduction to LTE**, 2, John Wiley & Sons, 2014


### Complementary Bibliography


Viajy Garg, **Wireless Communications and Networking**, 1, Morgan Kaufmann, 2007

Kaveh Pahlavan, Prashant Krishnamurthy, **Networking Fundamentals: Wide, Local and Personal Area Communications**, 1, Wiley, 2009

Pei Zheng, Larry L. Peterson, Bruce S. Davie, Adrian Farre, **Wireless Networking Complete**, 1, Morgan Kaufmann, 2009

F. Adelstein, Sandeep K.S. Gupta, Golden G. Richard III, Loren Schwiebert, **Fundamentals of Mobile and Pervasive Computing**, 1, McGraw-Hill Professional, 2004

John Krumm, **Ubiquitous Computing Fundamentals**, 1, Chapman and Hall/CRC, 2009

Jean-Philippe vasseur, Adam Dunkels, **Interconnecting smart objects with IP**, 1, Morgan Kaufmann, 2010

James F. Kurose, Keith W. Ross, **Computer Networking: A Top-Down Approach**, 7, Pearson, 2016


## Recommendations