

**1. General information****Course:** MOBILE NETWORKS AND SERVICES**Type:** ELECTIVE**Degree:** 407 - DEGREE PROGRAMME IN COMPUTER SCIENCE ENGINEERING**Center:** 108 - SCHOOL OF COMPUTER SCIENCE OF C. REAL**Year:** 4**Main language:** Spanish**Use of additional languages:****Web site:** <http://campusvirtual.uclm.es>**Code:** 42395**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 20**Duration:** C2**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** FELIX JESUS VILLANUEVA MOLINA - Group(s): 20

| Building/Office | Department | Phone number | Email | Office hours |
|-------------------------|---------------------------------------|--------------|--------------------------|--|
| Fermin Caballero / 3.12 | TECNOLOGÍAS Y SISTEMAS DE INFORMACIÓN | | Felix.Villanueva@uclm.es | Available at https://esi.uclm.es/index.php/grado-en-ingenieria-informatica/profesorado/ |

2. Pre-Requisites

It is highly recommended to have passed the subjects of:

Computer Networks I and II
Programming principles I and II
Distributed Systems

3. Justification in the curriculum, relation to other subjects and to the profession

The new wireless technologies are enabling new applications in various domains (intelligent agriculture, industry 4.0, intelligent cities, etc.), this subject aims to learn to select the best technology for each scenario and to design solutions based on these technologies.

Specifically, this subject is framed within the optional subject in the undergraduate training and is aimed at providing the student with knowledge related to wireless networks, characteristics of them and design of applications on mobile devices, case studies of commercial platforms, development of systems based on sensor networks and development of services for mobile phones.

4. Degree competences achieved in this course**Course competences**

| Code | Description |
|--------|--|
| BA01 | Ability to solve mathematical problems which can occur in engineering. Skills to apply knowledge about: lineal algebra; integral and differential calculus; numerical methods, numerical algorithms, statistics, and optimization. |
| IC01 | Ability to design and build digital systems, including computers, based on microprocessors and communication systems. |
| PER01 | Team work abilities. |
| SIS01 | Critical thinking. |
| TI04 | Ability to select, design, develop, integrate, and manage communication networks and infrastructures in a organisation. |
| UCLM01 | Command of a second language at a B1 level within the Common European Framework of Reference for Languages |
| UCLM02 | Ability to use Information and Communication Technologies. |

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

Knowledge and experience in the use of the characteristics of the development platforms for mobile systems and an ability to design applications and services on them.

Knowledge of the basics of low-coupling architectures for the development of distributed and scalable applications on the Internet.

An understanding of how technology has evolved in engineering and particularly in computers, such that it will allow the interpretation and analysis of future innovations.

6. Units / Contents**Unit 1: Wireless communication fundamentals****Unit 2: wireless networking for IoT****Unit 3: wireless personal area network****Unit 4: wide area wireless networks****Unit 5: App development****Unit 6: Mobile Services**

| 7. Activities, Units/Modules and Methodology | | | | | | | |
|--|----------------------------------|---|---|------------|----|-----|---|
| Training Activity | Methodology | Related Competences (only degrees before RD 822/2021) | ECTS | Hours | As | Com | Description |
| Class Attendance (theory) [ON-SITE] | Lectures | IC01 SIS01 TI04 UCLM01 UCLM02 | 0.72 | 18 | N | - | Exposition of the lesson by the professor |
| Individual tutoring sessions [ON-SITE] | | SIS01 UCLM01 | 0.18 | 4.5 | N | - | Individual mentorship or reduced groups in the office, classroom or laboratory. |
| Study and Exam Preparation [OFF-SITE] | Self-study | BA01 IC01 SIS01 TI04 | 2.1 | 52.5 | N | - | Individual study |
| Other off-site activity [OFF-SITE] | Practical or hands-on activities | BA01 IC01 PER01 SIS01 TI04 UCLM01 UCLM02 | 0.6 | 15 | N | - | Individual preparation of the lab work. |
| Problem solving and/or case studies [ON-SITE] | Problem solving and exercises | BA01 IC01 SIS01 | 0.6 | 15 | Y | N | Case study analysis and problem resolution by professor and students. |
| Writing of reports or projects [OFF-SITE] | Self-study | BA01 IC01 SIS01 TI04 UCLM01 UCLM02 | 0.9 | 22.5 | Y | N | An individual report about a specific topic suggested by professor. |
| Laboratory practice or sessions [ON-SITE] | Practical or hands-on activities | BA01 IC01 PER01 SIS01 | 0.6 | 15 | Y | Y | Laboratory work. |
| Other on-site activities [ON-SITE] | Assessment tests | BA01 IC01 SIS01 TI04 UCLM01 UCLM02 | 0.15 | 3.75 | Y | Y | Exam about the first half of the topics of the subject. |
| Other on-site activities [ON-SITE] | Assessment tests | BA01 IC01 SIS01 TI04 UCLM01 UCLM02 | 0.15 | 3.75 | Y | Y | Exam about the second half of the topics of the subject. |
| Total: | | | 6 | 150 | | | |
| Total credits of in-class work: 2.4 | | | Total class time hours: 60 | | | | |
| Total credits of out of class work: 3.6 | | | Total hours of out of class work: 90 | | | | |

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

| 8. Evaluation criteria and Grading System | | | |
|---|-----------------------|----------------------------|---|
| Evaluation System | Continuous assessment | Non-continuous evaluation* | Description |
| Mid-term tests | 25.00% | 25.00% | Partial Test 1. Compulsory activity that can be retaken (rescheduling). To be carried out at the end of the first half of the teaching period |
| Mid-term tests | 25.00% | 25.00% | Partial Test 2. Compulsory activity that can be retaken. To be carried out within the planned dates of the final exam call. The Partial Test 1 retake will be performed at this date. |
| Theoretical papers assessment | 15.00% | 15.00% | Non-compulsory activity that can be retaken. To be carried out before end of teaching period |
| Laboratory sessions | 25.00% | 25.00% | Compulsory activity that can be retaken. To be carried out during lab sessions |
| Oral presentations assessment | 10.00% | 10.00% | Non-compulsory activity that can be retaken. To be carried out during the theory/lab sessions |
| Total: | 100.00% | 100.00% | |

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

In compulsory activities, a minimum mark of 40% is required in order to pass that activity and have the possibility to therefore pass the entire subject. The evaluation of the activities will be global and therefore must be quantified by means of a single mark. In the case of the activities that may be retaken (i.e., rescheduling), an alternative activity or test will be offered in the resit/retake exam call (convocatoria extraordinaria).

The partial tests will be common for all the theory/laboratory groups of the subject and will be evaluated by the lecturers of the subject in a serial way, i.e., each part of the partial tests will be evaluated by the same lecturer for all the students. A student is considered to pass the subject if she/he obtains a minimum of 50 points out of 100, taking into account the points obtained in all the evaluable activities, and also has passed all the compulsory activities.

For students who do not pass the subject in the final exam call (convocatoria ordinaria), the marks of activities already passed will be conserved for the resit/retake exam call (convocatoria extraordinaria). If an activity is not recoverable, its assessment will be preserved for the resit/retake exam call (convocatoria extraordinaria) even if it has not been passed. In the case of the passed recoverable activities, the student will have the opportunity to receive an alternative evaluation of those activities in the resit/retake exam call and, in that case, the final grade of the activity will correspond to the latter grade obtained.

The mark of the passed activities in any call, except for the partial tests, will be conserved for the subsequent academic year at the request of the student, provided that mark is equal or greater than 50% and that the activities and evaluation criteria of the subject remain unchanged prior to the beginning of that academic year.

The failure of a student to attend the partial 1 and partial 2 tests will automatically result in her/him receiving a "Failure to attend" (no presentado). If the student has not passed any compulsory evaluation activity, the maximum final grade will be 40%.

Non-continuous evaluation:

Students may apply at the beginning of the semester for the non-continuous assessment mode. In the same way, the student may change to the non-continuous evaluation mode as long as she/he has not participated during the teaching period in evaluable activities that together account for at least 50% of the total mark of the subject. If a student has reached this 50% of the total obtainable mark or the teaching period is over, she/he will be considered in continuous assessment without the possibility of changing to non-continuous evaluation mode.

Students who take the non-continuous evaluation mode will be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences), through the assessment systems indicated in the column "Non-continuous evaluation".

In the "non-continuous evaluation" mode, it is not compulsory to keep the mark obtained by the student in the activities or tests (progress test or partial test) taken in the continuous assessment mode.

Specifications for the resit/retake exam:

Evaluation tests will be conducted for all recoverable activities.

Specifications for the second resit / retake exam:

Same characteristics as the resit/retake exam call.

| 9. Assignments, course calendar and important dates | |
|--|-------|
| Not related to the syllabus/contents | |
| Hours | hours |
| General comments about the planning: The course is taught in three weekly sessions of 1.5 hours. | |

| 10. Bibliography and Sources | | | | | | |
|------------------------------|--|---------------------------------|------|---------------|------|-------------|
| Author(s) | Title/Link | Publishing house | Citv | ISBN | Year | Description |
| Andres F. Molisch | Wireless Communications | Wiley | | 0470741864 | 2010 | |
| Mark Ciampa | CWNA Guide to Wireless LANs | Thomson | | 0619215798 | 2005 | |
| Paul GOLDIN | Connected Services: A Guide to the Internet Technologies Shaping the Future of Mobile Services and Operators | Wiley | | 0470974559 | 2011 | |
| Stallings, William | Wireless communications and networks | Pearson Education International | | 0-13-196790-8 | 2005 | |