Universidad de Alcalá

TEACHING GUIDE

Ubiquitous Computing

Degree in
Computer Science Engineering (GII)

Universidad de Alcalá

Academic Year 2021/2022

3rd Year - 1st Semester (GII)

Approved by the School Board on July 6, 2021

TEACHING GUIDE

Course Name:	**Ubiquitous Computing**
Code:	**781002 (GII)**
Degree in:	**Computer Science Engineering (GII)**
Department and area:	**Ciencias de la Computación** **Computer Science**
Type:	**Compulsory (GII)**
ECTS Credits:	**6.0**
Year and semester:	**3rd Year - 1st Semester (GII)**
Teachers:	Ana Castillo Martínez Javier Albert Segui
Tutoring schedule:	Consultar al comienzo de la asignatura
Language:	English

1. COURSE SUMMARY

This course shows present time immersion of people in intelligent environments with computational and communication capabilities. These environments cover ambient intelligent, pervasive computing, mobile computing as well as ubiquitous computing. The characteristics of every type will be studied and complete development projects will be offered.

Invisible technology creation will be studied, using sensors, actuators and easy to program boards. Advanced development methodologies adapted to these projects will be presented and used on development. Also, business models will be analysed and best fitted for proposed projects will be selected.

Entry requirements:

Students are required to have previously taken 'Programming' and 'Network' courses.

2. SKILLS

Basic, Generic and Cross Curricular Skills.

This course contributes to acquire the following basic, generic and cross curricular skills:

en_CG4 - Ability to define, evaluate and select hardware and software platforms for the development and execution of computer systems, services and applications, in accordance with the knowledge acquired as set out in section 5, annex 2, of resolution BOE-A-2009 -12977.

en_CG6 - Ability to conceive and develop centralized or distributed computer systems or architectures integrating hardware, software and networks in accordance with the knowledge acquired as set out in section 5, annex 2, of resolution BOEA-2009-12977.

en_CB1 - That students have demonstrated to possess and understand knowledge in an area of study that is based on general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

en_CB2 - That the students know how to apply their knowledge to their work or vocation in a professional manner and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

en_CB3 - That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

en_CB4 - That students can transmit information, ideas, problems and solutions to both a specialized and non-specialized public.

en_CB5 - That the students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

en_TRU1 - Capacity of analysis and synthesis.

en_TRU2 - Oral and written competencies.

en_TRU3 - Ability to manage information.

en_TRU4 - Autonomous learning skills.

en_TRU5 - Team work.

Specific Skills

This course contributes to acquire the following specific skills:

en_CC4 - Ability to know the fundamentals, paradigms and techniques of intelligent systems and analyze, design and build systems, services and computer applications that use these techniques in any field of application.

en_CC5 - Ability to acquire, obtain, formalize and represent human knowledge in a computable way to solve problems through a computer system in any field of application, particularly those related to aspects of computing, perception and performance in intelligent environments or environments.

en_CC6 - Ability to develop and evaluate interactive systems and complex information presentation and its application to the resolution of problems of interaction design person computer.

Learning Outcomes

After succeeding in this subject the students will be able to:

RA1. Evaluate the characteristics of the design of interfaces for computer systems.

RA2. Know the basic characteristics of the development platforms available to identify the most appropriate to the context of the problem to be solved.

RA3. Analyse and apply the fundamentals, paradigms and techniques of intelligent systems.

RA4. Identify the available development methodologies and select the most appropriate for the development of computer systems in intelligent environments or environments

3. CONTENTS

Units and Topics	Total number of hours
Ubiquitous computing Topic 1: Ubiquitous computing and related technologies.	4
Intelligent systems Topic 2: Intelligent systems, sensors, actuators, and microcontrollers.	16
Servers Topic 3: Introduction to programming in servers	8
IoT and Cloud Computing Topic 4: Internet of Things. Architectures. Communication protocols. Cloud Computing	8
Smart Cities and Industry 4.0 Topic 5: SmartCities. Integrated services. Frameworks	8
Projects development Topic 6: Proposals, validation, development and presentation of projects	16

4. TEACHING - LEARNING METHODOLOGIES. FORMATIVE ACTIVITIES.

4.1. Credits Distribution

Number of on-site hours:	58 hours (56 hours on-site +2 exams hours)
Number of hours of student work:	92
Total hours	150

4.2. Methodological strategies, teaching materials and resources

The course contents previously described shall be taught in the following ways:

- Taught theory classes
- Supervised practical classes: problem solving in class.
- Supervised practical labs.
- Tutorials: individual or group.

In addition, depending on the nature of the work, the students may make use of the following study methods, as well as others:

- Individual realization of coursework but with information input and management as part of a team.
- Exchange of information, problems and doubts which arise during individual work with course mates.
- Organization and production of published journal articles alongside oral presentations and discussions on the results.
- Use of the Virtual Learning Platform as a principal form of access to all activities and subject materials.

Class contact hours:

1. In class: Presentation and discussion of core subject knowledge. Planning and theoretical solving and problems and related hypotheses. Oriented towards the teaching of subject specific skills, especially those related to the key concepts and practices of the imperative programming paradigm.
2. In practical labs: Planning and development of practical exercises which allow problems to be solved and hypotheses to be analysed, contributing to the development of analytical and critical reasoning skills as well as an understanding of problem-solving methods. These will serve as a basis for acquiring the general skills described in part 2 of this guide.

Outside of class:

1. Analysing and learning course contents, solving of problems, consulting the bibliography, preparing coursework individually, sitting exams and self-evaluation. Oriented especially towards developing personal organization skills and planning work individually or as part of a team.
2. Tutorials: Individuals and group guidance throughout the learning process. Students may attend in person or online.

Materials and resources

- Reference bibliography of core and further reading on the subject.
- Personal computers.
- Development environments and accompanying user guides
- Internet connection.
- Virtual Learning Platform and accompanying user guides.
- Projectors.

5. ASSESSMENT: procedures, evaluation and grading criteria

Preferably, students will be offered a continuous assessment model that has characteristics of formative assessment in a way that serves as feedback in the teaching-learning process.

5.1. PROCEDURES

The evaluation must be inspired by the criteria of continuous evaluation (Learning Assesment Guidelines, LAG, art 3). However, in compliance with the regulations of the University of Alcalá, an alternative process of final evaluation is made available to the student in accordance with the Learning Assesment Guidelines as indicated in Article 10, students will have a period of fifteen days from the start of the course to request in writing to the Director of the Polytechnic School their intention to take the

non-continuous evaluation model adducing the reasons that they deem convenient. The evaluation of the learning process of all students who do not apply for it or are denied it will be done, by default, according to the continuous assessment model. The student has two calls to pass the subject, one ordinary and one extraordinary.

The grading system shall adhere to the '"NORMATIVA REGULADORA DE LOS PROCESOS DE EVALUACIÓN DE LOS APRENDIZAJES" (Regulation of learning assessment procedures) ruled by the Governing Council of the University of Alcalá on the 24 March 2011.

The assessment of students' acquired skills shall consider the student's attitude and participation in class. Students may choose between Continuous Assessment (PEC: Pruebas de Evaluación Continua) throughout the semester or in certain cases they may request to sit a final exam at the end of the semester if they are able to provide appropriate justification in a timely manner.

As a general criterion, to pass the subject the skills developed in the theory must be exceeded with their respective key learning results evaluated in the different Evaluation Tests.

Ordinary Call

Continuous Assessment:

The continuous assessment proposed is compound of one examination and the evaluation of students work in groups through a development project.

Results of cooperation in projects will be presented by students in the classroom for grading. In those sessions, every group will participate in the evaluation of others and will be graded for that.

There will be set four CAT, two related to examination (T1, T2) and two related to projects (L1 and L2) containing proposal, and plans, included development and business, in the first one, and fully develop in the second one.

Weighting of continuous assessments (PEC) in the overall grade:

Theory PEC	% of overall grade
PECT1	15%
PECT2	25%

Laboratory PEC	% of overall grade
PECT1	20%
PECT2	40%

Failing a PEC will not prevent the student from participating in further continuous assessments.
At the end of every PEC students will receive required feedback to guide their learning process.

End of term examination:

The end of term examination is only available in certain specified cases and must be requested by students who meet the criteria and who have been granted permission by school administration in accordance with the applicable regulation of the University of Alcalá.

Students who take the summative end of term examination will sit an exam which will cover all the theoretical aspects of the course. They must also provide practical project work similar to the content of PECL1 and PECL2, and do a test equivalent to the theoretical PECT1 and PECT2.

Extraordinary call

Examination re-sits shall be held during the month of June for students who failed to pass both continuous assessments and the final exam. It consists of an examination in the same format as the final exam, with the same type of submissions (with a different focus).

5.2. EVALUATION

Evaluation Criteria

The following evaluation criteria are established for the course:

CE1. The student knows the existing types of non-conventional computation and their characteristics.

CE2. The student knows the existing development methodologies and the required characteristics to select one methodology for a development project of a non-conventional computing system.

CE3. The student is able to develop and evaluate interactive and complex information presentation systems.

CE4. The student is able to evaluate different unconventional computing platforms to find the most suitable one for a project.

CE5. The student actively participates in a development team in an unconventional software development project.

CE6. The student is able to create complete documentation of unconventional computing projects.

CE7. El student shows initiative in applying the computing paradigms explained in the subject to new problems.

The next tables show the percentage of marks (0-100) of every test and their relation with evaluation criteria, learning results and competences. The meaning of codes used for evaluation tools is: PEDP (plus number or not) is a project related PEC Ex is a theoretical examination.

CALIFICATION CRITERIA

Continuous assessment:

General Competences	Specific Competences	Learning Outcomes	Evalution Criteria	Evaluation Tool	Percentage
CG4, CG6	CC4, CC5, CC6	RA1, RA2, RA3, RA4	CE1, CE2, CE3	PECT1	15%
CG4, CG6	CC4, CC5, CC6	RA1, RA2, RA3, RA4	CE1, CE2, CE3	PECT2	25%
CG4, CG6	CC4, CC5, CC6	RA1, RA3, RA4	CE2, CE4, CE5, CE6	PECL1	20%
CG4, CG6	CC4, CC5, CC6	RA2, RA3, RA4	CE3, CE4, CE5, CE6, CE7	PECL2	40%

End of term examination and examination re-sits:

General Competences	Specific Competences	Learning Outcomes	Evalution Criteria	Evaluation Tool	Percentage
CG4, CG6	CC4, CC5, CC6	RA1, RA2, RA3, RA4	CE1, CE2, CE3	PECT	40%
CG4, CG6	CC4, CC5, CC6	RA1, RA2, RA3, RA4	CE2, CE3, CE4, CE5, CE6, CE7	PECL	60%

6. BIBLIOGRAPHY

6.1. Basic Bibliography

- "Ubiquitous Computing and Intelligent Systems". 2016
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- Bertolotti, Ivan Cibrario. "Real-time embedded systems: open-source operating systems perspective". CRC Press, 2012
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- Fraden, Jacob. "Handbook of Modern Sensors: Physics, Designs, and Applications". Springer Science+Business Media, LLC, 2010.
- Weber, Werner. "Ambient Intelligence". Springer-Verlag, 2005.
- Paul Dourish. "Where the action is", MIT Press, 2004
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- Mark Weiser. "The Computer of the 21st Century", ACM, 1997
- Mark Weiser, Brown J. S. "The Coming of Age of Calm Technology", Copernicus, 1997
- Blum, Richard, and Bresnahan, Christine. Python Programming for Raspberry Pi. Sams Teach Yourself. Sams Teach Yourself Python Programming for Raspberry Pi in 24 Hours. 2013.
- Internet of Things. Pearson Education India. 2019

6.2. Additional Bibliography

Disclosure Note

The University of Alcalá guarantees to its students that, if due to health requirements the competent authorities do not allow the total or partial attendance of the teaching activities, the teaching plans will achieve their objectives through a teaching-learning and evaluation methodology in online format, which will return to the face-to-face mode as soon as these impediments cease.