ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

593000502 - Mobile Devices Programming

DEGREE PROGRAMME

59AH - Master Universitario En Internet Of Things (iot)

ACADEMIC YEAR & SEMESTER

2019/20 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	593000502 - Mobile Devices Programming
No of credits	4.5 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	59AH - Master Universitario En Internet Of Things (iot)
Centre	59 - Escuela Tecnica Superior de Ingenieria y Sistemas de Telecomunicacion
Academic year	2019-20

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Antonio Da Silva Fariña	A4417	antonio.dasilva@upm.es	Sin horario.
Ana Belen Garcia Hernando (Subject coordinator)	A4404	anabelen.garcia@upm.es	Sin horario.

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Good Java programming skills

4. Skills and learning outcomes *

4.1. Skills to be learned

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CE.03 - Programar dispositivos móviles en diferentes escenarios de aplicación en IoT en las que se recopilan datos del entorno a través de los sensores integrados en los dispositivos móviles.

CG02 - Los alumnos serán capaces de aplicar métodos y tecnologías avanzadas que les permitan abordar necesidades y problemas en aplicaciones IoT

CG03 - Los alumnos demostrarán tener las destrezas necesarias para integrar y aplicar los conocimientos adquiridos de forma que puedan desarrollar soluciones innovadoras y servicios IoT en general

CT.01 - Capacidad de uso de la lengua inglesa para el trabajo en contextos internacionales

CT.02 - Capacidad para el trabajo en grupo y dirigir, organizar y supervisar equipos multidisciplinares.

CT.03 - Creatividad, iniciativa y capacidad emprendedora

4.2. Learning outcomes

RA5 - To know what sensor types are present in a modern mobile terminal, together with their applicability in IoT environments

RA6 - To design and develop mobile applications which can control and visualize data in IoT environments

RA7 - To design and develop mobile applications which can collect data from the nearby environment and publish them in the cloud

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

This subject studies the application scenarios in which mobile terminals (smartphones, tablets, and smartwatches) are utilized in IoT applications, including their possible functional roles: IoT control and visualization terminals, gateways to external networks, and providers of measurements and data. More specifically the following items will be considered:

1. Location, movement and environmental sensors in mobile terminals. Characteristics and applications. Data reading from sensors in mobile terminals.

2. Programming of mobile terminal user interfaces. Specific aspects related to data visualization.

3. Communication interfaces in mobile systems. Communication with nearby sensor networks through Bluetooth / WIFI. Communication with datacenters and data publishing in the cloud.

5.2. Syllabus

1. Basic Android User Interfaces
   1.1. Android Application Architecture
   1.2. UI Elements and events processing
   1.3. Intents
2. Sensor Data Access
   2.1. Common mobile sensors
   2.2. Movement Sensors
   2.3. Location sensors
3. Advanced Android User Interfaces
   3.1. Clean Architecure Design (Adapters)
   3.2. Maps interfaces: geolocation of measurements, open maps APIs, ...
   3.3. Other UI elements, e.g. Toolbar, NavigationDrawer, ...
4. Communications and data processing
   4.1. Network Interfaces
   4.2. Data parsing and responsiveness
   4.3. Cloud data management
5. Bluetooth Communications
   5.1. Beacons Indoor Location

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Other face-to-face activities	Assessment activities
1	**Basic Android UI** Duration: 02:00	**Android Framework, Basic APPs** Duration: 03:30		
2	**Mobile sensors API** Duration: 02:00	**Sensors APP exercise** Duration: 03:30		
3	**Advanced Android UI** Duration: 02:00	**Advanced UI, Clean Architecture, Data visualization** Duration: 03:30		
4	**Network interfaces, Cloud data processing** Duration: 02:00	**Cloud data access** Duration: 03:30		
5	**Outdoor location, GPS** Duration: 02:00	**Maps APP exercise** Duration: 03:30		
6	**Bluetooth communications, Indoor location** Duration: 02:00	**Bluetooth beacons APP exercise** Duration: 03:30		
7	**Students projects discussion** Duration: 02:00	**Students projects development** Duration: 03:30		
8				**Project document, oral presentation, code quality and peer- and self-assessment.** Continuous assessment and final examination Duration: 05:30
9				
10				
11				
12				
13				
14				
15				
16				

17				

The independent study hours are training activities during which students should spend time on individual study or individual assignments.

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The subject schedule is based on a previous theorical planning of the subject plan and might go to through experience some unexpected changes along throughout the academic year.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
8	Project document, oral presentation, code quality and peer- and self-assessment.		Face-to-face	05:30	100%	5 / 10	CG03 CT.01 CT.03 CE.03 CB07 CB10 CT.02 CG02

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
8	Project document, oral presentation, code quality and peer- and self-assessment.		Face-to-face	05:30	100%	5 / 10	CG03 CT.01 CT.03 CE.03 CB07 CB10 CT.02 CG02

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills

Project document, oral presentation, code quality.		Face-to-face	03:00	100%	5 / 10	CG03 CT.01 CT.03 CE.03 CB07 CB10 CT.02 CG02

7.2. Assessment criteria

The lectures given by the teachers will provide students with the basic knowledge on the design and implementation of mobile apps for IoT environments. Taking this knowledge as a starting point, students have to do both guided practices and more self-guided elaborated projects in groups. To perform these projects students will receive assistance from the teachers, in class and in supervision sessions. The evaluation of this work will be done by assessing the code produced, a written report and an oral presentation done in front of the class.

At the beginning of the teaching period, each student can choose between two evaluation itineraries:

- Continuous evaluation itinerary: this is the option by default. In this itinerary, attendance to class is compulsory, and the students will receive guidance during the development of their projects.
- Final exam itinerary. To choose this option, it is necessary that the student requests it in written form, not later than one month after the beginning of the classes, and registers this application at the Secretariat of the Department of Telematic and Electronic Engineering, addressed to the course coordinator. In this case, it is understood that the student waives the right to receive guidance in class for their project, and attendance to class is not compulsory.

Independently of the chosen itinerary, all students will have to do the practical work proposed by the teachers throughout the class period, produce the written report and participate in the oral presentation of their project. Besides, attendance to the oral presentations of the rest of the groups (which may span several face-to-face sessions) is compulsory for both itineraries.

The final mark for each student is calculated from three components: the mark granted by the teachers (teachers' evaluation), the mark that the rest of the students give to the group's project (peer evaluation), and the mark that the student gives to himself/herself (self evaluation). The following formula will be used: Final mark = (teachers'

evaluation) * 0.7 + (peer evaluation) * 0.2 + (self evaluation) * 0.1

The teachers' evaluation will take into account the competence of the students when evaluating both their own and their colleagues' work. Peer evaluations will be anonymous for the other students.
If a student does not pass the subject in the ordinary period, he/she will have the opportunity of going through an additional evaluation process during the extraordinary period.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Android Studio 2 Essentials	Bibliography	Belén Cruz Zapata. Publisher: Packt Publishing. ISBN: 978-1-78439-720-3
Android: Programming for Developer	Bibliography	John Horton; Helder Vasconcelos; Raul Portales. Publisher: Packt Publishing. ISBN: 978-1-78712-369-4.
Android Sensor Programming By Example	Bibliography	Varun Nagpal. Publisher: Packt Publishing. ISBN: 9781785285509

9. Other information

9.1. Other information about the subject

The information contained in this document is of an orientative nature. Thus, it is subject to change due to errors,omissions or if the circumstances occurring during the course duration advise to do so.