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

2020/21 - 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	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Ana Belen Garcia Hernando (Subject coordinator)	A4404	anabelen.garcia@upm.es	Sin horario.
Jesus Rodriguez Molina	A4415	jesus.rodriguezm@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. Introduction and basic Android User Interfaces
    1.1. Introduction and IDE
    1.2. Basic UI Elements
    1.3. Events processing, responsiveness
2. Sensor Data Access
    2.1. Common mobile sensors
    2.2. Movement Sensors
    2.3. Location sensors
3. Advanced Android User Interfaces
    3.1. Intents, layouts, orientation, lists
    3.2. Clean Architecure Design, Adapters
    3.3. Maps interfaces: geolocation of measurements, open maps APIs, ...
    3.4. Data visualization
    3.5. Other UI elements, e.g. Toolbar, NavigationDrawer, ...
4. Communications and data processing
    4.1. Network Interfaces
    4.2. Data parsing
    4.3. Cloud data management
    4.4. Bluetooth interfaces and indoor location

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	**Introduction. Android IDE. Basic Android UI. Android sensor framework.** Duration: 03:00	**Android Framework, Basic APPs, Sensor framework: practice** Duration: 03:00		
2	**Advanced Android UI: intents, layouts, orientation, lists and adapters.** Duration: 02:00	**Advanced UI guided practices** Duration: 01:30		
3	**Background threads. Network connection. Data parsing.** Duration: 02:00	**Bk threads, network connection and data parsing guided practices.** Duration: 01:30		
4	**Cloud data interfaces. Maps.** Duration: 02:00	**Cloud data interfaces and Maps guided practices** Duration: 01:30		
5		**Practice to exercise the latest learnt contents** Duration: 02:30		
6	**Data visualization. Location (outdoors, indoors).** Duration: 02:00	**Data visualization and location guided practice.** Duration: 01:30		
7	**Students projects discussion** Duration: 02:00			**Individual assessment** Continuous assessment and final examination Presential Duration: 01:30
8		**Project work in groups** Duration: 03:30		
9		**Project work in groups** Duration: 02:30		
10		**Project work in groups** Duration: 03:30		**Project in groups: written document** Continuous assessment and final examination Not Presential Duration: 00:00 **Project in groups: application source code** Continuous assessment and final examination Not Presential

				Duration: 00:00
11				**Project in groups: oral presentation** Continuous assessment and final examination Presential Duration: 06:00
12				
13				
14				
15				
16				
17				

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 schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
7	Individual assessment		Face-to-face	01:30	15%	/ 10	CT.01 CE.03
10	Project in groups: written document		No Presential	00:00	25%	/ 10	CT.01 CT.02
10	Project in groups: application source code		No Presential	00:00	40%	/ 10	CG03 CT.01 CT.03 CE.03 CB07 CB10 CT.02 CG02
11	Project in groups: oral presentation		Face-to-face	06:00	20%	/ 10	CT.01 CT.03 CT.02

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
7	Individual assessment		Face-to-face	01:30	15%	/ 10	CT.01 CE.03
10	Project in groups: written document		No Presential	00:00	25%	/ 10	CT.01 CT.02
10	Project in groups: application source code		No Presential	00:00	40%	/ 10	CG03 CT.01 CT.03 CE.03 CB07 CB10 CT.02 CG02
11	Project in groups: oral presentation		Face-to-face	06:00	20%	/ 10	CT.01 CT.03 CT.02

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Individual assessment, project document, oral presentation, app.		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 individually and 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, as well as an intermediate individual assessment.

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 (either physically or remotely via online classes, depending on the circumstances), 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, no 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 or may not span several face-to-

face or online sessions, depending on the circumstances of confinement or attendance) is compulsory for both itineraries.

The final grade for the course will be provided by the teachers. It will be obtained taking into account a) the work assigned individually to the students (15%), b) the project to be carried out in groups, with its code (40%) and generated documentation (25%) and c) the oral presentation of the project (20%).

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 developers website	Web resource	https://developer.android.com/
Android Studio: download and user guide	Web resource	https://developer.android.com/studio
Android Sensor Programming By Example	Bibliography	NAGPAL, V., 2016. Android sensor programming by example?: take your Android applications to the next level of interactivity by exploring the wide variety of Android sensors. S.l.: s.n. ISBN 1-78528-466-5.
Android Programming for Beginners	Bibliography	HORTON, J., 2018. Android Programming for Beginners - Second Edition. 2. S.l.: Packt Publishing. ISBN 9781789538502.

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.

IMPORTANT: Specifically, and due to the worldwide exceptional sanitary situation, it is likely that some or all of the activities have to be moved online, either entirely or partially. The teachers will do their best to follow UPM's guidelines with respect to maximizing the face to face activities that provide the greatest added value when compared with online methodologies, while respecting the recommended safety recommendations made by the legal authorities.