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

2024/25 - 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	2024-25

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.
Miguel Angel Valero Duboy	A4422	miguelangel.valero@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

- XML understanding

- Either Java or other OO programming language

- Basic background on user interfaces design

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 devices (smartphones, tablets, and smartwatches) are utilized in IoT applications, including their possible functional roles: IoT control and visualization devices, gateways to external networks, and providers of measurements and data.

5.2. Syllabus

1. Introduction and basic Android apps development
    1.1. Introduction to Android programming and IDE
    1.2. Basic UI elements and GUI events
2. Advanced Android user interfaces and elements
    2.1. Intents, different layouts, orientation, lists and adapters
    2.2. Accessibility and design for all
    2.3. Data persistence
    2.4. Data visualization
    2.5. Background threads
    2.6. Other elements and interfaces, e.g. location, maps.
3. Sensor data access
    3.1. Common mobile sensors
    3.2. Movement sensors
    3.3. Other sensors
4. Communications and data processing
    4.1. Network interfaces
    4.2. Data parsing
    4.3. IoT cloud data management

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1		**Introduction. Android IDE. Basic Android UI.** Duration: 02:00 Lecture **Android IDE, basic APPs and UI: practice** Duration: 01:30 Laboratory assignments		
2		**Advanced Android UI: intents, layouts, orientation, lists and adapters.** Duration: 02:00 Lecture **Accessibility and design for all.** Duration: 02:00 Lecture **Advanced UI and accessibility & design for all guided practices** Duration: 01:30 Laboratory assignments		
3		**Sensors fundamentals. Android sensor framework. Data persistence.** Duration: 02:00 Lecture **Sensors fundamentals and data persistence: exercise.** Duration: 01:30 Laboratory assignments		
4		**Background threads. Network connection. Data parsing.** Duration: 02:00 Lecture **Bk threads, network connection and data parsing guided practices.** Duration: 01:30 Laboratory assignments		
5		**Data visualization. IoT cloud data interfaces.** Duration: 02:00 Lecture **Data visualization and IoT cloud data interfaces guided practices.** Duration: 01:30 Laboratory assignments		

6		**Other possible features: maps, location.** Duration: 01:30 Lecture **Extended practice and exercises about the material learnt so far during the course** Duration: 04:00 Laboratory assignments		
7		**Individual assessment** Duration: 02:00 Additional activities **Project work in groups** Duration: 01:30 Laboratory assignments		**Individual assessment** Written test Progressive assessment Presential Duration: 02:00
8		**Project work in groups** Duration: 03:30 Laboratory assignments		
9		**Project work in groups** Duration: 03:30 Laboratory assignments		
10		**Project work in groups** Duration: 03:30 Laboratory assignments		
11		**Project in groups: oral presentation.** Duration: 03:30 Additional activities		**Project in groups: written document** Group work Progressive assessment and Global Examination Not Presential Duration: 00:00 **Project in groups: application source code** Group work Progressive assessment and Global Examination Not Presential Duration: 00:00 **Project in groups: oral presentation** Group presentation Progressive assessment and Global Examination Presential Duration: 03:30
12		**Project in groups: oral presentation (Cont)** Duration: 01:30 Additional activities **Individual assessment (resit, if necessary)** Duration: 02:00 Additional activities		**Project in groups: oral presentation (Cont. See weight and evaluated skills in the previous one)** Group presentation Progressive assessment and Global Examination Presential Duration: 01:30 **Individual assessment (resit, if necessary)** Written test Global examination Presential Duration: 02:00

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.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
7	Individual assessment	Written test	Face-to-face	02:00	20%	3 / 10	CT.01 CE.03
11	Project in groups: written document	Group work	No Presential	00:00	20%	/ 10	CT.01 CT.02
11	Project in groups: application source code	Group work	No Presential	00:00	40%	/ 10	CB07 CB10 CG02 CG03 CT.01 CT.02 CT.03 CE.03
11	Project in groups: oral presentation	Group presentation	Face-to-face	03:30	20%	/ 10	CT.01 CT.02 CT.03
12	Project in groups: oral presentation (Cont. See weight and evaluated skills in the previous one)	Group presentation	Face-to-face	01:30	%	/ 10	

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
11	Project in groups: written document	Group work	No Presential	00:00	20%	/ 10	CT.01 CT.02
11	Project in groups: application source code	Group work	No Presential	00:00	40%	/ 10	CB07 CB10 CG02 CG03 CT.01 CT.02 CT.03 CE.03

11	Project in groups: oral presentation	Group presentation	Face-to-face	03:30	20%	/ 10	CT.01 CT.02 CT.03
12	Project in groups: oral presentation (Cont. See weight and evaluated skills in the previous one)	Group presentation	Face-to-face	01:30	%	/ 10	
12	Individual assessment (resit, if necessary)	Written test	Face-to-face	02:00	20%	3 / 10	CT.01 CE.03

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Individual assessment, project document, oral presentation, app.	Other assessment	Face-to-face	03:00	100%	5 / 10	CB07 CB10 CG02 CG03 CT.01 CT.02 CT.03 CE.03

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 intermediate individual assessment will measure the knowledge acquired by the students through the lessons taught by the teachers and the individual practices that will be proposed week by week by the teachers. This assesment criteria will provide students and teachers with an updated formative feedback about the intermediate course learning outcomes to be enhanced and extended in practice along the next Android project development activity. A minimum of 3 out of 10 is required in this exam. Only for those students who do not reach this minimum, this individual assessment is to be repeated at the end of the teaching period (resit individual assessment).

The project developed in groups will be assessed through the code produced, a written report and an oral

presentation done in front of the class. These three outcomes are delivered by the students during the last weeks of the teaching period, thus, due to the time it takes the teachers to assess them, it is not feasible to re-try any of them during the ordinary period.

The final grade for the course will be provided by the teachers. It will be obtained taking into account a) the intermediate (or repeated) individual assessment, b) the project to be carried out in groups, including its code and the generated documentation and c) the oral presentation of that project. The weights of these deliverables are specified in the tables above.

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 Programming for Beginners	Bibliography	HORTON, J., 2021. Android Programming for Beginners - Third edition. Packt Publishing. (Free online access for UPM students and staff)
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. Packt Publishing. (Free online access for UPM students and staff)

9. Other information

9.1. Other information about the subject

This subject shares the mission of the **UN SDGs**: "nobody left behind". Sustainable Development Goals deal with equity, learning for all, climate protection and many other key issues such as poverty and hunger reduction. Mobile apps design, development and evaluation is not far from this mission. Everyone should be able to enjoy from developed Apps. Therefore, accessibility and design for all is a key issue to be learned along the subject. End users have the right to use the produced Apps in an easy, efficient and satisfactory way.