Universitat de Lleida

DEGREE CURRICULUM

NETWORKED COMPUTING PLATFORMS

Coordination: SENDIN VELOSO, MONTSERRAT

Academic year 2022-23

NETWORKED COMPUTING PLATFORMS 2022-23

Subject's general information

<table>
<tr><td><b>Subject name</b></td><td>NETWORKED COMPUTING PLATFORMS</td></tr>
<tr><td><b>Code</b></td><td>102030</td></tr>
<tr><td><b>Semester</b></td><td>2nd Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td><b>Typology</b></td><td><table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Computer Engineering</td><td>4</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Bachelor's Degree in Computer Engineering</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
</table></td></tr>
<tr><td><b>Course number of credits (ECTS)</b></td><td>6</td></tr>
<tr><td><b>Type of activity, credits, and groups</b></td><td><table>
<tr><th>Activity type</th><td>PRALAB</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>3</td><td>3</td></tr>
<tr><th>Number of groups</th><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td><b>Coordination</b></td><td>SENDIN VELOSO, MONTSERRAT</td></tr>
<tr><td><b>Department</b></td><td>COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING</td></tr>
<tr><td><b>Teaching load distribution between lectures and independent student work</b></td><td>– Independent student work (70%) = 105h
– Presential work (30%) = 45h</td></tr>
<tr><td><b>Important information on data processing</b></td><td>Consult this link for more information.</td></tr>
<tr><td><b>Language</b></td><td>Preferably Catalan (Spanish if any student shows dificulties with Catalan).</td></tr>
</table>

NETWORKED COMPUTING PLATFORMS 2022-23

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SENDIN VELOSO, MONTSERRAT	montse.sendin@udl.cat	6	

Subject's extra information

This subject is located in the 2nd semester of the forth course. Belongs to the specialization module 'Information Technologies'. It can be considered as a continuation of the subject 'Applications for Mobile Devices'.

So, *to follow this subject properly some previous knowledge in Android programming is recommended* (essential aspects covered in the previous subject), and preferently in Kotlin.

Learning objectives

- Being able to conceive, design your own development and adequately describe the functionality of a certain app, exploiting their possibilities of mobile computing
- Deepen the Android platform and elements that comprise it
- Consider diverse cost and quality parameters (battery consumption and other resources)
- Managing the data provided by sensors of a device
- Knowing some of the most used API related to location
- Knowing the most used options for connecting to the network
- Solve the user management (authentication) againts a backend based on *Cloud Computing*
- Synchronize simple data with based on *Cloud Computing*
- Solve funcionality related with simple data changes (listeners) on a backend based on *Cloud Computing*
- Organitze structured data and solve queries more complex in an effective manner
- Implement the necessary infraestructure for sending push notificacions from a backend based on *Cloud Computing*
- Combine and communicate correctly the frontend of and app with Synchronize simple data with based on *Cloud Computing*

Competences

Strategic Competitions of the UdL

CT2. Mastering a foreign language, especially English.

CT3. Training Experience in the use of the new technologies and the information and communication technologies.

Specific Competitions

GII-TI4. Capacity to choose, design, deploy, integrate and manage networks and infrastructures of communications in an organisation.

GII-TI5. Capacity to select, deploy, integrate and manage systems of information that satisfy the needs of the organisation, within the cost and quality requirements.

GII-TI6. Capacity to conceive systems, applications and services based in network technologies, including Internet, web, e-commerce, multimedia, interactive services and mobile computation.

GII-TI7. Capacity to comprise, apply and manage the computer systems guarantee and security.

Cross-disciplinary competitions

EPS11. Capacidad de comprender las necesidades del usuario expresadas en un lenguage no técnico

Subject contents

1. Sensor management

   1.1. Introduction

   1.2. The Android Sensor Framework

   1.3 Good practices for accessing and using sensors

   1.4. Particularities for specific sensors

   1.5. Special considerations on Location

   1.6. The Mapping API

   1.7. Google Places API

   1.8. Geofences

   1.9. Activity Recognition

2. Basic networking in Android

   2.1. Available APIs
   2.2. Networking basics
   2.3. Good practices
   2.4. Working with *Handler*
   2.5. Socket Programming

3. *Firebase*: a specific platform for mobile development based on *Cloud Computing*

   3.1. Preliminar notions on *Cloud Computing* and *Firebase*

   3.2. Preparing and configuring Firebase on Android apps

   3.3. Introduction to *Firebase Authentication*

   3.4. Introduction to *Firebase Realtime DDBB*

   3.5. Introduction to *Firebase Firestore*

   3.6. Introduction to *Firebase Cloud Storage*

   3.7. Preparing the infrastructure for enabling Push notifications: *Firebase Cloud Messaging*

   3.8. Responding to events and invoking functionality in the backend: *Firebase Cloud Functions*

Methodology

Presential Part (class sessions)

- Theoretical-Practical classes.
- *Project-Based learning* and *Active Learning*.
- Participatory and dynamic sessions.
- It is worked with examples and small projects (*Mini-Activities*), to be proposed and solved weekly.
- Put into practice of concepts through the development of a project (*Course project*).

Non Presential Part (autonomous work)

- The *Course project* will be developed on your own.
- ***The student will have to*** deepen the study of the various topics on their own, as well as the exploration of the various options that are presented.
- In developing the **course project**, students must develop **critical thinking** in order to select and reasonably justify their decision making.

As the subject is eminently practice, the **avaluation system** (detailed in el corresponding section) is composed of different practices timely scheduled (preferently to be developed in groups of two people).

Development plan

Week	Laboratory addressed session - Theorical part (BsG)	Laboratory addressed session - Practical part (BsG)	Autonomous work
1	Subject presentation T1: Sensor management	*Course project* conception and gestation	Autonomous learning and *Course project* gestation
2	T1: Sensor management	Delivery 1 *Course project* development *MiniActiv-1*: Good practices in sensors usage	Autonomous learning, *Course project* gestation and *MiniActiv-1* completion
3	T1: Sensor management	Delivery 1 *Course project* development *MiniActv-2*: Receiving periodic updates from Location	Autonomous learning and *MiniActiv-2* completion
4	T1: Sensor management	Delivery 1 *Course project* completion *MiniActv-3*: Preparing and extending *HelloMap*	Autonomous learning, *MiniActiv-3* completion and app. eskeleton starting Delivery 1 *Course project*
5	T1: Sensor management	*MiniActv-4*: Experiencing with Location related additional libraries	Autonomous learning, *MiniActiv-4* completion and app skeleton development
6	T2: Basic networking in Android.	*MiniActv-5*: Verifying network state and downloading contents	Autonomous learning, *MiniActiv-5* completion and app skeleton development.

7	T2: Basic networking in Android.		Autonomous learning and app. skeleton development
8	T3: Specific platform for mobile development based on *Cloud Computing*		Autonomous learning and app. skeleton development
9	Midterm exam week		App. skeleton completion
10	T3: Specific platform for mobile development based on *Cloud Computing*	Delivery 2 *Course project* development	Autonomous learning and app muscle starting Delivery 2 *Course project*
11	T3: Specific platform for mobile development based on *Cloud Computing*		Autonomous learning and app muscle development
12	T3: Specific platform for mobile development based on *Cloud Computing*		Autonomous learning and app muscle development
13	T3: Specific platform for mobile development based on *Cloud Computing*		Autonomous learning and app muscle development
14	T3: Specific platform for mobile development based on *Cloud Computing*		Autonomous learning and Delivery 3 *Course project* development
15	T3: Specific platform for mobile development based on *Cloud Computing*	Delivery 3 *Course project* development	Delivery 3 Course project
16	2nd midterm week. Validation exam		*Course project* presentacion preparation
17	2nd midterm week		*Course project* presentation
18	Tutories		
19	Recovery		
20	Personalized interview (if Delivery 3 *Course project* is below the minimum mark required)		

Evaluation

Activt.	Description	Weight	Minimum Grade	In group	Presential	Mandatory	Recoverable
MiniActivs	Pack of Mini-activities	15%	No	Yes	Yes (50%)	No	No
Proj	Course project	85%	5,0	Yes	No	Yes	Yes

Final grade = 0,15 * MiniActivs + 0,85 * Proj

- Subject is passed if **final grade** is greater or equal than **5,0**, as well as in the final mark of the *Course project.* The last deliveriy of the *Course project* (weighted in 35%) also has a **minimum grade** of 4.0.

Other considerations and criteria

- Pack of mini-activities (*MiniActivs*):
    - Continuous work during 1rst midterm class sessions. Contents of the 2nd midterm are applied directly to the *Course project*.
    - *Objective*: put into practice *in-situ* new contents introduced in class.
    - *Delivery*: via CV and presentially (preferibly during the class).
    - *Evaluation*: up to 1,5 points (until 2,25 points -0,75 points over the mark- if also solved the optional parts)
- Course project (*Proj*):
    - Conception, design and development of an Android app in which to put in practical the contents studied in the subject (sensors management, Cloud connection)
    - Articulated in 3 deliveries
        - *Weight and calendar of each delivery*:
            - *1rst Delivery.* App gestation: 4rt week (10% of the final mark)
            - *2nd Delivery.* App central core (eskeleton): 9th week (25%)
            - *3th Delivery.* Addicional functionality (muscle) with cloud synchronization: 14th week (35%)
            - *Final project oral presentation* (15%)
                - To be realized the 2nd midterm exam day.
    - *Evaluation and recovery system*: continuous avaluation
        - There will be required:
            - Correction criteria and minimal requirements to be developed in code, established in advance.
            - Criteria set in the **Manual of good programming practices** will be required, specified as minimum requirements to fulfill.
            - Also additional requirements, which will be considered as extra points in the grade.
        - Students receive feedback according to the fulfillment of the established requirements.
            - *2nd delivery*: Possibility to improve throught 3rd delivery. Application of a ***correction factor of 0,75.***
            - *3rd delivery*: personalized interview during the 18th week, in order to bring improvements.
- For all activities: programmed deliveries, unmovable dates.

Bibliography

Basic bibliography

Mobile Platforms

- Pierre-Olivier Laurence, Amanda Hinchman-Dominguez, G. Blake Meike, Mike Dunn. Programming Android with Kotlin. O'Reilly Media, Inc. (2021)

Firebase

- Houssem Yahiaoui. Firebase Cookbook: Over 70 recipes to help you create real-time web and mobile applications with Firebase. Packt Publishing Ltd (2017)
- Ashok Kumar. Mastering Firebase for Android Development: Build real-time, scalable, and cloud-enabled Android apps with Firebase. Packt Publishing Ltd (2018)

Complementary bibliography

Mobile Platforms

- Erik Hellman. Android programming : pushing the limits. Wiley (2014)

Firebase

- Neil Smyth. Firebase Essentials. Android Edition. Payload Media, Inc. (2017)