Native and Cross-platform Framework in Mobile Application Development – KNCF

Amir Rizaan Rahiman

amir_r@upm.edu.my

Universiti Putra Malaysia, MALAYSIA

Winter 2023/2024

1. Amir Rizaan Rahiman

Academic experience:	Nearly 20 years (since 2004)
Current position:	• Senior Lecturer • Head of Mobility Unit, Faculty of Computer Science and IT (FCSiT), UPM
Research interests:	Multimedia Applications, Semiconductor Storage Systems, Mobile Computing, Software Engineering (Requirement Engineering), Fog Computing

Mobile application course experience	↳ Java 2 Micro Edition (J2ME)
	   ↳ Android Development Tools (ADT)
	      ↳ Android Studio
	         ↳ Flutter

2. Overview

- This course uses the Flutter SDK single codebase framework.
- Advised the recommended system requirements:
  i. Intel x86-64 : Core i5 or Core i7, either Mac or Windows. Necessary to be able to run the **Visual Studio Code (VS Code) / Android Studio** IDE.

  ii. 8 GB of RAM and at least 30GB of the device storage.

  iii. Administrator access to be able to install required course software without permission errors.

3. Course Synopsis

- This course covers the **concept**, **architecture**, **framework**, **interface design**, **technique**, and **methodology** of mobile application development.

- The course emphasizes the **successful practice** in developing an application for the current **mobile business market** using **native** and **cross-platform** mobile application development solutions.

- In the **practical session**, students will use the **Flutter SDK framework** to learn how to design and develop a range of mobile applications.

4. Learning Activities and Teaching Strategies

- Students will work on **solving** mobile application development problems using **single codebase programming** in the lab.

- Students are required to **prepare** for the lab each week.

- To complete the lab exercises, students are required to bring their own, fully-charged laptop computer to class.

5. Learning objectives: Professional competence

- After successful completion of the submodule, students can:

  i.   Compare **suitable tools**, **framework**, **design**, and **architecture** for native and cross-platform mobile application development. (2)

  ii. Design and develop a **real mobile application** using an appropriate development framework as a team. (3)

  iii. Deploy the application to the **marketplace** for digital distribution. (3)

  1– know, 2 – can, 3 – understand and apply

6. Learning objectives: Personal competence

- After successful completion of the submodule, students can:

    i.   Gain competence the **concept**, **architecture**, **framework**, **interface design**, **technique**, and **methodology** of mobile application development. (3)

    ii. Proficient the successful practice in developing an application for the **current mobile business market** by using the recent cross-platform mobile application development solutions. (3)

    iii. Efficient and skillful to use the **Flutter SDK framework** in designing and developing a range of mobile applications. (3)

    1 – know, 2 – can, 3 – understand and apply

7. Teaching form & Examination performance

- **Blended learning:**
  i. **Face-to-face class (26 hours)**
     - Lecture
     - Lab exercises
  ii. **Online lecture (6 sessions, 2.5 hours/session, 17 hours)**
     - Lecture
     - Lab exercises
     - Group project

- **Examination performance:**
  i. **Lab exercises – 20%**
  ii. **Assignments – 40%**
  iii. **Group project – 40%**

8. Course contents

- Chapter 1: Mobile application ecosystems
- Chapter 2: Mobile application development
- Chapter 3: Dart programming
- Chapter 4: Laying out widgets
- Chapter 5: Standard library – Plugins and packages
- Chapter 6: Network, storage I/O and navigation
- Chapter 7: Database in mobile application
- Chapter 8: Testing and debugging
- Chapter 9: Application deployment

9. Lab

- Lab 1: Native application development framework configuration
- Lab 2: Application on hardware devices
- Lab 3: Layout and Graphical user interface (GUI) – Frontend development
- Lab 4: Database application – Backend development
- Lab 5: Built-in packages and plugins
- Lab 6: Custom-made Package development
- Lab 7: Application distribution

10. Tools and Softwares

- Prerequisite programming skills: C++, Java, XML, JSON, Php.

- Software tools
  - Flutter SDK
  - Dart SDK

- IDE (Integrated Development Environment)
  - Write code, compile code, debug code, and monitor resources
  - VS code – version 1.79
  - Android Studio – version 4

References

i. **Carmine, Z. (2020). Programming Flutter: Native, Cross-Platform Apps the E asy Way. The Pragmatic Programmer.**

ii. P. Nawrocki, K. Wrona, M. Marczak, and B. Sniezynski. A Comparison of Native and CrossPlatform Frameworks for Mobile Applications. Computer, 54(3), 18-2 7 (2021)

iii. D. Inupakutika, S. Kaghyan, D. Akopian, P. Chalela, and A.G. Ramirez. Facilitati ng the development of cross-platform mHealth applications for chronic support ive care and a case study. Journal of biomedical informatics, 105, p.103420 (2 020).

iv. A. Biørn-Hansen, C. Rieger, T. M. Grønli, T. A. Majchrzak, and G. Ghinea, An em pirical investigation of performance overhead in crossplatform mobile develop ment frameworks. Empirical Software Engineering, 25, pp.2997-3040 (2020)