



**PENINSULA**  
**COLLEGE**  
GEORGETOWN DK266-03(P)



**UNIVERSITY OF**  
**PLYMOUTH**

# **MAL2020**

## **Computing Group Project**

Project Title: NFCampus - Android

### **Group Member:**

Eu Jin Yang

Yong Ken

Ng Kean Chun

Teoh Yi Shan

# BACKGROUND

Our college currently uses RFID cards for campus access, but the system identifies the card instead of the person. When cards are forgotten, lost, or damaged, students and staff get locked out, leading to delays and missed classes. Biometrics could address this issue, but they are costly and raise privacy concerns.

Due to these limitations, the current access system faces several problems:

- The system depends entirely on a physical card.
- Users frequently experience lockouts due to forgotten, misplaced, or damaged cards.
- These issues often result in missed classes, exams, and interruptions to campus activities.
- Biometrics, while secure, come with high costs and privacy risks.
- Using NFC on smartphones provides a more practical, secure, and user-friendly alternative.

# OBJECTIVE

Primary Goal: To create a secure, smartphone-based authentication system that acts as a digital backup for college access cards.

## S - Specific

Build a working Android app prototype.

It will use phone's NFC to emulate a college ID card.

## M - Measurable

Success is measured by the app unlocking a test door reader.

Test: App → Reader → "Unlock"  
Signal ✓

## A - Achievable

Tool: Android Studio.

Technology: Host Card Emulation (HCE).

Platform: Android only (due to iOS restrictions).

## R - Relevant

Solves the problem of forgotten cards.  
Uses a device students always have their smartphone.

A practical upgrade to the current system.

## T - Time-Bound

Project Deadline: March 28, 2026

# SCOPE OF THE PROJECT

## In

## Scope

- Development of an Android Mobile Application for Student Users (e.g. OCR, NFC Card Binding, MFA)
- Backend System and Database (e.g. NFC UID Validation)
- Proof-of-Concept Access Simulation

## Out Of Scope

- iOS Application Development
- Advanced OCR Data Parsing
- Admin Dashboard or Guard Interface
- Automatic Card Deactivation
- Real-time Communication with University Databases
- Fully Functional Reader System for Buildings

# LITERATURE REVIEW

Existing works on student identification and access systems highlight the limitations of traditional physical cards and closed digital ecosystems, as well as the growing role of NFC and national digitalisation efforts. These studies help position NFCampus as a secure, modern, and user-centric approach.

## Traditional Physical Student Cards

- Simple and low-cost, but easily lost or stolen.
- No inherent user authentication beyond possession of the card.
- Limited to basic visual ID and door access.

## Proprietary Wallet Passes (e.g., Apple/Google Wallet)

- Highly convenient and integrated with smartphones.
- Benefit from built-in device security.
- However, operate in a closed ecosystem with limited customization and control for institutions.



# LITERATURE REVIEW

## **NFC Technology in Access Control**

- Provides fast, contactless, and reliable communication.
- Supports standardised and secure credential storage and transmission.
- Traditionally tied to proprietary plastic cards, limiting flexibility.

## **National Digitalisation: MyJPJ Case Study**

- Demonstrates official acceptance of digital credentials and IDs.
- Offers user-centric, app-based access to personal information.
- Still mainly visual and manual verification, with no tap-based machine-readable access.

# METHODOLOGY

## Project Approach / Framework:

- **Sprints:** The project schedule will be divided into two week sprints.
- **Sprint Planning:** At the beginning of each sprint, our team will select a set of tasks from the product backlog to complete.
- **Daily Stand-ups:** Brief daily meetings will be held to synchronize activities and identify blockers.
- **Sprint Review & Retrospective:** At the end of each sprint, we will demonstrate the completed functionality and reflect on the process to improve the next sprint. This allows for regular feedback and continuous refinement of the product.

## Tools and technologies:

- Android Studio
- Firebase / Firebase
- Figma
- Kotlin
- GitHub

# EXPECTED DELIVERABLES

## Android Mobile Application

A fully functional NFCampus app featuring user registration, OCR card scanning, MFA login, NFC UID binding, and HCE-based access simulation.

## System Documentation & Technical Files

Complete project documentation including system architecture diagrams, UML diagrams, API references, testing plans, results, and security evaluations.

## Backend System & Cloud Database

A secure Firebase backend with user account management, UID validation logic, data storage for card images and OCR results, and API endpoints for authentication.

## Prototype Demonstration & Testing Output

A working proof-of-concept setup showcasing successful digital credential authentication, NFC-based access simulation, and recorded testing outcomes.



# PROJECT TIMELINE



[illegible]

[illegible]

# Expected Outcome and Significance

## Anticipated Results

- A Fully Functional Android Application
- Seamless NFC-Based Access Control
- Enhanced Security Model

## Beneficiaries

- The following groups will directly benefit from the NFCampus project:
  - Students
  - The Developer Team and Academic Institution

## Contributions & Significance

- **Academic Contributions:** Advancement in Mobile Computing and Security
- **Industrial & Practical Contributions:** Modernization of Campus Infrastructure
- **Societal Contributions & Benefits:** Enhanced User Convenience and Inclusivity