

CSC1108: Data Structures and Algorithms

Team Project (AY2022/23 Trimester 2)

1. Objectives

The main objective of this project is to provide an opportunity for students to experience the fun and practical aspect of data structures and algorithms through developing real-life applications. More importantly, it also allows students to experience the many issues concerning effective teamwork as well as the various activities in a software project.

2. Instructions

- The aim of this project is to design and implement, in a team of 4-5 students a real-world project as described in Section 3.
- The implementation of the algorithm and data structure must be in Python. Any suitable visualisation and/or web framework can be used to implement the GUI of the project.
- The implementation **MUST** apply some data structures and algorithms taught in this module. Teams must be able to justify this in the presentation video. Team should also be able to explain which part of the source code implements a particular algorithm or uses a particular data structure.
- A user interface (UI) or visualisation must be implemented for the application.

3. Project Description

Our neighbouring country Malaysia's Johor state government has implemented a FREE bus service called "*Bas Muafakat Johor*" to ease the rising burden of transportation cost.

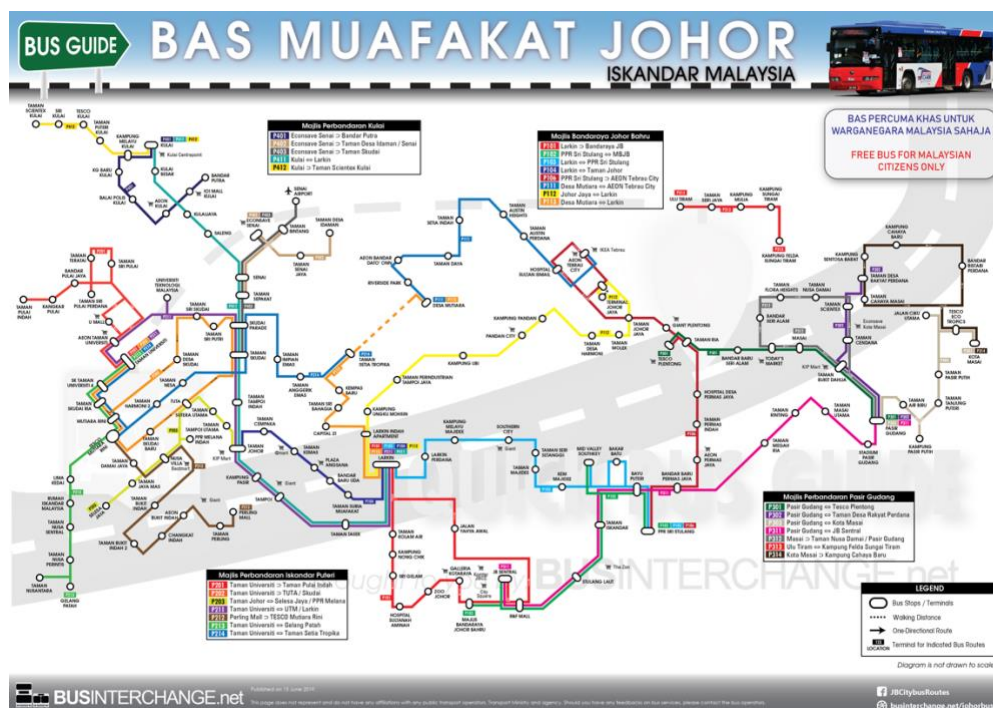


Image source and copyright: <https://businterchange.net/>

The “*Bas Muafakat Johor*” team is working with various city councils such as Johor Bahru, Iskandar Puteri, Kulai and Pasir Gudang to provide several free bus routes to the community. At this moment, they are working on real-time bus location tracking using GPS to provide an accurate estimated time of arrival (ETA) for these bus services. However, the current system lacks a journey planning application to enable commuters to plan their journey with *Bas Muafakat Johor*.

Imagine that we are a software house specialising in urban mobility and that we have been awarded this tender to develop a prototype to showcase our expertise in algorithms. As a start, only a subset of the entire *Bas Muafakat Johor* service routes listed as below will be used to implement the journey planning application prototype:

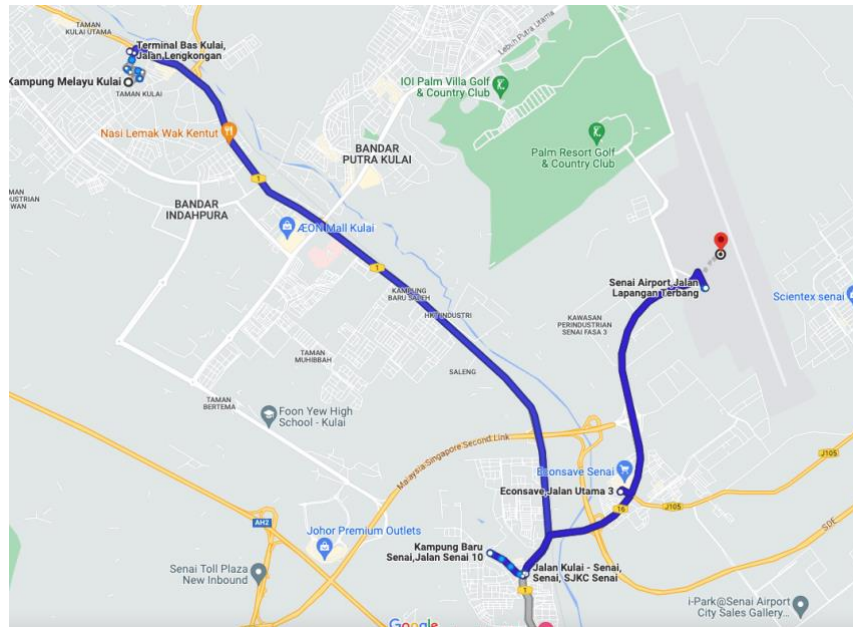
- P101 – Larkin Terminal \supset Johor Bahru City (loop service)
<https://businterchange.net/johorbus/routes/routeinfo.php?service=P101>
- P102 – PPR Sri Stulang \Leftrightarrow Majlis Bandaraya Johor Bahru
<https://businterchange.net/johorbus/routes/routeinfo.php?service=P102>
- P106 – PPR Sri Stulang \supset AEON Tebrau City (loop service)
<https://businterchange.net/johorbus/routes/routeinfo.php?service=P106>
- P202 – Taman Universiti \supset Taman Ungku Tun Aminah (loop service)
<https://businterchange.net/johorbus/routes/routeinfo.php?service=P202>
- P211 – Taman Universiti \Leftrightarrow Larkin Terminal
<https://businterchange.net/johorbus/routes/routeinfo.php?service=P211>
- P403 – Econsave Senai \supset Skudai Parade (loop service)
<https://businterchange.net/johorbus/routes/routeinfo.php?service=P403>
- P411 – Kulai \Leftrightarrow Larkin Terminal
<https://businterchange.net/johorbus/routes/routeinfo.php?service=P411>

Based on the service routes above, you will be given the list of bus stops and their respective GPS location. You are then required to develop algorithms and use appropriate data structures to implement the journey planning prototype with the following features:

1. Given a starting location, find the nearest bus stop to start the journey.
2. Recommend traveling routes based on the bus services listed above. This can be based on the *shortest path*, *fastest path*, etc
3. Provide a recommendation for the last mile connectivity from the destination bus stop, e.g., walking, if the destination cannot be reached by the bus.

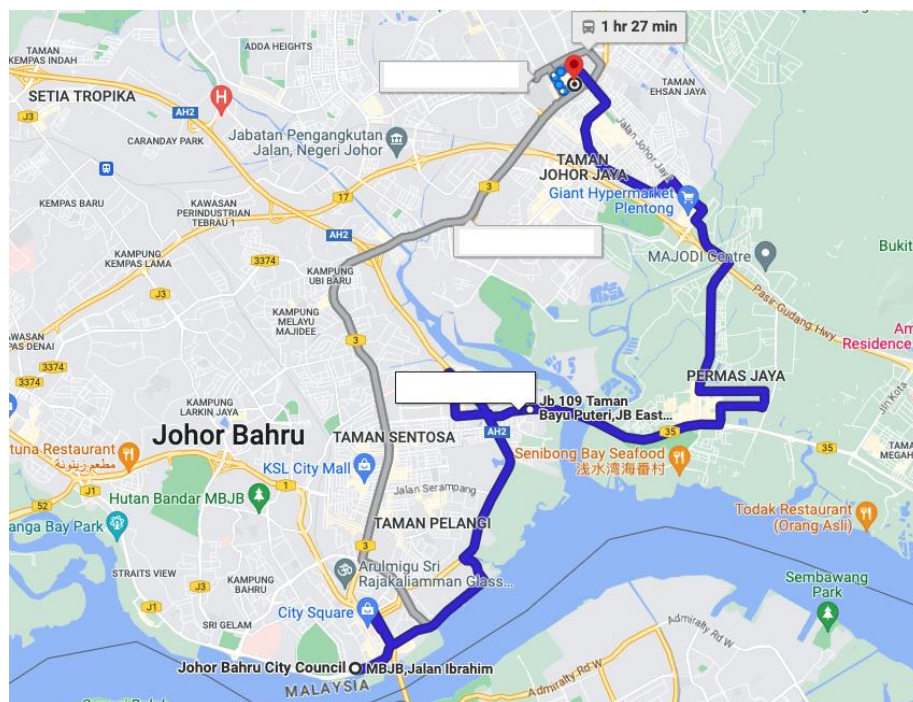
Example route 1: *Kampung Melayu Kulai to Senai Airport Terminal*

From Kampung Melayu Kulai, walk 10 mins to *Kulai Terminal*, then take P411, ride 10 stops and alight at *Medan Selera Senai*. Cross the road to *Opp Medan Selera Senai* and take P403, ride 6 stops to *Senai Airport Terminal*



Example route 2: *Majlis Bandaraya Johor Bahru to AEON Tebrau City*

Take P102 at *Majlis Bandaraya Johor Bahru (Johor Bahru City Council)*, ride 8 stops and alight at *Petronas Kiosks @ Taman Bayu Puteri*, then change to P106, ride 16 stops to *AEON Tebrau City*.



4. Deliverables and Submission

- a. Final product: Teams are required to submit the final complete project which must include your source code and installation instruction, readme files or any other files that are required to run the application. The team leader must submit ONE zip file containing the complete application on xSiTe before **2359PM** on **2nd April 2023**.
- b. Video presentation: Each team is required to submit a 10-15 minutes recorded video presentation (or a video link) to explain the features of the project as well as a demonstration of the final product. The presentation will be assessed based on the use of data structures and algorithms, functionalities, features, UI/Visualisation implemented. More importantly, teams must be able to explain precisely what data structures and algorithms that have been used in the implementation. Please follow the mark scheme in Section 5 and incorporate those aspects into your project and presentation.

LATE SUBMISSION

A penalty of **20%** per day of this assignment marks (including Sunday and public holiday) will be imposed for late submission unless extension has been granted **prior** to the submission date. Request for extension will be granted on a case-by-case basis. Any work submitted more than 4 days after the submission date will not be accepted and no mark will be awarded.

NOTES ON PLAGIARISM

The university's policy on copying does not allow you to copy software as well as your assessment solutions from another person or Internet. Copying of another person's work is unacceptable. It is the responsibility of all students that their assessment solutions are their own work. You must also ensure that others do not obtain access to your solutions for the purpose of copying a part of them. Where such plagiarism is detected, both assessments will receive **ZERO** mark.

5. Mark Scheme

This project is weighted at 25% of the total assessment of this module. Please refer to the detailed marking criteria table posted on xSiTe.

Criteria	Marks
Algorithms: Able to apply data structures and algorithms learned in the implementation of application.	30
Features: All basic features of the application should be implemented.	20
Creativity: The team might consider adding more features to the application.	15
UI: Quality of the visualisation	10
Presentation: The presenters speak clearly; presentation is organized and easy to follow.	25

6. Teamwork and Peer Assessment

Each project will be graded as a team. That is, each person receives the same grade if each person contributes equally. Great teams have great contributors, each contributing equally. Within the team, you must negotiate with one another on how much and what each person will contribute. Think carefully about your team members' strengths and weaknesses and distribute the workload wisely.

Each member of the team is asked to provide a peer assessment of each member of their team (including themselves), in terms of the quality of work and effort expended in the project.