School of Computing and Mathematical Sciences

BSc Final Year Project Form

1. Proposal

The student should complete parts 1(a), 1(b), 1(c) and 1(d) below. An electronic version of this form should be uploaded to the Final Year Project module on Moodle no later than the module deadlines specified on the BSc module on Moodle.

(a) Student details

Name: Hugsney Fabio Ferreira **Student Number: 13906450** **Email: hugsneyjc@gmail.com**	**Module: Type 4: BUCI072S6 BSc Data Science project**

(b) Project details

Title: Database Design for Car Park Analysis

Objectives:

- Design a scalable relational database that efficiently stores car park data.
- Conduct historical analyses on car park usage patterns and identify peak usage times.
- Develop predictive models for forecasting car park demand and average parking duration.
- Create a video demonstrating data entry, dashboard development, analysis, and predictions.

Problem description/Background:

Car park operators often face challenges in managing capacity, reducing wait times, and optimising available space, especially during peak periods. Currently, most car park usage data is stored in fragmented systems, making it difficult to gain meaningful insights and anticipate demand, resulting in reactive rather than proactive management.

This project aims to centralise car park data in a single database, simplifying the management and storage of essential information, such as entry and exit times, vehicle registration numbers, and site locations. With a unified data source, historical analyses can identify usage patterns, including peak times, seasonal trends, and frequent congestion points.

The project will also develop predictive models to forecast future parking demand and average duration of stay. These insights will support more effective operational planning, enabling resources to be allocated efficiently, high-demand periods to be anticipated, and strategies to reduce overcrowding to be implemented.

Title: Database Design for Car Park Analysis

Methodology and Methods:

Database Design and Setup:

- Define the data structure and schema to capture fields: Site, VRM, EntryLane, ExitLane, InDateTime, and OutDateTime.
- Implement the database in SQL

Data Collection and Ingestion:

- Use historical data in .xlsx with VRMs and Site masked due to GDPR protection.

Data Analysis:

- Perform descriptive analyses in Excel to understand historical trends and identify peak times.

Predictive Modelling:

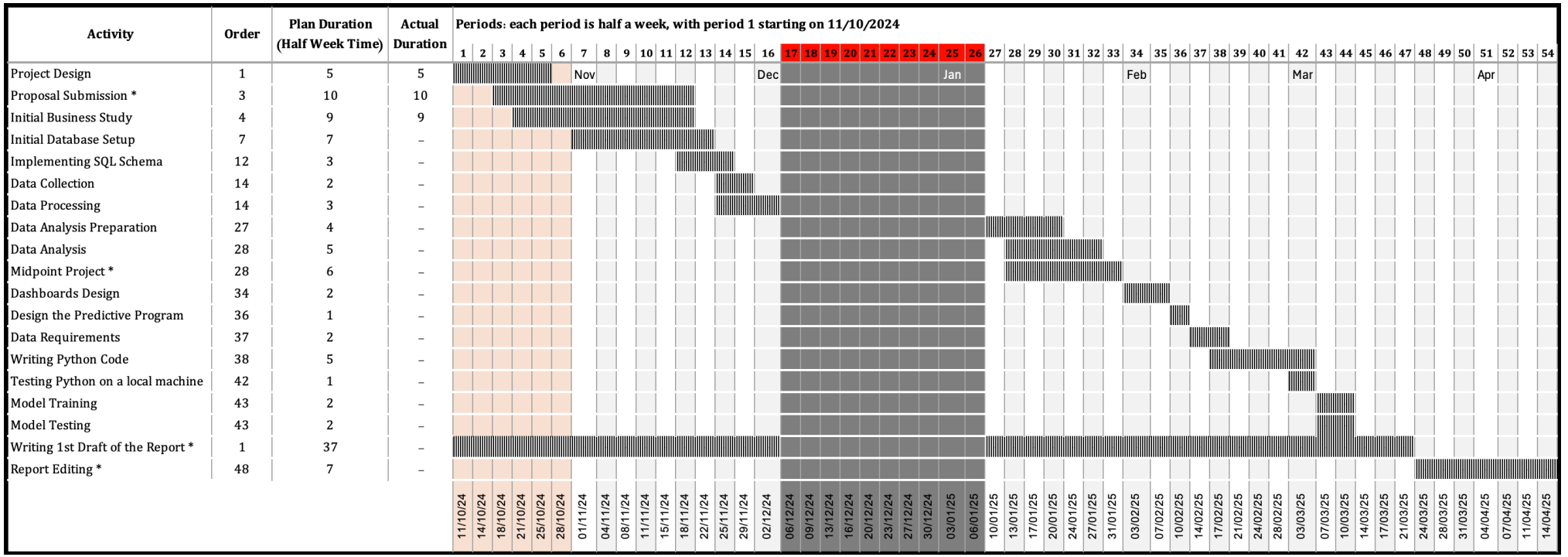
- Use Python and libraries like Scikit-learn, Pandas & Matplotlib to create predictive models.
- Train and validate models with historical data.

Visualisation:

- Recording screen with data being added, python program being run and all the outputs previous described.
- Graphs and Dashboards

Title: Database Design for Car Park Analysis

Activity	Order	Plan Duration (Half Week Time)	Actual Duration
Project Design	1	5	5
Proposal Submission *	3	10	10
Initial Business Study	4	9	9
Initial Database Setup	7	7	–
Implementing SQL Schema	12	3	–
Data Collection	14	2	–
Data Processing	14	3	–
Data Analysis Preparation	27	4	–
Data Analysis	28	5	–
Midpoint Project *	28	6	–
Dashboards Design	34	2	–
Design the Predictive Program	36	1	–
Data Requirements	37	2	–
Writing Python Code	38	5	–
Testing Python on a local machine	42	1	–
Model Training	43	2	–
Model Testing	43	2	–
Writing 1st Draft of the Report *	1	37	–
Report Editing *	48	7	–



Title: Database Design for Car Park Analysis

College equipment required:

No college equipment is required for this project

References

Bibliography:

- Chen, J., et al. Database Systems: Design, Implementation, & Management, 12th ed. (2020).
- Pedregosa, F., et al. "Scikit-learn: Machine Learning in Python." Journal of Machine Learning Research, vol. 12, 2011, pp. 2825-2830.
- Agarwal, R., and Dhar, V. "Big Data, Data Science, and Analytics: The Opportunity and Challenge for IS Research." Information Systems Research, vol. 25, no. 3, 2014, pp. 443-448.

Work Examples:

- "Machine Learning for Technical Information Quality Assessment." *Chalmers University of Technology*, 2016. Link to report
- "Credit Card Fraud Detection Using Machine Learning." *Stanford University, CS229 Project Report*, 2019. Link to report

(c) Ethical issues

Has the student consulted the guidelines on research with ethical implications? **Yes** / **No**

See "Key Information" tile on Moodle: https://moodle.bbk.ac.uk/course/view.php?id=44270

(d) Supervisor details

Name: Dimitrios Airantzis	**Date agreed:** 27/10/2024

Proposal and Report Marking

Please note the following descriptions of projects of types 2, 3 and 4, as given in the Project Briefing document.

Type 2: Information Systems Research projects (BSc in ISM only)
An Information Systems Research project involves the investigation of information systems phenomena usually using interpretative research methods such as case studies or action research. Often the phenomena are newly emergent technologies and their social settings, development approaches or some aspect of the success or failure of an information system. Students who are considering a Type 2 project must take the module Research Methods in Management prior to enrolling for the project module. Supervision is carried out by the SCMS.

Type 3: Information Systems Development projects
An Information Systems Development project could involve the requirements capture and design of an information system or the evaluation of an existing system in order to identify problems and suggest improvements. Code may be written to check the feasibility of requirements or for comparison with existing code. Supervision is carried out by the SCMS. Any code implemented during the project must be demonstrated to the supervisor and supplied on a disk or USB memory.

Type 4: Computing projects
A Computing project involves the use of one or more programming languages for implementing a system or for investigating particular algorithms and data processing methods or for investigating computer based models of natural or artificial phenomena. Supervision is carried out by the SCMS. Any code implemented during the project must be demonstrated to the supervisor and supplied on a disk or USB memory.

BSc project submissions are evaluated against five criteria, as shown in the table below. Default weights per criterion are used, namely 15%, 15%, 50%, 20%.

Marks and feedback appear on Moodle. Please note that any marks shown on Moodle are the original marks, i.e. no capping due to late submission, penalty due to plagiarism allegation or other assessment offence is applied to marks shown on Moodle.

The marking scheme provided below is for information only. Project submissions are marked online, i.e. markers complete parts (a) and (b) of the table shown below online using marking forms provided on Moodle. Fixed weights for the marking criteria, as shown below, are used.

(a) Marker's report

First/Second/Third Marker [Delete as appropriate] Name:	**Date received:**
Criterion A: Proposal **Mark ..... out of ....15%....**	
Criterion B: Awareness and understanding of related work **Mark ..... out of ....15%....**	

First/Second/Third Marker [Delete as appropriate] Name:	Date received:
Criterion C: Achievement, taking into account the difficulty of the project and also including but not limited to **Type 2: understanding and investigation of information systems phenomena** **Type 3: requirements capture, design or evaluation of an information system** **Type 4: design, layout and effectiveness of the code. If you are the supervisor, then indicate when you saw the code demonstrated.** **Mark ..... out of ....50%...**	
Criterion D: Grammar, spelling, structure and coherence of the report, ability to present complex or technical material **Mark ..... out of ....20%...**	
Date returned:	**Total ..... out of 100%**

(b) Student feedback

Feedback is provided on Moodle. Markers fill in the corresponding fields in the Marking form on Moodle. When marks become available, students should check the "Grade column" on Moodle- mark will be shown out of 100. To read the feedback students should click on the Turnitin icon to access the Turnitin Feedback Studio- then click the "Rubric/Form" icon (right side panel on Turnitin) to access the feedback.