

## Computer Science & Software Engineering

<b>5COSC020W DATABASE SYSTEMS COURSEWORK (2021/2022)</b>	
<b>Module leader</b>	Ragu Sivaraman
<b>Unit</b>	Database Systems Coursework – INDIVIDUAL COURSEWORK
<b>Weighting:</b>	60%
<b>Qualifying mark</b>	30%
<b>Description</b>	Produce a conceptual data model & a logical data model following given specs. Write SQL statements to complete specific tasks. Produce a supporting report.
<b>Learning Outcomes Covered in this Assignment:</b>	LO1 Design a robust relational database schema using UML notations; LO2 Produce robust SQL statements to create logically connected database tables and populate them; LO3 Produce solid SQL queries to retrieve, aggregate, update and delete data from one or multiple database tables; LO5 Critically evaluate the needs for non-relational databases e.g. No-SQL databases and XML Databases.
<b>Handed Out:</b>	18th October 2021
<b>DUE DATE</b>	<b>08 NOVEMBER 2021 at 13:00:00 – Part A</b> <b>06 DECEMBER 2021 at 13:00:00 – Part A + Part B</b>
<b>DELIVERABLES</b>	<p><b>08 NOVEMBER 2021 at 13:00:00 – Intermediary Report:</b></p> <p><b>Part A</b> Report in PDF format, font Calibri size 11</p> <ul style="list-style-type: none"> <li>• 1 cover page for part A, student details &amp; tutorial group</li> <li>• 1 side featuring conceptual ERD</li> <li>• 4 data dictionary tables supporting conceptual ERD</li> </ul> <p><b>06 DECEMBER 2021 at 13:00:00 – FINAL REPORT: Part A + Part B</b></p> <p><b>Report in PDF format, font Calibri size 11</b></p> <ul style="list-style-type: none"> <li>• 1 cover page for part A+B, student details &amp; tutorial group</li> <li>• 1 side featuring conceptual ERD</li> <li>• 4 data dictionary tables supporting conceptual ERD</li> <li>• 1 side featuring mapped logical ERD</li> <li>• 1 SQL query to retrieve data from specific database tables</li> <li>• 1 Comparative analysis table.</li> </ul>
<b>SUBMISSION</b>	Online in '2021-2022 SUBMIT COURSEWORK' section on Blackboard.
<b>Type of Feedback and Due Date:</b>	PART A: verbal formative feedback on conceptual ERD. PART A + B: online feedback and marks 15 working days (3 weeks) after the submission deadline. All marks provisional until formally agreed by Assessment Board.

BCS Accreditation Criteria	2.1.1 Knowledge and understanding of facts, concepts, principles & theories 2.1.2 Use of such knowledge in modelling and design 2.2.1 Specify, design or construct computer-based systems 2.3.2 Development of general transferable skills 3.1.3 Knowledge of systems architecture 3.2.1 Specify, deploy, verify and maintain information systems
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### Assessment regulations

For detailed information regarding University Assessment Regulations on how you are assessed, penalties and late submissions, what constitutes plagiarism etc. please refer to the following website:  
<http://www.westminster.ac.uk/study/current-students/resources/academic-regulations>

### Penalty for Late Submission

If you submit your coursework late but within 24 hours or one working day of the specified deadline, 10 marks will be deducted from the final mark, as a penalty for late submission, except for work which obtains a mark in the range 40 – 49%, in which case the mark will be capped at the pass mark (40%). If you submit your coursework more than 24 hours or more than one working day after the specified deadline you will be given a mark of zero for the work in question unless a claim of Mitigating Circumstances has been submitted and accepted as valid.

It is recognised that on occasion, illness or a personal crisis can mean that you fail to submit a piece of work on time. In such cases you must inform the Campus Office in writing on a mitigating circumstances form, giving the reason for your late or non-submission. You must provide relevant documentary evidence with the form. This information will be reported to the relevant Assessment Board that will decide whether the mark of zero shall stand. For more detailed information regarding University Assessment Regulations, please refer to the following website:

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### Coursework Part A: Conceptual ERD [40 Marks]

### Part A Project Brief: ArchipelagoCrazy

ArchipelagoCrazy is a touristic experience/adventure company that operates over an archipelago of a dozen islands located at about 15-20 miles off the Italian coast. Essentially, ArchipelagoCrazy organises exciting trips from May to November to allow tourists to visit the islands and fully experience the outstanding beauty of the landscape in this unspoilt corner of Italy.

The company operates a float of several <sup>1</sup>boats to provide this touristic experience/adventure service. <sup>2</sup>Larger motorised boats which can handle a higher number of customers are used for crossings to carry people from the mainland to the islands but also between different islands. Smaller motorised boats which can take 6-8 people are used to provide a local beach taxi service on the larger islands to allow tourists to conveniently travel to the main beautiful beaches. Finally, paddle-propelled boats (like kayaks, stand up paddleboards, canoes, etc.) can be used to explore an island locally and access the more remote bays and creeks. **The availability of a boat on an island needs to always be verified for it to be used to deliver a specific service as well as the capacity of the boat.** In addition to the great boating experience, ArchipelagoCrazy also organises nice walking tours on the islands and guided visits of the main landmarks located on the islands such as castles, fortresses, lighthouses, churches, monasteries, etc.

On their promotional material, ArchipelagoCrazy offers the possibility to book different <sup>3</sup>adventures to suit one's individual needs. An adventure can either be a Sea Adventure or a Land Adventure and customers can place bookings for more than one. A Sea Adventure can consist of a simple sea crossing (to an island or between islands on a larger motorised boat, with the option of a meal on board if required), a beach taxi service (to a specific beach or to hop between beaches on a smaller motorised boat) or a marine exploration (using a paddle-propelled boat) and again more than one can be booked. On the other hand, a Land Adventure refers to a walking tour with a guide or the guided visit of a key landmark on an island or both. Also, walking tours, can be nocturnal if they are scheduled to

take place at night. Therefore, customers should be able to place bookings for a wide range of interesting adventures to make the most of their visit to the beautiful archipelago.

In terms of staffing, the company relies on many **employees** with very specialised roles to fully support the many activities and adventures on offer. Noticeably, experienced **sea crew** help organise and manage the Sea Adventures (whether they are sea crossings, beach taxi services or marine explorations). Expert walking **guides** oversee the running of Land Adventures (walking tours and visits of key landmarks) and take people out on walks and cultural visits. Finally, and importantly, **boat mechanics** play a key role in ensuring the maintenance of all the boats used by ArchipelagoCrazy. They are assigned to work on the frequent servicing of boats. Each servicing needs to be very carefully recorded to keep a track of the regular top-quality maintenance of the watercrafts in use. It is a crucial business operation to ensure that all boats are always in top condition to ensure the best experience and the highest safety of ArchipelagoCrazy's paying customers.

## Part A Questions

You have been hired by ArchipelagoCrazy as a database architect to undertake a database project to support the data needs of the company. Your job in this first part is to produce a high-quality **CONCEPTUAL ENTITY RELATIONSHIP DIAGRAM (ERD)** and to produce a **data dictionary** to document and support your model.

**Prefix the names of all entities and attributes with your id number starting with w.**

- 1) Produce a complete **CONCEPTUAL ERD** for ArchipelagoCrazy.

This **CONCEPTUAL ERD** needs to include all the **entities, relationships, multiplicities, attributes** and **primary keys** that you have identified. It should be easy to read and needs to fit on one page of the report.

- 2) Create a **data dictionary** to document how you identified the **entities** for ArchipelagoCrazy. To achieve this, fill in the 2 tables below to summarise and briefly explain the meaning of each entity.

Entity name	Brief Description

General entity	Specialised entity	Brief Explanation

For more information, please refer to page 510 of the 6<sup>th</sup> edition of the Connolly's textbook.

- 3) Create a **data dictionary** to document how you identified the **relationships** and **multiplicities** for ArchipelagoCrazy. To achieve this, fill in the table below to summarise and justify the multiplicities for each relationship.

Entity name	Multiplicity	Relationship	Multiplicity	Entity name	Brief justifications for the multiplicity (4 statements for each relationship)

For more information, please refer to page 513 of the 6<sup>th</sup> edition of the Connolly's textbook.

- 4) Create a **data dictionary** to document how you identified the **attributes** and **primary keys** for each entity for ArchipelagoCrazy. To achieve this, fill in the table below to summarise and explain the meaning of each attribute and primary key.

Entity name	Attributes for this entity (include PK)	Justification

For more information, please refer to page 516 of the 6<sup>th</sup> edition of the Connolly's textbook.

## Interactive FAQ

To provide you with the support you may require as a Database Architect and answer any questions you may have about the ArchipelagoCrazy brief, an interactive FAQ is offered. This allows you to ask specific targeted questions to the ArchipelagoCrazy Managing Directors about the ArchipelagoCrazy business so that to improve and refine your conceptual ERD and for these questions and their answers to be shared with the entire class. The interactive FAQ is available as a discussion board on the module site on Blackboard.

## Part A Marks Allocation

**Part A** will be marked based on the following marking criteria:

Marking Criteria Marks	
Clarity, formatting, and structure of the conceptual ERD with correct UML notations	10
Correct identification of entities + data dictionary tables	10
Correct identification of specialisations, relationships & multiplicities + data dictionary tables	15
Correct identification of attributes and primary keys + table	05
<b>PART A TOTAL</b>	<b>40</b>

### Coursework Part B: Logical ERD, SQL and Discussion [60 Marks]

#### **Part B Project Brief: SoundStuff**

SoundStuff is a UK company that is specialised in hiring out audio equipment to recording artists to be used for the recording, mixing and mastering of audio projects, such as music tracks and albums. The company runs a number of recording studios located all over the UK. SoundStuff offers a really wide range of studio equipment to their customers such as analogue and digital recorders, mixing desks, audio interfaces, microphones, studio monitors, digital converters, controllers and other studio accessories. Some of these equipment items are fixed and can only be used in the SoundStuff studios under the supervision of an engineer. Other equipment items are portable and can be lent out to customers to be used in their home studios and can be delivered by a SoundStuff driver.

The conceptual ERD for SoundStuff is given in Figure 1 and Figure 2 (larger version).

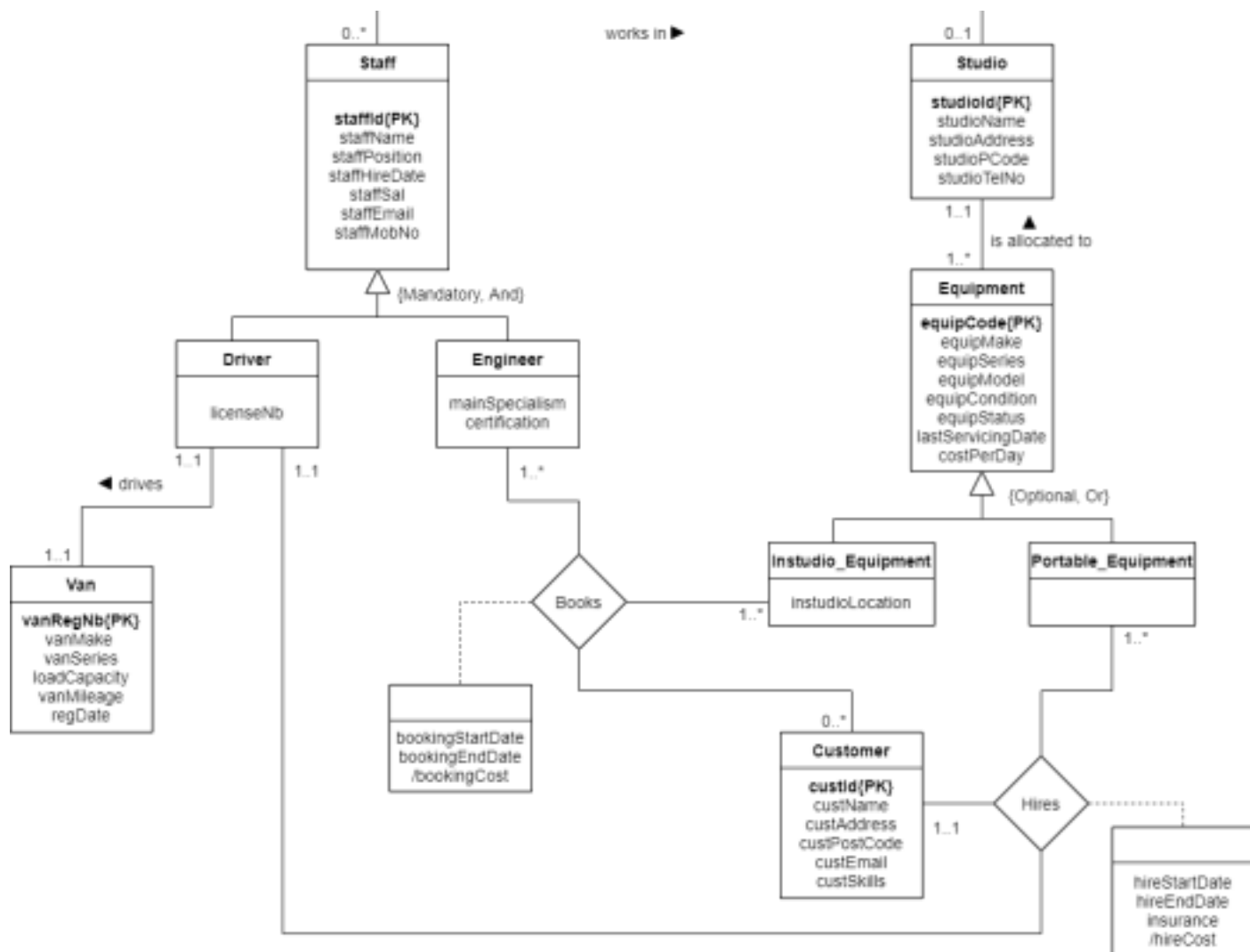


Figure 1. Conceptual ERD for SoundStuff

## Part B Questions

*Prefix the names of all tables and attributes with your id number starting with w.*

You have been hired by SoundStuff as a database consultant to undertake a database project to support the data needs of the firm. In this second part, you are given a conceptual data model for SoundStuff (figure 1), and your first goal is to **map it** onto a high-quality **LOGICAL ENTITY RELATIONSHIP DIAGRAM (ERD)** to logically represent how the key business data needs can be organised as a set of interrelated tables that can then be implemented. These tables need to be interconnected according to the strict rules of the relational model to be implementable. You also have to write a key **SQL query** to retrieve specific data. Finally, you need to present a brief comparative analysis of **relational databases vs. NoSQL databases** with the aim to provide SoundStuff with informed guidance on the best option for them to select.

- 5) Map the Conceptual ERD given on **figure 1** to produce a complete **LOGICAL ERD** for SoundStuff. This **LOGICAL ERD** needs to include all the **correct tables, relationships, multiplicity constraints, attributes, primary keys and foreign keys**. It should be easy to read and needs to fit on one page of the report.
- 6) Write an **SQL query** to retrieve a list of studio names for those studios that have an address in London, along with the makes, series, and models of the items of equipment in these studios, but only for the equipment that cost more than £125 a day to hire.

7) Create a **comparative analysis table** to compare and contrast Relational Databases vs. NoSQL databases with a view to inform the decision-making of the management of a firm.

Your table should present clear comparison criteria (or informative decision factors) as rows and have a column for Relational Databases and a column for NoSQL databases so that you can compare them side by side. You could consider areas such as schemas, data consistency, storage, performance, workload, infrastructures, security, etc.

You need to reference your findings in line with the University guidelines on referencing available here:

<https://libguides.westminster.ac.uk/referencing> and the reference guide available here:

[https://www.westminster.ac.uk/sites/default/public-files/general-documents/Referencing%20Your%20Work%20booklet\\_06.1.pdf](https://www.westminster.ac.uk/sites/default/public-files/general-documents/Referencing%20Your%20Work%20booklet_06.1.pdf)

You need to include a list of references right at the end of your report.

## Part B Marks Allocation

Part B will be marked based on the following marking criteria:

Marking Criteria Marks	
Clarity, formatting, and structure of the logical ERD with correct UML notations	10
Correct mapping of specialisations	10
Correct mapping of ternary relationships	10
Correct mapping of binary relationships	05
Correctness of the SQL Query	05
Relevance of comparison criteria and decision factors used to compare 2 database paradigms	20
<b>PART B TOTAL</b>	<b>60</b>

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### \_ Key Requirements for the entire coursework

- Only **UML notations** are accepted, as introduced in this module.
- You need to **prefix** all your entities and attributes with “w + the 7 digits of your ID number” as provided by the University.

For example, if my name is Francois Roubert and my ID number is w1234567, when I identify the entity “Module” and its attributes “moduleCode”, “moduleName” and “moduleType”, I will have to represent it this way:

<b>w1234567_Module</b>
<b>w1234567_moduleCode{PK}</b> w1234567_moduleName w1234567_moduleType

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