COM1025: Web and Database Systems

COURSEWORK

# Web & Database Design Project

This coursework will assess your understanding of the key concepts and technologies taught in this module. The assessment is based on a University Accommodation Office or University Sports Park Database System scenario:

* Eliciting appropriate business rules.
* Enhanced Entity Relationship (EER) data modelling.
* Relational databases and EER to Relational Schema Mapping Implementing tables and querying data using SQL.
* Accessing data stored in a MySQL relational database Node.js.
* Creating a dynamic web interface to the database using front-end technologies such as HTML, CSS and EJS templates.

It will count towards **100%** of your total module mark.

## Introductory Guidelines

This coursework is **individual work,** and the focus is to test your **independent capability** of

modelling data, designing and implementing a relational database, using Node.JS and front-end technologies to create a dynamic website. You will be using the MySQL relational database and Node.js that comes bundles with Laragon, [or these technologies can be installed, individually, separate from Laragon.](https://surreylearn.surrey.ac.uk/d2l/le/lessons/252843/topics/2862912)

**Please read the following guidelines very carefully:**

**When** you need to Submit

|  |  |
| --- | --- |
| Coursework Released: | Monday, Week 4 (October 17th 2022) |
| Deadline for Submission: | Wednesday, Week 12 (January 4th 2023), 4:00pm |

**Where** you need to Submit

* You should submit your work to **SurreyLearn** in the right submission folder (Assessment - > Assignments -> Individual Coursework).
* If you have any technical problems submitting to SurreyLearn, you should try to submit via email before the above deadline (m.cirovic@surrey.ac.uk).
* Please always double check after submission to SurreyLearn to make sure your submission has indeed been uploaded to the system without any error and you have uploaded all the correct documents.

**What** you need to Submit

You need to submit the 4 files listed below as 4 separate items by the deadline. The tasks you need to do and what you need to submit in each of the 4 files is described in detail in the following sections.

|  |  |  |
| --- | --- | --- |
|  | File Name | File Description |
| 1 | db\_setup.sql | This file should be an .sql file (see Task 1).  It should contain ALL the DDL CREATE DATABASE/TABLE as well as INSERT SQL statements you used to create the database and insert appropriate data. |
| 2 | sql\_queries.sql | This file should be a .sql file (see Task 1).  It should contain ALL the SQL query statements you used. |
| 3 | website.zip | This is a **zip** folder.  This will be a compressed folder containing your Node.js project. In the root of the folder, there should be a package.json file (generated through NPM init). The package.json file must include the script "start" that will run your program (e.g., "start": "nodemon index.js"). As your dependencies are in the p.json file, **please delete the node modules folder**before zipping. Before running your program, we will run the "db\_setup.sql" file; you should ensure this file is up to date. |
| 4 | report.pdf | This is a PDF document. It should contain the business rules as well as ERD, relational schema, and description of the website – please see Section 6. |

**IMPORTANT:** **you can use your own laptops to do the work with Laragon, or stand-alone installs of Node.js and MySql, but you must test it out on the Laragon set-up we have provided via Azure Labs before submitting the work. If it does not run on Azure Labs, you run the risk of failing your coursework!**

Extensions, Late Submissions and Academic Integrity:

Coursework will be routinely checked for academic misconduct:

* Please refer to your Student Handbook and the advice given on SurreyLearn on plagiarism and collusion and make sure that you understand the regulations.
* If you are in any doubt, please seek advice from your Module Leader or Personal Tutor.

Students are reminded of the University policy on late submission of coursework as outlined in the Student Handbook

* Deadlines are very strict: if you have a 4:00pm deadline then 4:00:01 pm is considered LATE (even by 1 second). Depending how late your submission is; your grade will be adjusted as follows:
  + up to 48-hours (2 calendar days) after the deadline: your mark will be reduced by 10 percentage points.
  + between 48-hours (2 calendar days) and 120-hours (5 calendar days): the mark given will be the pass mark (40%).
  + from 4.00:01pm on the fifth day after the deadline (120 hours), or not submitted at all: 0 will be given.

For further information see General Regulations: para 120.

If you need to apply for Extenuating Circumstances, please read your Student Handbook or check SurreyLearn for the policy for mitigating or extenuating circumstances (ECs).

## Feedback on EERD

Feedback will be given on the EERD. You will need to submit your EERD in a pdf document. Please also include your business rules so I can understand what you are trying to model in the EERD. Feedback will be given in the order that the submissions are made once the folder is open.

|  |  |
| --- | --- |
| Folder to Submit | Assessment - > Assignment -> Feedback on EERD |
| Folder Opens: | 31st October 2022 4:00pm (Monday, Week 6) |
| Folder Closes: | 28th November 2022 4:00pm (Monday, Week 10) |

I will aim to do give the feedback within 5 working days but if there is a high volume of submissions, especially towards the end, then up to 10 working days.

## Coursework Mark Distribution

The 100 marks of this coursework are distributed to different marking items as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | MARKING ITEM | Basic  Marks | Additional Marks |
| Technical Parts | **Task 1**: EER data model/diagram (as shown in the report) | 15 | 5 |
| **Task 2**: Conceptual/Logical relational database schema (as shown in the report) | 12.5 | 2.5 |
| **Task 3**: MySQL code (content of the .sql file submitted plus any technical description of your MySQL code in the report) | 12.5 | 2.5 |
| **Task 4**: Back-end Node.js code bridging MySQL and your web pages. | 12.5 | 2.5 |
| **Task 5:** Front-end website using HTML, CSS, EJS (screen shots shown in the report) | 15 | 5 |
|  | Written Report (non-technical part) | 12.5 | 2.5 |
|  | TOTAL | 80 | 20 |

The coursework awards basic marks (80%) for attempting the explicitly listed requirements. An additional 20% can be gained for attempting anything more technically complicated or advanced then the basic tasks. Examples of advanced tasks are given for each task but the number of additional marks for any advanced task will be determined on a case-by-case basis.

**NOTE:** You don’t have to complete ALL the suggestions for the advanced tasks - doing one or two very well will get you the additional marks.

## Coursework Tasks/Deliverables

You need to choose ONE of the following options (A or B) for your database design project:

1. A University Accommodation Office Database system

Have a look at the University’s accommodation office website. If you are staying in university accommodation, then you can also study the application form.

1. A University Sports Park Database system

Have a look at the Surrey Sports Park website.

You can look at other websites and reference material. Remember to list all the references you used in the report.

Task 1: Extended Entity-Relationship Modelling

As the first step of your coursework, you need to identify the main entities, attributes, and relationships in the coursework topic you selected (A or B). Then you should note down the business rules and any assumptions you make. The business rules will be marked as part of the report so please see section 6 for the marks allocated. Next you need to start sketching out the EER model to represent the data. The business rules and the EERD will be shown in specified sections of your report. The marks for the EERD are listed below while the marks for the business rules will be part of the report.

To attain all the basic marks, the EER Diagram should show the following:

1. At least one supertype and two subtypes
2. at least two additional entity types (apart from the supertype and subtypes in the first requirement), which are **not** an associative or weak entity.
3. at least two (binary) relationships with at least one relationship being one-to-many
4. the appropriate attributes for the entity types with at least one multi-valued attribute in one of the entity types.

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| --- | --- | --- |
| Task 1 | Description of tasks | Mark |
|  | BASIC REQUIREMENTS – 15 Marks |  |
| 1.1 | One supertype and two subtypes correctly represented with the disjointness and participation constraints | 4 |
| 1.2 | Two additional entities | 3 |
| 1.3 | Relationships a) One-to-Many relationship  b) Any other binary relationship  All the relationships should show the connectivity (cardinality) and participation constraints | 2.5  2.5 |
| 1.4 | Attributes (for all 5 entities) including one multivalued attribute | 3 |
|  | ADDITIONAL WORK – 5 Marks |  |
| 1.5 | Create a more complicated EER Diagram with additional entity types and relationships (or e.g., unary relationships). Feedback well incorporated into the diagram. | 5 |
|  | TOTAL MARKS | 20 |

SUBMISSION: as an EER Diagram in the report (report.pdf – see section 6)

The EER diagram must be drawn following the notations taught in this module and as indicated in the report template, and not those used by software tools like MySQL Workbench or phpMyAdmin. You can use any diagram drawing software tool to create your notation-compatible EER diagram (e.g. diagrams.net or PowerPoint). The EER Diagram, with a description of the business rules and any assumptions you make should be in the appropriate section of the written report.

Task 2: Mapping the EER Model to a Relational Schema

The next step is to translate your ER Model to a relational schema using the appropriate mapping algorithms. You will need to translate ALL elements of the basic ER Model to a relational schema to earn the basic marks. You do not have to translate the whole ER Model if you did additional work to gain more marks for the ER model in Task 1.

|  |  |  |
| --- | --- | --- |
| Task 2 | Description | Mark |
|  | BASIC REQUIREMENTS – 12.5 Marks |  |
| 2.1 | Mapping of one supertype and two subtypes | 3 |
| 2.2 | Mapping two additional entities | 2 |
| 2.3 | 1. One-to-Many relationship 2. Any other binary relationship   Showing the appropriate foreign keys and indicating which tables they are referencing | 2  2 |
| 2.4 | Mapping the multivalued attribute | 2 |
| 2.5 | Primary Keys for all relations | 1.5 |
|  | ADDITIONAL WORK – 2.5 Marks |  |
| 2.6 | Check if the relations are in third normal form and decompose them further if they are not; convert more elements of EER model. | 2.5 |
|  | TOTAL MARKS | 15 |

SUBMISSION: schemas included in the report (report.pdf – see section 6)

Please show schemas as indicated in the provided report template. You run the risk of losing marks if you do not adhere to the requested format.

Task 3: Implement Relation Schema in MySQL, Populate with Data & Query the Data

The third step is to create the tables using SQL and populate them with data. You don’t have to implement all the relations – for the basic marks you need at least three tables linked with foreign keys and such that you can write the queries specified below.

You should populate the tables with at least 5 but recommended 10 rows of data.

|  |  |  |
| --- | --- | --- |
| Task | Description of tasks | Mark |
|  | BASIC REQUIREMENTS – 12.5 Marks |  |
| 3.1 | Table implementations with all regular attributes (3 tables) | 1.5 |
| 3.2 | Domains of all the attributes specified correctly | 2 |
| 3.3 | Primary keys specified correctly | 1.5 |
| 3.4 | Foreign keys specified properly | 2 |
| 3.5 | One SELECT statement using GROUP BY or/and an aggregate function or an operator (with comments on what the query does) | 1.5 |
| 3.6 | One statement with a subquery (with comments on what the query does) | 2 |
| 3.7 | One statement with a JOIN (with comments on what the query does) | 2 |
|  | ADDITIONAL WORK – 2.5 Marks |  |
| 3.8 | Specifying any other constraints and/or more complicated queries | 2.5 |
|  | TOTAL MARKS | 15 |

SUBMISSION: two .sql files

1. The CREATE and INSERT statements should be in one file called db\_setup.sql.

*This should include CREATE DATABASE and USE DATABASE commands such that the file can be automatically run.* You should ensure you drop your database, at the top of the file (e.g., “*DROP DATABASE IF EXISTS sports*;”); this means there is a fresh instance of the database and data each time db\_setup.sql is run.

1. The three SQL queries should be in another file called sql\_queries.sql

*This should also include the USE DATABASE command such that the file can be automatically run. ­­­*

If you used the queries 3.5, 3.6 and 3.7 in your Node.js code you still need to include them in the sql\_queries.sql – otherwise they will not be marked. For task 3 only the .sql files will be used for marking.

Task 4: Use Node.js to Interact with the Database and create some dynamic Web Content

This part of the assessment requires you to create a Node.js application to connect to your database and display some results based on input data or choices made by the user of your website.

As a minimum, you should ensure you have a single "index.js" that serves four routes, each route should have a related EJS template (see, the week 10 lab class for guidance on how to do this):

* the homepage - served on / and may well contain summaries of the data in the database.
* view all - this will display a list of records.
* view one - displays a single record.
* update one – updates a record.

The structure of your application should be as follows:

├── app

│ ├── index.js

│ ├── package.json

| ├── views

| | ├── index.ejs

| | ├ .... other views

| ├── public

| | ├── main.css

| | ├── ... other static assets

**Note: You are welcome to add further files and folders, as long as you based your project conforms to the above.**

|  |  |  |
| --- | --- | --- |
| Task 4 | Description of tasks | Mark |
|  | BASIC REQUIREMENTS – 26 |  |
| 4.1 | Functionality for connecting to the MySQL database and handling any connection errors. | 2 |
| 4.2 | All three routes, specified above, constructed. | 3 |
| 4.6 | Functionality for displaying records in a table. | 4 |
| 4.7 | Functionality for displaying a single record. | 4 |
| 4.8 | Functionality for updating a single record. | 4 |
| 4.7 | Your EJS templates consist of well-structured HTML:   * Correct use of basic HTML elements (e.g., Body, Head, * Headings, Titles, Paragraphs, Attributes, Tags, etc) * A top navigation bar (shared across each page) with links to every page. | 4  1  1 |
| 4.9 | CSS to style the EJS templates. You are welcome to use a HTML template or library (e.g., bootstrap, tailwind), if it is free, and you attribute the use of it in your report. | 3 |
|  | ADDITIONAL WORK – 4 Marks |  |
| 4.6 | Here are some ideas for additional marks:  - Node.js code to handle and validate the basic input of data.  - Node.js code to handle the deletion of a record.  - The functionality to create new records. | 4 |
|  | TOTAL MARKS | 30 |

SUBMISSION: The web files will be submitted in the zip folder website.zip. Before zipping, check the following:

* ensure your project is based on the stuture specified above.
* ensure you have a package.json file (generated using “npm init”) in the root of your project. The package.json file must include the script "start" that will run your program (e.g., "start": "nodemon index.js").
* since your dependancies are in the package.json folder, please delete your node\_modules folder before submitting.
* before running your program, we will run the "db\_setup.sql" file; you should ensure this file is up to date.



### 5 - Coursework Report

This is an opportunity for you to demonstrate your transferable skills of good report writing, presentation and digital skills which are very important for the workplace.

|  |  |
| --- | --- |
| DESCRIPTION OF CATEGORIES | MARK |
| 1. Business rules/assumptions (describing ALL the EER Model entities, relationships, the more complicated attributes, and any constraints). | 6.5 |
| 2. EER Diagram |  |
| 3. Logical relational database schema |  |
| 4. Website/PHP code working with MySQL database (describe what your website does). | 3 |
| 5. Any advanced tasks attempted |  |
| 6. Self-reflection; how you incorporated the feedback | 3 |
| 7. References |  |
| 8. Appendix (screenshots of website) |  |
| ADDITIONAL MARKS |  |
| Excellent presentation and layout. | 2.5 |
| TOTAL | 15 |

SUBMISSION submitted in pdf format with the following title report.pdf

Please refer to the provided report template “COM1025\_2022-24\_Report\_Template.doc” available on SurreyLearn under the coursework folder for the format and structure of the written report and to see what exactly is expected. The submitted report must be a single PDF file.

The template structure is as follows:

**Page 1** (one page maximum):

1. Business Rules and Assumptions for the chosen application **Page 2** (one page maximum)
2. EER Diagram

**Page 3** (one page maximum)

1. Logical Database Schema

**Page 4** (one page maximum)

1. Short description of the web interface – what it hopes to achieve and a list of all the files you created for your web development with short descriptions. Do not include any screen shots here but place them in the Appendix. Remember to reference the screenshots that you will include in the Appendix.

**Page 5** (one page maximum)

1. Advanced Tasks Attempted
2. Self-reflection; how you incorporated the feedback. This is a brief discussion of how you incorporated the feedback given to you as well as what you learned from the project and things you would do differently in retrospect. **Page 6** (one page maximum)
3. References

**Page 7** (this can be more than 1 page)

1. Appendix with screenshots of your webpages. Please include all the screen shots if you have more than one webpage.

IMPORTANT

* You are expected to use font size 11 and Arial or Calibri font style.
* Please make sure that you limit yourself to the specified length of the written report (**6 pages**). This DOES NOT include the screenshots in the Appendix.

**Any extra pages will not be marked.**