# Systems Design and Databases (CIS1018-N) UML Tutorial 4: ERD & Data Normalisation

## Before You Start

Finish the previous tutorials before attempting this one. Try to complete this set of tasks before your next tutorial.

**Hint:** It is important before starting the lab, you should walk-through the lecture(s) and demonstration exercises

## Introduction

This week’s lectures covered entity relationship diagrams (ERD) and data normalisation. Therefore, in this lab, we are going to have a series of exercises to help you better understand the ideas. The background story we are using in this lab is the same as the one we used in our previous labs. If you are not familiar with or forget the scenario setup, please go back to last week’s lab material. You can also find useful information and guides from the lecture slides.

Note that, this lab is individual work, but you are encouraged to discuss it with your groupmates and your lab tutors while you are doing some of the following exercises.

## Exercise 1: ERD

Recall the teamwork support system we have studied in the past few weeks. In this exercise, we are going to devise the ERD for the system.

1. Understanding ERD

To help you get started, we provided the following examples. Firstly, in Figure 1, the ERD captures the relationship between the Instructor entity the Team entity. Note that it has a 1-mandatory-to-many-optional relationship as we require one team must have one and only one Instructor, while an instructor can supervise 0 to many teams.

Diagram

Description automatically generated

Figure 1 a simple ERD

But what if we change the rules and require that “one team must have AT LEAST one instructor”? In this case, the relationship will become many to many as illustrated in Figure 2.

Diagram, table

Description automatically generated

Figure 2 an ERD with many-to-many relationship

We can resolve the many-to-many relationship by introducing a “bridge table” as illustrated in Figure 3.

Diagram

Description automatically generated

Figure 3 resolve many-to-many relationship

Now, answer the following questions:

* What are the entities in the diagram(s)?
* What are the relationships in Figure 3?
* Why isn’t it a good idea to have many-to-many relationships?

Then reproduce the ERD in diagrams.net.

1. Completing the ERD

Complete the ERD by adding the other entities. Refer to the class diagram you devised in the last lab to see what entities are missing.

1. Design Challenge (Optional)

If you have time left, challenge yourself and start designing an e-commerce platform (Tutorial 1/Week 1 - List of requirements & MoSCoW). Devise an ERD for your system. The system should be able to store information about the items available on your platform, the registered customers, and their orders.

## Exercise 2: Data Normalisation

Now let us get back to the teamwork support system scenario. Supposing you are provided with the following piece of data, where all different kinds of information are presented in the same table and some records are duplicated.

|  |  |  |  |
| --- | --- | --- | --- |
| Student Email | Student Name | Salutation | Team Name |
| j.jones@tees.ac.uk | Janet Jones | Ms | Dominators |
| j.jones@tees.ac.uk | Janet Jones | Ms | Dominators |
| j.jackson@tees.ac.uk | Jack Jackson | Mr | Avengers |
| j2.jackson@tees.ac.uk | Jack Jackson | Mr | Dominators |

Use your knowledge gained from the lectures to normalise the data to its 1NF, 2NF, and 3NF forms. Go back to the lecture slides if you are not sure how to do it. Note that it is possible that students have the same name, but their email addresses are always unique.

## Extra Activity: ICA

If you have time left, keep working on your ICA. Ideally, after this week you should have all UML-related tasks finished.