

Distinction Level Project: Class Enrolment Data Storage
COS20015 – Fundamentals of Data Management

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1. Introduction

- In this project, I have created a Relational Database named “Classes”, inspired by the timetable in Swinburne University of Technology; the database contains 7 entities which store different multiple information about a class session that a student can possibly have:
 - + Convener: Stores personal information about a unit convener.
 - + Tutor: Stores personal information about a tutor.
 - + Student: Stores personal information about a student.
 - + Room: Stores information about a teaching room at Swinburne.
 - + Unit: Is a child table of Convener table, stores information about a unit at Swinburne.
 - + Class: Is a child table of Unit, Room and Tutor entities, containing information about a particular class at Swinburne.
 - + Sessions: Is the weakest entity of the database, a child table of Class and Student tables, storing the enrolment of students into classes at Swinburne.
- Entities relationships:
 - + Convener – Unit: 1 to Many
 - + Unit – Convener: 1 to 1
 - + (Unit, Room, Tutor) – Class: 1 to Many
 - + Class – (Unit, Room, Tutor): 1 to 1
 - + (Class, Student) – Sessions: 1 to Many
 - + Sessions – (Class, Student): 1 to 1

2. UML Entity Relationship Diagram

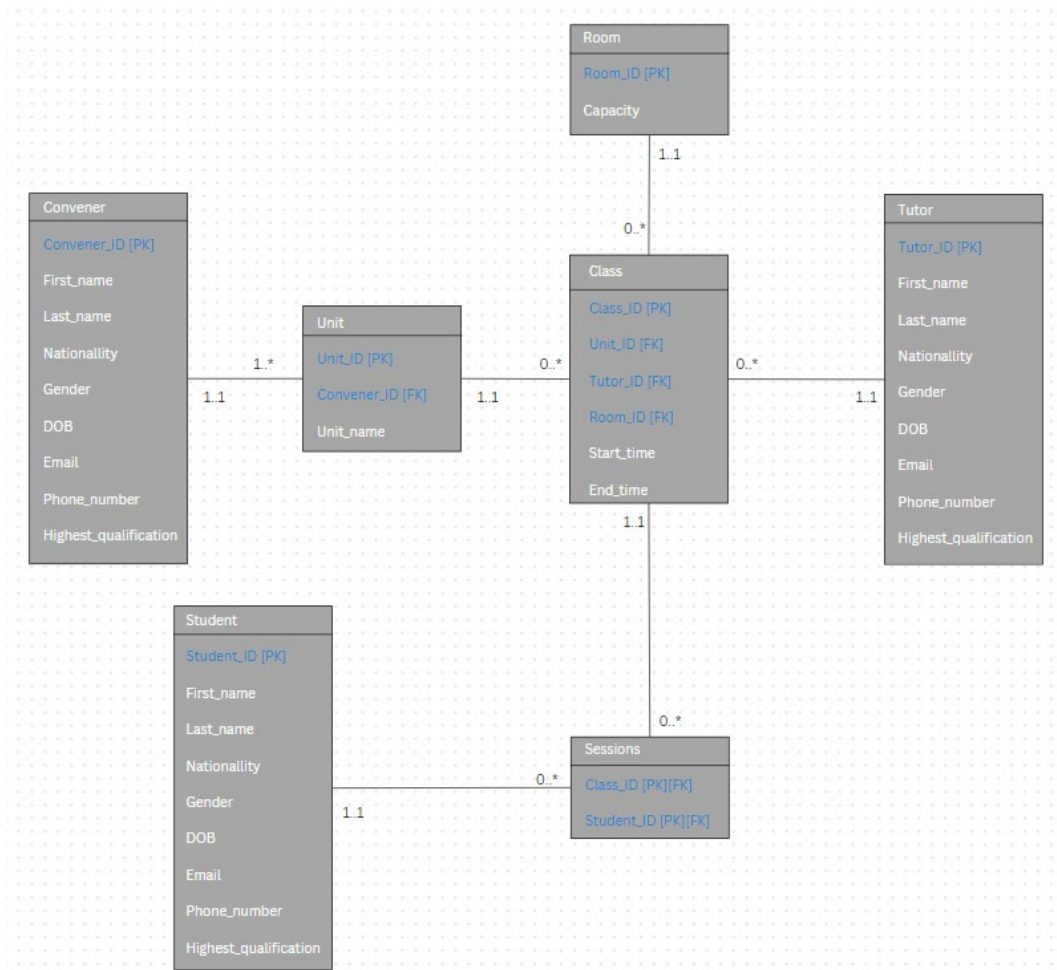


Figure 1: UML Relationship Diagram

3. Normalisation Design

- All tables having no repeating groups and the attributes are atomic -> the design is in 1NF.
- No table has partial dependencies among non-primary attributes because 6 tables have 1 surrogate primary key in each and the Sessions table has no non-primary attributes -> the design is in 2NF.
- There are no transitive dependencies in any table as well due to most of them only have 1 surrogate key and 1 table contains only composite keys -> the design is in 3NF.

4. Database implementation

a) Creating tables

```
CREATE DATABASE Distinction;
USE Distinction;

CREATE TABLE IF NOT EXISTS Convener
(
Convener_ID CHAR(7) NOT NULL,
First_name VARCHAR(15) NOT NULL,
Last_name VARCHAR(15) NOT NULL,
Nationality VARCHAR(15) NOT NULL,
Gender VARCHAR(6) NOT NULL,
DOB DATE NOT NULL,
Email CHAR(19) NOT NULL,
Phone_number CHAR(10) NOT NULL,
Highest_qualification VARCHAR(50),
PRIMARY KEY(Convener_ID)
);

CREATE TABLE IF NOT EXISTS Unit
(
Unit_ID CHAR(8) NOT NULL,
Convener_ID CHAR(7) NOT NULL,
Unit_name VARCHAR(50) NOT NULL,
PRIMARY KEY(Unit_ID),
FOREIGN KEY(Convener_ID) REFERENCES Convener(Convener_ID)
);

CREATE TABLE IF NOT EXISTS Tutor
(
Tutor_ID CHAR(7) NOT NULL,
First_name VARCHAR(15) NOT NULL,
Last_name VARCHAR(15) NOT NULL,
Nationality VARCHAR(15) NOT NULL,
Gender VARCHAR(6) NOT NULL,
DOB DATE NOT NULL,
Email CHAR(19) NOT NULL,
Phone_number CHAR(10) NOT NULL,
Highest_qualification VARCHAR(50),
PRIMARY KEY(Tutor_ID)
);
```

```

CREATE TABLE IF NOT EXISTS Room
(
Room_ID VARCHAR(8) NOT NULL,
Capacity SMALLINT UNSIGNED NOT NULL,
PRIMARY KEY(Room_ID)
);

CREATE TABLE IF NOT EXISTS Class
(
Class_ID CHAR(13) NOT NULL,
Unit_ID CHAR(8) NOT NULL,
Tutor_ID CHAR(7) NOT NULL,
Room_ID VARCHAR(8) NOT NULL,
Start_time CHAR(12) NOT NULL,
End_time CHAR(12) NOT NULL,
PRIMARY KEY(Class_ID),
FOREIGN KEY(Unit_ID) REFERENCES Unit(Unit_ID),
FOREIGN KEY(Tutor_ID) REFERENCES Tutor(Tutor_ID),
FOREIGN KEY(Room_ID) REFERENCES Room(Room_ID)
);

CREATE TABLE IF NOT EXISTS Student
(
Student_ID CHAR(9) NOT NULL,
First_name VARCHAR(15) NOT NULL,
Last_name VARCHAR(15) NOT NULL,
Nationality VARCHAR(15) NOT NULL,
Gender VARCHAR(6) NOT NULL,
DOB DATE NOT NULL,
Email CHAR(29) NOT NULL,
Phone_number CHAR(10) NOT NULL,
Highest_qualification VARCHAR(50) NOT NULL,
PRIMARY KEY(Student_ID)
);

CREATE TABLE IF NOT EXISTS Sessions
(
Class_ID CHAR(13) NOT NULL,
Student_ID CHAR(9) NOT NULL,
PRIMARY KEY(Class_ID, Student_ID),
FOREIGN KEY(Class_ID) REFERENCES Class(Class_ID),
FOREIGN KEY(Student_ID) REFERENCES Student(Student_ID)
);

```

b) Inserting Data Records

```

INSERT INTO Convener(Convener_ID, First_name, Last_name, Nationality, Gender, DOB, Email,
Phone_number, Highest_qualification)
VALUES
    ('1876543', "Henry", "McCartney", "Australian", "Male", "1967-06-05",
"1876543@swin.edu.au", "0414563698", "PhD of Computer Engineering"),
    ('1245678', "Emma", "Vega", "Australian", "Female", "1972-02-04",
"1245678@swin.edu.au", "0444569987", "PhD of Software Engineering")

```

```

;

INSERT INTO Unit(Unit_ID, Convener_ID, Unit_name)
VALUES
    ("COS20007", '1876543', "Object Oriented Programming"),
    ("SWE30009", '1876543', "Software Testing and Reliability"),
    ("TNE30023", '1245678', "Advanced Switching"),
    ("COS20015", '1245678', "Fundamentals of Data Management")
;

INSERT INTO Room(Room_ID, Capacity)
VALUES
    ("ATC405", 30),
    ("BA502", 24),
    ("AMDC301", 35),
    ("EN310", 30),
    ("ATC101", 300)
;

INSERT INTO Tutor(Tutor_ID, First_name, Last_name, Nationality, Gender, DOB, Email,
Phone_number, Highest_qualification)
VALUES
    ('1056321', "John", "Clark", "Australian", "Male", "1985-05-05",
"1256321@swin.edu.au", "0456365213", "Master of Data Science"),
    ('1034567', "Linda", "Li", "Chinese", "Female", "1995-06-23",
"1034567@swin.edu.au", "0435217896", "PhD of Information System"),
    ('1012345', "Michael", "Martin", "American", "Other", "1992-02-24",
"1012345@swin.edu.au", "0416596324", "PhD of ICT"),
    ('1098765', "Ishaan", "Patel", 'Indian', 'Male', '2000-09-29',
'1098765@swin.edu.au', '0425369852', 'PhD of Computer Science'),
    ('1456721', 'Grace', 'Thompson', 'Australian', 'Female', '1976-12-02',
'1456721@swin.edu.au', '0415632025', 'Master of Cyber Security')
;

INSERT INTO Student(Student_ID, First_name, Last_name, Nationality, Gender, DOB, Email,
Phone_number, Highest_qualification)
VALUES
    ('104563214', "Kevin", "Nguyen", "Vietnamese", "Male", "2002-03-14",
"104563214@student.swin.edu.au", "0465369852", "High School Diploma"),
    ('125463978', "Adam", "West", "Australian", "Male", "2004-06-26",
"125463978@student.swin.edu.au", "0423654123", "Foundation"),
    ('102365975', "Jane", "Kelly", "Australian", "Other", "2003-11-06",
"102365975@student.swin.edu.au", "0425369963", "Bachelor of Computer Science"),
    ('123068466', "Sofia", "Garcia", 'Spanish', 'Female', '2004-03-26',
'123068466@student.swin.edu.au', '0432653213', 'High School Diploma'),
    ('168306833', 'Ibrahim', 'Abara', 'Nigerian', 'Male', '2003-12-06',
'168306833@student.swin.edu.au', '0425556321', 'Vocational Education')
;

INSERT INTO Class (Class_ID, Unit_ID, Tutor_ID, Room_ID, Start_time, End_time)
VALUES
    ('COS20007LEC01', 'COS20007', '1098765', 'ATC101', 'Mon 09:00 AM', 'Mon 10:30 AM'),
    ('COS20007WOK01', 'COS20007', '1034567', 'BA502', 'Tue 10:00 AM', 'Tue 11:30 AM'),

```

```
( 'COS20007WOK02', 'COS20007', '1012345', 'AMDC301', 'Wed 01:00 PM', 'Wed 02:30 PM'),
( 'COS20007LAB01', 'COS20007', '1098765', 'BA502', 'Thu 09:30 AM', 'Thu 11:00 AM'),
( 'COS20007LAB02', 'COS20007', '1034567', 'EN310', 'Fri 11:00 AM', 'Fri 12:30 PM'),
( 'COS20007WOK03', 'COS20007', '1456721', 'ATC405', 'Mon 03:00 PM', 'Mon 04:30 PM'),
( 'COS20007LAB03', 'COS20007', '1034567', 'BA502', 'Tue 02:00 PM', 'Tue 03:30 PM'),
( 'COS20007LEC02', 'COS20007', '1056321', 'ATC101', 'Wed 09:00 AM', 'Wed 10:30 AM'),
( 'SWE30009LEC01', 'SWE30009', '1098765', 'ATC101', 'Tue 09:00 AM', 'Tue 10:30 AM'),
( 'SWE30009WOK01', 'SWE30009', '1034567', 'BA502', 'Wed 10:00 AM', 'Wed 11:30 AM'),
( 'SWE30009WOK02', 'SWE30009', '1012345', 'AMDC301', 'Thu 01:00 PM', 'Thu 02:30 PM'),
( 'SWE30009LAB01', 'SWE30009', '1098765', 'BA502', 'Fri 09:30 AM', 'Fri 11:00 AM'),
( 'SWE30009LAB02', 'SWE30009', '1034567', 'EN310', 'Mon 11:00 AM', 'Mon 12:30 PM'),
( 'SWE30009WOK03', 'SWE30009', '1456721', 'ATC405', 'Tue 03:00 PM', 'Tue 04:30 PM'),
( 'SWE30009LAB03', 'SWE30009', '1098765', 'AMDC301', 'Wed 02:00 PM', 'Wed 03:30 PM'),
( 'TNE30023LEC01', 'TNE30023', '1098765', 'ATC101', 'Thu 09:00 AM', 'Thu 10:30 AM'),
( 'TNE30023WOK01', 'TNE30023', '1034567', 'BA502', 'Fri 10:00 AM', 'Fri 11:30 AM'),
( 'TNE30023WOK02', 'TNE30023', '1012345', 'AMDC301', 'Mon 01:00 PM', 'Mon 02:30 PM'),
( 'TNE30023LAB01', 'TNE30023', '1098765', 'BA502', 'Tue 09:30 AM', 'Tue 11:00 AM'),
( 'TNE30023LAB02', 'TNE30023', '1034567', 'EN310', 'Wed 11:00 AM', 'Wed 12:30 PM'),
( 'TNE30023WOK03', 'TNE30023', '1456721', 'ATC405', 'Thu 03:00 PM', 'Thu 04:30 PM'),
( 'TNE30023LAB03', 'TNE30023', '1098765', 'AMDC301', 'Fri 02:00 PM', 'Fri 03:30 PM'),
( 'COS20015LEC01', 'COS20015', '1098765', 'ATC101', 'Mon 09:00 AM', 'Mon 10:30 AM'),
( 'COS20015WOK01', 'COS20015', '1034567', 'BA502', 'Tue 10:00 AM', 'Tue 11:30 AM'),
( 'COS20015WOK02', 'COS20015', '1012345', 'AMDC301', 'Wed 01:00 PM', 'Wed 02:30 PM'),
( 'COS20015LAB01', 'COS20015', '1098765', 'BA502', 'Thu 09:30 AM', 'Thu 11:00 AM'),
( 'COS20015LAB02', 'COS20015', '1034567', 'EN310', 'Fri 11:00 AM', 'Fri 12:30 PM'),
( 'COS20015WOK03', 'COS20015', '1456721', 'ATC405', 'Mon 03:00 PM', 'Mon 04:30 PM'),
( 'COS20015LAB03', 'COS20015', '1098765', 'AMDC301', 'Tue 02:00 PM', 'Tue 03:30 PM')
;
```

```
INSERT INTO Sessions (Class_ID, Student_ID)
VALUES
```

```
( 'COS20007LEC01', '104563214'),
( 'COS20007LEC01', '125463978'),
( 'COS20007WOK01', '102365975'),
( 'COS20007WOK01', '123068466'),
( 'COS20007WOK02', '168306833'),
( 'COS20007LAB01', '104563214'),
( 'COS20007LAB01', '102365975'),
( 'COS20007LAB02', '125463978'),
( 'COS20007WOK03', '123068466'),
( 'COS20007LAB03', '104563214'),
( 'SWE30009LEC01', '102365975'),
( 'SWE30009LEC01', '104563214'),
( 'SWE30009WOK01', '125463978'),
( 'SWE30009WOK01', '168306833'),
( 'SWE30009WOK02', '102365975'),
( 'SWE30009LAB01', '104563214'),
( 'SWE30009LAB02', '123068466'),
( 'SWE30009WOK03', '125463978'),
( 'TNE30023LEC01', '104563214'),
( 'TNE30023LEC01', '125463978'),
( 'TNE30023WOK01', '102365975'),
( 'TNE30023WOK01', '123068466'),
```

```
( 'TNE30023WOK02' , '168306833' ),
( 'TNE30023LAB01' , '104563214' ),
( 'TNE30023LAB02' , '125463978' ),
( 'TNE30023WOK03' , '123068466' ),
( 'COS20015LEC01' , '102365975' ),
( 'COS20015LEC01' , '104563214' ),
( 'COS20015WOK01' , '125463978' ),
( 'COS20015WOK01' , '168306833' )
;
```

c) Results

The screenshot shows MySQL Workbench with a SQL query executed. The query is: `SELECT * FROM Convener;`. The results are displayed in a table with the following columns: `Convener_ID`, `First_name`, `Last_name`, `Nationality`, `Gender`, `DOB`, `Email`, `Phone_number`, and `Highest_qualification`.

Convener_ID	First_name	Last_name	Nationality	Gender	DOB	Email	Phone_number	Highest_qualification
1245678	Dima	Vega	Australian	Female	1972-11-04	1245678@swin.edu.au	0444669987	PhD of Software Engineering
1876543	Henry	McCartney	Australian	Male	1967-06-05	1876543@swin.edu.au	0414563668	PhD of Computer Engineering

The Action Output pane shows the execution of the query, indicating that 2 rows were returned.

Figure 2: Convener table

The screenshot shows MySQL Workbench with a SQL query executed. The query is: `SELECT * FROM Unit;`. The results are displayed in a table with the following columns: `Unit_ID`, `Convener_ID`, and `Unit_name`.

Unit_ID	Convener_ID	Unit_name
COS20007	1876543	Object Oriented Programming
COS20015	1245678	Fundamentals of Data Management
SWE30009	1876543	Software Testing and Reliability
TNE30023	1245678	Advanced Switching

The Action Output pane shows the execution of the query, indicating that 4 rows were returned.

Figure 3: Unit table

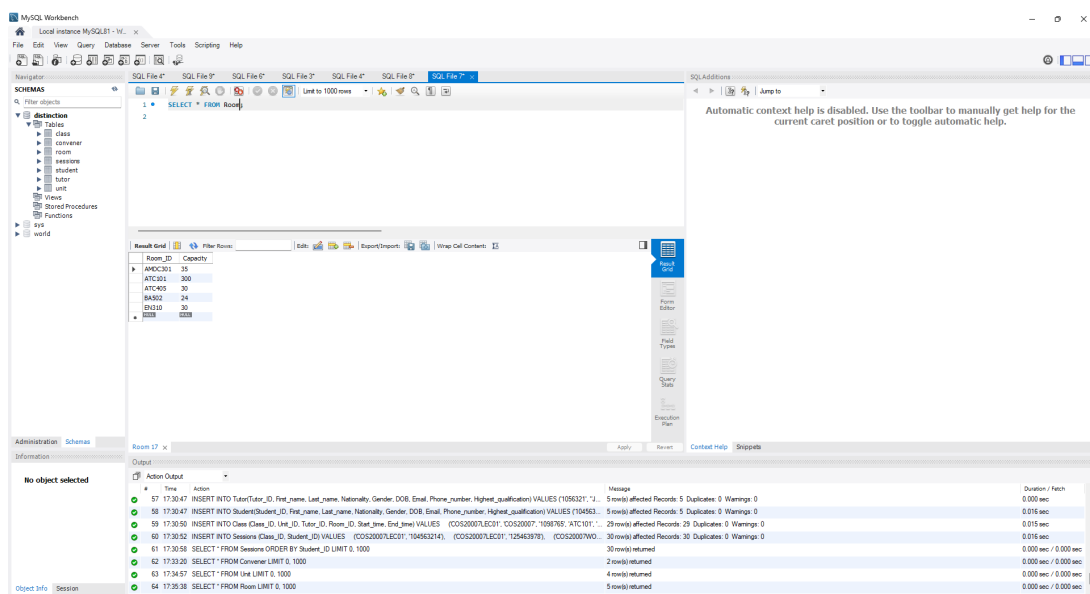


Figure 4: Room table

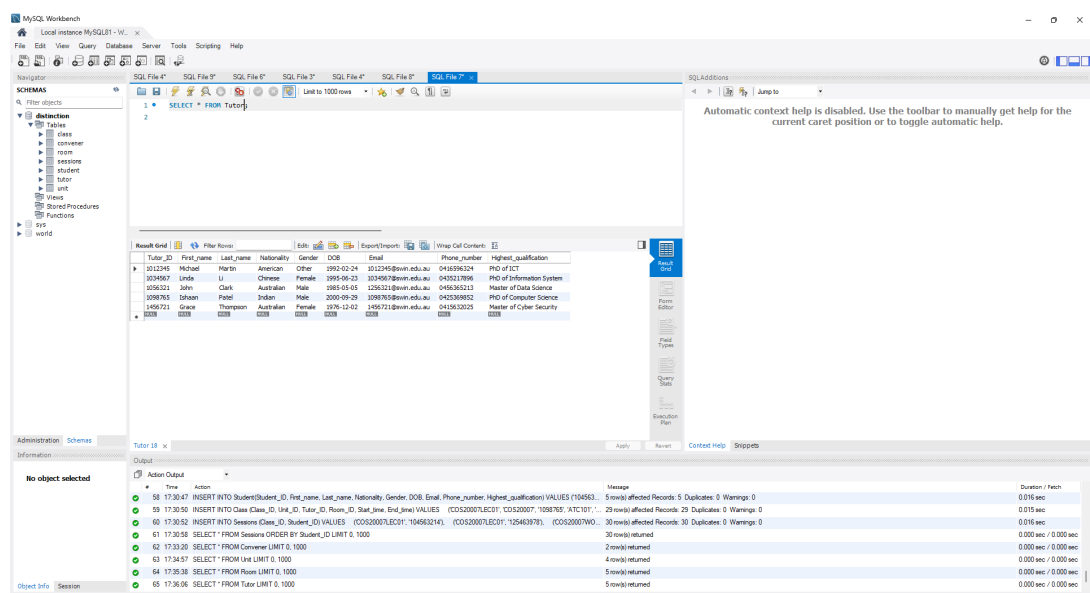


Figure 5: Tutor table

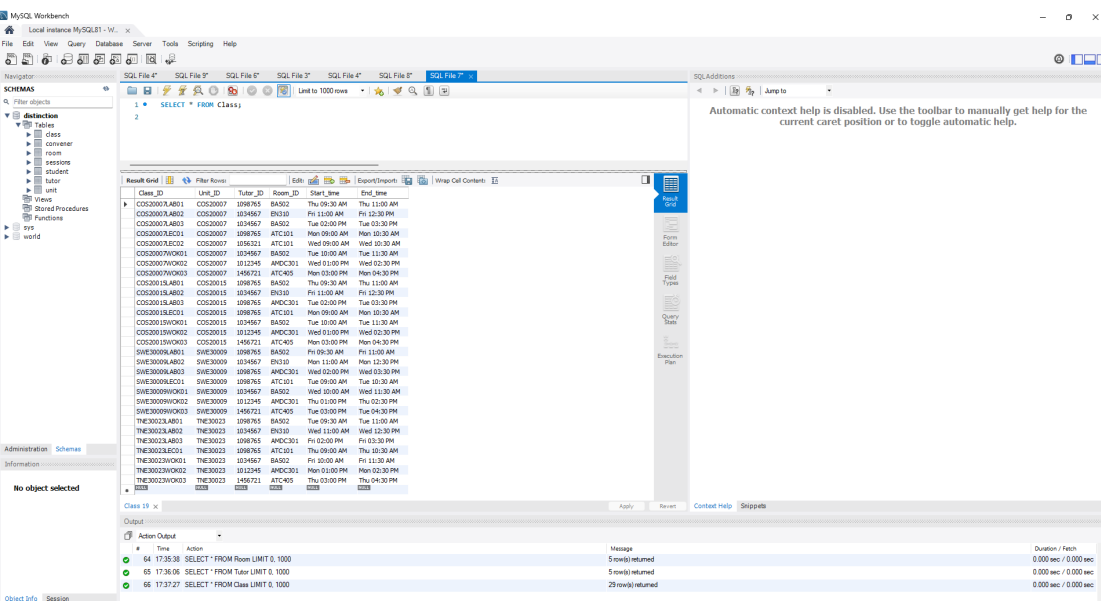


Figure 6: Class table


```

FROM

    Class AS c

INNER JOIN Unit AS u ON c.Unit_ID = u.Unit_ID

INNER JOIN Tutor AS t ON c.Tutor_ID = t.Tutor_ID

INNER JOIN Room AS r ON c.Room_ID = r.Room_ID

LEFT JOIN Sessions AS s ON c.Class_ID = s.Class_ID

GROUP BY c.Class_ID

HAVING Students != 0

ORDER BY c.Class_ID;

```

Result:

The screenshot shows the MySQL Workbench interface. The central SQL editor contains the following query:

```

1 SELECT
2   c.Class_ID,
3   c.Start_time,
4   c.End_time,
5   CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name,
6   r.Room_ID,
7   r.Capacity,
8   COUNT(s.Student_ID) AS Students

```

The Result Grid pane displays the following data:

Class_ID	Start_time	End_time	Tutor_Name	Room_ID	Capacity	Students
COS20007LAB01	Thu 09:30 AM	Thu 11:00 AM	Ishaan Patel	BA502	24	2
COS20007LAB02	Fri 11:00 AM	Fri 12:30 PM	Linda Li	EN310	30	1
COS20007LAB03	Tue 02:00 PM	Tue 03:30 PM	Linda Li	BA502	24	1
COS20007LEC01	Mon 09:00 AM	Mon 10:30 AM	Ishaan Patel	ATC101	300	2
COS20007WOK01	Tue 10:00 AM	Tue 11:30 AM	Linda Li	BA502	24	2
COS20007WOK02	Wed 01:00 PM	Wed 02:30 PM	Michael Martin	AMDC301	35	1
COS20007WOK03	Mon 03:00 PM	Mon 04:30 PM	Grace Thompson	ATC405	30	1
COS20015LEC01	Mon 09:00 AM	Mon 10:30 AM	Ishaan Patel	ATC101	300	2
COS20015WOK01	Tue 10:00 AM	Tue 11:30 AM	Linda Li	BA502	24	2
SWE30009LAB01	Fri 09:30 AM	Fri 11:00 AM	Ishaan Patel	BA502	24	1
SWE30009LAB02	Mon 11:00 AM	Mon 12:30 PM	Linda Li	EN310	30	1
SWE30009LEC01	Tue 09:00 AM	Tue 10:30 AM	Ishaan Patel	ATC101	300	2
SWE30009WOK01	Wed 10:00 AM	Wed 11:30 AM	Linda Li	BA502	24	2
SWE30009WOK02	Thu 01:00 PM	Thu 02:30 PM	Michael Martin	AMDC301	35	1
SWE30009WOK03	Tue 03:00 PM	Tue 04:30 PM	Grace Thompson	ATC405	30	1
TNE30023LAB01	Tue 09:30 AM	Tue 11:00 AM	Ishaan Patel	BA502	24	1
TNE30023LAB02	Wed 11:00 AM	Wed 12:30 PM	Linda Li	EN310	30	1
TNE30023LEC01	Thu 09:00 AM	Thu 10:30 AM	Ishaan Patel	ATC101	300	2
TNE30023WOK01	Fri 10:00 AM	Fri 11:30 AM	Linda Li	BA502	24	2
TNE30023WOK02	Mon 01:00 PM	Mon 02:30 PM	Michael Martin	AMDC301	35	1
TNE30023WOK03	Thu 03:00 PM	Thu 04:30 PM	Grace Thompson	ATC405	30	1

The bottom pane shows error messages:

```

# Time Action
21 22:39:17 SELECT c.Class_ID, c.Start_time, c.End_time, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, r.Room_ID, r.Capacity, COU... Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use ne... 0.000 sec / Fetch
22 22:39:26 SELECT c.Class_ID, c.Start_time, c.End_time, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, r.Room_ID, r.Capacity, COU... Error Code: 1111. Invalid use of group function 0.000 sec
23 22:39:42 SELECT c.Class_ID, c.Start_time, c.End_time, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, r.Room_ID, r.Capacity, COU... Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use ne... 0.000 sec
24 22:40:35 SELECT c.Class_ID, c.Start_time, c.End_time, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, r.Room_ID, r.Capacity, COU... 21 row(s) returned 0.000 sec / 0.000 sec

```

Figure 9: Query 1's result

- This query returns detailed information about class sessions that have at least 1 student attending using LEFT JOIN.

b) Query 2:

```

SELECT
    c.Tutor_ID,
    CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name,
    c.Class_ID,
    c.Start_time,

```

```

    c.End_time,
    r.Room_ID
FROM
    Class AS c
INNER JOIN Tutor AS t ON c.Tutor_ID = t.Tutor_ID
INNER JOIN Unit AS u ON c.Unit_ID = u.Unit_ID
INNER JOIN Room AS r ON c.Room_ID = r.Room_ID
WHERE c.Start_time LIKE '%Mon%'
GROUP BY c.Tutor_ID, Tutor_Name, c.Class_ID, c.Start_time, c.End_time, r.Room_ID
ORDER BY c.Class_ID;

```

Result:

The screenshot shows the MySQL Workbench interface. The SQL Editor contains the following query:

```

SELECT
    c.Tutor_ID,
    CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name,
    c.Class_ID,
    c.Start_time,
    c.End_time,
    r.Room_ID
FROM
    Class AS c
INNER JOIN Tutor AS t ON c.Tutor_ID = t.Tutor_ID
INNER JOIN Unit AS u ON c.Unit_ID = u.Unit_ID
INNER JOIN Room AS r ON c.Room_ID = r.Room_ID
WHERE c.Start_time LIKE 'Mon%'
GROUP BY c.Tutor_ID, Tutor_Name, c.Class_ID, c.Start_time, c.End_time, r.Room_ID
ORDER BY c.Class_ID;

```

The Results tab shows the following data:

Tutor_ID	Tutor_Name	Class_ID	Start_time	End_time	Room_ID
1098765	Ishaan Patel	COS20007LEC01	Mon 09:00 AM	Mon 10:30 AM	ATC101
1456721	Grace Thompson	COS20007WOK03	Mon 03:00 PM	Mon 04:30 PM	ATC405
1098765	Ishaan Patel	COS20015LEC01	Mon 09:00 AM	Mon 10:30 AM	ATC101
1456721	Grace Thompson	COS20015WOK03	Mon 03:00 PM	Mon 04:30 PM	ATC405
1034567	Linda Li	SWE30009AB02	Mon 11:00 AM	Mon 12:30 PM	EN310
1012245	Michael Martin	TNE30023WOK02	Mon 01:00 PM	Mon 02:30 PM	AMDC301

The Output tab shows the execution log with the following messages:

```

# Time Action Message
38 23:12:14 SELECT c.Tutor_ID, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, c.Class... 6 row(s) returned
39 23:12:15 SELECT c.Tutor_ID, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, c.Class... 6 row(s) returned
40 23:12:17 SELECT c.Tutor_ID, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, c.Class... 6 row(s) returned
41 23:12:24 SELECT c.Tutor_ID, CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name, c.Class... 6 row(s) returned

```

Figure 10: Query 2's result

- This query returns the tutors that have classes on Monday.

c) Query 3:

```

SELECT
    c.Class_ID,
    c.Start_time,
    c.End_time,
    c.Room_ID,
    COUNT(s.Student_ID) AS Students
FROM

```

```

Sessions AS s
RIGHT JOIN Class AS c ON s.Class_ID = c.Class_ID
GROUP BY c.Class_ID
ORDER BY Students DESC;

```

Result:

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Class_ID	Start_time	End_time	Room_ID	Students
COS20007LAB01	Thu 09:30 AM	Thu 11:00 AM	BA502	2
COS20007LEC01	Mon 09:00 AM	Mon 10:30 AM	ATC101	2
COS20007WOK01	Tue 10:00 AM	Tue 11:30 AM	BA502	2
COS20015LEC01	Mon 09:00 AM	Mon 10:30 AM	ATC101	2
COS20015WOK01	Tue 10:00 AM	Tue 11:30 AM	BA502	2
SWE30009LEC01	Tue 09:00 AM	Tue 10:30 AM	ATC101	2
SWE30009WOK01	Wed 10:00 AM	Wed 11:30 AM	BA502	2
TNE30023LEC01	Thu 09:00 AM	Thu 10:30 AM	ATC101	2
TNE30023WOK01	Fri 10:00 AM	Fri 11:30 AM	BA502	2
COS20007LAB02	Fri 11:00 AM	Fri 12:30 PM	EN310	1
COS20007LAB03	Tue 02:00 PM	Tue 03:30 PM	BA502	1
COS20007WOK02	Wed 01:00 PM	Wed 02:30 PM	AMDC301	1
COS20007WOK03	Mon 03:00 PM	Mon 04:30 PM	ATC405	1
SWE30009LAB01	Fri 09:30 AM	Fri 11:00 AM	BA502	1
SWE30009LAB02	Mon 11:00 AM	Mon 12:30 PM	EN310	1
SWE30009WOK02	Thu 01:00 PM	Thu 02:30 PM	AMDC301	1
SWE30009WOK03	Tue 03:00 PM	Tue 04:30 PM	ATC405	1
TNE30023LAB01	Tue 09:30 AM	Tue 11:00 AM	BA502	1
TNE30023LAB02	Wed 11:00 AM	Wed 12:30 PM	EN310	1
TNE30023WOK02	Mon 01:00 PM	Mon 02:30 PM	AMDC301	1
TNE30023WOK03	Thu 03:00 PM	Thu 04:30 PM	ATC405	1
COS20007LEC02	Wed 09:00 AM	Wed 10:30 AM	ATC101	0
COS20015LAB01	Thu 09:30 AM	Thu 11:00 AM	BA502	0
COS20015LAB02	Fri 11:00 AM	Fri 12:30 PM	EN310	0
COS20015LAB03	Tue 02:00 PM	Tue 03:30 PM	AMDC301	0
COS20015WOK02	Wed 01:00 PM	Wed 02:30 PM	AMDC301	0
COS20015WOK03	Mon 03:00 PM	Mon 04:30 PM	ATC405	0
SWE30009LAB03	Wed 02:00 PM	Wed 03:30 PM	AMDC301	0
TNE30023LAB03	Fri 02:00 PM	Fri 03:30 PM	AMDC301	0

Figure 11: Query 3's result

- This query returns all classes in the order from most attending students to 0 attendance using RIGHT JOIN.

d) Query 4:

```

SELECT
    u.Unit_name,
    u.Unit_ID,
    COUNT(s.Student_ID) AS Enrolled_Students
FROM
    Unit AS u
LEFT JOIN Class AS c ON u.Unit_ID = c.Unit_ID
LEFT JOIN Sessions AS s ON c.Class_ID = s.Class_ID
GROUP BY u.Unit_name, u.Unit_ID

```

```
ORDER BY Enrolled_Students DESC;
```

Result:

The screenshot shows the MySQL Workbench interface. The SQL editor contains the following query:

```
1 SELECT
2   u.Unit_name,
3   u.Unit_ID,
4   COUNT(s.Student_ID) AS Enrolled_Students
5 FROM
6   Unit AS u
7 LEFT JOIN Class AS c ON u.Unit_ID = c.Unit_ID
8 LEFT JOIN Sessions AS s ON c.Class_ID = s.Class_ID
9 GROUP BY u.Unit_name, u.Unit_ID
10 ORDER BY Enrolled_Students DESC;
```

The Result Grid shows the following data:

Unit_name	Unit_ID	Enrolled_Students
Object Oriented Programming	COS20007	10
Software Testing and Reliability	SWE30009	8
Advanced Switching	TNE30023	8
Fundamentals of Data Management	COS20015	4

The Output pane shows the execution log with the following messages:

```
75 10:22:58 SELECT u.Unit_name, c.Unit_ID, COUNT(s.Student_ID) AS Students FROM Class A... 15 row(s) returned
76 10:23:36 SELECT u.Unit_name, u.Unit_ID, COUNT(s.Student_ID) AS Students FROM Class A... Error Code: 1055. Expression #2 of SELECT list is not in GROUP BY clause and contains nonaggregated column 'u.Unit_ID' which is not functionally dependent on columns in GROUP BY clause; this... 4 row(s) returned
77 10:23:41 SELECT u.Unit_name, u.Unit_ID, COUNT(s.Student_ID) AS Students FROM Class A... 4 row(s) returned
78 10:25:06 SELECT u.Unit_name, u.Unit_ID, COUNT(s.Class_ID) AS Students FROM Class AS c... 4 row(s) returned
79 10:27:44 SELECT u.Unit_name, u.Unit_ID, COUNT(s.Class_ID) AS Classes FROM Unit AS u... 4 row(s) returned
80 10:27:59 SELECT u.Unit_name, u.Unit_ID, COUNT(s.Student_ID) AS Enrolled_Students FROM... 4 row(s) returned
81 10:28:59 SELECT u.Unit_name, u.Unit_ID, COUNT(s.Student_ID) AS Enrolled_Students FROM... Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'GROUP BY u.Unit_name, u.Unit_ID ORDER BY Enroll... 0.000 sec
82 10:29:08 SELECT u.Unit_name, u.Unit_ID, COUNT(s.Student_ID) AS Enrolled_Students FROM... 4 row(s) returned
```

Figure 12: Query 4's result

- This query returns the number of students enrolled in classes of each unit.

e) Query 5:

```
SELECT
  t.Tutor_ID,
  CONCAT(t.First_name, ' ', t.Last_name) AS Tutor_Name,
  COUNT(s.Student_ID) AS Students
FROM Tutor as t
LEFT OUTER JOIN Class AS c ON t.Tutor_ID = c.Tutor_ID
LEFT OUTER JOIN Sessions AS s ON c.Class_ID = s.Class_ID
GROUP BY t.Tutor_ID
ORDER BY Tutor_Name;
```

Result:

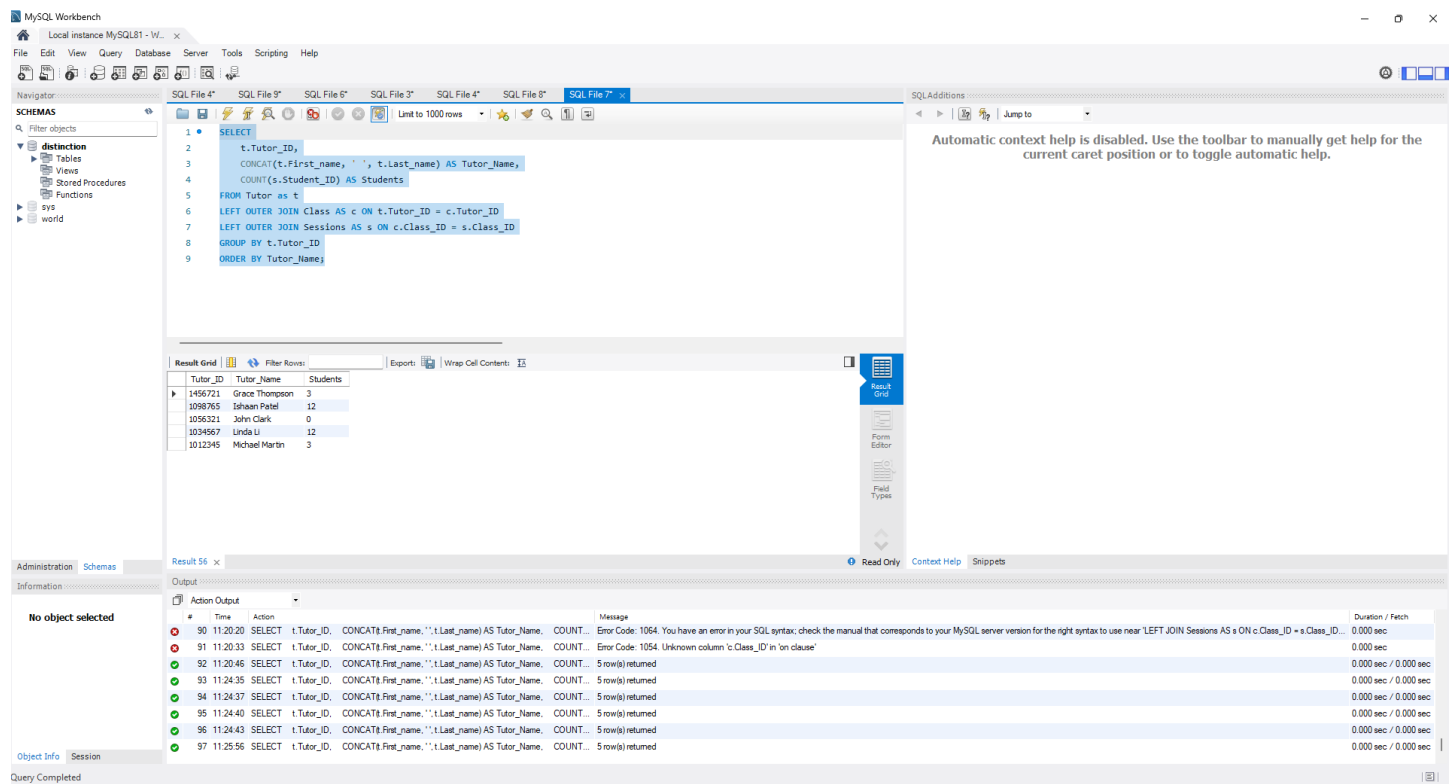


Figure 13: Query 5's result

- This query returns the number of students that a tutor is teaching every week.

6. Link to Presentation Video (In case the submitted video has issues)

<https://youtu.be/bpLih1vGkDw>