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Project Title: **SMPweb** **Technical Report**

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A. SMPweb System

SMPweb is a student information system that was designed by National University of Malaysia. Like from others university, it also has same objective to manage student data which is to store and track all the students information including their grades, biodata of student, record of registered course, class schedule and others. Students need to login this system by using their matric number and password. Using this system, the administration can reduce the time spent on maintaining and organizing the student data.

Besides that, student can also drop their registered course if the schedule of that course is clashed by another course. They can update their profile from time to time if they want to make some changes. In addition, SMPweb is able to manage, store and organize all information about students in efficient ways. It also ensure the data for integrity, privacy and secure in this system.

A.1 Report 1 – Entity Relationship Diagram

This report consists of information related to conceptual database design for the case study

A.1.1 Introduction

This part is all about conceptual database design and ER diagram of the system. Conceptual design is an initial phase that involve to create database. It is important to come up with a general concept before proceeding. The purpose of the conceptual design phase is to build a conceptual model based on identified requirements. A commonly used conceptual model is called an entity-relationship diagram.

As a team, we need to identify what is the specific and detailed of entities, attributes and relationships for the ER diagram and the database design for SMPweb. We also doing background research and specifying the requirements in this system. In addition, conceptual design will help us to clearly understand and define the problem to be solved.

A.1.2 Case Background

In recent decades, the world has seen tremendous growth in technology. With clouding and data storage necessity, many organization have opened their gates to simplify procedures by reducing human effort. This is because, mishandling of data is the biggest concerns in many organization. Therefore, SMPweb system had designed as a student information system in National University of Malaysia. All information about students must be stored and organize and able to manage in this system in efficient ways.

Using this system, the student can review their profile detail such as name, address, email and others. If they want to make some changes, they need to update their profile to the latest information. For each semester, they need to register the courses and they can choose which set that they want to take. They can drop the courses if the course is not compatible for them. The administration also able to keep track student record for the course that has been enrolled.

The total credits taken by a student must not exceed the limit of credits for each mode. As we know, students in full time mode in this university, they can only take up to 20 credits for each semester. However, if they want to take more credits than that, students need to apply manually through their head of programme and cannot apply it in this system.

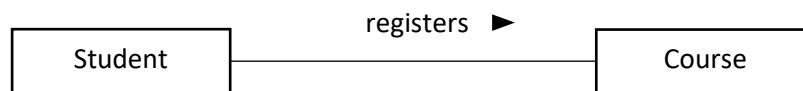
A.1.3 Business Process & Rules

Student will be the main user in this system. They will be able to access their academic record and performance by using this system. Below are the process that involved in SMPweb.

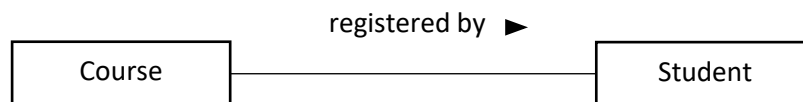
- Each student need register one to many course
- One course can be registered by many students
- Each student can take only one program
- A program can be taken by many students

A.1.4 Conceptual Database Design

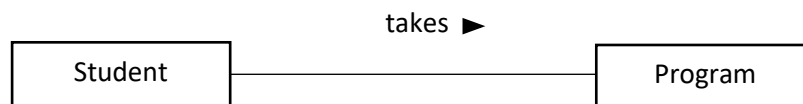
- Each student need register one to many course



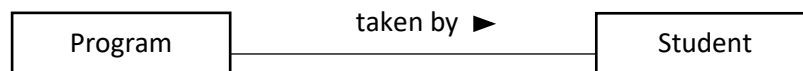
- One course can be registered by many students



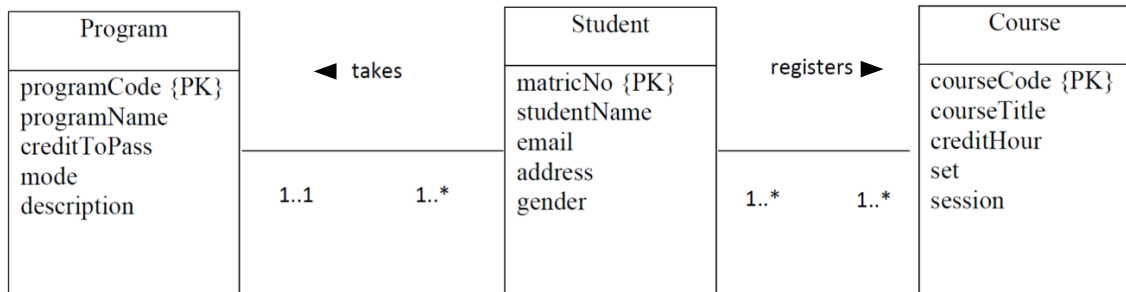
- Each student takes only one program



- A program can be taken by many students



A.1.5 Entity Relationship Diagram (ERD) using UML Notation



A.1.6 Conclusion

There are 3 entities involved in the SMPweb which are Student, Program, Course. Primary key for entity Student is matricNo while for entity Program is programCode. courseCode is primary key for entity Course.

The main idea for this system is that one student can take only one program and a program can be taken by many students. One student can register one to many course and a course can be registered by many students. The relationship between Student and Program is one to one and Student between Course is many to many. The assumption that can be made is that each student need to take only one program and can register to many courses.

A.2 Report 2 – Normalization

This report consists of information related to logical database design for the case study

A.2.1 Introduction

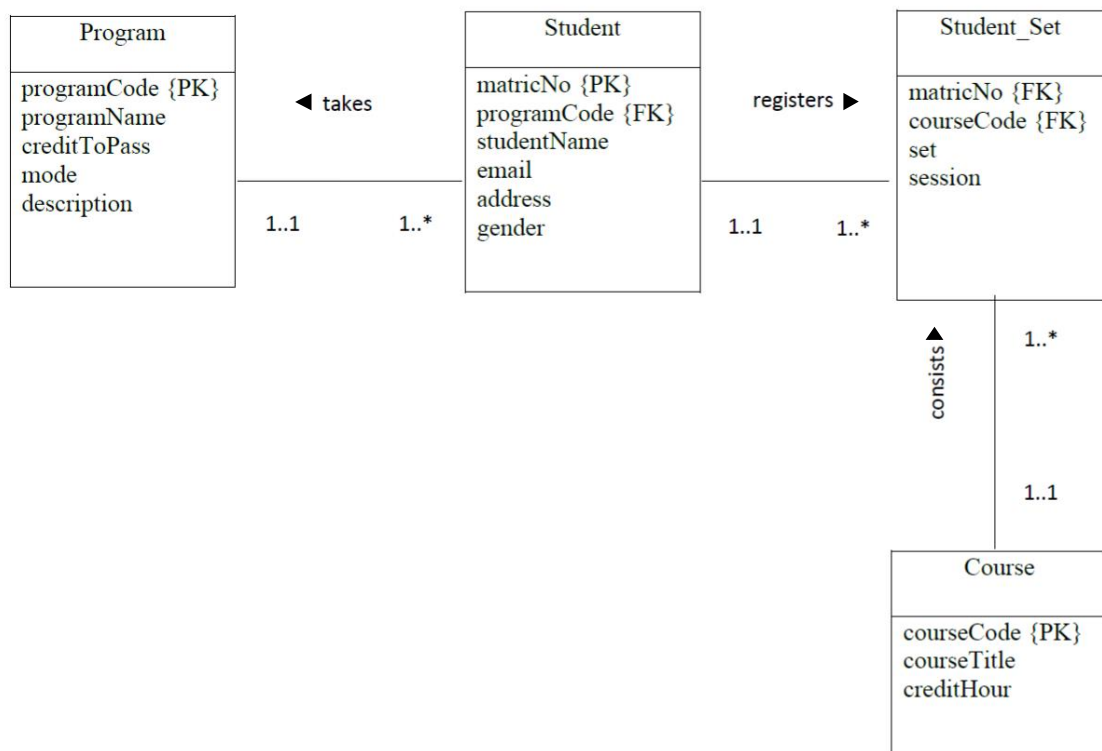
Normalization is a relation between attributes by producing data into sets or tables for further maintenance. Database normalization is needed for our system because we need to verify our previous ERD about SMPweb. Normalization is basically to organise the data into tables so that we could easily update or make any modifications to the system efficiently without losing data. There are a few reasons to normalise a database.

The main purpose is to make the database more effective. This objective can be achieved by preventing anomalies from happening. For example, we would want to prevent the same data from being stored in more than one place that would cause redundancy. This is called an insert anomaly. Sometimes, there is a need to update the database as new recruits registered and ensure that some data is updated but not others. This is called an update anomaly. Lastly, a delete anomaly that happens when a data is not being deleted when it is supposed to be, or data being lost when it is not supposed to. In addition to that, a good normalised database could reduce the storage space that is needed and be able to ensure that queries can run as fast as possible without lagging. Thus, this can secure that the data is accurate and constantly up-to-date by any time. Regarding the matter, the fundamentals of normalization can be achieved which is to minimize the number of attributes, reduce any redundancy and to find attributes with close relationships. All of this can be obtained after disposing the anomalies and a reasonable ERD can be made out of it.

There are two ways of approach for normalization. The first is a bottom-up technique. Normalization is made after collecting raw data and attaining ERD from it. The other technique is called validation technique which we would be using in this process. An ERD is made after the collecting of raw data and followed by normalization from the same data to verify the preceding ERD. To conclude, normalization is important to make sure that the system can operate well and its functionalities are used to its extent.

A.2.2 Logical Database Design

Logical database design is the process of transforming a conceptual database design. It also provides more details than the conceptual database design including attributes, primary and foreign keys other than the entities and the relationships. In our previous part, our ER diagram has many to many relationship between Student and Course. Hence, we separate this two entities and create relationships between them with a new intersect entity, which is Student_Set. This is because, DBMS cannot directly implement many to many relationship therefore they are decomposed into two another relationships.



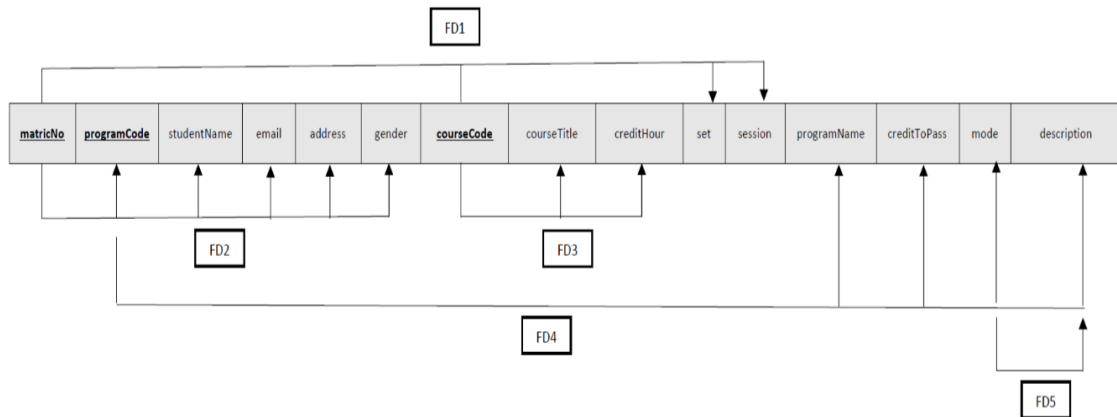
A.2.3 Table and Records

UNF Table

matricNo	programCode	studentName	email	address	gender	courseCode	courseTitle	creditHour	set	session	programName	creditToPass	mode	description
A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M	TTTE3053	Software Testing	3	1	18/19	Bachelor of Software Engineering	132	Full Time	Only take 15 to 20 credits per semester
						TTTE3088	Software Design	3	2	18/19				
A176566	CS001	Farah binti Akim	A176566@siswa.ukm.edu.my	No 2, Taman Permai, Kuantan	F	TTTS3088	Artificial Intelligence	3	2	19/20	Bachelor of Computer Science	132	Part Time	Only take 9 to 14 credits per semester
						TTTT1022	Data Analysis	2	1	19/20				
A174321	SE004	Hasif bin Anuri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M	TTTE3053	Software Testing	3	1	18/19	Bachelor of Software Engineering	132	Full Time	Only take 15 to 20 credits per semester
						TTTT1022	Data Analysis	2	1	18/19				
A179877	EC002	Ahmad bin Nam	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M	EPPD1013	Microeconomic	3	3	19/20	Bachelor of Economic	121	Full Time	Only take 15 to 20 credits per semester
						EPPD1113	Business	4	2	19/20				
A178999	EC002	Siti binti Yassin	A178999@siswa.ukm.edu.my	No 4, Taman Aman, Cheras	F	EPPD1113	Business	4	2	19/20	Bachelor of Economic	121	Full Time	Only take 15 to 20 credits per semester
A171112	EC003	Siew Mei	A171112@siswa.ukm.edu.my	No 5, Taman Ria, Klang	F	EPPD1017	Math for Economic	4	2	18/19	Bachelor of Entrepreneur	121	Part Time	Only take 9 to 14 credits per semester

A.2.4 Functional Dependencies

FD Diagram



FD List

FD1 : matricNo, courseCode → set, session (partial)

FD2 : matricNo → programCode, studentName, email, address, gender (partial)

FD3 : courseCode → courseTitle, creditHour (partial)

FD4 : programCode → programName, creditToPass, mode, description (partial)

FD5 : mode → description (transitive)

A.2.5 Normalization Process

1NF (Remove Repeating Group)

Student_Course (matricNo, programCode, courseCode, studentName, email, address, gender, courseTitle, creditHour, set, session, programName, creditToPass, mode, description)

<u>matricNo</u>	<u>programCode</u>	studentName	email	address	gender	<u>courseCode</u>	courseTitle	creditHour	set	session	programName	creditToPass	mode	description
A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M	TTTE3053	Software Testing	3	1	18/19	Bachelor of Software Engineering	132	Full Time	Only take 15 to 20 credits per semester
A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M	TTTE3088	Software Design	3	2	18/19	Bachelor of Software Engineering	132	Full Time	Only take 15 to 20 credits per semester
A176566	CS001	Farah binti Akim	A176566@siswa.ukm.edu.my	No 2, Taman Permai, Kuantan	F	TTTS3088	Artificial Intelligence	3	2	19/20	Bachelor of Computer Science	132	Part Time	Only take 9 to 14 credits per semester
A176566	CS001	Farah binti Akim	A176566@siswa.ukm.edu.my	No 2, Taman Permai, Kuantan	F	TTTT1022	Data Analysis	2	1	19/20	Bachelor of Computer Science	132	Part Time	Only take 9 to 14 credits per semester
A174321	SE004	Hasif bin Amri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M	TTTE3053	Software Testing	3	1	18/19	Bachelor of Software Engineering	132	Full Time	Only take 15 to 20 credits per semester
A174321	SE004	Hasif bin Amri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M	TTTT1022	Data Analysis	2	1	18/19	Bachelor of Software Engineering	132	Full Time	Only take 15 to 20 credits per semester
A179877	EC002	Ahmad bin Naim	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M	EPPD1013	Microeconomic	3	3	19/20	Bachelor of Economic	121	Full Time	Only take 15 to 20 credits per semester
A179877	EC002	Ahmad bin Naim	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M	EPPD1113	Business	4	2	19/20	Bachelor of Economic	121	Full Time	Only take 15 to 20 credits per semester
A178999	EC002	Siti binti Yassin	A178999@siswa.ukm.edu.my	No 4, Taman Aman, Cheras	F	EPPD1113	Business	4	2	19/20	Bachelor of Economic	121	Full Time	Only take 15 to 20 credits per semester
A171112	EC003	Siew Mei	A171112@siswa.ukm.edu.my	No 5, Taman Ria, Klang	F	EPPD1017	Math for Economic	4	2	18/19	Bachelor of Entrepreneur	121	Part Time	Only take 9 to 14 credits per semester

2NF (Remove Partial)

Student (matricNo, programCode, studentName, email, address, gender)

<u>matricNo</u>	programCode	studentName	email	address	gender
A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M
A176566	CS001	Farah binti Akim	A176566@siswa.ukm.edu.my	No 2, Taman Permai, Kuantan	F
A174321	SE004	Hasif bin Amri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M
A179877	EC002	Ahmad bin Naim	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M
A178999	EC002	Siti binti Yassin	A178999@siswa.ukm.edu.my	No 4, Taman Aman, Cheras	F
A171112	EC003	Siew Mei	A171112@siswa.ukm.edu.my	No 5, Taman Ria, Kluang	F

Course (courseCode, courseTitle, creditHour)

<u>courseCode</u>	courseTitle	creditHour
TTTE3053	Software Testing	3
TTTE3088	Software Design	3
TTTS3088	Artificial Intelligence	3
TTTT1022	Data Analysis	2
EPPD1013	Microeconomic	3
EPPD1113	Business	4
EPPD1017	Math for Economic	4

Program (programCode, programName, creditToPass, mode, description)

<u>programCode</u>	programName	creditToPass	mode	description
SE004	Bachelor of Software Engineering	132	Full Time	Only take 15 to 20 credits per semester
CS001	Bachelor of Computer Science	132	Part Time	Only take 9 to 14 credits per semester
EC002	Bachelor of Economic	121	Full Time	Only take 15 to 20 credits per semester
EC003	Bachelor of Entrepreneur	121	Part Time	Only take 9 to 14 credits per semester

Student_Set (matricNo, courseCode, set, session)

<u>matricNo</u>	<u>courseCode</u>	set	session
A173432	TTTE3053	1	18/19
A173432	TTTE3088	2	18/19
A176566	TTTS3088	2	19/20
A176566	TTTT1022	1	19/20
A174321	TTTT1022	1	18/19
A174321	TTTE3053	1	18/19
A179877	EPPD1013	3	19/20
A179877	EPPD1113	2	19/20
A178999	EPPD1113	2	19/20
A171112	EPPD1017	2	18/19

3NF (Remove Transitive)

Student (matricNo, programCode, studentName, email, address, gender)

<u>matricNo</u>	programCode	studentName	email	address	gender
A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M
A176566	CS001	Farah binti Akim	A176566@siswa.ukm.edu.my	No 2, Taman Permai, Kuantan	F
A174321	SE004	Hasif bin Amri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M
A179877	EC002	Ahmad bin Naim	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M
A178999	EC002	Siti binti Yassin	A178999@siswa.ukm.edu.my	No 4, Taman Aman, Cheras	F
A171112	EC003	Siew Mei	A171112@siswa.ukm.edu.my	No 5, Taman Ria, Kluang	F

Course (courseCode, courseTitle, creditHour)

<u>courseCode</u>	courseTitle	creditHour
TTTE3053	Software Testing	3
TTTE3088	Software Design	3
TTTS3088	Artificial Intelligence	3
TTTT1022	Data Analysis	2
EPPD1013	Microeconomic	3
EPPD1113	Business	4
EPPD1017	Math for Economic	4

Program (programCode, programName, creditToPass, mode)

<u>programCode</u>	programName	creditToPass	mode
SE004	Bachelor of Software Engineering	132	Full Time
CS001	Bachelor of Computer Science	132	Part Time
EC002	Bachelor of Economic	121	Full Time
EC003	Bachelor of Entrepreneur	121	Part Time

Student_Set (matricNo, courseCode, set, session)

<u>matricNo</u>	<u>courseCode</u>	set	session
A173432	TTTE3053	1	18/19
A173432	TTTE3088	2	18/19
A176566	TTTS3088	2	19/20
A176566	TTTT1022	1	19/20
A174321	TTTT1022	1	18/19
A174321	TTTE3053	1	18/19
A179877	EPPD1013	3	19/20
A179877	EPPD1113	2	19/20
A178999	EPPD1113	2	19/20
A171112	EPPD1017	2	18/19

Mode (mode, description)

<u>mode</u>	description
Full Time	Only take 15 to 20 credits per semester
Part Time	Only take 9 to 14 credits per semester

A.2.6 Conclusion

In conclusion, normalization is an important process for a database as it organizes the attributes of the database to minimize or eliminate data redundancy. This can be achieved by storing each data only once in the database. It also removes any type of error and undesirable characteristic like insertion, update and deletion anomalies that might exist in the database design.

SMPweb uses the normalization process to avoid any data redundancy and ensure data dependencies, stored logically and eliminate any useless data. It also makes the data organized well and tidy as no undesirable characteristic anomalies can occur.

A.3 Report 3 – Structured Query Language (SQL)

This report consists of information related to Data Definition and Data Manipulation for the case study.

A.3.1 Introduction

After following the normalization process, we will obtain a more detailed Entity Relationship Diagram (ERD) from the third normal form (3NF). This process is necessary as it will prevent anomalies before proceeding onto the next step which is creating a database.

To create a database, one must know which relational database management system (DBMS) to use such as MySQL, QuickBase, Oracle and many more. We would use MS Access as it is quick and easy to create database systems and it is also well known which we could get support from the community. In order to perform the main objective, we would need to familiarize ourselves with the Structured Query Language (SQL) which is used to communicate with a database. It is also the standard language for relational DBMS. SQL statements are used to perform tasks such as updating or retrieving data on the database.

We could categorize the SQL statements into Data Definition Language (DDL) and Data Manipulation Language (DML) which have different commands to transfer data into the preferred system requirement. DDL is used to make data introduced and define the column of the table. Basically, DDL is to create and refine the basic structure of the table which will hold the data in. Next, DML is used to add, retrieve or update data in the database. If DDL is used to alter columns, DML is used to alter its rows by information that is keyed in by the user.

A.3.2 Data Definition

1. Table Course

```
CREATE TABLE Course(
  courseCode varchar(8) NOT NULL,
  courseTitle varchar(100) NOT NULL,
  creditHour int NOT NULL,
  PRIMARY KEY(courseCode)
)
```

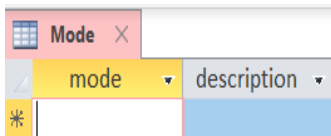
Course	courseCode	courseTitle	creditHour
*			

```
INSERT INTO Course VALUES('EPPD1013', 'Microeconomic', 3);
INSERT INTO Course VALUES('EPPD1017', 'Math for Economic', 4);
INSERT INTO Course VALUES('EPPD1113', 'Business', 4);
INSERT INTO Course VALUES('TTTE3053', 'Software Testing', 3);
INSERT INTO Course VALUES('TTTE3088', 'Software Design', 3);
INSERT INTO Course VALUES('TTTS3088', 'Artificial Intelligence', 3);
INSERT INTO Course VALUES('TTTT1022', 'Data Analysis', 2);
```

Course	courseCode	courseTitle	creditHour
+	EPPD1013	Microeconomic	3
+	EPPD1017	Math for Economic	4
+	EPPD1113	Business	4
+	TTTE3053	Software Testing	3
+	TTTE3088	Software Design	3
+	TTTS3088	Artificial Intelligence	3
+	TTTT1022	Data Analysis	2

2. Table Mode

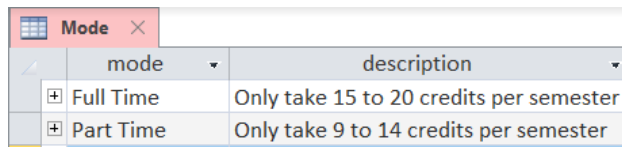
```
CREATE TABLE Mode(
mode varchar(30) NOT NULL,
description varchar(100) NOT NULL,
PRIMARY KEY(mode)
)
```



mode	description

```
INSERT INTO Mode VALUES('Full Time', 'Only take 15 to 20
credits per semester');
```

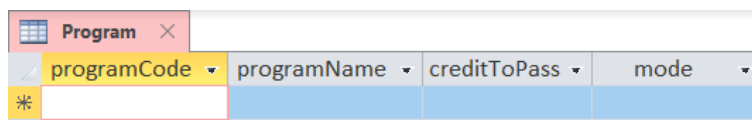
```
INSERT INTO Mode VALUES('Part Time', 'Only take 9 to 14
credits per semester');
```



mode	description
Full Time	Only take 15 to 20 credits per semester
Part Time	Only take 9 to 14 credits per semester

3. Table Program

```
CREATE TABLE Program(
programCode varchar(5) NOT NULL,
programName varchar(100) NOT NULL,
creditToPass int NOT NULL,
mode varchar(30) NOT NULL,
PRIMARY KEY(programCode),
FOREIGN KEY(mode)
REFERENCES Mode(mode)
)
```



programCode	programName	creditToPass	mode

```
INSERT INTO Program VALUES('CS001', 'Bachelor of Computer
Science', 132, 'Part Time');
```

```
INSERT INTO Program VALUES('EC002', 'Bachelor of Economic',
121, 'Full Time');
```

```
INSERT INTO Program VALUES('EC003', 'Bachelor of
Entrepreneur', 121, 'Part Time');
```

```
INSERT INTO Program VALUES('SE004', 'Bachelor of Software
Engineering', 132, 'Full Time');
```

Program				
	programCode	programName	creditToPass	mode
+	CS001	Bachelor of Computer Science	132	Part Time
+	EC002	Bachelor of Economic	121	Full Time
+	EC003	Bachelor of Entrepreneur	121	Part Time
+	SE004	Bachelor of Software Engineering	132	Full Time

4. Table Student

```
CREATE TABLE Student(
matricNo varchar(7) NOT NULL,
programCode varchar(5) NOT NULL,
studentName varchar(100) NOT NULL,
email varchar(100) NOT NULL,
address varchar(100) NOT NULL,
gender varchar(1) NOT NULL,
PRIMARY KEY(matricNo),
FOREIGN KEY(programCode)
REFERENCES Program(programCode)
)
```

Student						
	matricNo	programCode	studentName	email	address	gender
*						

```
INSERT INTO Student VALUES('A171112', 'EC003', 'Siew Mei',
'A171112@siswa.ukm.edu.my', 'No 5, Taman Ria, Kluang', 'F');

INSERT INTO Student VALUES('A173432', 'SE004', 'Ali bin
Ahmad', 'A173432@siswa.ukm.edu.my', 'No 1, Taman Mutiara,
Bangi', 'M');

INSERT INTO Student VALUES('A174321', 'SE004', 'Hasif bin
Amri', 'A174321@siswa.ukm.edu.my', 'Lot 15, Kampung Pandan,
Kuantan', 'M');

INSERT INTO Student VALUES('A176566', 'CS001', 'Farah binti
Hakim', 'A176566@siswa.ukm.edu.my', 'No 2, Taman Permai,
Kuantan', 'F');

INSERT INTO Student VALUES('A178999', 'EC002', 'Siti binti
Yassin', 'A178999@siswa.ukm.edu.my', 'No 4, Taman Aman,
Cheras', 'F');

INSERT INTO Student VALUES('A179877', 'EC002', 'Ahmad bin
Naim', 'A179877@siswa.ukm.edu.my', 'Lot 3, Kampung Baru,
Kajang', 'M');
```

Student	matricNo	programCode	studentName	email	address	gender
+	A171112	EC003	Siew Mei	A171112@siswa.ukm.edu.my	No 5, Taman Ria, Kluang	F
+	A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M
+	A174321	SE004	Hasif bin Amri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M
+	A176566	CS001	Farah binti Hakim	A176566@siswa.ukm.edu.my	No 2, Taman Permai, Kuantan	F
+	A178999	EC002	Siti binti Yassin	A178999@siswa.ukm.edu.my	No 4, Taman Aman, Cheras	F
+	A179877	EC002	Ahmad bin Naim	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M

5. Table Student_Set

```
CREATE TABLE Student_Set (
  matricNo varchar(7) NOT NULL,
  courseCode varchar(8) NOT NULL,
  set int NOT NULL,
  session varchar(30) NOT NULL,
  FOREIGN KEY(matricNo)
  REFERENCES Student(matricNo),
  FOREIGN KEY(courseCode)
  REFERENCES Course(courseCode)
)
```

Student_Set	matricNo	courseCode	set	session
*				

```
INSERT INTO Student_Set VALUES('A179877', 'EPPD1013', 3,
'19/20');

INSERT INTO Student_Set VALUES('A171112', 'EPPD1017', 2,
'18/19');

INSERT INTO Student_Set VALUES('A179877', 'EPPD1113', 2,
'19/20');

INSERT INTO Student_Set VALUES('A178999', 'EPPD1113', 2,
'19/20');

INSERT INTO Student_Set VALUES('A173432', 'TTTE3053', 1,
'18/19');

INSERT INTO Student_Set VALUES('A174321', 'TTTE3053', 1,
'18/19');

INSERT INTO Student_Set VALUES('A173432', 'TTTE3088', 2,
'18/19');

INSERT INTO Student_Set VALUES('A176566', 'TTTS3088', 2,
'19/20');

INSERT INTO Student_Set VALUES('A176566', 'TTTT1022', 1,
'19/20');

INSERT INTO Student_Set VALUES('A174321', 'TTTT1022', 1,
'18/19');
```

Student_Set			
matricNo	courseCode	set	session
A179877	EPPD1013	3	19/20
A171112	EPPD1017	2	18/19
A179877	EPPD1113	2	19/20
A178999	EPPD1113	2	19/20
A173432	TTTE3053	1	18/19
A174321	TTTE3053	1	18/19
A173432	TTTE3088	2	18/19
A176566	TTTS3088	2	19/20
A176566	TTTT1022	1	19/20
A174321	TTTT1022	1	18/19

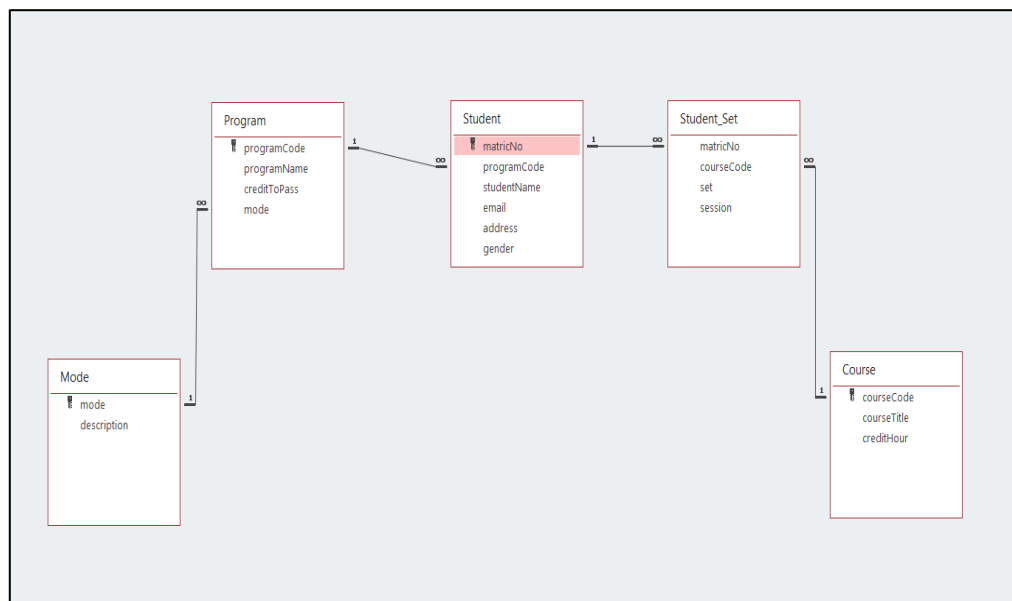


Figure 1 : Relationship of the tables from DBMS of MS Access

A.3.3 Data Manipulation

1. INSERT

Purpose : Insert new data for PJJ mode into mode table

```
INSERT INTO MODE
VALUES ('PJJ', 'Only take 6 to 15 credits per semester');
```

Mode	
mode	description
Full Time	Only take 15 to 20 credits per semester
Part Time	Only take 9 to 14 credits per semester
PJJ	Only take 6 to 15 credits per semester

2. UPDATE

Purpose : Student named Farah binti Hakim who has matric number A176566 move to new house from 'No 2, Taman Permai, Kuantan' to 'No 132, Taman Murni, Alor Star'

```
UPDATE Student
SET address = 'No 132, Taman Murni, Alor Star'
WHERE matricNo = 'A176566';
```

Student						
matricNo	programCode	studentName	email	address	gender	
A171112	EC003	Siew Mei	A171112@siswa.ukm.edu.my	No 5, Taman Ria, Kluang	F	
A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M	
A174321	SE004	Hasif bin Amri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M	
A176566	CS001	Farah binti Hakim	A176566@siswa.ukm.edu.my	No 2, Taman Permai, Kuantan	F	
A178999	EC002	Siti binti Yassin	A178999@siswa.ukm.edu.my	No 4, Taman Aman, Cheras	F	
A179877	EC002	Ahmad bin Naim	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M	

Student						
matricNo	programCode	studentName	email	address	gender	
A171112	EC003	Siew Mei	A171112@siswa.ukm.edu.my	No 5, Taman Ria, Kluang	F	
A173432	SE004	Ali bin Ahmad	A173432@siswa.ukm.edu.my	No 1, Taman Mutiara, Bangi	M	
A174321	SE004	Hasif bin Amri	A174321@siswa.ukm.edu.my	Lot 15, Kampung Pandan, Kuantan	M	
A176566	CS001	Farah binti Hakim	A176566@siswa.ukm.edu.my	No 132, Taman Murni, Alor Star	F	
A178999	EC002	Siti binti Yassin	A178999@siswa.ukm.edu.my	No 4, Taman Aman, Cheras	F	
A179877	EC002	Ahmad bin Naim	A179877@siswa.ukm.edu.my	Lot 3, Kampung Baru, Kajang	M	

3. DELETE

Purpose : Siew Mei has matric number A171112 cancel her registered course since she pause her study for a while

```
DELETE FROM Student_Set
WHERE matricNo = 'A171112';
```

matricNo	courseCode	set	session
A179877	EPPD1013		3 19/20
A171112	EPPD1017		2 18/19
A179877	EPPD1113		2 19/20
A178999	EPPD1113		2 19/20
A173432	TTTE3053		1 18/19
A174321	TTTE3053		1 18/19
A173432	TTTE3088		2 18/19
A176566	TTTS3088		2 19/20
A176566	TTTT1022		1 19/20
A174321	TTTT1022		1 18/19

matricNo	courseCode	set	session
A179877	EPPD1013		3 19/20
A179877	EPPD1113		2 19/20
A178999	EPPD1113		2 19/20
A173432	TTTE3053		1 18/19
A174321	TTTE3053		1 18/19
A173432	TTTE3088		2 18/19
A176566	TTTS3088		2 19/20
A176566	TTTT1022		1 19/20
A174321	TTTT1022		1 18/19

4. LIKE

Purpose : Display matric number and student name where name start from 'A' and gender is male

```
SELECT matricNo, studentName
FROM Student
WHERE studentName like 'A*'
AND
gender = 'M';
```

matricNo	studentName
A173432	Ali bin Ahmad
A179877	Ahmad bin Naim

5. DISTINCT

Purpose : List difference values of course code in student set and get the number of student take by each course

```
SELECT DISTINCT courseCode, COUNT(matricNo) AS
TotalNoStudent
FROM Student_Set
GROUP BY courseCode;
```

Query DISTINCT	
courseCode	TotalNoStudent
EPPD1013	1
EPPD1113	2
TTTE3053	2
TTTE3088	1
TTTS3088	1
TTTT1022	2

6. IN

Purpose : Display matric number, student name and gender who take course title Software Testing

```
SELECT matricNo, studentName, gender
FROM Student
WHERE matricNo IN (
  SELECT matricNo FROM Student_Set
  WHERE courseCode IN (
    SELECT courseCode FROM Course
    WHERE courseTitle = 'Software Testing'));
```

Query IN		
matricNo	studentName	gender
A173432	Ali bin Ahmad	M
A174321	Hasif bin Amri	M

7. SUM/AVG

Purpose : Calculate the total number of credit hour that taken by student with matric number A179877

```
SELECT SUM(creditHour) AS NoOfCredit
FROM Course AS C
WHERE EXISTS
(SELECT * FROM Student_Set AS E
WHERE C.courseCode = E.courseCode AND E.matricNo =
'A179877');
```

Query SUM	
NoOfCredit	
	7

8. COUNT

Purpose : Find the number of program that offered by each mode

```
SELECT COUNT(ProgramCode) AS NoOfProgram, Mode
FROM Program
GROUP BY Mode;
```

Query COUNT	
NoOfProgram	Mode
2	Full Time
2	Part Time

9. MATH EXPRESSION

Purpose : Display courseCode, courseTitle, and creditHour which are less than 4 creditHour

```
SELECT courseCode, courseTitle, creditHour
FROM Course
WHERE creditHour <=3;
```

Query MATH EXPRESSION		
courseCode	courseTitle	creditHour
TTTE3053	Software Testing	3
TTTE3088	Software Design	3
TTTS3088	Artificial Intelligence	3
EPPD1013	Microeconomic	3
TTTT1022	Data Analysis	2

A.3.4 Conclusion

In conclusion, Structured Query Language (SQL) is a main language used to extract, update, modify and delete data from a database. It works with Relational Databases where a series of tables are connected to each other with relationships involving a key or foreign key. These keys are unique for each row which serve as pointers for the tuple or row and it allows for the combination of tables by matching which relate to each other in other tables.

SQL is very important to interact with big data in an efficient and easy way. It is also useful for data manipulation and data testing by providing the capability to create and manipulate a wide variety of database objects using various commands such create, alter and drop. And finally, SQL has been used widely in all Business Intelligence Tools and many of the databases that exist today depend on it.

B. References

- **SMPweb** <http://www.ukm.my/smpweb> Access Date : 7 July 2020 10.30 a.m
- **Data Modeling and Entity Relationship Diagram**
<http://www.cs.uregina.ca/Links/class-info/215/erd/> Access Date : 8 July 2020
11.00 a.m
- **Normalization in DBMS** <https://www.tutorialcup.com/dbms/normalization.htm>
Access Date : 8 July 2020 12.40 a.m

