CC5051NA Databases Systems

50% Individual Coursework

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I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

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Chapter 1: Introduction

1.1 Introduction of the college

Islington College is among the most reputable colleges in Nepal providing world-class IT and business academic qualifications. Established in 1996, Islington College has a long and proud history of producing industry ready graduates. Islington College provides high-quality overseas degree programs through partnership with established universities from Singapore and the UK. (Islington College, 2020)

1.2 Current business activities

The college currently focuses on the following points.

1. College provides courses on multiple subjects.
2. Qualified instructors are appointed to teach the courses.
3. Courses can have many modules within them.
4. Students can enroll for any course that they want.
5. The college currently provides 7 courses Computing, Networking, Multimedia for BIT and Finance, Management, Marketing and Business for MBA courses.
6. Each module is taught within the college's own buildings in classes.

1.3 Business Rules

A database is used by the college to keep its records, it follows the following rules:

1. Students and instructors need to provide information about their name, contact and address.
2. Phone number is a requirement for contact information, is permanent but email and fax can be optional and changeable.
3. All phone numbers are unique.
4. The college also keeps record of when a student enrolled in a course and their marks out of 100.

5. The college requires country, province, city, street and house number for the address, each student/instructor may provide 1 set of data, many people can have same address.
6. The address provided is also the mailing address.
7. The college also keeps track of the courses it provides.
8. The college provides 7 courses, each course either contains BIT or MBA in its name denoting specification.
9. Each course has a course leader.
10. A person cannot be the leader of more than 1 course.
11. Different courses do not have same modules.
12. Each module has a leader.
13. Course leaders cannot be module leaders.
14. Multiple people can teach the same module.
15. Curse leaders and module leaders are also instructors i.e. they can teach. Each instructor id contains a letter at its start. CL for course leader and ML for module leader and I for every other instructor.
16. Students can only apply for one course at a time.
17. Students get enrolled in all the modules within a course.
18. Instructors cannot be students and students cannot be instructors within the same college.
19. Modules are taught in classes; many modules can be taught in the same class, but the same module is not taught in multiple classes.
20. Each class has a unique name.

1.4 Identification of entities and attributes

1.4.1 List of created objects- Entities and Attributes

In simple language, entities are objects in real life like school, student etc. they represent something of interest to the end user and attributes are the properties of the entities like name, age etc. The following entities were developed with following attributes:

Entities	Attributes
Course	course_id (PK), course_name, course_leader, yearly_fee
Module	module_id (PK), course (FK), module_title, module_leader, class, building
Contact	Phone (PK), email, fax
Student	student_id (PK), contact (FK), course (FK), student_name, enrollment_date, marks, country, province, city, street, house
Instructor	instructor_id (PK), contact (FK), instructor_name, salary, country, province, city, street, house, module (FK)

1.4.2 Initial ERD

The ERD (Entity-Relationship Diagram) represents the conceptual database as viewed by the end user. ERDs depict the database's main concepts: entities, attributes and relationship. (Carlos Coronel, 2016)

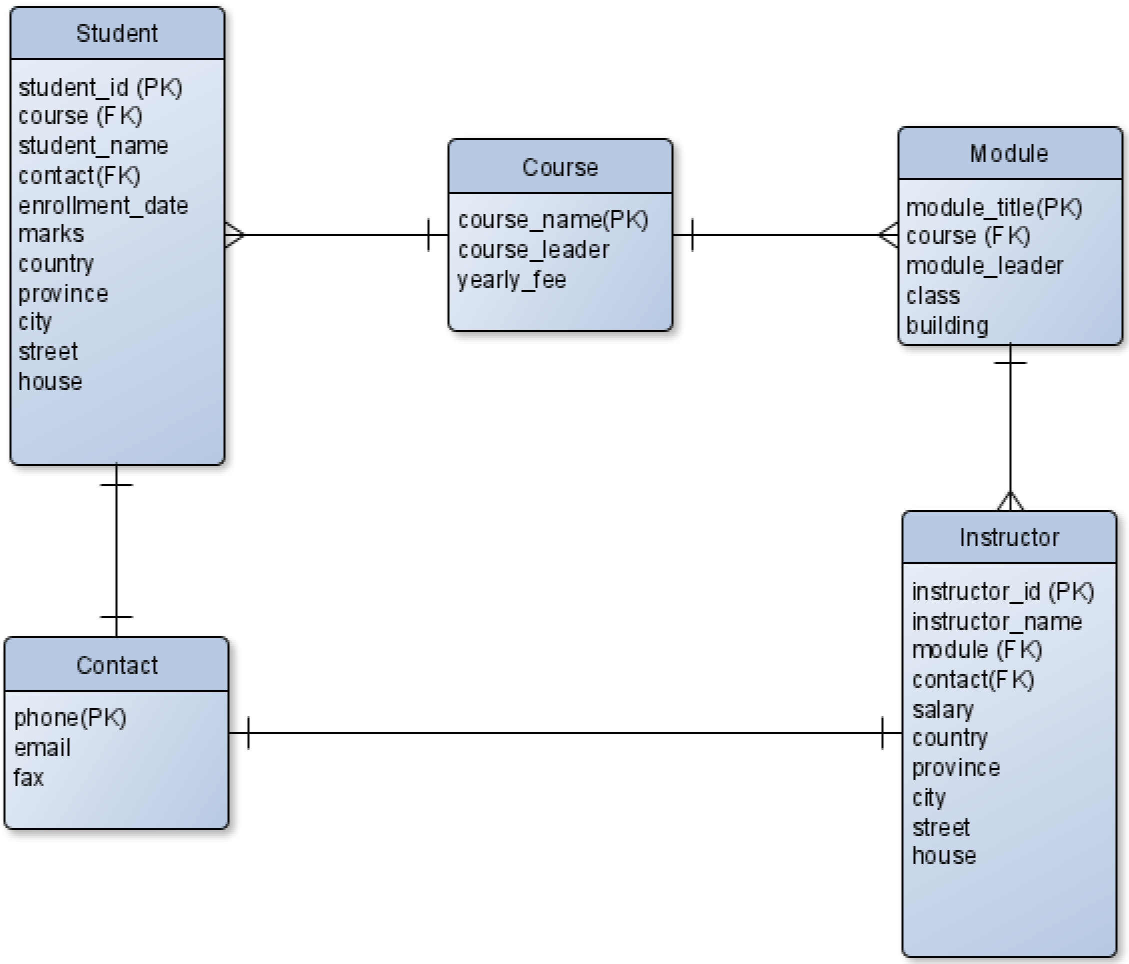


Figure 1: Initial ERD

The basic concept for the ERD shown in figure 1 is multiple students can enroll to a course, single course can have multiple modules, many instructors can teach a module and instructors and students provide details about themselves. The ER diagram may look okay at first glance, but it contains anomalies (anomalies are undesirable outcomes in a database when data is not managed properly) like insertion, update and deletion anomalies. The data in the student and instructor tables are especially redundant, to fix these problems, we need normalization.

Chapter 2: Normalization

2.1 Assumptions

The assumptions that validate the ERD and normalization process are the business rules (**Chapter 1 section 1.3 of the report**)

2.2 Normalization

Normalization is a process for evaluation and correcting table structures to minimize data redundancies, thereby reducing the likelihood of data anomalies. The normalization process involves assigning attributes to tables on the concept of determination. (Carlos Coronel, 2016)

Our goal is to ensure that all the tables that we created in this database are at least in the 3rd normal form (3NF). It is to be noted that higher normalization forms exist, but in a business scenario, are discouraged.

NORMAL FORMS	
NORMAL FORM	CHARACTERISTIC
First normal form (1NF)	Table format, no repeating groups, and PK identified
Second normal form (2NF)	1NF and no partial dependencies
Third normal form (3NF)	2NF and no transitive dependencies
Boyce-Codd normal form (BCNF)	Every determinant is a candidate key (special case of 3NF)
Fourth normal form (4NF)	3NF and no independent multivalued dependencies

Figure 2: Normal Forms

(Carlos Coronel, 2016)

Before we begin normalization, lets define functional, partial and transitive dependencies.

- A functional dependency is when an attribute is dependent on another attribute. An example would be student roll number and student name for a class.

Student roll no → student name

Roll no determines name roll no. is determinant attribute and name is dependent attribute

- A partial dependency exists when there is a functional dependence in which the determinant is only part of the primary key. For example, if (A, B) → (C, D), B → C, and (A, B) is the primary key, then the functional dependence B → C is a partial dependency because only part of the primary key (B) is needed to determine the value of C. (Carlos Coronel, 2016)

- A transitive dependency exists when there are functional dependencies such that X → Y, Y → Z, and X is the primary key. In that case, the dependency X → Z is a transitive dependency because X determines the value of Z via Y. (Carlos Coronel, 2016)

2.2.1 UNF (Un-Normalized Form)

This is the data in our initial design, as it is without any modification or changes.

We will have the data as follows in UNF. The primary keys will be underlined and denoted by PK, foreign key with FK and repeating groups will be represented inside curly brackets, data will be shown as in initial tables as per the design represented in **Chapter 1 section 1.4.2.**

- Course (<u>course_name</u> (PK), course_leader, yearly_fee)
- Module (<u>module_title</u> (PK), course (FK), module_leader, {class, building})
- Contact (<u>phone</u> (PK), email, fax)
- Student (<u>student_id</u> (PK), contact (FK), course (FK), student_name, enrollment_date, marks, {country, province, city, street, house})
- Instructor (<u>instructor_id</u> (PK), contact (FK), instructor_name, salary, {country, province, city, street, house}, module (FK))

2.2.2 1NF (First Normal Form)

The first step in the normalization process, it describes a relation depicted in tabular format, with no repeating groups and a primary key identified. All non-key attributed in the relation are dependent on the primary key. (Carlos Coronel, 2016)

We get the following when we separate the data into 1NF:

- **Course -1** (course_name (PK), course_leader, yearly_fee)
- **Class -1** (class_name (PK), building)
- **Module -1**(module_title (PK), course (FK), class (FK) module_leader)
- **Contact-1** (phone (PK), email, fax)
- **Address -1** (address_id (PK), country, province, city, street, house)
- **Student-1** (student_id (PK), course (FK), address (FK), contact (FK), student_name, enrollment_date, marks,)
- **Instructor-1** (instructor_id (PK), module (FK), address (FK), contact (FK) instructor_name, salary)

In 1NF, our objective was to define primary key, reduce data redundancy, make sure there are no repeating groups in our tables and all the values are dependent on the primary key.

2.2.3 2NF (Second Normal Form)

Second normal form is achieved when the tables are already in 1NF and partial dependencies are eliminated.

We get the following tables in 2NF:

- **Course -2** (course_name (PK), course_leader, yearly_fee)
- **Class-2** (class_name (PK), building)
- **Module -2** (module_title (PK), course (FK), class (FK) module_leader)
- **Contact-2** (phone (PK), email, fax)
- **Address -2** (address_id (PK), country, province, city, street, house)
- **Student-2** (student_id (PK), course (FK), address (FK), contact (FK), student_name, enrollment_date, marks,)
- **Instructor-2** (instructor_id (PK), module (FK), address (FK), contact (FK) instructor_name, salary)

We eliminated partial dependencies (check **Chapter 2 section 2.2**) for 2NF. If there is only one key value, then we don't have to check for partial dependencies, else we need to check. Below is the description for how we achieved 2NF for each table.

- Course: There are no partial dependencies, as there is only 1 key in the table
- Class: There is only 1 key, so there is no partial dependency
- Module: This table has foreign keys, so there may be partial dependencies. We check this by seeing if any key other than primary key can give the value for non-key attribute. The process is as follows:

  Module -1(module_title (PK), course (FK), class (FK) module_leader)

  module_title → module_leader

  course →

  class →

module_title, course →

module_title, course, class →

- Contact: There is only 1 key so, there is no partial dependency.
- Address: There is only 1 key so, partial dependencies do not exist.
- Student: The process is same as described for Module. The process is:

  Student-1 (student_id (PK), course (FK), address (FK), contact (FK), student_name, enrollment_date, marks,)

  Student_id → student_name, enrollment_date, marks

  course →

  address →

  contact →

  student_id, course →

  student_id, address →

  student_id, contact →

  course, contact →

  address, contact →

  course, address →

  student_id, course, contact, address →

  all attributes are given by student_id, partial dependencies do not exist, so the table is in 2NF.

- Instructor: Process is given below:

  Instructor-1 (instructor_id (PK), module (FK), address (FK), contact (FK) instructor_name, salary) instructor_id → instructor_name, salary

module →

address →

contact →

instructor_id, contact →

instructor_id, module →

instructor_id, address →

module, contact →

module, address →

address, contact →

instructor_id, module, address, contact →

all attributes are given by instructor_id so partial dependencies do not exist, so the table is in 2NF

2.2.4 3NF (Third Normal Form)

Third normal form is achieved when the tables are already in 2NF and transitive dependencies are eliminated.

We get the following tables in 3NF:

- **Course -3** (course_name (PK), course_leader, yearly_fee)
- **Class-3** (class_name (PK), building)
- **Module -3** (module_title (PK), course (FK), class (FK) module_leader)
- **Contact-3** (phone (PK), email, fax)
- **Address -3** (address_id (PK), country, province, city, street, house)
- **Student-3** (student_id (PK), course (FK), address (FK), contact (FK), student_name, enrollment_date, marks)
- **Instructor-3** (instructor_id (PK), module (FK), address (FK), contact (FK) instructor_name, salary)

We eliminated transitive dependencies (check **Chapter 2 section 2.2**) i.e. no non key value should be able to give any other non key value. Below is the description for how we achieved 3NF for each table.

- Course:

    Course -2 (course_name (PK), course_leader, yearly_fee)

    The table is already in 3NF there are no partial dependency. Course_name gives course_leader and yearly_fee and neither of those can give value for the other.

- Class:

    Class-2 (class_name (PK), building)

    There is only 1 non key so, there is no transitive dependency.

- Module:

  Module -2(module_title (PK), course (FK), class (FK) module_leader)

  There is only 1 non key so, there is no transitive dependency.

- Contact:

  Contact-2 (phone (PK), email, fax)

  Email and fax are non-key attributes, they cannot give the value for one another, so there is no transitive dependency in the table.

- Address:

  Address -2 (address_id (PK), country, province, city, street, house)

  Province numbers in different countries can be same, house numbers can be same in different streets, two cities can have same names and so on. The table is already in 3NF as no non-key attribute can clearly give the value for any other non-key attribute.

- Student:

  Student-2 (student_id (PK), course (FK), address (FK), contact (FK), student_name, enrollment_date, marks,)

  Student_id, course, address, contact → student_name, enrollment_date

  Student_name cannot give enrollment_date, as many students with same name can enroll in different dates and enrollment_date cannot give student_name, as many students can enroll in same date. The table is free of transitive dependencies.

- Instructor:

  Instructor-2 (instructor_id (PK), module (FK), address (FK), contact (FK) instructor_name, salary)

  instructor_id, module, address, contact → instructor_name, salary

  instructor_name cannot give salary as 2 people with same name can have different salary and salary cannot give instructor_name as, many instructors can have the same salary, so there are no transitive dependencies.

2.3 ERD after normalization

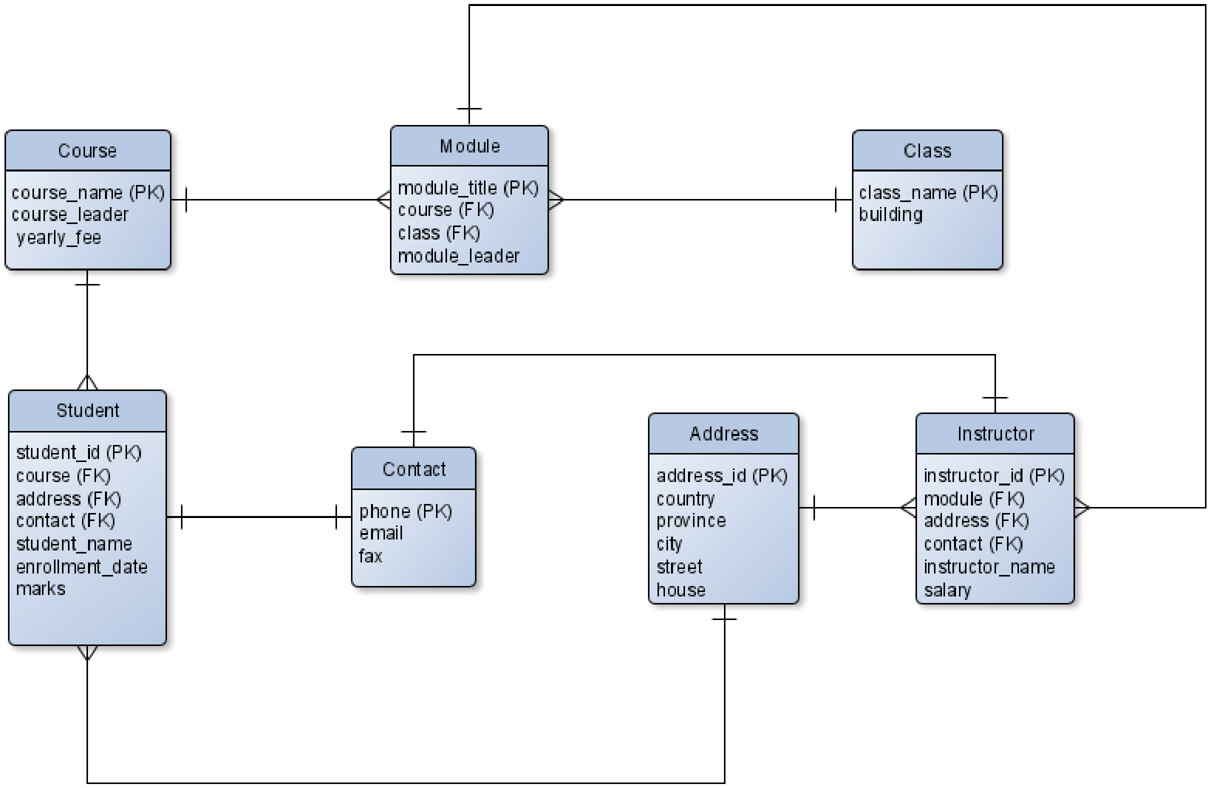


Figure 3: ERD after normalization

This is the final ERD, it has less data redundancy and fewer data anomalies compared to the design in initial ERD. Space is saved for our database and efficiency is increased as a result of normalization. It also makes it easier to manipulate the data in our database and makes maintenance easier.

Chapter 3: Implementation

3.1 Creation of tables

CREATE TABLE statement is used to create tables in MYSQL. It is part of Data Definition Language (DDL), statements for creating and modifying tables, users etc. in a database. The basic structure of the statement is given below:

- CREATE TABLE [table name] ([column name, datatype, constraints]);

3.1.1 Course table

CREATE TABLE course (

course_name VARCHAR (25) NOT NULL CHECK (course_name LIKE 'BIT%' OR course_name LIKE 'MBA%'),

course_leader VARCHAR (25) NOT NULL,

yearly_fee INT NOT NULL CHECK (yearly_fee>0),

CONSTRAINT course_pk PRIMARY KEY (course_name));

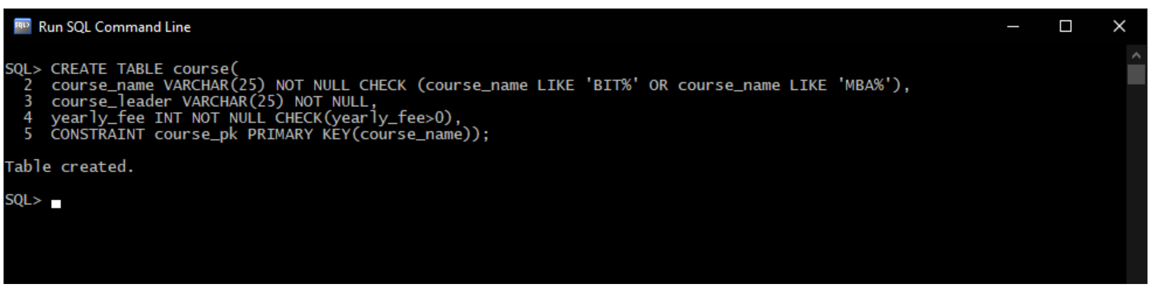


Figure 4: Creating course table

VARCHAR and INT specify the datatypes for the columns. CHECK is used to make sure only certain types of values can be entered PRIMARY KEY is to denote primary key for the table.

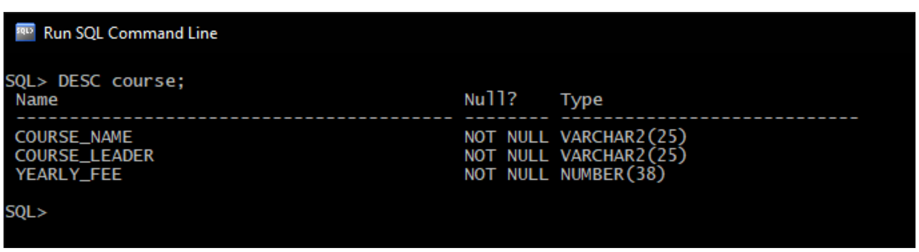


Figure 5: DESC course

3.1.2 Class Table

CREATE TABLE class(

class_name VARCHAR(25) NOT NULL,

building VARCHAR(25) NOT NULL,

CONSTRAINT class_pk PRIMARY KEY(class_name));

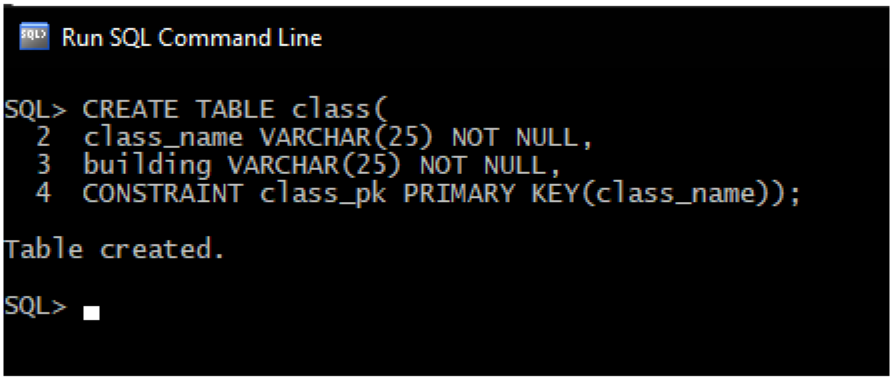


Figure 6: Creating class table

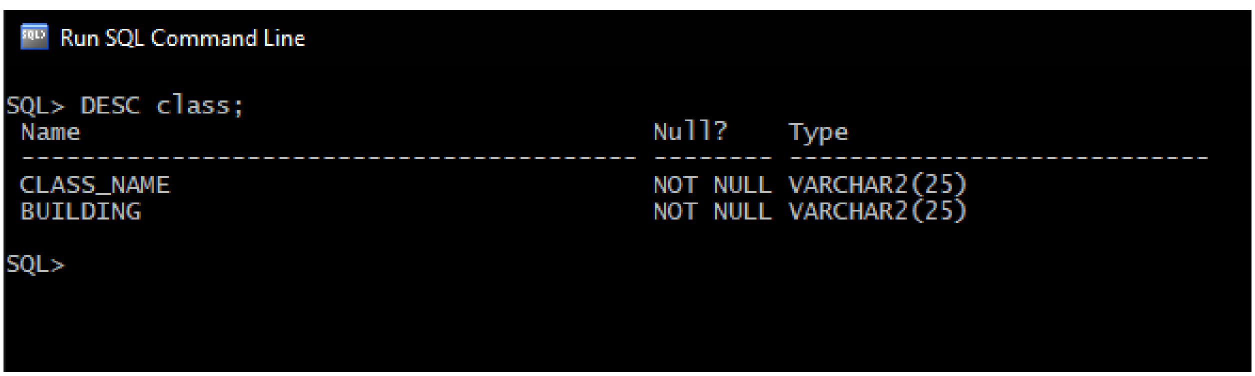


Figure 7: DESC class

3.1.3 Module Table

CREATE TABLE module(

module_title VARCHAR(25) NOT NULL,

course VARCHAR(25) NOT NULL CHECK(course LIKE 'BIT%' OR course LIKE 'MBA%'),

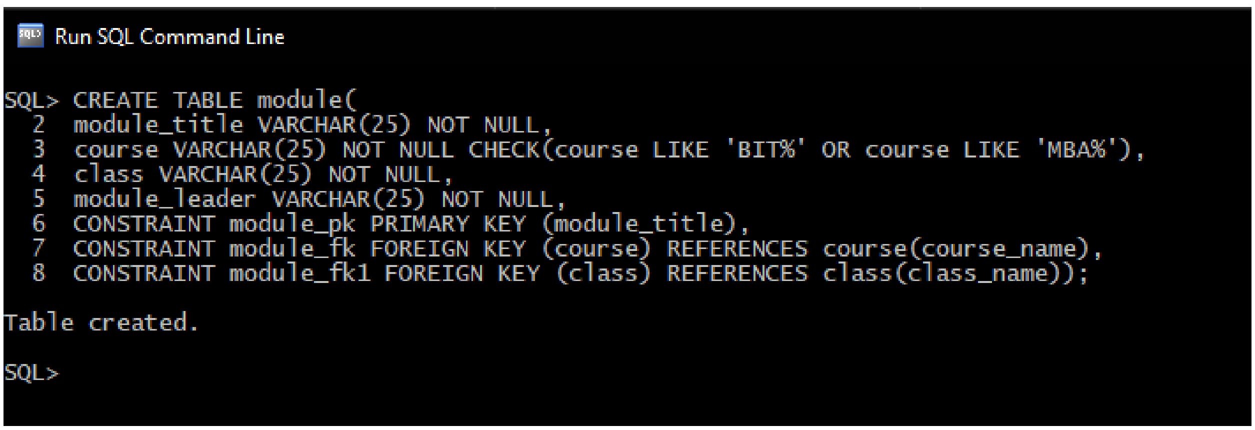
class VARCHAR(25) NOT NULL,

module_leader VARCHAR(25) NOT NULL,

CONSTRAINT module_pk PRIMARY KEY (module_title),

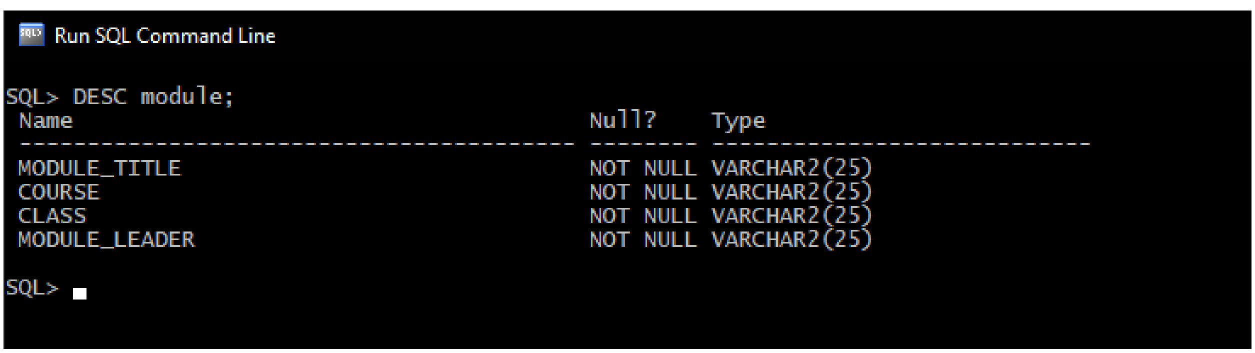
CONSTRAINT module_fk FOREIGN KEY (course) REFERENCES course(course_name),

CONSTRAINT module_fk1 FOREIGN KEY (class) REFERENCES class(class_name));



```
Run SQL Command Line

SQL> CREATE TABLE module(
  2  module_title VARCHAR(25) NOT NULL,
  3  course VARCHAR(25) NOT NULL CHECK(course LIKE 'BIT%' OR course LIKE 'MBA%'),
  4  class VARCHAR(25) NOT NULL,
  5  module_leader VARCHAR(25) NOT NULL,
  6  CONSTRAINT module_pk PRIMARY KEY (module_title),
  7  CONSTRAINT module_fk FOREIGN KEY (course) REFERENCES course(course_name),
  8  CONSTRAINT module_fk1 FOREIGN KEY (class) REFERENCES class(class_name));

Table created.

SQL>
```

Figure 8: Creating module table



```
Run SQL Command Line

SQL> DESC module;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 MODULE_TITLE                              NOT NULL VARCHAR2(25)
 COURSE                                    NOT NULL VARCHAR2(25)
 CLASS                                     NOT NULL VARCHAR2(25)
 MODULE_LEADER                             NOT NULL VARCHAR2(25)

SQL>
```

Figure 9: DESC module

3.1.4 Contact table

CREATE TABLE contact(

phone NUMBER(10) NOT NULL,

email VARCHAR(45),

fax NUMBER(10),

CONSTRAINT contact_pk PRIMARY KEY(phone));

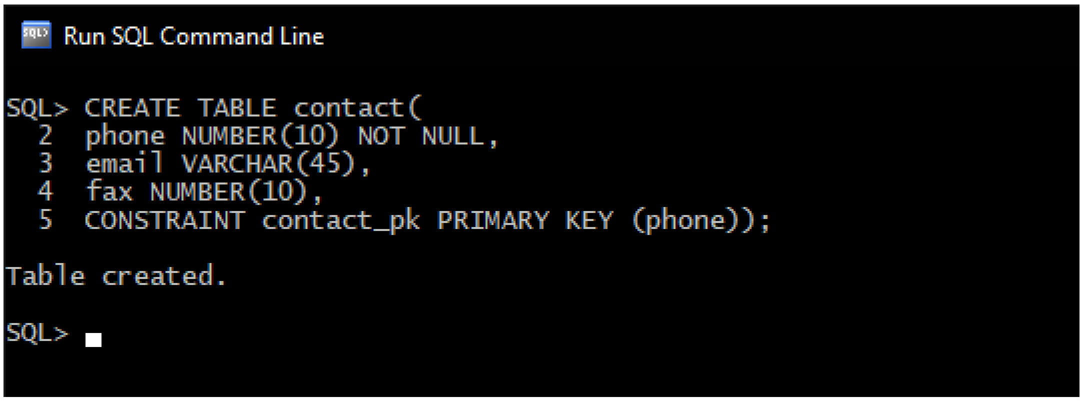


Figure 10: Creating contact table

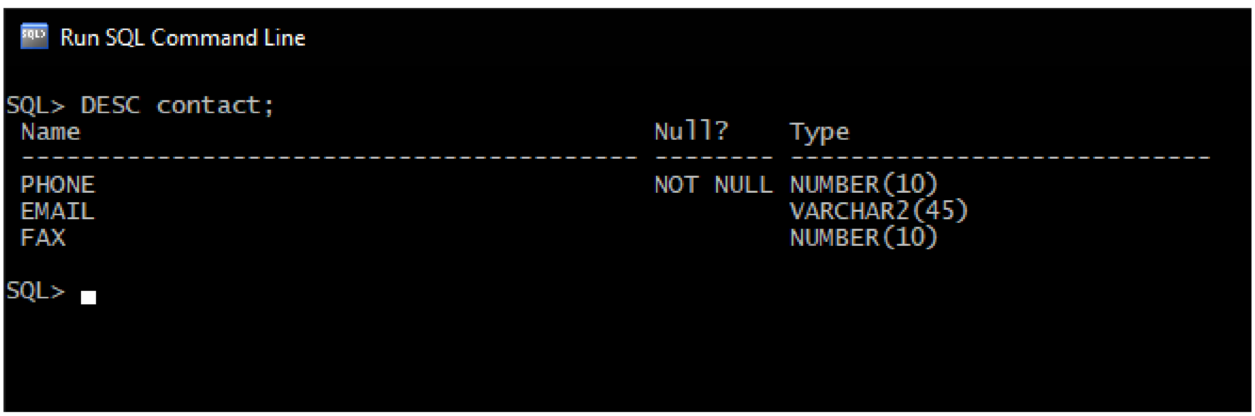


Figure 11: DESC contact

3.1.5 Address Table

CREATE TABLE address(

address_id INT NOT NULL,

country VARCHAR(25) NOT NULL,

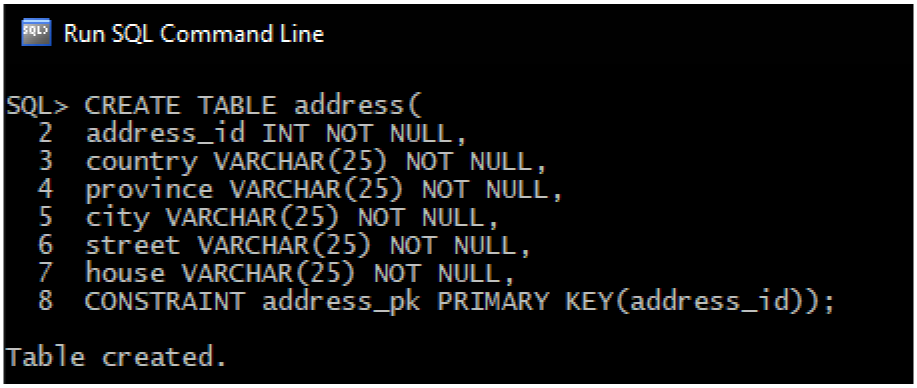
province VARCHAR(25) NOT NULL,

city VARCHAR(25) NOT NULL,

street VARCHAR(25) NOT NULL,

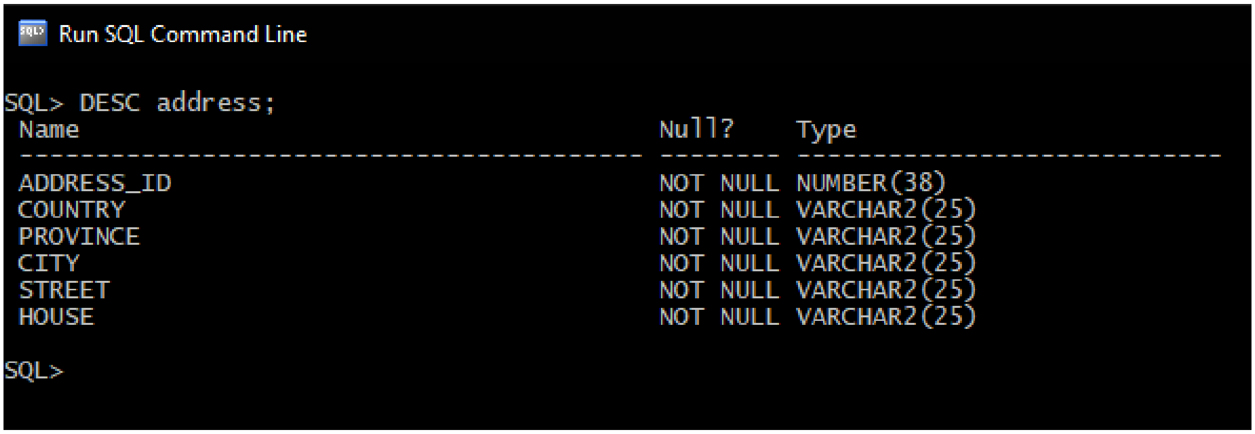
house VARCHAR(25) NOT NULL,

CONSTRAINT address_pk PRIMARY KEY(address_id));



```
Run SQL Command Line

SQL> CREATE TABLE address(
  2  address_id INT NOT NULL,
  3  country VARCHAR(25) NOT NULL,
  4  province VARCHAR(25) NOT NULL,
  5  city VARCHAR(25) NOT NULL,
  6  street VARCHAR(25) NOT NULL,
  7  house VARCHAR(25) NOT NULL,
  8  CONSTRAINT address_pk PRIMARY KEY(address_id));

Table created.
```

Figure 12: Creating address table



```
Run SQL Command Line

SQL> DESC address;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 ADDRESS_ID                                NOT NULL NUMBER(38)
 COUNTRY                                   NOT NULL VARCHAR2(25)
 PROVINCE                                  NOT NULL VARCHAR2(25)
 CITY                                      NOT NULL VARCHAR2(25)
 STREET                                    NOT NULL VARCHAR2(25)
 HOUSE                                     NOT NULL VARCHAR2(25)

SQL>
```

Figure 13: DESC address

3.1.6 Student table

CREATE TABLE student(

student_id INT NOT NULL,

course VARCHAR(25) NOT NULL CHECK (course LIKE 'BIT%' OR course LIKE 'MBA%'),

address INT NOT NULL,

contact NUMBER(10) NOT NULL,

student_name VARCHAR(30) NOT NULL,

enrollment_date DATE NOT NULL,

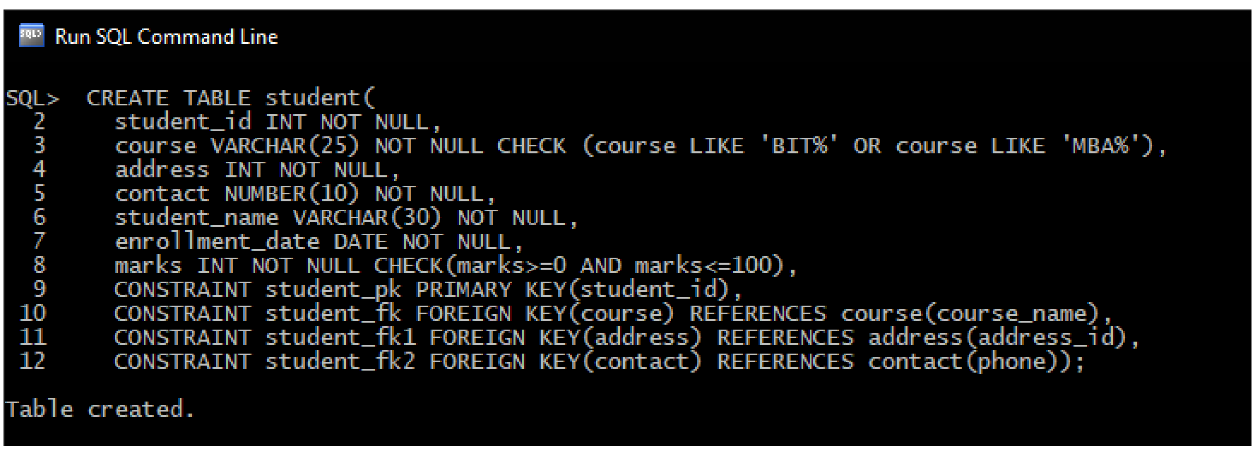
marks INT NOT NULL CHECK(marks>=0 AND marks<=100),

CONSTRAINT student_pk PRIMARY KEY(student_id),

CONSTRAINT student_fk FOREIGN KEY(course) REFERENCES course(course_name),

CONSTRAINT student_fk1 FOREIGN KEY(address) REFERENCES address(address_id),

CONSTRAINT student_fk2 FOREIGN KEY(contact) REFERENCES contact(phone));



```
Run SQL Command Line

SQL>  CREATE TABLE student(
  2     student_id INT NOT NULL,
  3     course VARCHAR(25) NOT NULL CHECK (course LIKE 'BIT%' OR course LIKE 'MBA%'),
  4     address INT NOT NULL,
  5     contact NUMBER(10) NOT NULL,
  6     student_name VARCHAR(30) NOT NULL,
  7     enrollment_date DATE NOT NULL,
  8     marks INT NOT NULL CHECK(marks>=0 AND marks<=100),
  9     CONSTRAINT student_pk PRIMARY KEY(student_id),
 10     CONSTRAINT student_fk FOREIGN KEY(course) REFERENCES course(course_name),
 11     CONSTRAINT student_fk1 FOREIGN KEY(address) REFERENCES address(address_id),
 12     CONSTRAINT student_fk2 FOREIGN KEY(contact) REFERENCES contact(phone));

Table created.
```

Figure 14: Creating student table

```
Run SQL Command Line

SQL> DESC student;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 STUDENT_ID                                NOT NULL NUMBER(38)
 COURSE                                    NOT NULL VARCHAR2(25)
 ADDRESS                                   NOT NULL NUMBER(38)
 CONTACT                                   NOT NULL NUMBER(10)
 STUDENT_NAME                              NOT NULL VARCHAR2(30)
 ENROLLMENT_DATE                           NOT NULL DATE
 MARKS                                     NOT NULL NUMBER(38)

SQL>
```

Figure 15: DESC student

3.1.7 Instructor table

CREATE TABLE instructor(

instructor_id VARCHAR(25) NOT NULL CHECK(instructor_id LIKE 'CL%' OR instructor_id LIKE'ML%' OR instructor_id LIKE 'I%'),

module VARCHAR(25) NOT NULL,

address INT NOT NULL,

contact NUMBER(10) NOT NULL,

instructor_name VARCHAR(30) NOT NULL,

salary INT NOT NULL,

CONSTRAINT instructor_pk PRIMARY KEY(instructor_id),

CONSTRAINT instructor_fk FOREIGN KEY(module) REFERENCES module(module_title),

CONSTRAINT instructor_fk1 FOREIGN KEY(address) REFERENCES address(address_id),

CONSTRAINT instructor_fk2 FOREIGN KEY(contact) REFERENCES contact(phone));

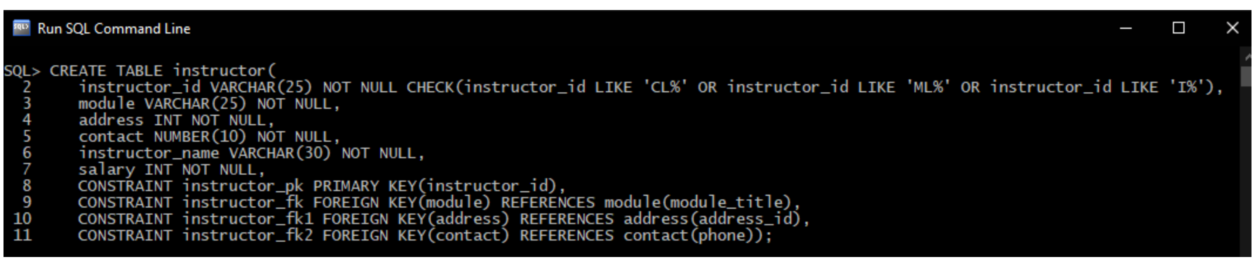


Figure 16: Creating instructor table

```
Run SQL Command Line
SQL> DESC instructor;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 INSTRUCTOR_ID                             NOT NULL VARCHAR2(25)
 MODULE                                    NOT NULL VARCHAR2(25)
 ADDRESS                                   NOT NULL NUMBER(38)
 CONTACT                                   NOT NULL NUMBER(10)
 INSTRUCTOR_NAME                           NOT NULL VARCHAR2(30)
 SALARY                                    NOT NULL NUMBER(38)
```

Figure 17: DESC instructor

3.2 Populating data into the tables

The INSERT, INSERT ALL and COMMIT statements are used to enter data into the tables. INSERT statement enters one row of data at a time while INSERT ALL enters multiple rows of data. They are part of DML (Data Modification Language), used to add, change remove data, here we are only using INSERT to add data.

We use COMMIT statement to finalize entering data into out tables. It is part of TCL (Transaction Control Language) used to manage data that we enter via DML. There are other TCL like ROLLBACK, but here we are only concerned with COMMIT.

Use the COMMIT statement to end your current transaction and make permanent all changes performed in the transaction. A transaction is a sequence of SQL statements that Oracle Database treats as a single unit. This statement also erases all save points in the transaction and releases transaction locks. (Oracle, 2016)

The queries for entering data and necessary screenshots are provided below.

3.2.1 Course Table

3.2.1.1 Statement

INSERT INTO course VALUES ('BIT Computing', 'James',150000);

INSERT INTO course VALUES ('BIT Multimedia', 'Ron',150000);

INSERT INTO course VALUES ('BIT Networking', 'Tom',200000);

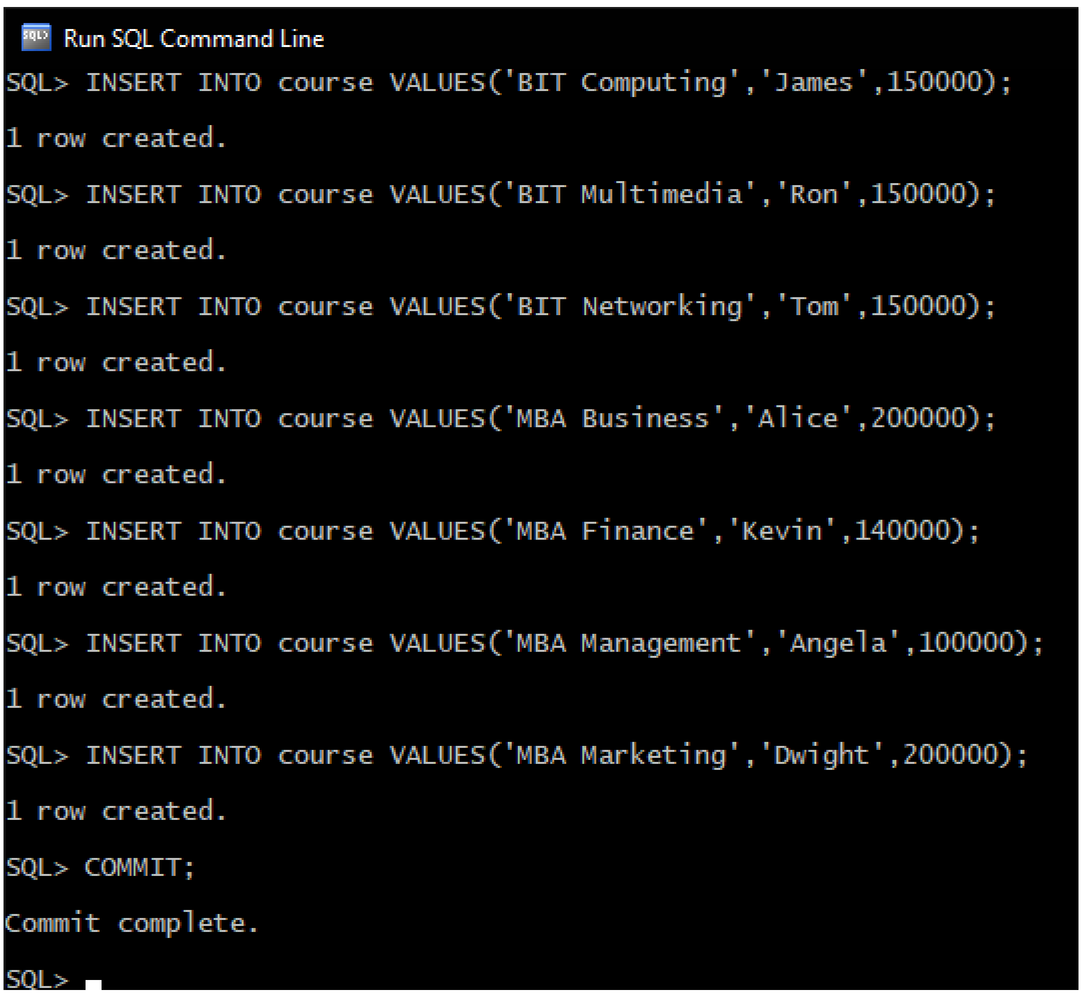
INSERT INTO course VALUES ('MBA Business', 'Alice',100000);

INSERT INTO course VALUES ('MBA Finance', 'Kevin',100000);

INSERT INTO course VALUES ('MBA Management', 'Angelina',140000);

INSERT INTO course VALUES ('MBA Marketing', 'Dwight',120000);

3.2.1.2 Screenshots



```
Run SQL Command Line
SQL> INSERT INTO course VALUES('BIT Computing','James',150000);

1 row created.

SQL> INSERT INTO course VALUES('BIT Multimedia','Ron',150000);

1 row created.

SQL> INSERT INTO course VALUES('BIT Networking','Tom',150000);

1 row created.

SQL> INSERT INTO course VALUES('MBA Business','Alice',200000);

1 row created.

SQL> INSERT INTO course VALUES('MBA Finance','Kevin',140000);

1 row created.

SQL> INSERT INTO course VALUES('MBA Management','Angela',100000);

1 row created.

SQL> INSERT INTO course VALUES('MBA Marketing','Dwight',200000);

1 row created.

SQL> COMMIT;

Commit complete.

SQL>
```

Figure 18: Inserting values in course table

```
Run SQL Command Line
SQL> COMMIT;

Commit complete.

SQL> SELECT * FROM course;

COURSE_NAME                  COURSE_LEADER                 YEARLY_FEE
---------------------------- ----------------------------- ----------
BIT Computing                James                             150000
BIT Multimedia               Ron                               150000
BIT Networking               Tom                               150000
MBA Business                 Alice                             200000
MBA Finance                  Kevin                             140000
MBA Management               Angela                            100000
MBA Marketing                Dwight                            200000

7 rows selected.
```

Figure 19: Values in course table

3.2.2 Class Table

3.2.2.1 Statement

INSERT INTO class VALUES('Pokhara','West');

INSERT INTO class VALUES('Kathmandu','Centre');

INSERT INTO class VALUES('Sagarmatha','New');

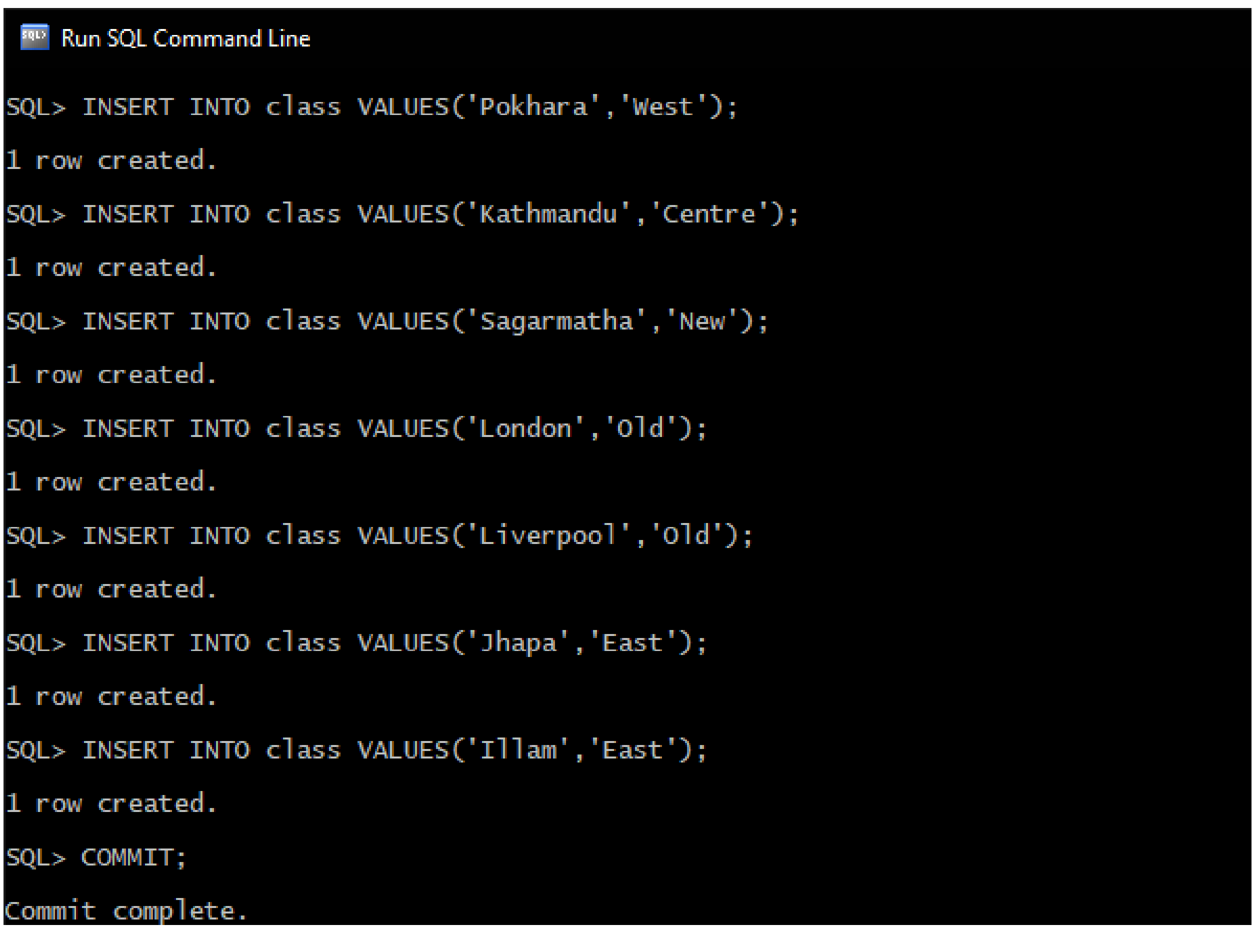
INSERT INTO class VALUES('London','Old');

INSERT INTO class VALUES('Liverpool','Old');

INSERT INTO class VALUES('Jhapa','East');

INSERT INTO class VALUES('Illam','East');

3.2.2.2 Screenshots



Run SQL Command Line

```
SQL> INSERT INTO class VALUES('Pokhara','West');

1 row created.

SQL> INSERT INTO class VALUES('Kathmandu','Centre');

1 row created.

SQL> INSERT INTO class VALUES('Sagarmatha','New');

1 row created.

SQL> INSERT INTO class VALUES('London','Old');

1 row created.

SQL> INSERT INTO class VALUES('Liverpool','Old');

1 row created.

SQL> INSERT INTO class VALUES('Jhapa','East');

1 row created.

SQL> INSERT INTO class VALUES('Illam','East');

1 row created.

SQL> COMMIT;

Commit complete.
```

Figure 20: Inserting values in class table

```
Run SQL Command Line

SQL> SELECT * FROM class;

CLASS_NAME                BUILDING
------------------------- -------------------------
Pokhara                   West
Kathmandu                 Centre
Sagarmatha                New
London                    Old
Liverpool                 Old
Jhapa                     East
Illam                     East

7 rows selected.

SQL>
```

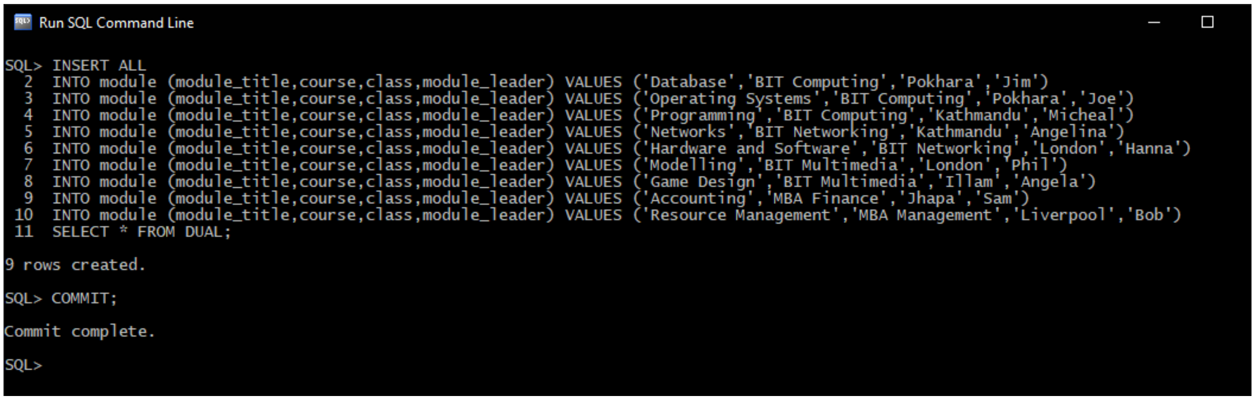
Figure 21: Values in course table

3.2.3 Module Table

3.2.3.1 Statement

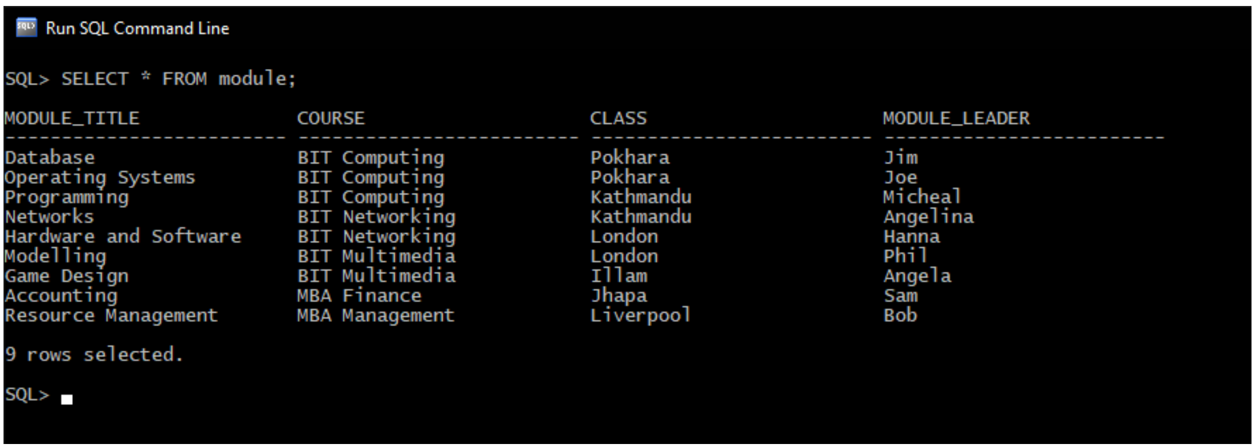
```
INSERT ALL

 INTO module (module_title,course,class,module_leader)

VALUES ('Database','BIT Computing','Pokhara','Jim')

 INTO module (module_title,course,class,module_leader)

VALUES ('Operating Systems','BIT Computing','Pokhara','Joe')

 INTO module (module_title,course,class,module_leader)

VALUES ('Networks','BIT Networking','Kathmandu','Angelina')

 INTO module (module_title,course,class,module_leader)

VALUES ('Hardware and Software','BIT Networking','London','Hanna')

 INTO module (module_title,course,class,module_leader)

VALUES ('Modelling','BIT Multimedia','London','Phil')

 INTO module (module_title,course,class,module_leader)

VALUES ('Game Design','BIT Multimedia','Illam','Angela')

 INTO module (module_title,course,class,module_leader)

VALUES ('Accounting','MBA Finance','Jhapa','Sam')

 INTO module (module_title,course,class,module_leader)

VALUES ('Resource Management','MBA Management','Liverpool','Bob')

 SELECT * FROM DUAL;
```

3.2.3.2 Screenshots



```
Run SQL Command Line

SQL> INSERT ALL
  2  INTO module (module_title,course,class,module_leader) VALUES ('Database','BIT Computing','Pokhara','Jim')
  3  INTO module (module_title,course,class,module_leader) VALUES ('Operating Systems','BIT Computing','Pokhara','Joe')
  4  INTO module (module_title,course,class,module_leader) VALUES ('Programming','BIT Computing','Kathmandu','Micheal')
  5  INTO module (module_title,course,class,module_leader) VALUES ('Networks','BIT Networking','Kathmandu','Angelina')
  6  INTO module (module_title,course,class,module_leader) VALUES ('Hardware and Software','BIT Networking','London','Hanna')
  7  INTO module (module_title,course,class,module_leader) VALUES ('Modelling','BIT Multimedia','London','Phil')
  8  INTO module (module_title,course,class,module_leader) VALUES ('Game Design','BIT Multimedia','Illam','Angela')
  9  INTO module (module_title,course,class,module_leader) VALUES ('Accounting','MBA Finance','Jhapa','Sam')
 10  INTO module (module_title,course,class,module_leader) VALUES ('Resource Management','MBA Management','Liverpool','Bob')
 11  SELECT * FROM DUAL;

9 rows created.

SQL> COMMIT;

Commit complete.

SQL>
```

Figure 22: Inserting values in module table



```
Run SQL Command Line

SQL> SELECT * FROM module;

MODULE_TITLE              COURSE                    CLASS                     MODULE_LEADER
------------------------- ------------------------- ------------------------- -------------------------
Database                  BIT Computing             Pokhara                   Jim
Operating Systems         BIT Computing             Pokhara                   Joe
Programming               BIT Computing             Kathmandu                 Micheal
Networks                  BIT Networking            Kathmandu                 Angelina
Hardware and Software     BIT Networking            London                    Hanna
Modelling                 BIT Multimedia            London                    Phil
Game Design               BIT Multimedia            Illam                     Angela
Accounting                MBA Finance               Jhapa                     Sam
Resource Management       MBA Management            Liverpool                 Bob

9 rows selected.

SQL>
```

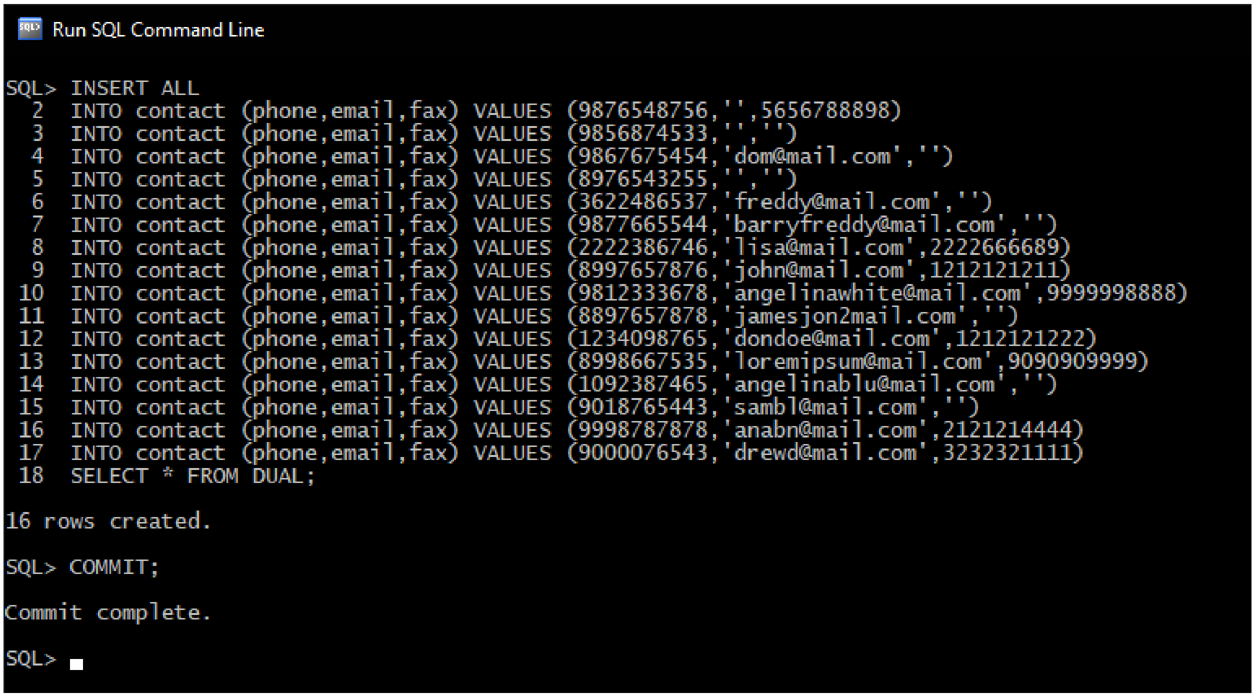
Figure 23: Values in module table

3.2.4 Contact Table

3.2.4.1 Statement

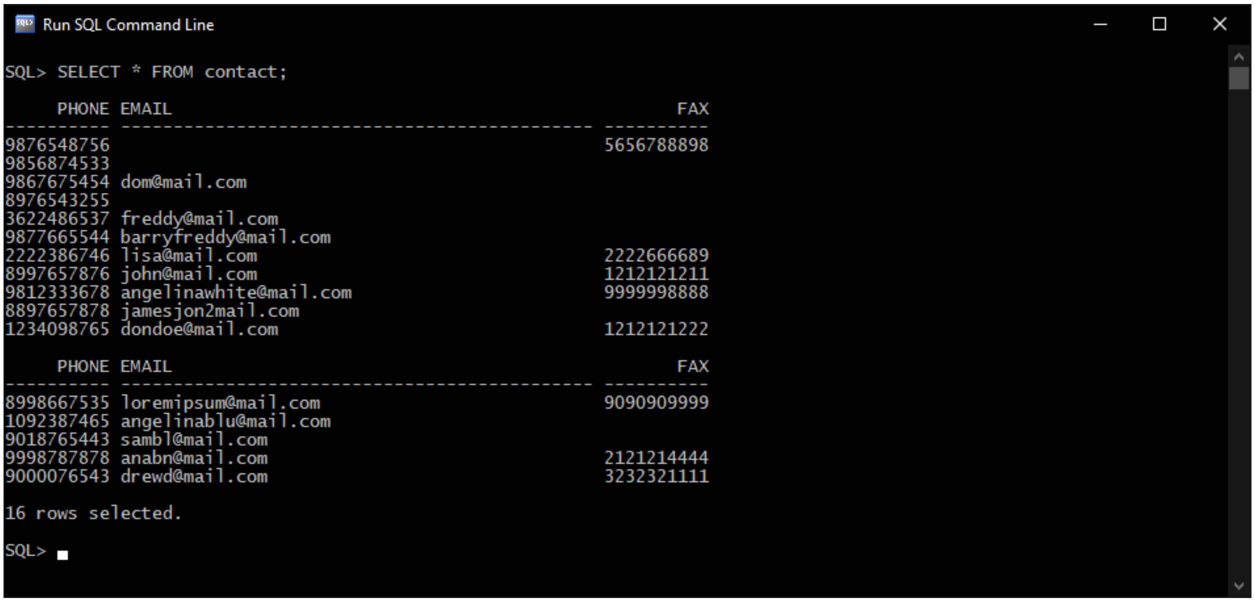
```
INSERT ALL

 INTO contact (phone,email,fax) VALUES (9876548756,'',5656788898)

 INTO contact (phone,email,fax) VALUES (9856874533,'','')

 INTO contact (phone,email,fax) VALUES (9867675454,'dom@mail.com','')

 INTO contact (phone,email,fax) VALUES (8976543255,'','')

 INTO contact (phone,email,fax) VALUES (3622486537,'freddy@mail.com','')

 INTO contact (phone,email,fax) VALUES (9877665544,'barryfreddy@mail.com','')

 INTO contact (phone,email,fax) VALUES (2222386746,'lisa@mail.com',2222666689)

 INTO contact (phone,email,fax) VALUES (8997657876,'john@mail.com',1212121211)

 INTO contact (phone,email,fax)

VALUES (9812333678,'angelinawhite@mail.com',9999998888)

 INTO contact (phone,email,fax) VALUES (8897657878,'jamesjon2mail.com','')

 INTO contact (phone,email,fax) VALUES (1234098765,'dondoe@mail.com',1212121222)

 INTO contact (phone,email,fax) VALUES (8998667535,'loremipsum@mail.com',9090909999)

 INTO contact (phone,email,fax) VALUES (1092387465,'angelinablu@mail.com','')

 INTO contact (phone,email,fax) VALUES (9018765443,'sambl@mail.com','')

 INTO contact (phone,email,fax) VALUES (9998787878,'anabn@mail.com',2121214444)

 INTO contact (phone,email,fax) VALUES (9000076543,'drewd@mail.com',3232321111)

 SELECT * FROM DUAL;
```

3.2.4.2 Screenshots



```
Run SQL Command Line

SQL> INSERT ALL
  2  INTO contact (phone,email,fax) VALUES (9876548756,'',5656788898)
  3  INTO contact (phone,email,fax) VALUES (9856874533,'','')
  4  INTO contact (phone,email,fax) VALUES (9867675454,'dom@mail.com','')
  5  INTO contact (phone,email,fax) VALUES (8976543255,'','')
  6  INTO contact (phone,email,fax) VALUES (3622486537,'freddy@mail.com','')
  7  INTO contact (phone,email,fax) VALUES (9877665544,'barryfreddy@mail.com','')
  8  INTO contact (phone,email,fax) VALUES (2222386746,'lisa@mail.com',2222666689)
  9  INTO contact (phone,email,fax) VALUES (8997657876,'john@mail.com',1212121211)
 10  INTO contact (phone,email,fax) VALUES (9812333678,'angelinawhite@mail.com',9999998888)
 11  INTO contact (phone,email,fax) VALUES (8897657878,'jamesjon2mail.com','')
 12  INTO contact (phone,email,fax) VALUES (1234098765,'dondoe@mail.com',1212121222)
 13  INTO contact (phone,email,fax) VALUES (8998667535,'loremipsum@mail.com',9090909999)
 14  INTO contact (phone,email,fax) VALUES (1092387465,'angelinablu@mail.com','')
 15  INTO contact (phone,email,fax) VALUES (9018765443,'sambl@mail.com','')
 16  INTO contact (phone,email,fax) VALUES (9998787878,'anabn@mail.com',2121214444)
 17  INTO contact (phone,email,fax) VALUES (9000076543,'drewd@mail.com',3232321111)
 18  SELECT * FROM DUAL;

16 rows created.

SQL> COMMIT;

Commit complete.

SQL>
```

Figure 24: Inserting values in contact table



```
Run SQL Command Line

SQL> SELECT * FROM contact;

     PHONE EMAIL                                              FAX
---------- -------------------------------------------- ----------
9876548756                                              5656788898
9856874533
9867675454 dom@mail.com
8976543255
3622486537 freddy@mail.com
9877665544 barryfreddy@mail.com
2222386746 lisa@mail.com                                2222666689
8997657876 john@mail.com                                1212121211
9812333678 angelinawhite@mail.com                       9999998888
8897657878 jamesjon2mail.com
1234098765 dondoe@mail.com                              1212121222

     PHONE EMAIL                                              FAX
---------- -------------------------------------------- ----------
8998667535 loremipsum@mail.com                          9090909999
1092387465 angelinablu@mail.com
9018765443 sambl@mail.com
9998787878 anabn@mail.com                               2121214444
9000076543 drewd@mail.com                               3232321111

16 rows selected.

SQL>
```

Figure 25: Values in contact table

3.2.5 Address Table

3.2.5.1 Statement

```
INSERT ALL

  INTO address (address_id,country,province,city,street,house)

   VALUES (1,'Nepal','3','Koteshwor','Kotdevi','11')

  INTO address (address_id,country,province,city,street,house)

   VALUES (2,'Nepal','3','Koteshwor','Dronacharya','11')

  INTO address (address_id,country,province,city,street,house)

   VALUES (3,'Nepal','3','Patan','111','90/2')

  INTO address (address_id,country,province,city,street,house)

   VALUES (4,'Nepal','3','Changunrayan','Changu','100')

  INTO address (address_id,country,province,city,street,house)

   VALUES (5,'Nepal','1','Patan','44','1')

  INTO address (address_id,country,province,city,street,house)

   VALUES (6,'Nepal','3','Baneshwor','Old Street','355')

  INTO address (address_id,country,province,city,street,house)

   VALUES (7,'Nepal','1','Namche','Point','12')

  SELECT * FROM DUAL
```

3.2.5.1 Screenshots

```
Run SQL Command Line

SQL> INSERT ALL
  2  INTO address (address_id,country,province,city,street,house) VALUES (1,'Nepal','3','Koteshwor','Kotdevi','11')
  3  INTO address (address_id,country,province,city,street,house) VALUES (2,'Nepal','3','Koteshwor','Dronacharya','11')
  4  INTO address (address_id,country,province,city,street,house) VALUES (3,'Nepal','3','Patan','111','90/2')
  5  INTO address (address_id,country,province,city,street,house) VALUES (4,'Nepal','3','Changunrayan','Changu','100')
  6  INTO address (address_id,country,province,city,street,house) VALUES (5,'Nepal','1','Patan','44','1')
  7  INTO address (address_id,country,province,city,street,house) VALUES (6,'Nepal','3','Baneshwor','Old Street','355')
  8  INTO address (address_id,country,province,city,street,house) VALUES (7,'Nepal','1','Namche','Point','12')
  9  SELECT * FROM DUAL;

7 rows created.

SQL> COMMIT
  2  ;

Commit complete.

SQL>
```

Figure 26: Inserting values in address table

```
Run SQL Command Line

SQL> SELECT * FROM address;

ADDRESS_ID COUNTRY                  PROVINCE                 CITY                     STREET                   HOUSE
---------- ------------------------ ------------------------ ------------------------ ------------------------ ------------------------
         1 Nepal                    3                        Koteshwor                Kotdevi                  11
         2 Nepal                    3                        Koteshwor                Dronacharya              11
         3 Nepal                    3                        Patan                    111                      90/2
         4 Nepal                    3                        Changunrayan             Changu                   100
         5 Nepal                    1                        Patan                    44                       1
         6 Nepal                    3                        Baneshwor                Old Street               355
         7 Nepal                    1                        Namche                   Point                    12

7 rows selected.

SQL>
```

Figure 27: Values in address table

3.2.6 Student Table

3.2.6.1 Statement

```
INSERT ALL

  INTO student VALUES (1001,'BIT Computing',1,9876548756,'John Doe','01-sep-2017',85)

  INTO student VALUES (1002,'BIT Computing',1,9856874533,'Peter Parker','01-sep-2017',90)

  INTO student VALUES (1003,'BIT Multimedia',3,9867675454,'Dom Mann','01-sep-2017',100)

  INTO student VALUES (1004,'BIT Multimedia',4,8976543255,'George Guy','01-sep-2018',75)

  INTO student VALUES (1005,'BIT Networking',5,3622486537,'Freddy Day','01-sep-2018',63)

  INTO student VALUES (1006,'BIT Networking',6,9877665544,'Barry Berry','01-sep-2019',70)

  INTO student VALUES (1007,'MBA Management',6,2222386746,'Lisa Mona','01-sep-2019',100)

  INTO student VALUES (1008,'MBA Management',2,8997657876,'john Smith','01-sep-2019',90)

  SELECT * FROM DUAL;
```

3.2.6.2 Screenshots

```
Run SQL Command Line

SQL> INSERT ALL
  2  INTO student VALUES (1001,'BIT Computing',1,9876548756,'John Doe','01-sep-2017',85)
  3  INTO student VALUES (1002,'BIT Computing',1,9856874533,'Peter Parker','01-sep-2017',90)
  4  INTO student VALUES (1003,'BIT Multimedia',3,9867675454,'Dom Mann','01-sep-2017',100)
  5  INTO student VALUES (1004,'BIT Multimedia',4,8976543255,'George Guy','01-sep-2018',75)
  6  INTO student VALUES (1005,'BIT Networking',5,3622486537,'Freddy Day','01-sep-2018',63)
  7  INTO student VALUES (1006,'BIT Networking',6,9877665544,'Barry Berry','01-sep-2019',70)
  8  INTO student VALUES (1007,'MBA Management',6,2222386746,'Lisa Mona','01-sep-2019',100)
  9  INTO student VALUES (1008,'MBA Management',2,8997657876,'john Smith','01-sep-2019',90)
 10  SELECT * FROM DUAL;

8 rows created.

SQL> COMMIT;

Commit complete.
```

Figure 28: Inserting values in student table

```
Run SQL Command Line

SQL> SELECT * FROM student;

STUDENT_ID COURSE                            ADDRESS    CONTACT STUDENT_NAME                   ENROLLMEN      MARKS
---------- ------------------------------ ---------- ---------- ------------------------------ --------- ----------
      1001 BIT Computing                           1 9876548756 John Doe                       01-SEP-17         85
      1002 BIT Computing                           1 9856874533 Peter Parker                   01-SEP-17         90
      1003 BIT Multimedia                          3 9867675454 Dom Mann                       01-SEP-17        100
      1004 BIT Multimedia                          4 8976543255 George Guy                     01-SEP-18         75
      1005 BIT Networking                          5 3622486537 Freddy Day                     01-SEP-18         63
      1006 BIT Networking                          6 9877665544 Barry Berry                    01-SEP-19         70
      1007 MBA Management                          6 2222386746 Lisa Mona                      01-SEP-19        100
      1008 MBA Management                          2 8997657876 john Smith                     01-SEP-19         90

8 rows selected.
```

Figure 29: Values in student table

3.2.7 Instructor Table

3.2.7.1 Statement

```
INSERT ALL
  INTO instructor VALUES ('CL1000','Resource Management',7,9812333678,'Angelina White',60000)
  INTO instructor VALUES ('CL1001','Database',5,8897657878,'James John',55000)
  INTO instructor VALUES ('I1002','Database',7,1234098765,'Dona De',55000)
  INTO instructor VALUES ('I1003','Networks',4,8998667535,'Lorem Ipsum',44000)
  INTO instructor VALUES ('ML1004','Networks',2,1092387465,'Angelina Blue',52000)
  INTO instructor VALUES ('ML1005','Accounting',3,1092387465,'Sam Bla',50000)
  INTO instructor VALUES ('I1006','Game Design',3,9998787878,'Ana Bna',51000)
  INTO instructor VALUES ('ML1007','Modelling',1,9000076543,'Drew D',55000)
  SELECT * FROM DUAL;
```

3.2.7.2 Statement

```
Run SQL Command Line

SQL> INSERT ALL
  2  INTO instructor VALUES ('CL1000','Resource Management',7,9812333678,'Angelina White',60000)
  3  INTO instructor VALUES ('CL1001','Database',5,8897657878,'James John',55000)
  4  INTO instructor VALUES ('I1002','Database',7,1234098765,'Dona De',55000)
  5  INTO instructor VALUES ('I1003','Networks',4,8998667535,'Lorem Ipsum',44000)
  6  INTO instructor VALUES ('ML1004','Networks',2,1092387465,'Angelina Blue',52000)
  7  INTO instructor VALUES ('ML1005','Accounting',3,1092387465,'Sam Bla',50000)
  8  INTO instructor VALUES ('I1006','Game Design',3,9998787878,'Ana Bna',51000)
  9  INTO instructor VALUES ('ML1007','Modelling',1,9000076543,'Drew D',55000)
 10  SELECT * FROM DUAL;

8 rows created.

SQL> COMMIT;

Commit complete.

SQL>
```

Figure 30: Inserting values in instructor table

```
Run SQL Command Line

SQL> SELECT * FROM instructor;

INSTRUCTOR_ID             MODULE                       ADDRESS    CONTACT INSTRUCTOR_NAME                    SALARY
------------------------- ------------------------- ---------- ---------- ------------------------------ ----------
CL1000                    Resource Management                7 9812333678 Angelina White                      60000
CL1001                    Database                           5 8897657878 James John                          55000
I1002                     Database                           7 1234098765 Dona De                             55000
I1003                     Networks                           4 8998667535 Lorem Ipsum                         44000
ML1004                    Networks                           2 1092387465 Angelina Blue                       52000
ML1005                    Accounting                         3 1092387465 Sam Bla                             50000
I1006                     Game Design                        3 9998787878 Ana Bna                             51000
ML1007                    Modelling                          1 9000076543 Drew D                              55000

8 rows selected.
```

Figure 31: Values in instructor table

Chapter 4: Information and Transaction Queries

4.1 List all the students with all their addresses with their phone numbers.

4.1.1 Query

SELECT

s.student_name,

s.contact,

a.country,

a.province,

a.city,

a.street,

a.house

FROM student s JOIN address a

ON

(s.address=a.address_id);

4.1.2 Screenshot

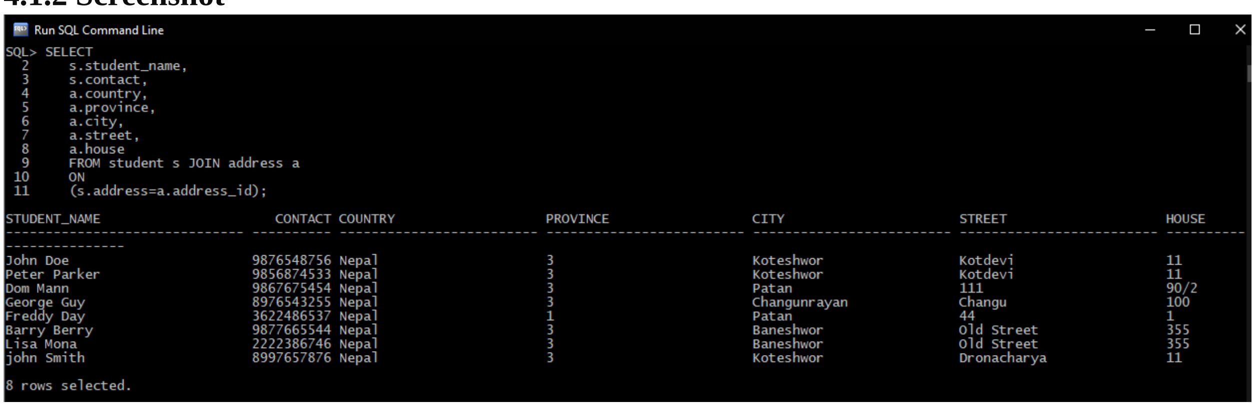


Figure 32: Information query 1

student table was given alias s and a for address table. JOIN with ON was used to join student and address table based on address FK in student table and address_id PK in address table.

4.2 List all the modules which are taught by more than one instructor.

4.2.1 Query

SELECT

module "modules_by_many_instructors"

FROM instructor

GROUP BY

module

HAVING COUNT(*)>1;

4.2.2 Screenshot

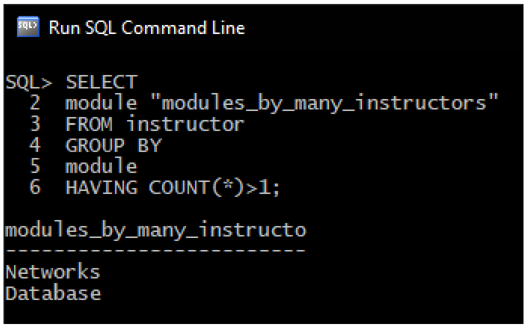


Figure 33: Information query 2

The instructor table holds information about which instructor teaches which module. To find module taught by more than one instructor, COUNT(*) was used to see how many times a module appeared and if it was more than 1, it was taken and displayed using HAVING statement. GROUP BY is used to take the matching values for the columns. Note: (If we want to see the number of instructors, following query can be used:)

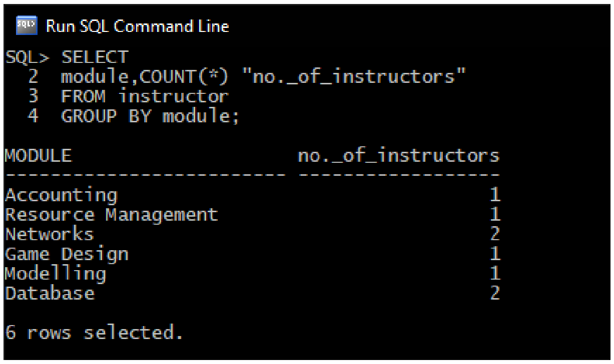


Figure 34: Seeing how many times a value appears

4.3 List the name of all the instructors whose name contains ‘s’ and salary is above 50,000.

4.3.1 Query

SELECT

instructor_name

FROM instructor

WHERE

LOWER(instructor_name) LIKE '%s%'

AND

salary>50000;

4.3.2 Screenshot

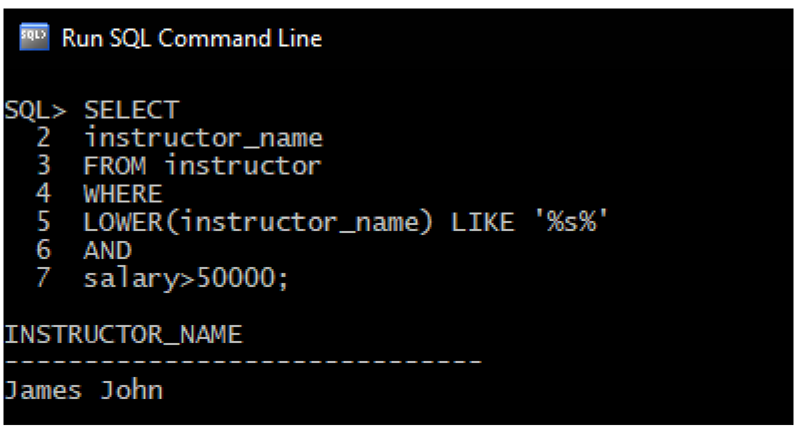


Figure 35: Information query 3

LIKE was used to specify what to search and LOWER was used so all data would be in lowercase and nothing will be missed. There is only 1 result because the sample size of the database was small, but the query will function even for large databases.

4.4 List the modules comes under the ‘Multimedia’ specification.

4.4.1 Query

SELECT

Module_title “Modules under Multimedia”

FROM

Module

WHERE

Course = 'BIT Multimedia';

4.4.2 Screenshot

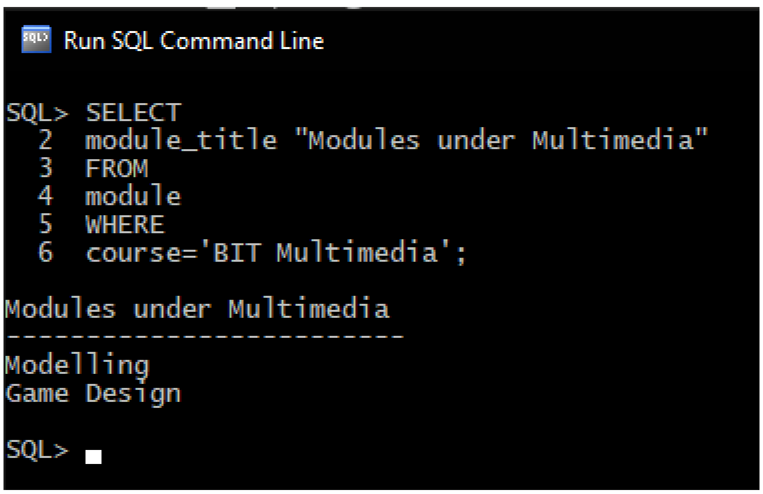


Figure 36: Information query 4

WHERE clause was used to select modules under Multimedia.

4.5 List the name of the head of modules with the list of his phone number.

4.5.1 Query

SELECT

instructor_name "Module Head",

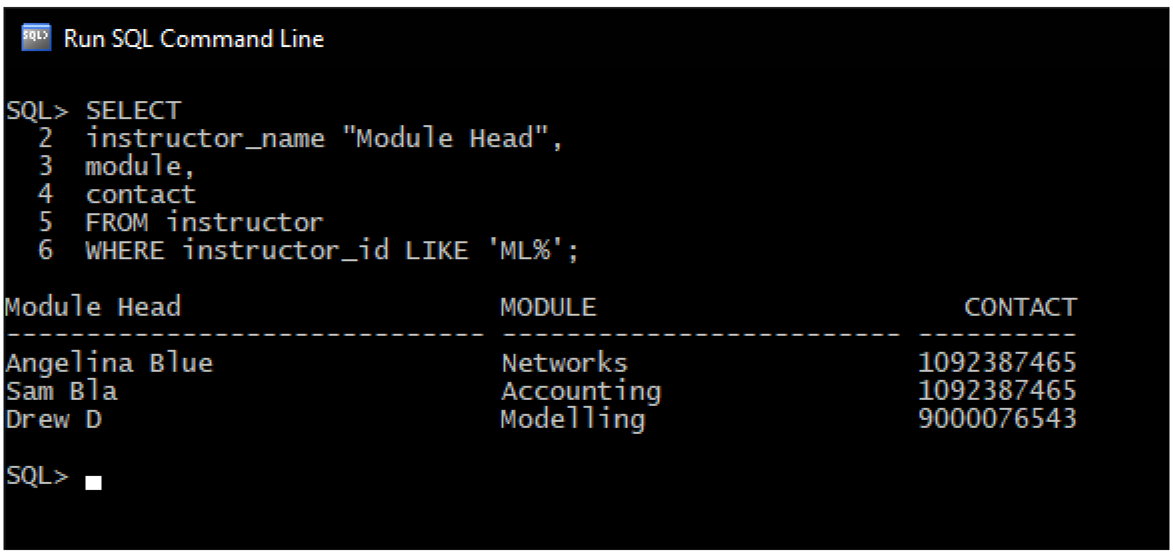
module,

contact

FROM instructor

WHERE instructor_id LIKE 'ML%';

4.5.2 Screenshot



```
Run SQL Command Line

SQL> SELECT
  2  instructor_name "Module Head",
  3  module,
  4  contact
  5  FROM instructor
  6  WHERE instructor_id LIKE 'ML%';

Module Head                    MODULE                       CONTACT
------------------------------ ------------------------- ----------
Angelina Blue                  Networks                  1092387465
Sam Bla                        Accounting                1092387465
Drew D                         Modelling                 9000076543

SQL>
```

Figure 37: Information query 5

Since, module leaders have ML in their id, we checked for occurrence of ML.

4.6 List all Students who have enrolled in ‘networking’ specifications.

4.6.1 Query

SELECT

student_name "Students in Networking"

FROM student

WHERE

course='BIT Networking';

4.6.2 Screenshot

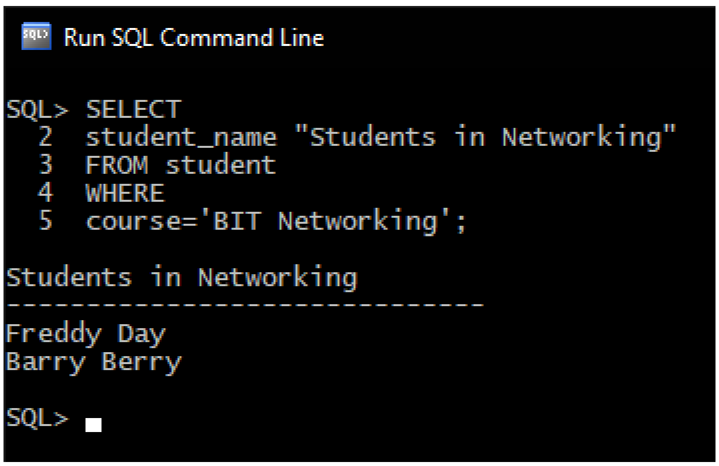


Figure 38: Information query 6

To check for students in networking, we specified course as networking.

4.7 List the fax number of the instructor who teaches the ‘database’ module

4.7.1 Query

SELECT

i.instructor_name,

c.fax

FROM instructor i JOIN contact c

ON

(i.contact=c.phone)

WHERE i.module='Database';

4.7.2 Screenshot

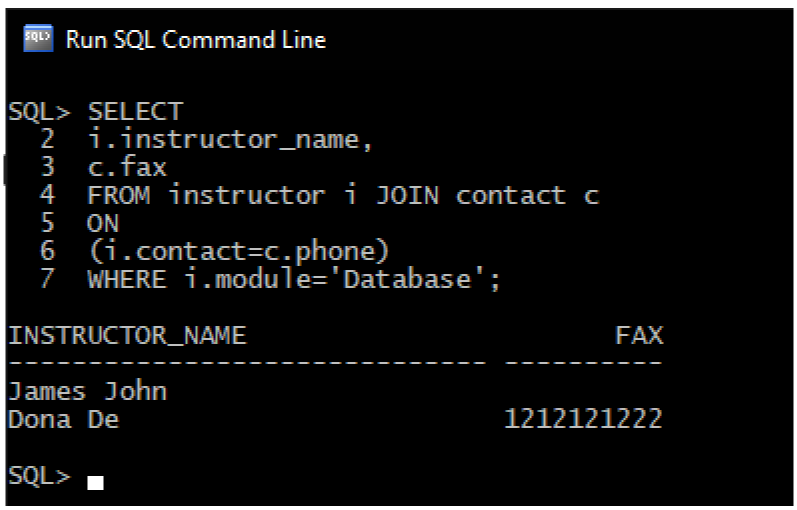


Figure 39: Information query 7

We join instructor and contact table then only select fax if module is Database.

4.8 List the specification falls under the BIT course.

4.8.1 Query

SELECT

SUBSTR(course_name,4) "Specifications under BIT"

FROM course

WHERE course_name LIKE 'BIT%';

4.8.2 Screenshot

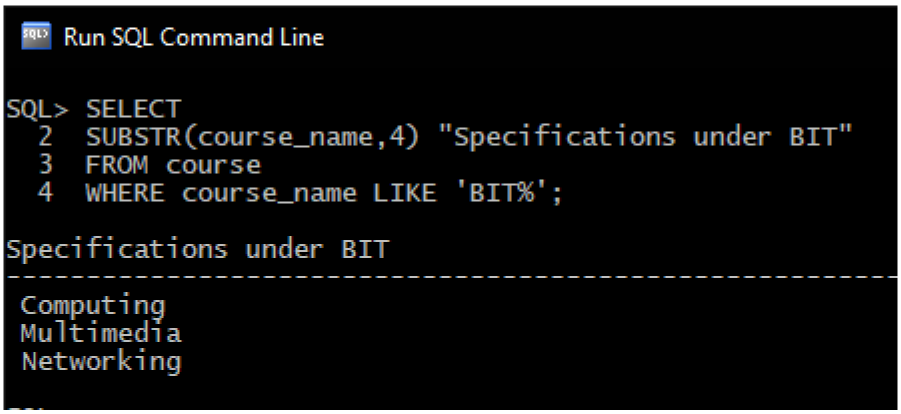


Figure 40: Information query 8

As per the business rules, courses for BIT have BIT in their ids, so we use LIKE to check and display such courses.

4.9 List all the modules taught in any one particular class.

4.9.1 Query

SELECT

module_title "taught in Pokhara class"

FROM module

WHERE

class='Pokhara';

4.9.2 Screenshot

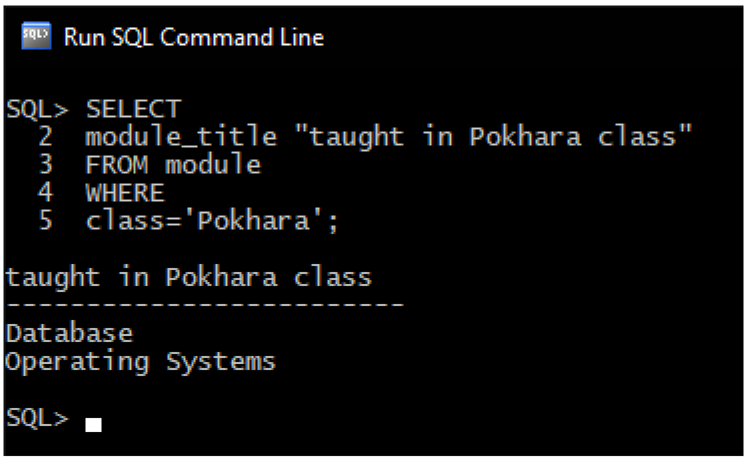


Figure 41: Information query 9

4.10 List all the teachers with all their addresses who have ‘a’ at the end of their first name.

4.10.1 Query

SELECT

i.instructor_name,

a.country,

a.province,

a.city,

a.street,

a.house

FROM instructor i JOIN address a

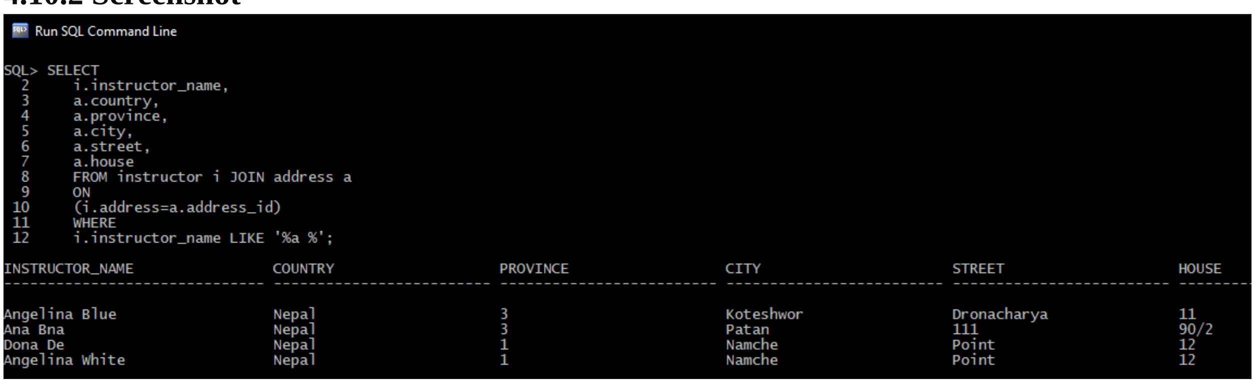
ON

(i.address=a.address_id)

WHERE

i.instructor_name LIKE '%a %';

4.10.2 Screenshot



```
Run SQL Command Line

SQL> SELECT
  2      i.instructor_name,
  3      a.country,
  4      a.province,
  5      a.city,
  6      a.street,
  7      a.house
  8      FROM instructor i JOIN address a
  9      ON
 10      (i.address=a.address_id)
 11      WHERE
 12      i.instructor_name LIKE '%a %';
```

INSTRUCTOR_NAME	COUNTRY	PROVINCE	CITY	STREET	HOUSE
Angelina Blue	Nepal	3	Koteshwor	Dronacharya	11
Ana Bna	Nepal	3	Patan	111	90/2
Dona De	Nepal	1	Namche	Point	12
Angelina White	Nepal	1	Namche	Point	12

Figure 42: Information query 10

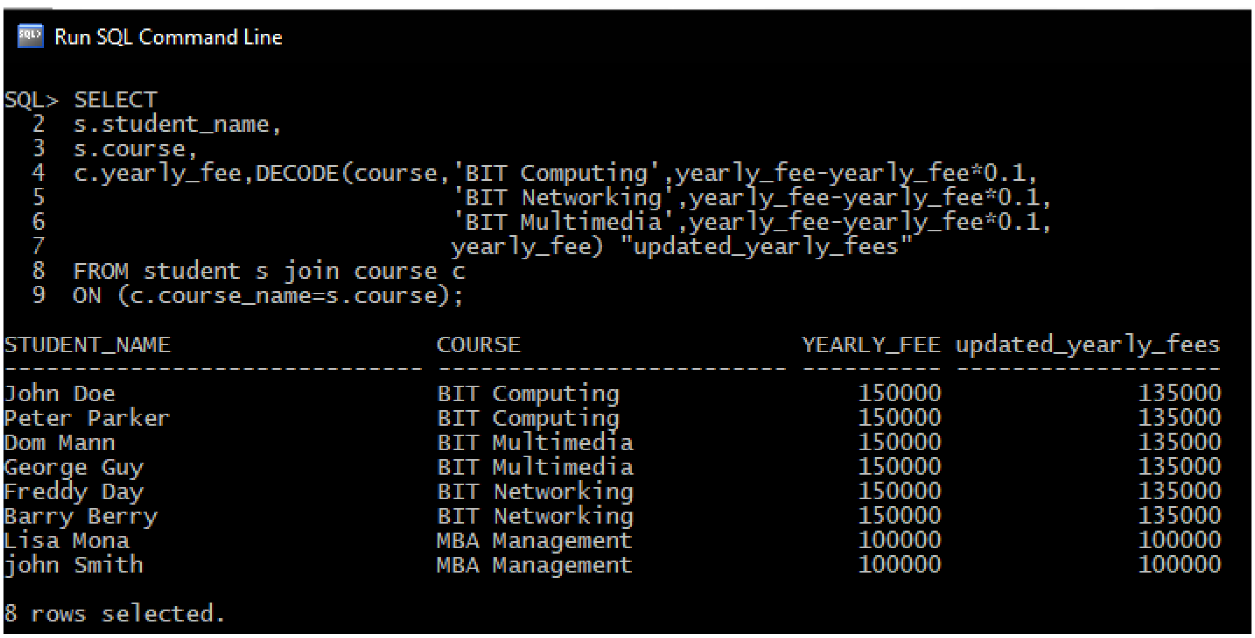
Since name was stored in a single column, LIKE was used to match the given case.

4.11 Show the students, course they enroll in and their fees. Reduce 10% of the fees if they are enrolled in a computing course.

4.11.1 Query

```
SELECT

    s.student_name,

    s.course,

    c.yearly_fee,DECODE(course,'BIT Computing',yearly_fee-yearly_fee*0.1,

                             'BIT Networking',yearly_fee-yearly_fee*0.1,

                             'BIT Multimedia',yearly_fee-yearly_fee*0.1,

                             yearly_fee) "updated_yearly_fees"

    FROM student s join course c

    ON (c.course_name=s.course);
```

4.11.2 Screenshot



```
Run SQL Command Line

SQL> SELECT
  2  s.student_name,
  3  s.course,
  4  c.yearly_fee,DECODE(course,'BIT Computing',yearly_fee-yearly_fee*0.1,
  5                             'BIT Networking',yearly_fee-yearly_fee*0.1,
  6                             'BIT Multimedia',yearly_fee-yearly_fee*0.1,
  7                             yearly_fee) "updated_yearly_fees"
  8  FROM student s join course c
  9  ON (c.course_name=s.course);

STUDENT_NAME                   COURSE                    YEARLY_FEE updated_yearly_fees
------------------------------ ------------------------- ---------- -------------------
John Doe                       BIT Computing                 150000              135000
Peter Parker                   BIT Computing                 150000              135000
Dom Mann                       BIT Multimedia                150000              135000
George Guy                     BIT Multimedia                150000              135000
Freddy Day                     BIT Networking                150000              135000
Barry Berry                    BIT Networking                150000              135000
Lisa Mona                      MBA Management                100000              100000
john Smith                     MBA Management                100000              100000

8 rows selected.
```

Figure 43: Transaction query 1

DECODE was used to check if the course was related to computing, then discount was applied if the result was true.

4.12 Place the default Number 1234567890 if the list of phone numbers to the location of the address is empty and give the column name as ‘Contact details.

4.12.1 Query

SELECT

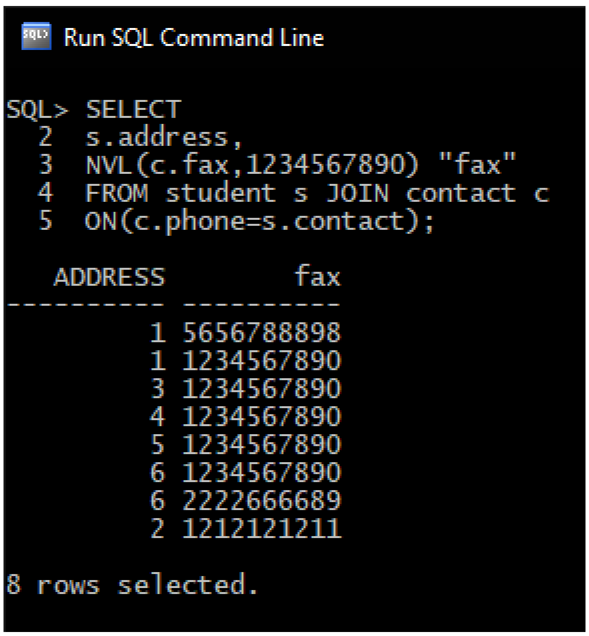
s.address,

NVL(c.fax,1234567890) "fax"

FROM student s JOIN contact c

ON(c.phone=s.contact);

4.12.2 Screenshot



```
Run SQL Command Line

SQL> SELECT
  2  s.address,
  3  NVL(c.fax,1234567890) "fax"
  4  FROM student s JOIN contact c
  5  ON(c.phone=s.contact);

   ADDRESS        fax
---------- ----------
         1 5656788898
         1 1234567890
         3 1234567890
         4 1234567890
         5 1234567890
         6 1234567890
         6 2222666689
         2 1212121211

8 rows selected.
```

Figure 44: Transaction query 2

As per the assumptions made, phone number cannot be empty, so we are using fax number to complete the query. NVL is used to convert the null value into the value that we have specified.

4.13 Show the name of all the students with the number of weeks since they have enrolled in the course

4.13.1 Query

```
SELECT

    student_name,

    (SYSDATE-enrollment_date)/7 "weeks_since_enrollment"

    FROM student;
```

4.13.1 Screenshot

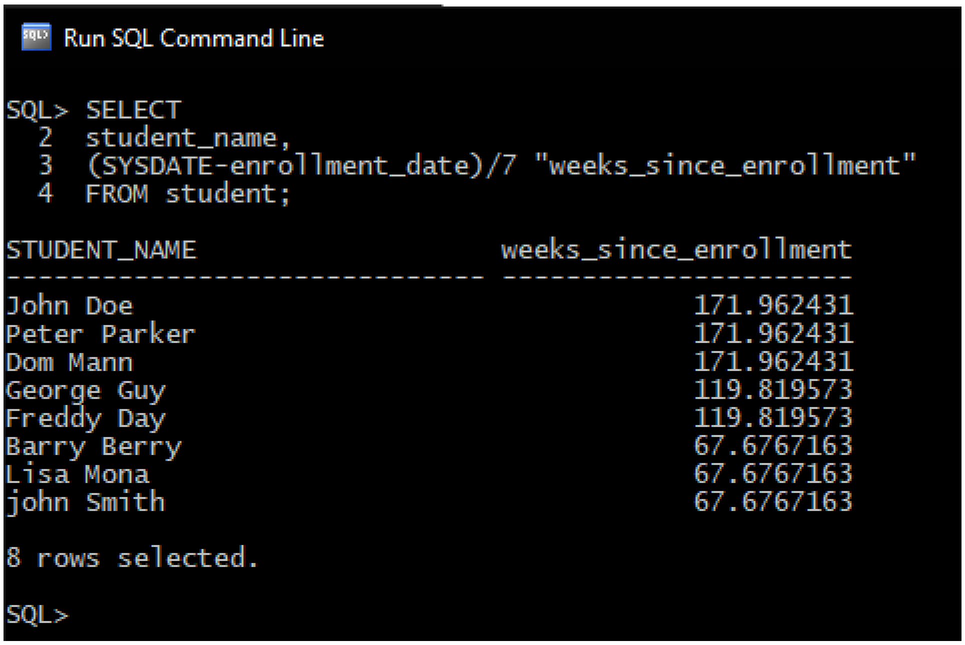


Figure 45: Transaction query 3

To find weeks since a student has enrolled in a course, we subtract enrollment date from current date to get the number of days which is divided by 7 to get number of weeks.

4.14 Show the name of the instructors who got equal salary and work in the same specification.

4.14.1 Query

```
SELECT

    i.instructor_name

    FROM

    instructor i

    INNER JOIN

    instructor j

    ON i.salary=j.salary

    AND i.module=j.module

    AND i.instructor_id!=j.instructor_id;
```

We join the instructor table with itself to compare the value in the columns. We check for same value for module and salary but check for different id. Checking for difference in id is necessary, else the query will return value for all the instructors, but in this case we only get values for which module and salary are same.

4.14.2 Screenshot

```
Run SQL Command Line

SQL> SELECT * FROM instructor;

INSTRUCTOR_ID            MODULE                   ADDRESS    CONTACT INSTRUCTOR_NAME                    SALARY
------------------------ ------------------------ ---------- ---------- ------------------------------ ----------
CL1000                   Resource Management               7 9812333678 Angelina White                      60000
CL1001                   Database                          5 8897657878 James John                          55000
I1002                    Database                          7 1234098765 Dona De                             55000
I1003                    Networks                          4 8998667535 Lorem Ipsum                         44000
ML1004                   Networks                          2 1092387465 Angelina Blue                       52000
ML1005                   Accounting                        3 1092387465 Sam Bla                             50000
I1006                    Game Design                       3 9998787878 Ana Bna                             51000
ML1007                   Modelling                         1 9000076543 Drew D                              55000

8 rows selected.
```

Figure 46: Data in instructor table

```
Run SQL Command Line

SQL> SELECT
  2  i.instructor_name
  3  FROM
  4  instructor i
  5  INNER JOIN
  6  instructor j
  7  ON i.salary=j.salary
  8  AND i.module=j.module
  9  AND i.instructor_id!=j.instructor_id;

INSTRUCTOR_NAME
------------------------------
Dona De
James John
```

Figure 47: Transaction query 4

Here only the instructors with same salary and module is displayed.

4.15 List all the courses with the total number of students enrolled course name and the highest marks obtained.

4.15.1

SELECT

course, COUNT(*) "students enrolled",

MAX(marks) "highest marks"

FROM

student

GROUP BY course;

4.15.2 Screenshot

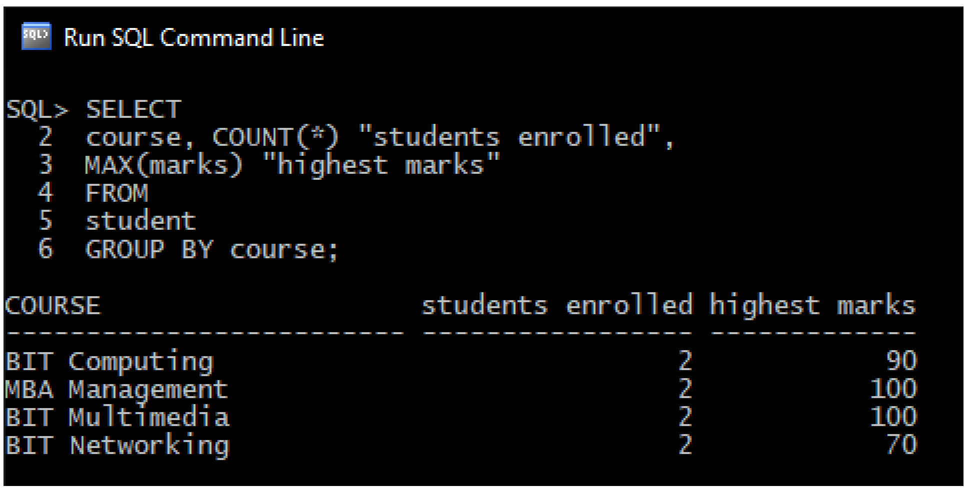


Figure 48: Transaction query 5

The query is performed on student table, COUNT is used to find the number of times a course appears, and MAX gives the maximum value for the given data.

4.16 List all the instructors who are also a course leader

4.16.1 Query

SELECT

instructor_name

FROM instructor

WHERE

instructor_id LIKE 'CL%';

4.16.2 Screenshot

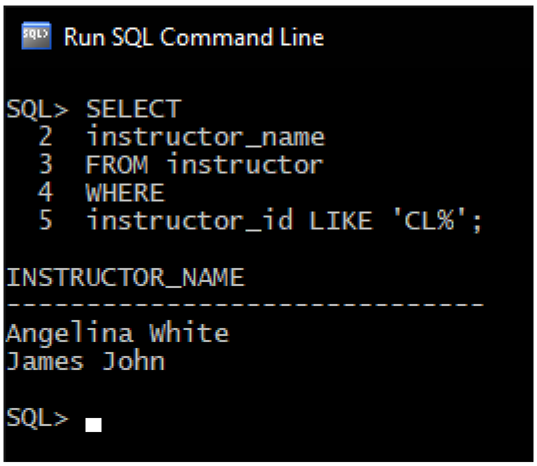


Figure 49: Transaction query 6

As per our business rules, instructors who are course leaders have CL in their id, so all the instructors were listed who had CL in the beginning if their id to find instructors who are also course leaders.

Dump file creation, dropping tables

Screenshot for dump file creation

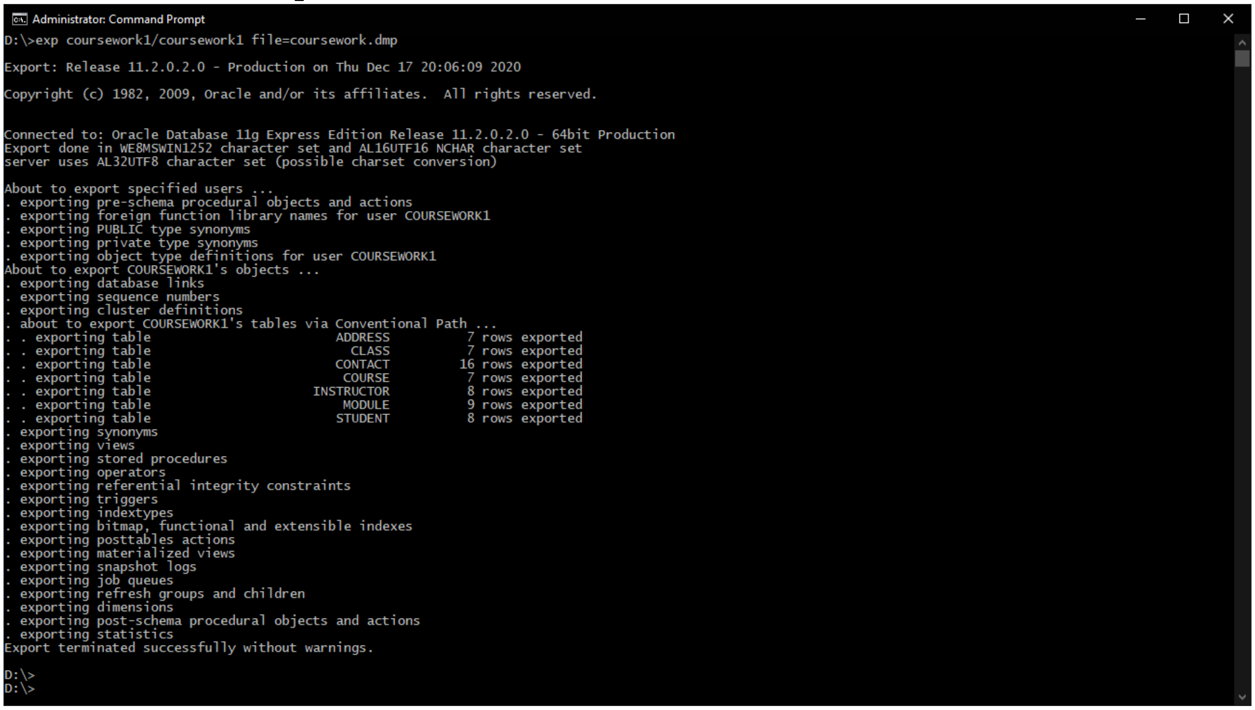


Figure 50: Creating dmp file

Queries to drop tables

DROP TABLE instructor;

DROP TABLE student;

DROP TABLE address;

DROP TABLE contact;

DROP TABLE module;

DROP TABLE class;

DROP TABLE course;

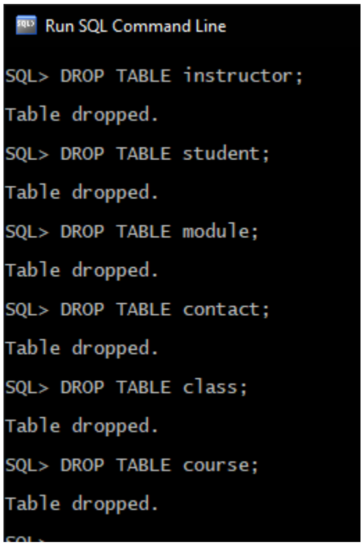


Figure 51: Dropping tables

Chapter 5: Conclusion

The learning experience was wonderful, many things were revised, and some new things were learnt during research. ERD’s were formulated and normalization was carried out to sort out mistakes and improve the database.

The course work also helped in understanding design for a database, why we need normalization and what problems a poorly designed database can cause when implemented without checking for problems.

The experience in the coursework can be very useful in real life work scenario of manipulating data in a database. During the coursework one got to be familiar with different queries for extracting data and which query to use according to the scenario. The overall experience of the coursework was rewarding and a great exercise on the topics learnt so far.

Chapter 6: References

References

Carlos Coronel, S.M. (2016) *DATABASE SYSTEMS Design,Implementation and Management*. 12th ed. Boston: Cengage Learning.

Islington College. (2020) *Islington* [Online]. Available from: https://islington.edu.np/about/ [Accessed 16 December 2020].

Oracle. (2016) *Database SQL Reference* [Online]. Available from: https://docs.oracle.com/cd/B19306_01/server.102/b14200/statements_4010.htm [Accessed 16 December 2020].