

## Lab Sheet 1

**IT1090 – Information Systems and Data Modeling**

**Objective:** At the end of this lab session you will get a basic knowledge about the SQL Server, its working environment, usage of its components and you will be able to write a simple select query for a single table and select some rows.

## Introduction

### Section 1

Here you will obtain a basic understanding of the Database and the Database Management System

- a. What is a database?
- b. Give some real time examples of the existing databases used by different companies in Sri Lanka.
- c. What is the uniqueness that we can find in a database?
- d. When do we need a database?
- e. What is a Database Management System?
- f. What are the DBMS types available?
- g. Is implementing a database be a good solution for all the places that deal with data?

## Lab Sheet 1

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## Section 2

1. Let's download the SQL Server software by using the below link and after that install the software.

<https://go.microsoft.com/fwlink/?linkid=866658>

2. Starts the SQL Server.
  - a. Run a simple select query and learn how to run it. Also, find where the result is displayed.

## Lab Sheet 2

**IT1090 – Information Systems and Data Modeling****Semester 2**

**Objective:** At the end of this lab session you should be able to write the SELECT command with the WHERE clause and ORDER BY clause for single table queries.

## Section 1

SELECT command is used to retrieve data from the database tables. The syntax of the basic SELECT command is given below.

Syntax:

```
SELECT column1, column2,  
FROM table_name;
```

WHERE clause is used to filter out the results according to our requirements and different conditions. The syntax of a query with the WHERE clause included is given below.

Syntax:

```
SELECT column1, column2,  
FROM table_name  
WHERE condition;
```

We can use the following Relational operators to define the conditions in the WHERE clause.

=, != or <>, >, <, >=, <=

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Ex:

Select sname from Student where CID ='IT';

Select cname from Course where fees > 100000;

Also, we can use the following keywords in the WHERE clause.

AND, OR, BTWEEN, NOT BETWEEN, IN, NOT IN, IS NULL, IS NOT NULL, LIKE, NOT LIKE

Ex:

Select SID, sname from Student where CID = 'IT' OR DOB < '3/5/1999';

Select \* from Student where address IS NULL;

Table 1 given below defines the operators and keywords that can be used in the WHERE clause

Operator	Description
=	Equal
>	Greater than
<	Less than
>=	Greater than or equal
<=	Less than or equal
<>	Not equal. Note: In some versions of SQL this operator may be written as !=
BETWEEN	Between a certain range

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LIKE	Search for a pattern
IN	To specify multiple possible values for a column
AND	displays a record if all the conditions separated by AND are TRUE
OR	displays a record if any of the conditions separated by OR is TRUE
NOT	NOT operator displays a record if the condition(s) is NOT TRUE

Table 1: Operators and keywords in WHERE clause

**Exercise**

- a. Find all information about the students.
- b. Find the module name and the no of credits for a module.
- c. Find students whose name start with letter 'A'.
- d. Find the names of the students who were born before 1996/01/01.
- e. Find name and NIC of students who are from 'Colombo' District.
- f. Find the students whose names are starting from 'K' and following 'DS' course.
- g. Select the students who are following either 'DS' or 'IT' courses.

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## Section 2

The ORDER BY clause in SQL is used to sort the results of a query. It sorts the result in ascending order by default. To sort the records in descending order, we use the DESC keyword.

Syntax:

```
SELECT column1, column2, ...
FROM table_name
ORDER BY column1, column2, ... ASC|DESC;
```

### Exercises

- a. Select all the students sorted by the sname column.
- b. Select all students from the "Student" table, sorted DESCENDING by the "NIC" column.
- c. Select all students from the "Student" table, sorted ASCENDING by the "sname" column and descending by the "CID" column

## Lab Sheet 3

**IT1090 – Information Systems and Data Modeling****Semester 2**

**Objective:** At the end of this lab session you should be able to use Aggregate functions with correct syntax.

Furthermore, you will understand where we can use these functions.

## Aggregate Functions

### Section 1

What is an Aggregate Function?

An aggregate function performs a calculation on a set of values, and returns a single value. Aggregate functions ignore null values. Aggregate functions allows us to get summarized data from the database.

From a university database, management/external people may require following reports;

- Number of students in the university
- Least cost Course available in the university
- Average marks a student achieved for a particular module in an exam

In order to produce the above reports we need to make use of Aggregate functions.

Let's look at some of the Aggregate functions given in Table 1.

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Function	Description
COUNT()	Function returns the number of rows that matches a specified criterion.
SUM()	Function returns the total sum of a numeric column.
MAX()	Function returns the largest value of the selected column.
MIN()	Function returns the smallest value of the selected column.
AVG()	Function returns the average value of a numeric column.
ROUND()	used to round the value up to a specific decimal places
FIRST()	Returns the first value in a column.
LAST()	Returns the last value in a column.

*Table 1*

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## Section 2

### Example

- a. How many students are in the university?

#### Step 01

Now you must count the amount of entries in the Student table,

```
SELECT COUNT(SID)
FROM Student|
```

#### Step 02

Then answer is like this,

Results		Messages
(No column name)		
1	12	

You can check this answer using select(\*) from Student quarry,

	SID	Sname	Address	dob	NIC	CID
1	CN18384756	Kamal	No122, Rose street, matale	1994-05-02	946785467v	CSNE
2	CN19465738	Sampath	No173, New kandy Road, kaduwella	1996-11-20	968764567v	CSNE
3	CS18223645	kalani	No08 , Gamini Road, Anuradhapura	1996-10-11	968564857v	CS
4	CS18234867	Damith	No125 , 1st street, kurunegala	1996-02-15	968763456v	CS
5	DS18234876	Pubudu	No678 , 3rd new lane, Maharahgama	1994-11-08	948763759v	DS
6	DS18375688	Kamani	No10 , new street, jaffna	1994-03-05	948763456v	DS
7	IS18758649	Jayni	No111, Perera street, kurunegala	1998-09-07	982359856v	ISE
8	IS19234876	Dulina	No124 , 2nd street, colombo10	1998-12-08	983485764v	ISE
9	IT18234568	Ann	No12, Kings street, colombo	1996-11-11	961234587v	IT
10	IT19275687	Rayan	No14, flower street, colombo12	1994-01-10	945673456v	IT
11	SE19238567	Malith	No08, st.thomas street, Kandy	1992-12-20	922356785v	SE
12	SE20284567	Pooja	No15, lakshmi Road, jaffna	1996-08-07	965678645v	SE

12 entries

## Lab Sheet 3

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- a. How many students are in the university?
- b. How many courses are offered by the university?
- c. Display the above result with the title “Number of courses”.
- d. How many modules are there which have 03 credits only?
- e. If one student wants to register all courses at ones, what is the total course fee that he/she wants to pay?
- f. What is the highest course fee?
- g. What is the lowest course fee?
- h. What is the Average courses fee of a course?

## Lab Sheet 4

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**Objective:** At the end of this lab session you should be able to write the SELECT command with GROUP BY clause for single table queries. Furthermore, you will understand where we can use these functions.

## Section 1

### GROUP BY

The GROUP BY Statement in SQL is used to arrange identical data into groups with the help of some functions. if a particular column has same values in different rows then it will arrange these rows in a group.

Important:

- GROUP BY clause is used with the SELECT statement.
- In the query, GROUP BY clause is placed after the WHERE clause.
- Where clause use here only if it needed according to the given question.
- In the query, GROUP BY clause is placed before ORDER BY clause if used any.

Syntax:

```
SELECT column1, function_name(column2)
FROM table_name
WHERE condition
GROUP BY column1, column2
ORDER BY column1, column2;
```

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Example:

Display the number of students from each course.

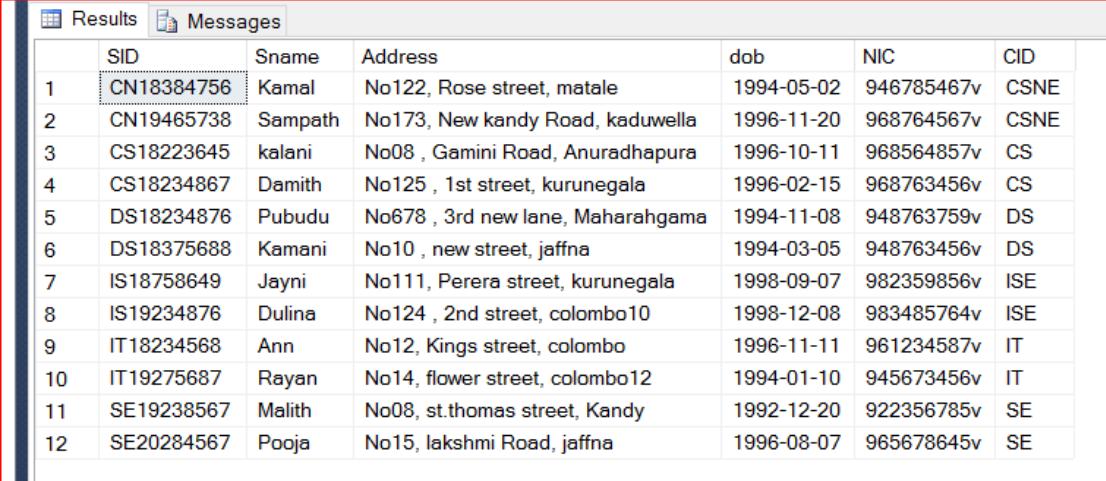
First of all, you need to check the Student table by following simple query. Then you can view the full Student table. It's helpful to write a suitable query for the above question.

```

| SELECT *
| FROM Student;|

```

Then we can see following table.



The screenshot shows the SSMS interface with the 'Results' tab selected. The query `SELECT \* FROM Student;` has been run, and the results are displayed in a table. The table has columns: SID, Sname, Address, dob, NIC, and CID. The data consists of 12 rows of student information.

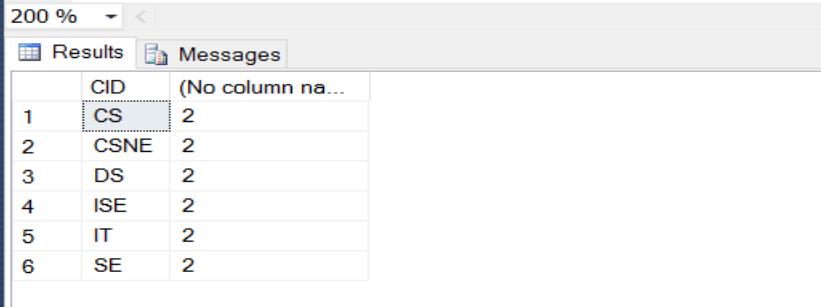
	SID	Sname	Address	dob	NIC	CID
1	CN18384756	Kamal	No122, Rose street, matale	1994-05-02	946785467v	CSNE
2	CN19465738	Sampath	No173, New kandy Road, kaduwella	1996-11-20	968764567v	CSNE
3	CS18223645	kalani	No08 , Gamini Road, Anuradhapura	1996-10-11	968564857v	CS
4	CS18234867	Damith	No125 , 1st street, kurunegala	1996-02-15	968763456v	CS
5	DS18234876	Pubudu	No678 , 3rd new lane, Maharahgama	1994-11-08	948763759v	DS
6	DS18375688	Kamani	No10 , new street, jaffna	1994-03-05	948763456v	DS
7	IS18758649	Jayni	No111, Perera street, kurunegala	1998-09-07	982359856v	ISE
8	IS19234876	Dulina	No124 , 2nd street, colombo10	1998-12-08	983485764v	ISE
9	IT18234568	Ann	No12, Kings street, colombo	1996-11-11	961234587v	IT
10	IT19275687	Rayan	No14, flower street, colombo12	1994-01-10	945673456v	IT
11	SE19238567	Malith	No08, st.thomas street, Kandy	1992-12-20	922356785v	SE
12	SE20284567	Pooja	No15, lakshmi Road, jaffna	1996-08-07	965678645v	SE

Now you can write down following SQL query to get the answer for the above question.

```

| SELECT CID, COUNT(SID)
| FROM Student
| GROUP BY CID;|

```



The screenshot shows the SSMS interface with the 'Results' tab selected. The query `SELECT CID, COUNT(SID) FROM Student GROUP BY CID;` has been run, and the results are displayed in a table. The table has columns: CID and COUNT(SID). The data consists of 6 rows, showing that each course has exactly 2 students.

	CID	(No column na...)
1	CS	2
2	CSNE	2
3	DS	2
4	ISE	2
5	IT	2
6	SE	2

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**Section 2****Exercise**

- a. Display the total number of modules in each course?
- b. How many students are there for each course? Re name the count as ‘Number of Student’.
- c. What is the number of Modules offered by each course in each academic year?
- d. What is the number of Modules in Semester 02 only?
- e. Sort the results of Question (d.) according to the ascending order of CID.

## Lab Sheet 5

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**Objective:** At the end of this lab session you should be able to write the SELECT command with HAVING clause for single table queries. Furthermore, you will understand where we can use these functions.

## Section 1

### HAVING CLAUSE

The HAVING Clause enables you to specify conditions that filter which group results appear in the results.

The HAVING clause was added to SQL because the WHERE keyword could not be used with aggregate functions.

### Syntax

```
SELECT Column1, Column2, aggregate_function (aggregate_ Column)
  FROM table
 [WHERE conditions]
 GROUP BY Column1, Column2
 [HAVING condition];
```

- **Column1, column2,**

Columns that are not encapsulated within an aggregate function must be included in the GROUP BY Clause before the HAVING clause.

- **aggregate\_function**

This is an aggregate function such as the SUM, COUNT, MIN, MAX, or AVG functions.

- **aggregate\_column**

This is the column or expression that the aggregate\_function will be used on.

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- **Table**

The tables that you wish to retrieve records from.

- **WHERE condition**

Optional. These are the conditions for the records to be selected.

- **HAVING condition**

This is a further condition applied only to the aggregated results to restrict the groups of returned rows. Only those groups whose condition evaluates to TRUE will be included in the result set.

Difference between WHERE clause and HAVING clause.

The main difference between WHERE and HAVING clause comes when used together with GROUP BY clause

- WHERE is used to filter rows before grouping
- HAVING is used to exclude records after grouping.

When SQL statements have both a WHERE clause and HAVING clause, keep in mind the WHERE clause is applied first, then the results grouped, and finally, the groups filtered according to the HAVING clause.

Example:

What are the courses which offer more than 2 modules in semester 01?

First of all, you need to check the Offers table by following simple query. Then you can view the full Offers table. It's helpful to write a suitable query for the above question.

```
SELECT *
FROM Offers;
```

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Then we can see following table.

	CID	Mcode	Accadamic_y...	Semest...
1	CS	IE3082	Y3	1
2	CS	IE3102	Y3	2
3	CS	IE4042	Y4	1
4	CS	IE4052	Y4	1
5	CSNE	IE3030	Y3	1
6	CSNE	IE3070	Y3	1
7	CSNE	IE3080	Y3	2
8	CSNE	IE4040	Y4	1
9	DS	IT3011	Y3	1
10	DS	IT3051	Y3	2
11	DS	IT3071	Y3	2
12	DS	IT4011	Y4	1
13	ISE	IE2051	Y2	2
14	ISE	IE3051	Y3	1
15	ISE	IE3081	Y3	2
16	ISE	IE4011	Y4	1
17	IT	IT1010	Y1	2
18	IT	IT1050	Y1	2
19	IT	IT1100	Y1	2
20	IT	IT2050	Y2	1
21	SE	IT3100	Y3	2
22	SE	SE3...	Y3	2
23	SE	SE3...	Y3	2
24	SE	SE4...	Y4	1

Now you can write down following SQL query to get the answer for the above question.

```

SELECT CID, COUNT(Mcode)
FROM Offers
WHERE Semester = 1
GROUP BY CID
HAVING COUNT(Mcode) > 2;

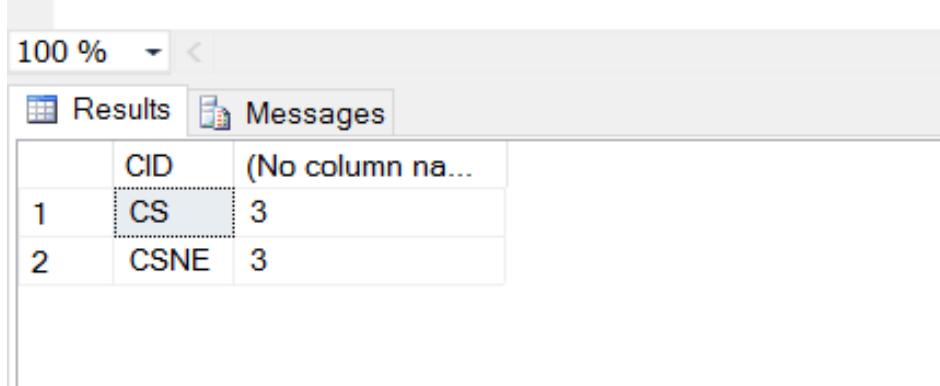
```

Then you can see following data set retrieving from the Offers table.

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The screenshot shows a software interface with a toolbar at the top containing a magnifying glass icon and a dropdown menu set to '100 %'. Below the toolbar is a tab bar with 'Results' selected and 'Messages' as the other tab. The main area displays a table with two rows. The first row has three columns: 'CID' (containing '1'), '(No column name)' (containing 'CS'), and '3'. The second row has three columns: 'CID' (containing '2'), '(No column name)' (containing 'CSNE'), and '3'.

	CID	(No column na...)
1	CS	3
2	CSNE	3

**Lab Sheet 5****IT1090 – Information Systems and Data Modeling****Semester 2****Section 2****Exercise**

- a) Display the number of students for each course? List the Course\_ID of courses only if there are less than 10 students for the course.
- b) List the Course\_ID and the number of modules offered for each course. Display only the course ids which have more than 3 modules offered in it. Sort the result according to the ascending order of the module count.
- c) Display the course id, academic year and the number of modules offered. The number of modules offered should be less than 10.
- d) List the courses that offer more than 2 modules for year 3 students?

## Lab Sheet 6

IT1090 – Information Systems and Data Modeling

Semester 2

**Objective:** At the end of this lab session students should be able to join tables and retrieve information

## Table joining – part 1

### Section 1

Part a - What is table joining?

When retrieving data from two or more related tables in a relational database, matching rows of tables are joined together to produce the answer. Here the rows of tables are combined, based on a related columns between them.

For example, suppose we want to make a list of names of students and the courses they have enrolled from our database. The corresponding rows of ‘Student’ and ‘Course’ tables are linked and the desired answer is obtained accordingly.

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**Section 2**
**Example**

- a) Display a list of Names of all employees with the corresponding Department names.

**Employee table**

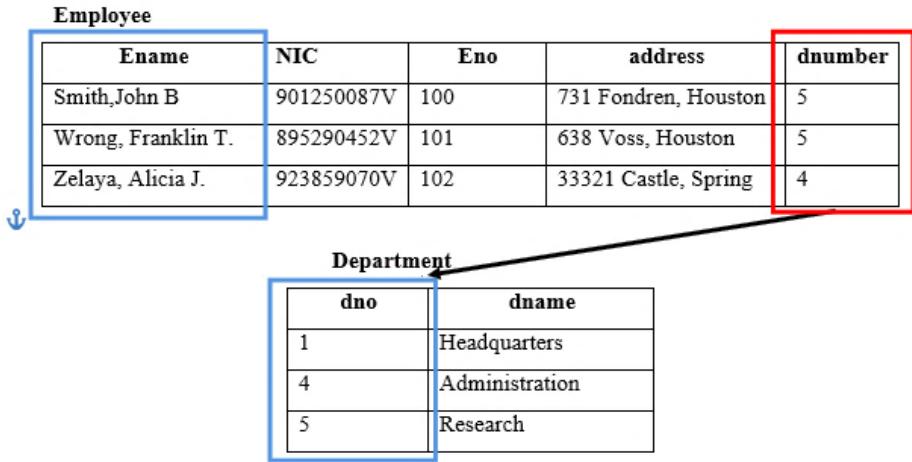
Ename	NIC	Eno	address	dnumber
Smith,John B	901250087V	100	731 Fondren, Houston	5
Wrong, Franklin T.	895290452V	101	638 Voss, Houston	5
Zelaya, Alicia J.	923859070V	102	33321 Castle, Spring	4

**Department table**

dno	dname
1	Headquarters
4	Administration
5	Research

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**Step 01**

Before answering, you need to look at the data in these two tables.



**Employee**

Ename	NIC	Eno	address	dnumber
Smith, John B	901250087V	100	731 Fondren, Houston	5
Wrong, Franklin T.	895290452V	101	638 Voss, Houston	5
Zelaya, Alicia J.	923859070V	102	33321 Castle, Spring	4

**Department**

dno	dname
1	Headquarters
4	Administration
5	Research

When you just look at these two tables, you can tell that both tables have the similar data in their Department number columns (dno , dnumber) . Employee table ‘dnumber’ column refer the data in Department table ‘dno’ column. Therefore we can join both of these tables using that ‘dno’ and ‘dnumber’ columns.

**Step 02**

So let's see how to make a query to get the answer.

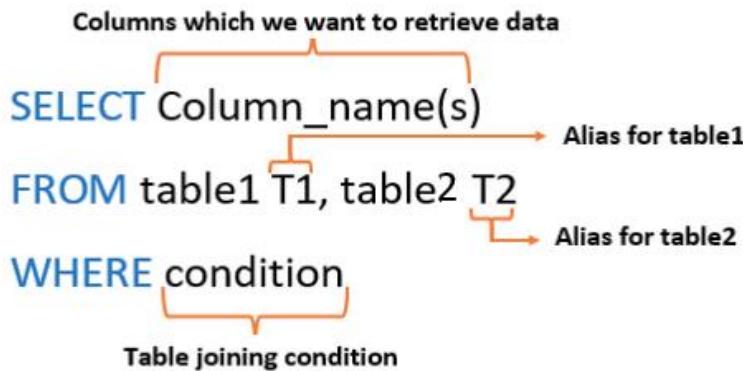


Figure 1: Table join syntax

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**Alias**

Alias give a temporary name to a table or a column. An alias only exists for the duration of the query.

Now let's create the query we want to get the answer.

```
SELECT E.Ename, D. dname  

FROM Employee E, Department D  

WHERE E. dnumber = D. dno
```

Here 'E' and 'D' are the aliases for Employee and Department tables respectively. Here the table joining condition must be specified correctly. Otherwise we get a wrong answer.

**Step 03**

Then both tables will get joined as in figure 2. The resulting table is given in figure 3.

Ename	NIC	Eno	address	dnumber	dno	dname
Smith,John B	901250087V	100	731 Fondren, Houston	5	5	Research
Wrong, FranklinT.	895290452V	101	638 Voss, Houston	5	5	Research
Zelaya, Alicia J.	923859070V	102	33321 Castle, Spring	4	4	Administration

Figure 2 : Joined table

Ename	dname
Smith,John B	Research
Wrong, FranklinT.	Research
Zelaya, Alicia J.	Administration

Figure 3: Output table

**Lab Sheet 6****IT1090 – Information Systems and Data Modeling****Semester 2**

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**Exercise**

- a) Make a list of the student ID, name and the name of the course the student is following.
- b) Make a list of the CIDs and the names of the modules offered by those courses.
- c) Make a list of course names and the names of modules offered.
- d) What are the ID and names of the students who have registered for the course by paying a registration fee of more than 1 Lak?
- e) What are the names of modules offered to year I students by the Information Technology Course?

## Lab Sheet 7

**IT1090 – Information Systems and Data Modeling**

**Semester 2**

**Objective:** At the end of this lab session students should be able to join tables and retrieve information.

# Table joining – part 2

## Section 1

You already know how join two or more tables when retrieving data in relational databases. Thus, in order for tables to be joined, there must be a foreign key relationship between them.

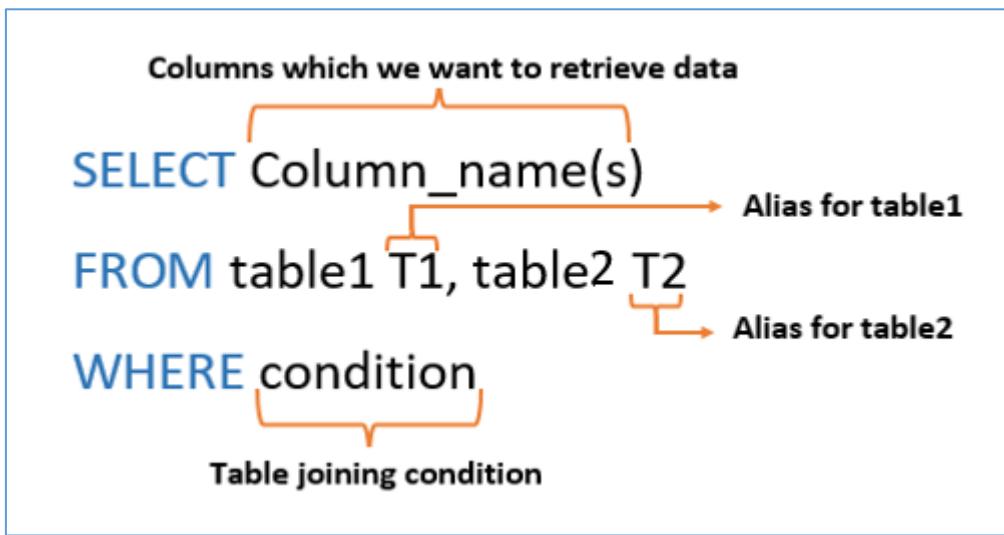


Figure 1: Table join syntax

Part a - Aliasing

Giving a temporary name (Alias) to a table or a column

Part b - Table joining condition

To join both tables the table joining condition should be written within the where clause always.

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**Semester 2**
**Section 2**
**Example**

- a) How many employees are there in each department, List the Department name and the no of Employees?

**Employee table**

Ename	NIC	Eno	address	dnumber
Smith,John B	901250087V	100	731 Fondren, Houston	5
Wrong, Franklin T.	895290452V	101	638 Voss, Houston	5
Zelaya, Alicia J.	923859070V	102	33321 Castle, Spring	4

**Department table**

dno	dname
1	Headquarters
4	Administration
5	Research

**Step 01**

We have to use both tables to get the required information and to get the number of employees in each department, COUNT function should be used.

```
SELECT D.dname, COUNT (*) AS 'No of employees'
FROM Employee E, Department D
WHERE E. dnumber = D. dno
GROUP BY D.dname,
```

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**Step 02**

The resulting table is given in figure 2.

dname	No of Employees
Research	2
Administration	1

*Figure 2: Output table*

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**Exercise**

- a) How many Students are there in each course? List the CID and the number of students.
  
- b) How many Students are there in each course? List the course name and the number of Students.
  
- c) What are the courses which offer more than 2 modules for year 1 students?
  
- d) What are the courses which offer more than 2 modules for any academic year? List the course names, academic year and the no of modules offered. Sort the result according to the no of modules.

**Lab Sheet 8**
**IT1090 – Information Systems and Data Modeling**
**Semester 2**

**Objective:** At the end of this lab session you will be able to learn about the CREATE TABLE command used to create database tables and to specify Primary key, foreign key and other constraints on the tables created.

## Section 1

### ***Create table:***

The CREATE TABLE statement is used to create a new table in a database.

### **Syntax for the CREATE TABLE**

```
CREATE TABLE <table_name> (
    <column_name1> data_type,
    <column_name2> data_type,
    <column_name3> data_type,
    ...
);
```

The following table lists few of the data types that is used in SQL

Data type	Definition
Integer	For numbers.
Char()	Use to store textual information. <ul style="list-style-type: none"> <li>The char data type is used to hold a fixed length text.</li> </ul>
Varchar()	Used to store textual information. <ul style="list-style-type: none"> <li>The varchar data type is similar to char but stores variable length text.</li> </ul>

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	<ul style="list-style-type: none"> <li>• Eg: char(10) – to store the NIC values.</li> </ul> <p>Varchar(50) – To store the address of a customer.</p>
Datetime	For date and time.
Real	For floating point numbers
Money	For currency values.

The following table shows the Syntaxes and the definitions for the Primary Key, Foreign Key and Check constraints.

Constraint	Syntax	Definition
Primary Key Constraint	<ol style="list-style-type: none"> <li>1. <b>Primary key (column name)</b></li> <li>2. <b>constraint &lt;constraint_name&gt;</b> <b>primary Key (&lt;column _name&gt;)</b></li> </ol>	The PRIMARY KEY constraint uniquely identifies each record in a table. Primary keys must contain UNIQUE values, and cannot contain NULL values.
Foreign Key Constraint	<ol style="list-style-type: none"> <li>1. <b>Foreign key (referencing column)</b> <b>references &lt;referenced table&gt;</b> <b>(referenced column)</b></li> <li>2. <b>constraint &lt;constraint_name&gt;</b> <b>foreign key</b> (&lt;this_table_column_name&gt;) <b>references &lt;reference_table&gt;</b> (&lt;reference_table_column_name&gt;)</li> </ol>	A FOREIGN KEY is a key used to link two tables together. A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.

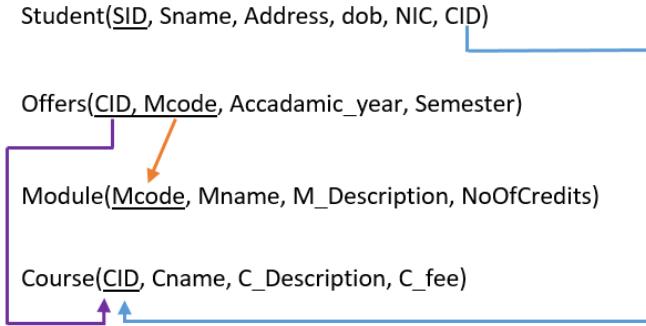
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Check Constraint	<b>1. Check &lt;condition&gt;</b> <b>2. constraint &lt;constraint_name&gt;</b> <b>check (&lt;put the condition here&gt;)</b>	The CHECK constraint is used to limit the value range that can be placed in a column.
------------------	--	---

\*\*\* even though there are different methods available inform the students that method 2 which provides name for the constraint is the best option, since we can easily figure out the error using the constraint name.

## Section 2

- Consider the following relational schema.



- List the primary keys and foreign keys you have identified in each table?

(Hint: In the above schema, Foreign keys (FK) are pointed by tail side of the arrow and the Primary Keys (PK) are pointed by the head side of the arrow.)

Table Name	Primary Key(PK)	Foreign Key(FK)
Student		
Offers		
Module		
Course		

**Lab Sheet 8**
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---

2. What is the correct order of creating tables in the above mention relational schema?

*Hint: When you consider about the order of creating tables, as the first table you have to identify the table which are not having foreign keys.*

3. Consider the following data types for the above schema, create the following relational database using CREATE TABLE SQL statement. Ensure that appropriate referential integrity constraints (Foreign key) are met. Save the script as “CreateDB.sql”.

Student(SID:CHAR(10), Sname:VARCHAR(50), Address:VARCHAR(50), dob:DATE, NIC:CHAR(10), CID:CHAR(6))

Offers (CID:CHAR(6) , Mcode:CHAR(6), Accadamic\_year:CHAR(2), Semester:INTEGER)

Module (Mcode:CHAR(6), Mname:VARCHAR(50), M\_Description:VARCHAR(200), NoOfCredits:INTEGER)

Course (CID:CHAR(6), Cname:VARCHAR(50), C\_Description:VARCHAR(200), C\_fee:INTEGER)

4. What is the difference between ALTER and DROP in SQL?

5. Use **CHECK** constraint to enforce the following rules stated by modifying existing **Student** and **Module** tables.

*Hint: Use ALTER TABLE <table\_name>*

**ADD CONSTRAINT <constraint\_name> CHECK(<condition>)**

- Ensure that the Student's NIC number contains 9 digits (0-9) and one character which is "V"or "v".
- Ensure that number of credits for module should be one of the following :1,2,3,4

**Objective:** At the end of this lab session you will get a basic knowledge about the INSERT, UPDATE and DELETE commands. You will be able to INSERT values to the created table, UPDATE values of a table and DELETE values from a table.

## Insert, Update and Delete commands

### Section 1

#### ***INSERT Command:***

The INSERT INTO statement is used to insert new records in a table.

#### **Syntax for INSERT**

It is possible to write the INSERT INTO statement in two ways.

The first way specifies both the column names and the values to be inserted:

```
INSERT INTO <table_name> (column1_name, column2_name, ...)  
VALUES (value1, value2, ...)
```

If you are adding values for all the columns of the table, you do not need to specify the column names in the SQL query.

However, make sure the order of the values is in the same order as the columns in the table.

The INSERT INTO syntax would be as follows:

```
INSERT INTO <table_name>  
VALUES (value1, value2, ...)
```

## Lab Sheet 9

**IT1090 – Information Systems and Data Modeling****Semester 2*****UPDATE Command:***

The UPDATE statement is used to modify the existing records in a table.

**Syntax for UPDATE**

```
UPDATE <table_name>
SET <column1_name> = <value1>, <column2_name> = <value2>, ...
WHERE <condition>
```

**Note:** Be careful when updating records in a table! Notice the WHERE clause in the UPDATE statement. The WHERE clause specifies which record(s) that should be updated. If you omit the WHERE clause, all records in the table will be updated!

***DELETE Command:***

The DELETE statement is used to delete existing records in a table.

**Syntax for DELETE**

```
DELETE FROM <table_name>
WHERE <condition>
```

**Note:** Be careful when deleting records in a table! Notice the WHERE clause in the DELETE statement. The WHERE clause specifies which record(s) should be deleted. If you omit the WHERE clause, all records in the table will be deleted!

**Lab Sheet 9**
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## Section 2

1. Insert the following data using INSERT SQL Statement for the tables you created in Lab sheet 8.

*(Hint: Here also you have to consider about the foreign keys, you can insert the values according to the order of table creation. Otherwise you may get errors)*

### Course

CID	Cname	C_Description	C_fee
IT	Information Technology	The programme is designed for technically focused students who capabilities in programming	175000
SE	Software Engineering	Software engineering is the discipline of designing, creating and maintaining	185000
CSNE	Computer Systems And Network Engineering	The programme aims to provide students with the knowledge, skills, planning, and designing	155000
DS	Data Scinece	The meticulous curriculum focuses on the fundamentals of computer science, statistics, and applied mathematics	170000

### Student

SID	Sname	Address	Dob	NIC	CID
CN18384756	Kamal	No122, Rose street, matale	1994-05-02	946785467v	CSNE
DS18234876	Pubudu	No678 , 3rd new lane, Maharahgama	1994-11-08	948763759v	DS
IT18234568	Ann	No12, Kings street, colombo	1996-11-11	961234587v	IT
SE19238567	Malith	No08, st.thomas street, Kandy	1992-12-20	922356785v	SE

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**Module**

Mcode	Mname	M_Description	NoOfCredits
SE3050	User Experience Engineering	subject under SE	3
IT1010	Introduction to Programming	subject under IT	4
IT2050	Computer Networks	subject under IT	4
IT3051	Fundamentals of Data Mining	subject under DS	4

**Offers**

CID	Mcode	Accadamic_year	Semester
SE	SE3050	Y3	2
IT	IT1010	Y1	2
IT	IT2050	Y2	1
DS	IT3051	Y3	2

2. Update the address of Ann as No15,Gamunupura,New Kandy Rd,Malabe
3. Remove the ‘User Experience Engineering’ module from the Module table since it is no longer consider as a module of the degree program.

**Objective:** At the end of this lab session you will learn about Nested Queries where Sub queries return only one value.

## Nested Query Part 1

### Section 1

Nested Query is a query within another SQL query and embedded within the WHERE/HAVING clause. A subquery is used to return data that will be used in the main query as a condition to further restrict the data to be retrieved.

Syntax:

```
SELECT column_name [,column_name]
FROM table1 [, table2 ]
WHERE [join condition AND] column_name OPERATOR (SELECT column_name [,,
                                                 column_name ]
                                                 FROM table1 [, table2 ]
                                                 [WHERE]);
```

**NOTE:** So, if you writing the subquery you must use parenthesis, and also normally we place the subqueries on the right side of the comparison condition.

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If Sub Query returns one value, we can use the following operators.

Operator	Meaning
=	Equal
>	Greater than
<	Less than
>=	Greater than or equal
<=	Less than or equal
◊	Not equal

## Section 2

Example Question:

Display Student names Where Student Course ID is the same as student ‘Sampath’.

Student Table

	SID	Sname	Address	dob	NIC	CID
1	CN18384756	Kamal	No122, Rose street, matale	1994-05-02	946785467v	CSNE
2	CN19465738	Sampath	No173, New kandy Road, kaduwella	1996-11-20	968764567v	CSNE
3	CS18223645	kalani	No08 , Gamini Road, Anuradhapura	1996-10-11	968564857v	CS
4	CS18234867	Damith	No125 , 1st street, kurunegala	1996-02-15	968763456v	CS
5	DS18234876	Pubudu	No678 , 3rd new lane, Maharahgama	1994-11-08	948763759v	DS
6	DS18375688	Kamani	No10 , new street, jaffna	1994-03-05	948763456v	DS
7	IS18758649	Jayni	No111, Perera street, kurunegala	1998-09-07	982359856v	ISE
8	IS19234876	Dulina	No124 , 2nd street, colombo10	1998-12-08	983485764v	ISE
9	IT18234568	Ann	No12, Kings street, colombo	1996-11-11	961234587v	IT
10	IT19275687	Rayan	No14, flower street, colombo12	1994-01-10	945673456v	IT
11	SE19238567	Malith	No08, st.thomas street, Kandy	1992-12-20	922356785v	SE
12	SE20284567	Pooja	No15, lakshmi Road, jaffna	1996-08-07	965678645v	SE

Display Student names Where Student Course ID is the same as student ‘Sampath’.

**Lab Sheet 11**
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So, first, we need to write the subquery to find the Course ID of Sampath

```

SELECT CID
FROM Student
Where Sname = 'Sampath'

100 % <
Results Messages
CID
1 CSNE

```

So, the course ID is CSNE So this query will be the subquery.

Then, we have to write the main Query and equal it to the subquery because we need to get the same Course ID as Sampath it means we need to find other students who do the course module ‘CSNE’.

```

SELECT Sname
FROM Student
WHERE CID = (<Sub Query>)

```

So, the Final query is,

```

SELECT Sname
FROM Student
WHERE CID = (
    SELECT CID
    FROM Student
    WHERE Sname = 'Sampath'
)

%
Results Messages
Sname
Kamal
Sampath

```

So, Kamal and Sampath are the students who do the CSNE course.

**Lab Sheet 11****IT1090 – Information Systems and Data Modeling****Semester 2****Exercise**

1. What are the Module names of the modules, Where number of credits same as module code 'IE3051'?
2. What is the name of the course with the highest registration fee?
3. What are the other modules which have lesser number credits than the 'Fundamental of Data Mining' module?
4. What is the name of the course which has a higher number of credits?
5. What are the courses which offer modules for year 4 students, greater than the Software Engineering course?

**Objective:** At the end of this lab session you will learn about Nested Queries where Sub queries return more than one value.

## Nested Query Part 2

### Section 1

Syntax:

```
SELECT column_name [,column_name]
FROM table1 [, table2 ]
WHERE [join condition AND] column_name OPERATOR (SELECT column_name [,,
                                                 column_name ]
                                                 FROM table1 [, table2]
                                                 [WHERE]);
```

If the subquery returns more than one row as a result then one of the following multiple-row comparison operators have to be used, along with any of the single-row comparison operators we discussed in the last lab sheet (Nested Query part 1).

Operator	Meaning
IN	Equal to any member in the list
ANY	Compare value to each value returned by the subquery
ALL	Compare value to every value returned by the subquery

**Lab Sheet 12**
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## Section 2

Example Question:

What are the course names that the number of credits less than ISE course modules???

So, first, we need to write the subquery to find the number of credits in the ISE course modules. There are 4 modules in the ISE course. Each module has Number of credits in the module table and to get Course Id we have to join Offers table Mcode with the Module table Mcode.

```

SELECT m.NoOfCredits
FROM Offers o, Module m
WHERE o.Mcode = m.Mcode AND o.CID = 'ISE'

100 % < 
Results Messages


|   | NoOfCredits |
|---|-------------|
| 1 | 4           |
| 2 | 3           |
| 3 | 4           |
| 4 | 4           |


```

In the main query, we joined three tables because we need to get the course names and we need to find the course names less than the no of credits in the ISE module. So, No of credits in the Module table and Course name in the Course table, we can't join those 2 tables because there is no foreign key. So, we need to get the help of the offer table as well to join these 2 tables.

```

SELECT c.Cname
FROM Module m, Course c, Offers o
WHERE m.Mcode = o.Mcode AND c.CID = o.CID AND m.NoOfCredits

```

**Lab Sheet 12**
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Now we need to find the course which has less credit module than the ISE course modules.

Here we get multiple results in the subquery. So we need to use ‘ALL’ because we need to check all the results in the subquery.



```

SELECT c.Cname
FROM Module m, Course c, Offers o
WHERE m.Mcode = o.Mcode AND c.CID = o.CID AND m.NoOfCredits < ALL (
    SELECT m.NoOfCredits
    FROM Offers o, Module m
    WHERE o.Mcode = m.Mcode AND o.CID = 'ISE')

```

Cname
Information Technology

## Exercise

1. What is the name of the course with the highest registration fee?
2. What are the names of modules common to both ‘Software Engineering’ and ‘Information Technology’?
3. What are the names of modules offered by ‘Software Engineering’ program but not in ‘Information Technology’?