# National University of Computer and Emerging Sciences



Lab Manual 3

"Data Retrieval"

Database Systems

Spring 2023

Department of Computer Science FAST-NU, Lahore, Pakistan



## FAST NU Lahore

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|    | 1  |   |



# 1. Objective

The purpose of this manual is to get stared with data retrieval queries, starting from simple Select-From-Where, Order by clause, arithmetic operations and finally covering set operations.

# 2. Pre-requisites

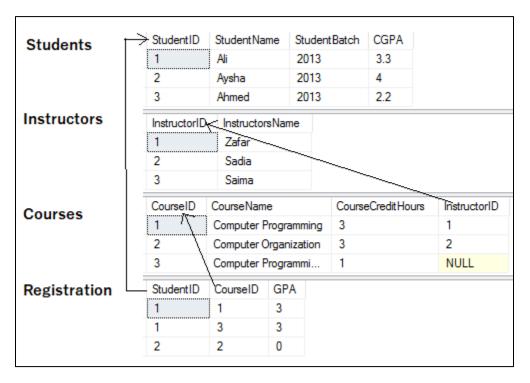
- Lab 2 manual, on how to get started with MS-SQL server
- How Select-From-Where clause works
- How Order by clause works
- How arithmetic operations like +, -, \*, /, % works
- How set Operations like Union, Intersect, Except work



## 3. SELECT-FROM-WHERE

Select from where is equivalent to projection and selection in Relational Algebra, it will give output in form of a table. The most basic select statement includes Select and from clause, and it will retrieve all columns and rows from the table.

We will use the following schema and database for the examples. Find the queries for this database in InLab3Practice.sql and start practicing.



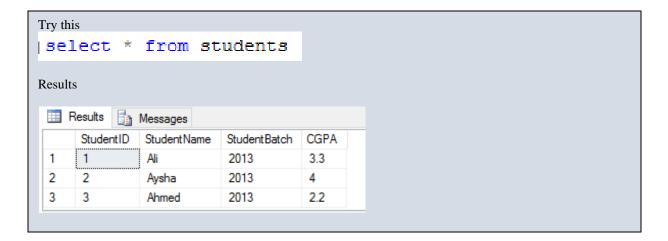
#### **Most Basic Select:**

Retrieve data from table. Operator \* after select means that all columns will be retrieved.

#### **Syntax:**

SELECT \*

FROM <tableName>



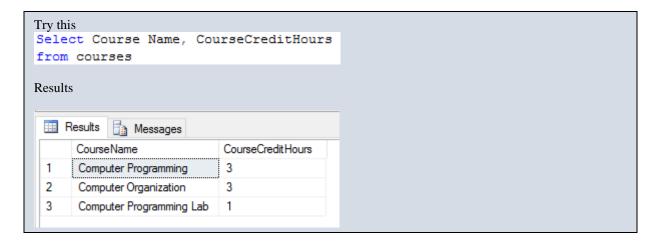


## **Retrieving Certain Columns from Select**

To retrieve only certain columns give a comma separated list of those columns after Select keyword

#### **Syntax:**

SELECT ColumnX, ColumnY, ColumnZ FROM <tableName>



## **Retrieving Certain Rows from SELECT - WHERE CLAUSE**

Rows can be filtered in SQL using WHERE clause. Rows that fulfill where clause conditions will be projected in result. Where clause can put condition on original columns of tables mentioned in from clause. Also, observe the use of Like operator in where clause.

#### **Syntax:**

SELECT \*
FROM <tableName>
where <conditions>

|         | s<br>ct CourseName, Cour<br>courses | seCreditHours             |  |
|---------|-------------------------------------|---------------------------|--|
| where   | CourseName like '                   | and CourseCreditHours>= 1 |  |
| Results | s<br>Results Messages               |                           |  |
|         | CourseName                          | CourseCredit Hours        |  |
| 1       | Computer Programming                | 3                         |  |
| 2       | Computer Programming Lab            | 1                         |  |
|         |                                     |                           |  |



## **Like Operator Scenarios**

| WHERE CourseName LIKE 'C%'   | Finds any values that start with "C"                    |
|------------------------------|---|
| WHERE CourseName LIKE '%C'   | Finds any values that end with "C"                      |
| WHERE CourseName LIKE '%Co%' | Finds any values that have "Co" in any position         |
| WHERE CourseName LIKE '_r%'  | Finds any values that have "r" in the second position   |
| WHERE CourseName LIKE 'C_%'  | Finds any values that start with "C" and are at least 2 |
|                              | characters in length                                    |
| WHERE CourseName LIKE 'C%    | Finds any values that start with "C" and are at least 3 |
|                              | characters in length                                    |
| WHERE CourseName LIKE 'C%r'  | Finds any values that start with "C" and ends with "r"  |

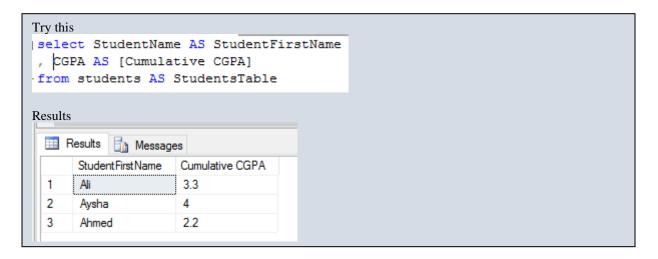
**NOTE:** % is referred to as wildcard.

## **Renaming Resulting Column**

You can rename a column in result by using AS keyword also called Alias. The scope of this renaming is only to that select query, this is useful in joining where more than one table have same column names.

#### **Syntax:**

SELECT ColumnX as X , ColumnY as Y, ColumnZ FROM <tableName> as Table1



## **SQL Server Built-in Functions**

Sql Server has many built-in functions which can be used for different purposes. For example:

- 1) GETDATE Returns the current database system date and time
- 2) CURRENT\_TIMESTAMP Returns the current date and time
- 3) SUBSTRING Extracts some characters from a string

#### **Syntax:**

- 1) SELECT GETDATE();
- 3) SELECT CURRENT\_TIMESTAMP;
- 2) SELECT SUBSTRING(columnName, startposition, substringlength) AS alias FROM <tableName>;



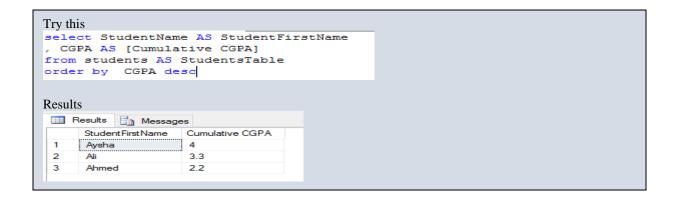
Try to explore as many string and data functions through this link: https://www.w3schools.com/sql/sql\_ref\_sqlserver.asp

# 4. Order by Clause

Order by clause is used to arrange the rows in ascending or descending order of one or more columns

#### **Syntax:**

SELECT ColumnX as X, ColumnY as Y, ColumnZ FROM <tableName> as Table1 ORDER BY ColumnX asc/desc, ColumnZ asc/desc



### **TOP Clause**

Top n clause will give you first n rows from result instead of all the rows.

#### **Syntax:**

SELECT TOP <n> \*
FROM <tableName>
WHERE <conditions>
ORDER BY <column Name> asc/desc

```
Try this

SQLQuery7.sql - (local)\...\Admin (55))* SQLQuery6.sql - (local)\...\Adm
select top 1 StudentName AS StudentFirstName
, CGPA AS [Cumulative CGPA]
from students AS StudentsTable
- order by CGPA desc

Results Messages

StudentFirstName Cumulative CGPA

Aysha 4
```



# **5. Arithmetic Operations**

Sql arithmetic operators are:

- + Addition
- Subtraction
- / Division
- \* Multiplication
- % Modulus

All operations can be performed on either single column or multiple columns

#### Syntax:

1. Apply operation on single columns SELECT ColumnX, ColumnY + 100 FROM <tableName>

2. Apply operation on multiple columns SELECT ColumnX, ColumnY + ColumnZ FROM <tableName>

Replace + with other operators and try them out yourself.

| ele  | elect CourseId, CourseName, CourseCreditHours, CourseCreditHours + 1   |  |  |   |   |                         |                          |  |  |  |
|--|--|--|--|---|---|-------------------------|--------------------------|--|--|--|
| s L  | UpdatedCourseCreditHours from Courses  |  |  |   |   |                         |                          |  |  |  |
| select CourseId, CourseName, CourseCreditHours, CourseId + CourseCreditHours<br>AS UpdatedCourseCreditHours from Courses |  |  |  |   |   |                         |                          |  |  |  |
|  | <pre>lect CourseId, CourseName, CourseCreditHours, CourseCreditHours * 2     UpdatedCourseCreditHours from Courses</pre> |  |  |   |   |                         |                          |  |  |  |
|  |  | Id, CourseNa<br>rseCreditHou   |  |   |   | irs, Course             | Id * CourseCreditHours   |  |  |  |
|  |  | tId, Student<br>A from Stude   |  | ntBa                                      | atch,                                   | CGPA, CGP               | A / 2                    |  |  |  |
| ele  | ect Studen   | tId, Student   | tName. Stude   | ntBa                                      | tch.                                    | CGPA / St               | udent I d                |  |  |  |
|  |  | A from Stude   |  | cou                                       | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | cdi A / Sc              | aderreia                 |  |  |  |
|  |  |  |  |   |   |                         |                          |  |  |  |
|  |  |  |  |   |   |                         |                          |  |  |  |
|  | Courseld   | CourseName   |  |   | CourseCredit Hours                      |                         | UpdatedCourseCreditHours |  |  |  |
| 1  | 1  | Computer Programming   |  |   | 3                                       |                         | 4                        |  |  |  |
| 2  | 2  | Computer Organization and Assembly   |  |   | 3                                       |                         | 4                        |  |  |  |
| 3  | 3  | Computer Programming Lab   |  | -   | 1                                       |                         | 2                        |  |  |  |
|  | Courseld   |  |  |   | CourseCredit Hours                      |                         | UpdatedCourseCreditHours |  |  |  |
| 1  | 1  | CourseName Computer Progra   |  |   | CourseCreditHours 3                     |                         | 4                        |  |  |  |
| 2  |  |  | amming<br>nization and Asse                          |   | 3                                       |                         | 5                        |  |  |  |
| 3  | 3  |  |  | mbiy                                      | 1                                       |                         | 4                        |  |  |  |
| 3  |  | Computer Programming Lab   |  |   |   |                         |                          |  |  |  |
|  | Courseld   | CourseName   |  |   | CourseCredit Hours                      |                         | UpdatedCourseCreditHours |  |  |  |
| 1  | 1  | Computer Programming   |  |   | 3                                       |                         | 6                        |  |  |  |
| 2  | 2  | Computer Organization and Assembly   |  |   | 3                                       |                         | 6                        |  |  |  |
|  | 3  | Computer Programming Lab   |  |   | 1                                       |                         | 2                        |  |  |  |
| 3  | Courseld   | CourseName   |  |   | CourseCredit Hours                      |                         | UpdatedCourseCreditHours |  |  |  |
| 3  |  | 1  | r Programming  |   | 3                                       |                         | 3                        |  |  |  |
| 3  | 1  | Computer Progr   |  | ation and Assembly                        |   |                         | 6                        |  |  |  |
|  |  |  | nization and Asse                                    |   | 3                                       |                         |                          |  |  |  |
| 1  | 1  |  |  |   | 1                                       |                         | 3                        |  |  |  |
| 1 2  | 1<br>2<br>3  | Computer Organ<br>Computer Progra  | amming Lab   |   | -                                       | IndatedCGP^             | 3                        |  |  |  |
| 1<br>2<br>3  | 1<br>2<br>3<br>StudentId   | Computer Organ<br>Computer Progra<br>StudentName   | StudentBatch   | CGF                                       | PA (                                    | JpdatedCGPA             | 3                        |  |  |  |
| 1<br>2<br>3  | 1<br>2<br>3<br>StudentId   | Computer Organ<br>Computer Progra<br>StudentName   | StudentBatch<br>2013                                 | CGP<br>3.3                                | PA (                                    | 1.65                    | 3                        |  |  |  |
| 1<br>2<br>3  | 1<br>2<br>3<br>StudentId   | Computer Organ<br>Computer Progra<br>StudentName<br>Ali<br>Aysha                         | StudentBatch<br>2013<br>2013                         | CGF<br>3.3<br>4                           | PA I                                    | 1.65<br>2               | 3                        |  |  |  |
| 1<br>2<br>3  | 1 2 3 StudentId 1 2 3  | Computer Organ<br>Computer Progra<br>StudentName<br>Ali<br>Aysha<br>Ahmed                | StudentBatch<br>2013<br>2013<br>2013                 | CGF<br>3.3<br>4<br>2.2                    | PA (                                    | 1.65<br>2<br>1.1        | 3                        |  |  |  |
| 1<br>2<br>3<br>1<br>2<br>3   | 1 2 3 StudentId 1 2 3 StudentId 5 StudentId 5 StudentId  | Computer Organ Computer Progri Student Name Ali Aysha Ahmed Student Name                 | StudentBatch<br>2013<br>2013<br>2013<br>StudentBatch | CGF<br>3.3<br>4<br>2.2                    | PA (                                    | 1.65<br>2<br>1.1        | 3                        |  |  |  |
| 1<br>2<br>3<br>1<br>2<br>3   | 1 2 3 Student ld 1 2 3 Student ld 1  | Computer Organ<br>Computer Progri<br>StudentName<br>Ali<br>Aysha<br>Ahmed<br>StudentName | StudentBatch 2013 2013 2013 StudentBatch 2013        | CGP<br>3.3<br>4<br>2.2<br>Upd<br>3.3      | PA (                                    | 1.65<br>2<br>1.1        | 3                        |  |  |  |
| 1<br>2<br>3<br>1<br>2<br>3   | 1 2 3 StudentId 1 2 3 StudentId 5 StudentId 5 StudentId  | Computer Organ Computer Progri Student Name Ali Aysha Ahmed Student Name                 | StudentBatch<br>2013<br>2013<br>2013<br>StudentBatch | CGF<br>3.3<br>4<br>2.2<br>Upd<br>3.3<br>2 | PA (                                    | 1.65<br>2<br>1.1<br>GPA | 3                        |  |  |  |