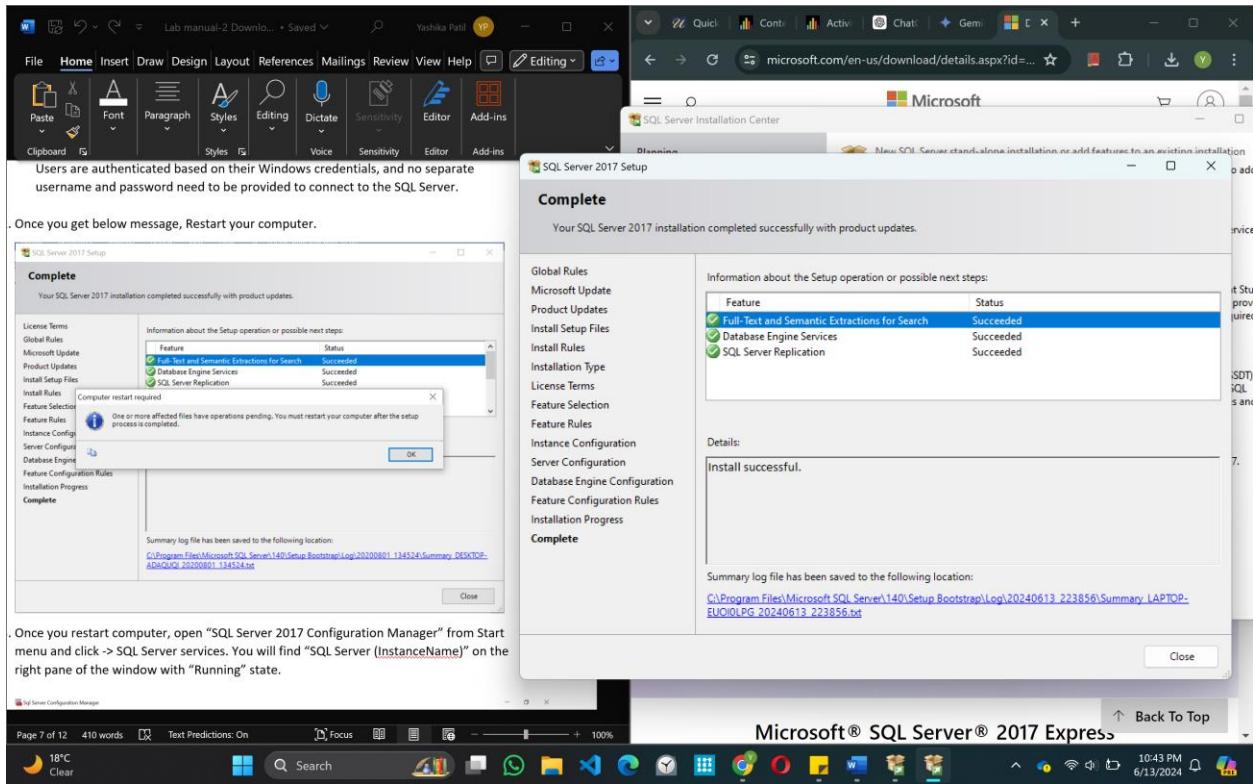


CIS-552: DATABASE DESIGN

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Lab 2- Task 1:

For this lab, I installed MS SQL Server 2017 successfully using the manual uploaded to MyCourses for Lab2. The following screenshot shows the same.



I created a database called Company. Then to add tables, I right clicked on Tables and created a new table called ‘Employee’. Then I added the column names for the table and defined their datatype as specified in slides of chapter 6.

The screenshot shows the Microsoft SQL Server Management Studio interface. The left pane displays the Object Explorer with the database 'COMPANY' selected. The main pane shows the 'Table Designer' for 'dbo.Table_1'. The table structure is as follows:

Column Name	Data Type	Allow Nulls
Fname	varchar(15)	<input type="checkbox"/>
Minit	char(10)	<input checked="" type="checkbox"/>
Lname	varchar(15)	<input type="checkbox"/>
SSN	char(9)	<input type="checkbox"/>
BDate	date	<input checked="" type="checkbox"/>
Address	varchar(30)	<input checked="" type="checkbox"/>
Sex	char(10)	<input checked="" type="checkbox"/>
Salary	decimal(10, 2)	<input checked="" type="checkbox"/>
Super_SSN	char(9)	<input checked="" type="checkbox"/>
Dno	int	<input type="checkbox"/>

The 'Column Properties' window is open for the 'SSN' column, showing the following details:

- (Name): SSN
- Allow Nulls: No
- Data Type: char
- Length: 9

By clicking on ‘New Query’, I generated a new query and used the ‘Insert’ command to populate the data as per figure 5.6 of chapter 5. After specifying the values, I clicked on ‘Execute’ to add the row in the table. The following screenshot shows the data for the first row in Employee.

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows the database structure, including the COMPANY database and its tables like Employee. The central pane displays a query window titled 'SQLQuery2.sql - LAPTOP-EUO1OLPG\SQLEXPRESS.COMPANY (LAPTOP-EUO1OLPG\yashi (51))' with the following SQL code:

```
Insert into Employee(Fname, Minit, Lname, SSN, BDate, Address, Sex, Salary, Super_SSN, Dno)
Values('John', 'B', 'Smith', 123456789, '1965-01-09', '731 Fondren, Houston, TX', 'M', 30000, 333445555, 5)
```

The 'Messages' pane at the bottom right shows the output: '1 row affected' and 'Completion time: 2024-06-15T20:18:47.1916821-04:00'. A yellow bar at the bottom indicates 'Query executed successfully.'

Similarly, all the rows in the ‘Employee’ table can be added by using the following commands.

This screenshot shows the Microsoft SQL Server Management Studio interface with a similar setup. The Object Explorer on the left shows the COMPANY database structure. The central pane displays a query window titled 'SQLQuery3.sql - LAPTOP-EUO1OLPG\SQLEXPRESS.COMPANY (LAPTOP-EUO1OLPG\yashi (51))' with the following SQL code:

```
INSERT INTO dbo.Employee (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno) VALUES
('John', 'B', 'Smith', 123456789, '1965-01-09', '731 Fondren, Houston, TX', 'M', 30000, 333445555, 5),
('Franklin', 'T', 'Wong', 333445555, '1955-12-08', '638 Voss, Houston, TX', 'M', 40000, 888655555, 5),
('Alicia', 'J', 'Zelaya', 999887777, '1968-01-19', '3321 Castle, Spring, TX', 'F', 25000, 987654321, 4),
('Jennifer', 'S', 'Wallace', 987654321, '1941-06-20', '291 Berry, Bellaire, TX', 'F', 43000, 888665555, 4),
('Ramesh', 'K', 'Narayan', 666884444, '1962-09-15', '975 Fire Oak, Humble, TX', 'M', 38000, 333445555, 5),
('Joyce', 'A', 'English', 453454353, '1972-07-31', '4531 Rice, Houston, TX', 'F', 25000, 333445555, 5),
('Ahmad', 'V', 'Jabbar', 987987987, '1969-03-29', '988 Dallas, Houston, TX', 'M', 25000, 987654321, 4),
('James', 'E', 'Borg', 888655555, '1937-11-10', '450 Stone, Houston, TX', 'M', 55000, NULL, 1);
```

The 'Messages' pane shows '0 rows affected' and 'Completion time: 2024-06-15T23:16:53.4133994-04:00'. A yellow bar at the bottom indicates 'Query executed successfully.'

The following screenshot shows the data has been populated in ‘Department’ table successfully.

This screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows a database named 'COMPANY'. The 'Tables' node under 'COMPANY' is expanded, showing 'dbo.Department' and other tables. The 'dbo.Department' table is selected. The 'SQLQuery4.sql' query window on the right contains the following SQL code:

```
INSERT INTO dbo.Department (Dname, Dnumber, Mgr_ssn, Mgr_start_date) VALUES
('Research', 5, 33344555, '1988-05-22'),
('Administration', 4, 987654321, '1995-01-01'),
('Headquarters', 1, 888665555, '1981-06-19');
```

The 'Messages' pane at the bottom shows the output: '(3 rows affected)' and 'Completion time: 2024-06-15T23:21:44.9749840-04:00'. A yellow status bar at the bottom indicates 'Query executed successfully.'

The following screenshot shows the data populated in ‘Dept_Locations’ table.

This screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows the same 'COMPANY' database. The 'Tables' node under 'COMPANY' is expanded, showing 'dbo.Dept_Locations' and other tables. The 'dbo.Dept_Locations' table is selected. The 'SQLQuery5.sql' query window on the right contains the following SQL code:

```
INSERT INTO dbo.Dept_Locations (Dnumber, Dlocation) VALUES
(1, 'Houston'),
(1, 'Stafford'),
(5, 'Bellaire'),
(5, 'Sugarland'),
(5, 'Houston');
```

The 'Messages' pane at the bottom shows the output: '(5 rows affected)' and 'Completion time: 2024-06-15T23:22:37.6722835-04:00'. A yellow status bar at the bottom indicates 'Query executed successfully.'

The following screenshot shows the data has been populated in ‘Project’ table successfully.

SQL Server Management Studio Screenshot showing the Object Explorer and a query window. The query window contains an INSERT INTO statement for the 'Project' table:

```
INSERT INTO dbo.Project (Pname, Pnumber, Plocation, Dnum) VALUES
('ProductX', 1, 'Bellaire', 5),
('ProductY', 2, 'Sugarland', 5),
('ProductZ', 3, 'Houston', 5),
('Computerization', 10, 'Stafford', 4),
('Reorganization', 20, 'Houston', 1),
('Newbenefits', 30, 'Stafford', 4);
```

The message pane shows '(6 rows affected)' and the completion time is 2024-06-15T23:22:54.6852802-04:00. The status bar indicates 'Query executed successfully.'

The following screenshot shows the data has been populated in ‘Works_on’ table successfully.

SQL Server Management Studio Screenshot showing the Object Explorer and a query window. The query window contains an INSERT INTO statement for the 'Works_on' table:

```
INSERT INTO dbo.Works_on (Esn, Pno, Hours) VALUES
(123456789, 1, 32.5),
(123456789, 2, 7.5),
(66688444, 3, 40.0),
(453453453, 1, 20.0),
(453453453, 2, 20.0),
(333445555, 2, 10.0),
(333445555, 3, 10.0),
(333445555, 10, 10.0),
(333445555, 20, 10.0),
(999887777, 30, 30.0),
(987987987, 20, 20.0),
(987654321, 30, 20.0),
(987654321, 3, 20.0),
(888665555, 20, NULL);
```

The message pane shows '(14 rows affected)' and the completion time is 2024-06-15T23:25:40.6082857-04:00. The status bar indicates 'Query executed successfully.'

Using the following command, we can see the values populated in ‘Employee’ table.

The screenshot shows the Microsoft SQL Server Management Studio interface. In the Object Explorer, the database 'COMPANY' is selected. In the center pane, a query window displays the following SQL command:

```
SELECT * FROM Employee
```

The results pane shows the data from the 'Employee' table:

Frame	Mint	Lname	SSN	BDate	Address	Sex	Salary	Super_SSN	Dno	
1	John	B	Smith	123456789	1965-01-01	731 Fondren, Houston, TX	M	30000.00	333445555	5
2	Franklin	T	Wong	333445555	1955-12-01	638 Voss, Houston, TX	M	40000.00	888665555	5
3	Joyce	A	Englin	454545454	1972-07-31	4531 Rice, Houston, TX	F	25000.00	333445555	5
4	Randall	H	Maryann	555555555	1968-05-15	12345 Old Times, TX	M	40000.00	888665555	6
5	Jennifer	E	Burns	888665555	1971-11-10	450 Stone, Houston, TX	M	55000.00	NULL	1
6	Jennifer	S	Wallace	987654321	1941-06-10	291 Berry, Bellaire, TX	M	43000.00	888665555	4
7	Ahmad	V	Jabber	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000.00	987654321	4
8	Alicia	J	Zelay	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000.00	987654321	4

Below the results, a message indicates: "Query executed successfully." The status bar at the bottom shows the date and time as 6/15/2024 11:27 PM.

Using the following command, we can see the values populated in all the tables. The two screenshots show that the data is embedded in the tables correctly.

The screenshot shows the Microsoft SQL Server Management Studio interface. In the Object Explorer, the database 'COMPANY' is selected. In the center pane, a query window displays the following SQL command:

```
SELECT * FROM dbo.Employee;
SELECT * FROM dbo.Department;
SELECT * FROM dbo.Dept_Locations;
SELECT * FROM dbo.Project;
SELECT * FROM dbo.Works_On;
SELECT * FROM dbo.Dependent;
```

The results pane shows the data from the 'Employee' table and its relationships:

DName	DNumber	Mgr_SSN	Mgr_start_date
Headquarters	1	888665555	1981-06-19
Administration	2	987654321	1995-01-01
Research	3	333445555	1988-05-22

Dnumber	Location
1	Houston
2	Stafford
3	Bellaire
4	Sugarland
5	Sugaria...
5	Houston

PName	PNumber	Location	Dnum
ProductA	1	Bellaire	5
ProductB	2	Sugarland	5
ProductC	3	Houston	5
Computer	10	Stafford	4
Reorga...	20	Houston	1
Newbie...	30	Stafford	4

Essn	Pro	Hours
7	333445555	3 10.0
8	333445555	10 10.0
9	333445555	10 10.0
10	999887777	20 30.0
11	987878787	20 20.0
12	987654321	30 20.0
13	987654321	3 20.0
14	888665555	20 NULL

Essn	Dependent_name	Sex	Bdate	Relationship
7	123456789	E	1967-05-05	Spouse
8	123456789	F	1968-01-01	Daughter
9	333445555	M	1955-10-25	Son
10	333445555	F	1955-05-03	Spouse
11	987654321	M	1942-02-28	Spouse
12	123456789	M	1988-01-04	Son
13	123456789	F	1988-01-04	Daughter
14	123456789	F	1967-05-05	Spouse

Below the results, a message indicates: "Query executed successfully." The status bar at the bottom shows the date and time as 6/15/2024 11:33 PM.

Lab 2- Task 2:

1. To retrieve the names of all employees who work in department 5 and more than 10 hours per week on the ProductX project, we can use the following commands that first selects the first name and last name, ‘Fname’ and ‘Lname’ respectively, of the employees, then takes the ‘Inner Join’ between the ‘Employee’ table and the ‘Works_on’ table. The ‘ON’ clause specifies the condition for the join, i.e. E.SSN = W.SSN, linking each employee with their respective work assignments based on their SSN. Then there’s another join between ‘Works_on’ table and ‘Project’ table to identify work assignment to the corresponding project based on the project number (PNo). The ‘WHERE P.Pname=’ProductX’ filters the results to include only the rows where the project name is ‘ProductX’. The additional conditions are: the department number is 5, and the number of working hours are more than 10 hours per week.

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows a database named 'COMPANY' with various tables like 'Employee', 'Project', and 'Works_on'. The central pane displays a query window with the following SQL code:

```
SELECT E.Fname, E.Lname
FROM dbo.Employee E
JOIN dbo.Works_on W ON E.Ssn = W.Ssn
JOIN dbo.Project P ON W.Pno = P.Pnumber
WHERE P.Pname = 'ProductX' AND E.Dno = 5 AND W.Hours > 10;
```

The results pane below shows the output of the query:

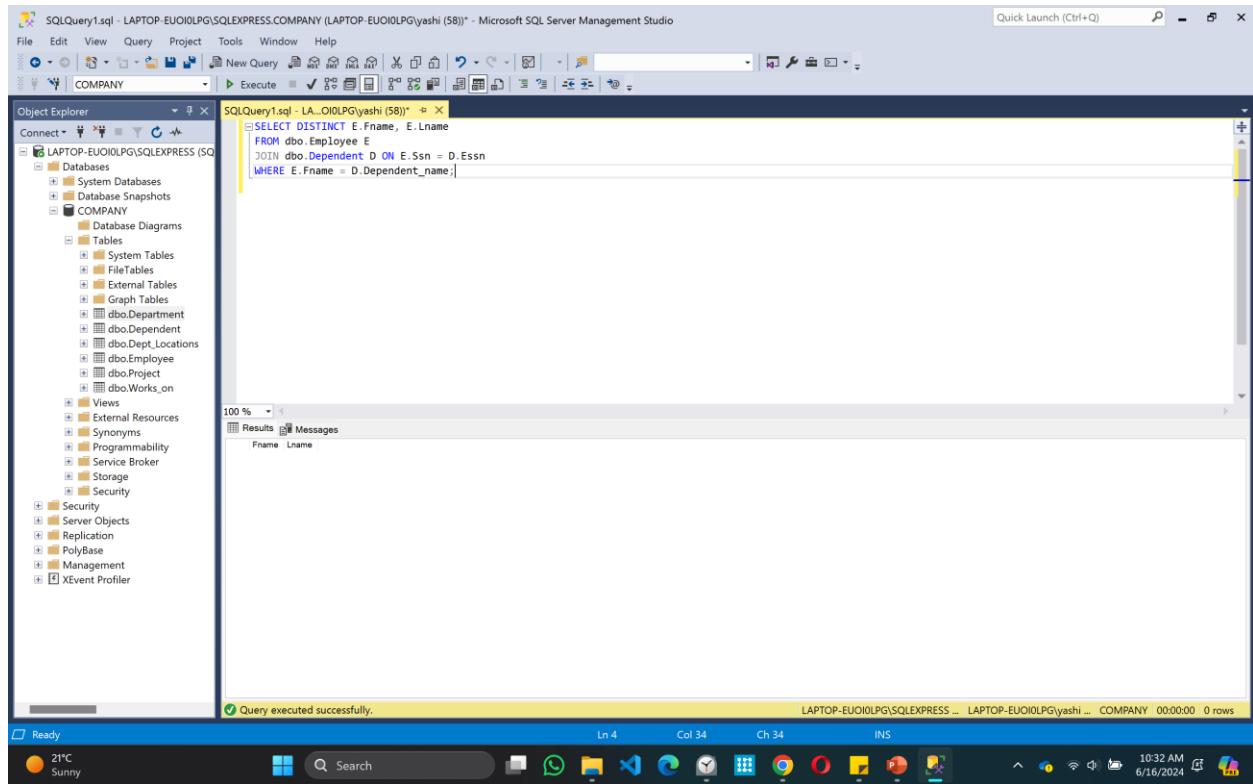
Fname	Lname
John	Smith
Joyce	English

A message at the bottom of the results pane says "Query executed successfully."

The results show that ‘John Smith’ and ‘Joyce English’ are the people satisfying the given conditions.

2. To list the names of all employees who have a dependent with the same first name as themselves, first we select the columns with ‘distinct’ keyword to take unique combinations of ‘Fname’ and ‘Lname’ from the ‘Employee’ table. The inner join between the ‘Employee’ table and the ‘Dependent’ tables is used and the condition ‘ON

`E.SSN = D.SSN`' links the employees to their dependents based on SSN. '`E.Fname = D.Dependent_name`' ensures that only the rows where the employee's first name matches the dependent's name are returned.



The screenshot shows the Microsoft SQL Server Management Studio interface. The left pane is the Object Explorer, displaying the database structure of 'COMPANY'. The right pane is the 'Results' tab of a query editor window titled 'SQLQuery1.sql - LAPTOP-EUOIOLPG\yashi (58)* - Microsoft SQL Server Management Studio'. The query is:

```
SELECT DISTINCT E.Fname, E.Lname  
FROM dbo.Employee E  
JOIN dbo.Dependent D ON E.Ssn = D.Ssn  
WHERE E.Fname = D.Dependent_name;
```

The results pane shows a table with columns 'Name' and 'Lname', which is currently empty. At the bottom of the results pane, a message says 'Query executed successfully.' The status bar at the bottom of the screen shows the date and time as '10:32 AM 6/16/2024'.

The screenshot shows that there are no entries where the employee's first name matches their dependent's first name.

3. **To get the names of all employees who are directly supervised by 'John Smith'**, we select the first name and last of the employees, take the inner join within the 'Employee' table, specify the condition 'ON E.Super_SSN = S.SSN' to link the employees with their supervisors. Then look for the rows where the supervisor's first name and last name matches 'John' and 'Smith' respectively.

The screenshot shows the Microsoft SQL Server Management Studio interface. In the Object Explorer, a database named 'COMPANY' is selected. In the center pane, a query window displays the following SQL code:

```
SELECT E.Fname, E.Lname
FROM dbo.Employee E
JOIN dbo.Employee S ON E.Super_ssn = S.Ssn
WHERE S.Fname = 'John' AND S.Lname = 'Smith';
```

The results pane below shows the output of the query, which is empty (0 rows). A status bar at the bottom indicates "Query executed successfully." The taskbar at the bottom of the screen shows the date and time as 6/16/2024 10:46 AM.

The screenshot shows that there are no employees who are supervised by John Smith.

Conclusion:

In this lab, I learned to use MS SQL Server 2017, starting with the installation and performing basic necessary database management tasks. The manual provided on MyCourses was straightforward and helped me understand the process and initial setup required.

Database and Table Creation: I learned to create a database (named 'Company') and defined several tables like Employee, Department, Dept_Locations, Project, and Works_on.

1. **CREATE Statements (DDL):** Used to establish the Company database, the schema, and the tables, each with defined columns and constraints, including Primary, Foreign, and Unique Keys.
2. **ALTER Statements (DDL):** Applied to modify constraints, column names, and data types, such as altering the Hours column in the Works_On table to allow NULL values.
3. **Constraints:** Included attribute constraints (DEFAULT, NOT NULL, CHECK) in the Department table definition.

Data Insertion and Modification:

1. **INSERT Statements:** I populated the tables with data as per figure 5.6 in chapter 5 using 'Insert'. I successfully inserted multiple rows into each table, ensuring the data matched the required format and constraints.
2. **UPDATE Statements (DML):** Used to modify existing data within the tables.

3. DELETE Statements (DML): Used to remove data from the tables, as demonstrated by clearing all records from the Employee, Department, Dept_Locations, Project, Works_On, and Dependent tables.

Querying the data: I executed the SQL queries to extract information from the database as per the given tasks. Creating these queries involved understanding and applying joins, conditions, correct syntax, and proper logic to get the results.

To conclude, MS SQL Server Management Studio is an efficient and user-friendly interface for database management. I developed a good understanding of relational database management, and it reinforced the theoretical concepts from the course slides. Initially, navigating SSMS and finding the right tools took some time. However, once familiarized, the software proved to be powerful to efficient database management.

References:

1. https://youtu.be/eEbr9Cepons?si=PSb_bCmn4BJsTzW9
2. https://youtu.be/BY_WHkzYUyo?si=FtgjcWPa0ohF4jE3
3. https://youtu.be/qBMo-AORiFQ?si=Yz_CwrNf4OKvr87X