

# **DATABASE CREATION AND MANIPULATION USING SQL**

# About Project

THE AIM OF THIS PROJECT IS TO CREATE AND APPLY DATA MANIPULATION TECHNIQUES THROUGH A SERIES OF STRUCTURED QUERIES

# CREATING TABLES

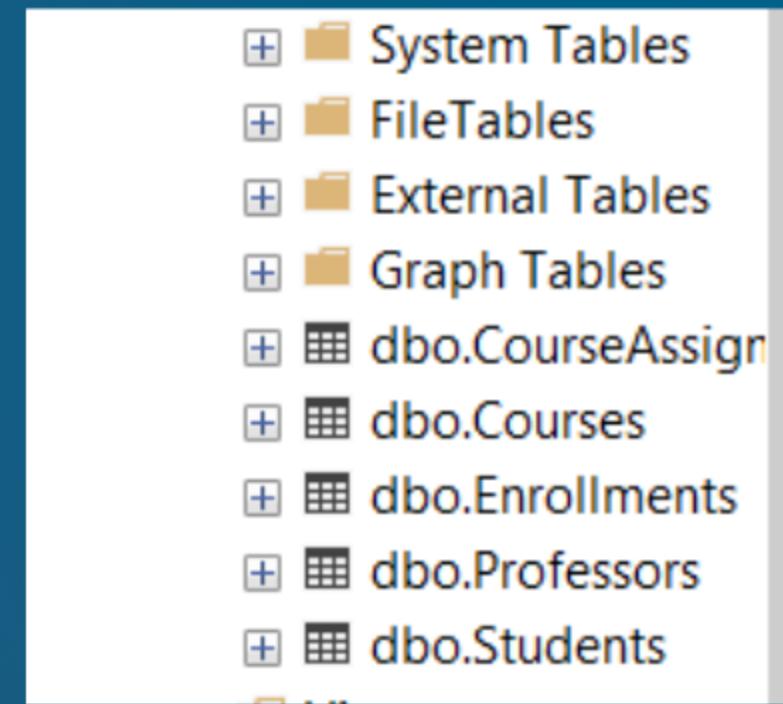
```
CREATE TABLE STUDENTS(  
STUDENTID INT PRIMARY KEY,  
FIRSTNAME VARCHAR (50),  
LASTNAME VARCHAR (50),  
DATEOFBIRTH DATE ,  
ENROLLMENTDATE DATE,  
EMAIL VARCHAR(100),  
AGE INT);
```

```
CREATE TABLE COURSES(  
COURSEID INT PRIMARY KEY,  
COURSENAME VARCHAR (100),  
CREDITS INT,  
DEPARTMENT VARCHAR(50));
```

```
CREATE TABLE ENROLLMENTS(  
ENROLLMENTID INT PRIMARY KEY,  
STUDENTID INT FOREIGN KEY(STUDENTID) REFERENCES  
STUDENTS(STUDENTID),  
COURSEID INT FOREIGN KEY(COURSEID) REFERENCES COURSES(COURSEID),  
GRADE VARCHAR (10),  
SEMESTER VARCHAR(10));
```

```
CREATE TABLE PROFESSORS(  
PROFESSORID INT PRIMARY KEY,  
FIRSTNAME VARCHAR (50),  
LASTNAME VARCHAR (50),  
DEPARTMENT VARCHAR(100),  
EMAIL VARCHAR(100)  
);
```

```
CREATE TABLE COURSEASSIGNMENTS(  
ASSIGNMENTID INT PRIMARY KEY,  
PROFESSORID INT FOREIGN KEY(PROFESSORID) REFERENCES  
PROFESSORS(PROFESSORID),  
COURSEID INT FOREIGN KEY(COURSEID) REFERENCES COURSES(COURSEID),  
SEMESTER VARCHAR(10));
```



# DATA IN TABLES

	EnrollmentID	StudentID	CourseID	Grade	Semester
▶	1	1	2	A	Fall2020
	2	2	3	B+	Spring2021
	3	3	2	A-	Fall2021
	4	4	3	B	Spring2022
	5	2	2	A	Fall2020
	6	5	1	B+	Fall2020
	7	6	4	A	Spring2021
	8	7	5	B	Fall2021
	9	8	6	A-	Spring2022
	10	9	7	B+	Fall2020
	11	10	1	A	Spring2021
	12	1	3	B	Spring2021
	13	2	4	A-	Fall2021
	14	3	5	B+	Spring2022
	15	4	6	A	Fall2020
*	NULL	NULL	NULL	NULL	NULL

Enrollments Table

Students Table

StudentID	FirstName	LastName	DateOfBirth	EnrollmentDate	Email	Age
1	John	Doe	2000-01-01	2018-09-01	john.doe@example.com	24
2	Jane	Smith	1999-05-15	2017-09-01	jane.smith@example.com	21
3	Robert	Brown	2001-11-21	2019-09-01	robert.brown@example.com	25
4	Emily	Jones	2002-03-03	2020-09-01	emily.jones@example.com	22
5	Michael	Davis	1998-07-22	2016-09-01	michael.davis@example.com	23
6	Linda	Wilson	2000-12-12	2018-09-01	linda.wilson@example.com	21
7	James	Taylor	2001-03-14	2019-09-01	james.taylor@example.com	22
8	Sarah	Lee	2002-07-07	2020-09-01	sarah.lee@example.com	23
9	David	Martin	1999-11-11	2017-09-01	david.martin@example.com	24
10	Susan	Clark	2001-05-05	2019-09-01	susan.clark@example.com	22

## Courses Table

	CourseID	CourseName	Credits	Department
▶	1	Introduction...	3	Computer S...
	2	Data Struct...	4	Computer S...
	3	Database M...	3	Information...
	4	Algorithms	4	Computer S...
	5	Operating S...	3	Information...
	6	Web Develop...	3	Computer S...
	7	Computer N...	3	Information...
*	NULL	NULL	NULL	NULL

## Course Assignments Table

	AssignmentID	ProfessorID	CourseID	Semester
▶	1	1	1	Fall2020
	2	1	2	Spring2021
	3	2	3	Fall2020
	4	3	2	Spring2022
	5	4	4	Fall2021
	6	5	5	Spring2022
	7	1	6	Fall2020
	8	2	7	Spring2021
*	NULL	NULL	NULL	NULL

## Professors Table

	ProfessorID	FirstName	LastName	Department	Email
▶	1	Dr. Alice	Johnson	Computer S...	alice.johnso...
	2	Dr. Bob	Miller	Information...	bob.miller...
	3	Dr. Carol	Williams	Computer S...	carol.willia...
	4	Dr. David	Jones	Information...	david.jones...
	5	Dr. Emma	Brown	Computer S...	emma.brown...

## Query 1

Update the email of the student with StudentID 1 to 'john.doe@newmail.com'

```
update Students  
set Email= 'john.doe@newmail.com'  
where StudentID=1;
```

	StudentID	FirstName	LastName	DateOfBirth	EnrollmentDate	Email	Age
1	1	John	Doe	2000-01-01	2018-09-01	john.doe@newmail.com	24
2	2	Jane	Smith	1999-05-15	2017-09-01	jane.smith@example.com	21
3	3	Robert	Brown	2001-11-21	2019-09-01	robert.brown@example.com	25
4	4	Emily	Jones	2002-03-03	2020-09-01	emily.jones@example.com	22
5	5	Michael	Davis	1998-07-22	2016-09-01	michael.davis@example.com	23
6	6	Linda	Wilson	2000-12-12	2018-09-01	linda.wilson@example.com	21
7	7	James	Taylor	2001-03-14	2019-09-01	james.taylor@example.com	22
8	8	Sarah	Lee	2002-07-07	2020-09-01	sarah.lee@example.com	23
9	9	David	Martin	1999-11-11	2017-09-01	david.martin@example.com	24
10	10	Susan	Clark	2001-05-05	2019-09-01	susan.clark@example.com	22

## Query 2

Delete the record of the student with StudentID 5 from the Students table

StudentID	FirstName	LastName	DateOfBirth	EnrollmentDate	Email	Age
1	John	Doe	2000-01-01	2018-09-01	john.doe@example.com	24
2	Jane	Smith	1999-05-15	2017-09-01	jane.smith@example.com	21
3	Robert	Brown	2001-11-21	2019-09-01	robert.brown@example.com	25
4	Emily	Jones	2002-03-03	2020-09-01	emily.jones@example.com	22
6	Linda	Wilson	2000-12-12	2018-09-01	linda.wilson@example.com	21
7	James	Taylor	2001-03-14	2019-09-01	james.taylor@example.com	22
8	Sarah	Lee	2002-07-07	2020-09-01	sarah.lee@example.com	23
9	David	Martin	1999-11-11	2017-09-01	david.martin@example.com	24
10	Susan	Clark	2001-05-05	2019-09-01	susan.clark@example.com	22

## Query 3

Select all records from the Students table.

	StudentID	FirstName	LastName	DateOfBirth	EnrollmentDate	Email	Age
1	1	John	Doe	2000-01-01	2018-09-01	john.doe@newmail.com	24
2	2	Jane	Smith	1999-05-15	2017-09-01	jane.smith@example.com	21
3	3	Robert	Brown	2001-11-21	2019-09-01	robert.brown@example.com	25
4	4	Emily	Jones	2002-03-03	2020-09-01	emily.jones@example.com	22
5	5	Michael	Davis	1998-07-22	2016-09-01	michael.davis@example.com	23
6	6	Linda	Wilson	2000-12-12	2018-09-01	linda.wilson@example.com	21
7	7	James	Taylor	2001-03-14	2019-09-01	james.taylor@example.com	22
8	8	Sarah	Lee	2002-07-07	2020-09-01	sarah.lee@example.com	23
9	9	David	Martin	1999-11-11	2017-09-01	david.martin@example.com	24
10	10	Susan	Clark	2001-05-05	2019-09-01	susan.clark@example.com	22

## Query 4

Select the FirstName and LastName of all students who enrolled after '2018-01-01'.

	FirstName	LastName
1	John	Doe
2	Robert	Brown
3	Emily	Jones
4	Linda	Wilson
5	James	Taylor
6	Sarah	Lee
7	Susan	Clark

## Query 5

Count the number of students in the Students table.

	Count_students
1	10

## Query 6

Select all records from the Courses table.

	CourseID	CourseName	Credits	Department
1	1	Introduction to SQL	3	Computer Science
2	2	Data Structures	4	Computer Science
3	3	Database Management Systems	3	Information Technology
4	4	Algorithms	4	Computer Science
5	5	Operating Systems	3	Information Technology
6	6	Web Development	3	Computer Science
7	7	Computer Networks	3	Information Technology

## Query 7

Select the CourseName and Credits for courses in the 'Computer Science' department.

	CourseName	Credits
1	Database Management Systems	3
2	Operating Systems	3
3	Computer Networks	3

## Query 8

Find the total number of credits offered by the 'Information Technology' department.

Results	
	Total_Credits
1	9

## Query 9

List each student's FirstName, LastName, and the names of the courses they are enrolled in

	FirstName	LastName	CourseName
1	John	Doe	Introduction to SQL
2	Jane	Smith	Data Structures
3	Robert	Brown	Database Management Systems
4	Emily	Jones	Algorithms
5	Michael	Davis	Operating Systems
6	Linda	Wilson	Web Development
7	James	Taylor	Computer Networks

## Query 10

Find the names of courses that have more than one student enrolled. List the CourseName and the number of students

	CourseName	NumberOfStudents
1	Algorithms	2
2	Data Structures	3
3	Database Management Systems	3
4	Introduction to SQL	2
5	Operating Systems	2
6	Web Development	2

## Query 11

Select all students and order them by their EnrollmentDate in descending order.

	StudentID	FirstName	LastName	DateOfBirth	EnrollmentDate	Email	Age
1	4	Emily	Jones	2002-03-03	2020-09-01	emily.jones@example.com	22
2	8	Sarah	Lee	2002-07-07	2020-09-01	sarah.lee@example.com	23
3	3	Robert	Brown	2001-11-21	2019-09-01	robert.brown@example.com	25
4	7	James	Taylor	2001-03-14	2019-09-01	james.taylor@example.com	22
5	10	Susan	Clark	2001-05-05	2019-09-01	susan.clark@example.com	22
6	6	Linda	Wilson	2000-12-12	2018-09-01	linda.wilson@example.com	21
7	1	John	Doe	2000-01-01	2018-09-01	john.doe@newmail.com	24
8	2	Jane	Smith	1999-05-15	2017-09-01	jane.smith@example.com	21
9	9	David	Martin	1999-11-11	2017-09-01	david.martin@example.com	24
10	5	Michael	Davis	1998-07-22	2016-09-01	michael.davis@example.com	23

## Query 12

Find the average number of credits for each department. List the Department and the average credits.

	Average_Credits	Department
1	3	Computer Science
2	3	Information Technology

## Query 13

List the FirstName, LastName, CourseName, and Grade of students enrolled in courses for the 'Fall2020' semester.

	FirstName	LastName	CourseName	Grade
1	John	Doe	Data Structures	A
2	Jane	Smith	Data Structures	A
3	Michael	Davis	Introduction to SQL	B+
4	David	Martin	Computer Networks	B+
5	Emily	Jones	Web Development	A

## Query 14

List the CourseName and the number of students enrolled in each course.

	FirstName	LastName	CourseName	Grade
1	John	Doe	Data Structures	A
2	Jane	Smith	Data Structures	A
3	Michael	Davis	Introduction to SQL	B+
4	David	Martin	Computer Networks	B+
5	Emily	Jones	Web Development	A

## Query 15

Find the FirstName, LastName, CourseName, and Grade of students who received a grade lower than 'B'.

	FirstName	LastName	CourseName	Grade
1	John	Doe	Data Structures	A
2	Robert	Brown	Data Structures	A-
3	Jane	Smith	Data Structures	A
4	Linda	Wilson	Algorithms	A
5	Sarah	Lee	Web Development	A-
6	Susan	Clark	Introduction to SQL	A
7	Jane	Smith	Algorithms	A-
8	Emily	Jones	Web Development	A

## Query 16

List each **StudentID**, **FirstName**, **LastName**, and the total number of enrollments.

	StudentID	FirstName	LastName	number_of_enrollements
1	1	John	Doe	15
2	2	Jane	Smith	15
3	3	Robert	Brown	15
4	4	Emily	Jones	15
5	5	Michael	Davis	15
6	6	Linda	Wilson	15
7	7	James	Taylor	15
8	8	Sarah	Lee	15
9	9	David	Martin	15
10	10	Susan	Clark	15

## Query 17

List the **CourseName** of courses that have no enrollments.

95 %	▼
Results	Messages
CourseName	

## Query 18

List the top 3 students with the highest number of course enrollments. Include StudentID, FirstName, LastName, and TotalEnrollments.

	TotalEnrollments	StudentID	FirstName	LastName
1	2	1	John	Doe
2	3	2	Jane	Smith
3	3	3	Robert	Brown

## Query 19

List each professor's FirstName, LastName, and the names of the courses they are assigned to teach.

	FirstName	LastName	CourseName
1	Dr. Alice	Johnson	Data Structures
2	Dr. Alice	Johnson	Introduction to SQL
3	Dr. Alice	Johnson	Web Development
4	Dr. Bob	Miller	Computer Networks
5	Dr. Bob	Miller	Database Management Systems
6	Dr. Carol	Williams	Data Structures
7	Dr. David	Jones	Algorithms
8	Dr. Emma	Brown	Operating Systems

## Query 20

Find the number of professors in each department. List the Department and the number of professors.

	NumOfProfessors	Department
1	3	Computer Science
2	2	Information Technology

## Query 21

Select all courses and order them by Credits in ascending order.

	CourseID	CourseName	Credits	Department
1	1	Introduction to SQL	3	Computer Science
2	3	Database Management Systems	3	Information Technology
3	5	Operating Systems	3	Information Technology
4	6	Web Development	3	Computer Science
5	7	Computer Networks	3	Information Technology
6	4	Algorithms	4	Computer Science
7	2	Data Structures	4	Computer Science

## Query 22

List the FirstName and LastName of professors who are teaching more than one course

The screenshot shows the SSMS interface with the 'Results' tab selected. A table is displayed with columns 'FirstName' and 'LastName'. Two rows are present: row 1 contains 'Dr. Alice' and 'Johnson', and row 2 contains 'Dr. Bob' and 'Miller'. The cell 'Dr. Alice' is highlighted with a dashed border.

	FirstName	LastName
1	Dr. Alice	Johnson
2	Dr. Bob	Miller

## Query 23

List the FirstName, LastName, and CourseName of students who are enrolled in courses taught by 'Dr. Alice Johnson'.

The screenshot shows the SSMS interface with the 'Results' tab selected. A table is displayed with columns 'FirstName', 'LastName', and 'CourseName'. Seven rows are present, each containing a student's name and the course they are enrolled in. The first row, 'John Doe' with 'Data Structures', has its 'FirstName' cell highlighted with a dashed border.

	FirstName	LastName	CourseName
1	John	Doe	Data Structures
2	Robert	Brown	Data Structures
3	Jane	Smith	Data Structures
4	Michael	Davis	Introduction to SQL
5	Sarah	Lee	Web Development
6	Susan	Clark	Introduction to SQL
7	Emily	Jones	Web Development

## Query 24

Find the total number of credits each student is enrolled in. List the **StudentID**, **FirstName**, **LastName**, and **TotalCredits**.

	FirstName	LastName	TotalCredits
1	Robert	Brown	7
2	Susan	Clark	3
3	Michael	Davis	3
4	John	Doe	7
5	Emily	Jones	6
6	Sarah	Lee	3
7	David	Martin	3
8	Jane	Smith	11
9	James	Taylor	3
10	Linda	Wilson	4

## Query 25

Find the number of students enrolled in each course for the 'Spring2021' semester. List the **CourseID**, **CourseName**, and **StudentCount**.

	CourseName	CourseID	StudentCount
1	Introduction to SQL	1	1
2	Database Management Systems	3	2
3	Algorithms	4	1

## Query 26

List the CourseName and Department of courses that had enrollments in 'Spring2021'.

	CourseName	Department
1	Database Management Systems	Information Technology
2	Algorithms	Computer Science
3	Introduction to SQL	Computer Science
4	Database Management Systems	Information Technology

## Query 27

For each student, list their StudentID, FirstName, LastName, and the date of their last enrollment.

	StudentID	FirstName	LastName	latestEnrollmentDate
1	1	John	Doe	2018-09-01
2	2	Jane	Smith	2017-09-01
3	3	Robert	Brown	2019-09-01
4	4	Emily	Jones	2020-09-01
5	5	Michael	Davis	2016-09-01
6	6	Linda	Wilson	2018-09-01
7	7	James	Taylor	2019-09-01
8	8	Sarah	Lee	2020-09-01
9	9	David	Martin	2017-09-01
10	10	Susan	Clark	2019-09-01

## Query 28

Find the names of students who have enrolled in 'Data Structures' (CourseID 2)

	FirstName	LastName
1	John	Doe
2	Robert	Brown
3	Jane	Smith

## Query 29

List all students along with the total number of courses they are enrolled in.

	StudentID	FirstName	LastName	TotalCourses
1	1	John	Doe	2
2	2	Jane	Smith	3
3	3	Robert	Brown	2
4	4	Emily	Jones	2
5	5	Michael	Davis	1
6	6	Linda	Wilson	1
7	7	James	Taylor	1
8	8	Sarah	Lee	1
9	9	David	Martin	1
10	10	Susan	Clark	1

## Query 30

List all students with their enrolled courses and grades. Include StudentID, FirstName, LastName, CourseName, and Grade

	StudentID	FirstName	LastName	courseName	Grade
1	1	John	Doe	Data Structures	A
2	2	Jane	Smith	Database Management Systems	B+
3	3	Robert	Brown	Data Structures	A-
4	4	Emily	Jones	Database Management Systems	B
5	2	Jane	Smith	Data Structures	A
6	5	Michael	Davis	Introduction to SQL	B+
7	6	Linda	Wilson	Algorithms	A
8	7	James	Taylor	Operating Systems	B
9	8	Sarah	Lee	Web Development	A-
10	9	David	Martin	Computer Networks	B+
11	10	Susan	Clark	Introduction to SQL	A
12	1	John	Doe	Database Management Systems	B
13	2	Jane	Smith	Algorithms	A-
14	3	Robert	Brown	Operating Systems	B+
15	4	Emily	Jones	Web Development	A

## Query 31

Find the total number of enrollments for each student. List the StudentID, FirstName, LastName, and TotalEnrollments.

	FirstName	LastName	StudentID	total_enrollments
1	John	Doe	1	5
2	Jane	Smith	2	9
3	Robert	Brown	3	7
4	Emily	Jones	4	9
5	Michael	Davis	5	1
6	Linda	Wilson	6	4
7	James	Taylor	7	5
8	Sarah	Lee	8	6
9	David	Martin	9	7

## Query 32

Create a view named EnrollmentSummary that displays StudentID, FirstName, LastName, CourseID, CourseName, and Grade from the Enrollments table.

The screenshot shows a SQL query window with the following content:

```
>Create view EnrollmentSummary as
select s.StudentID,s.FirstName,s.LastName,c.CourseId,c.CourseName,e.Grade
from Students s
join Enrollments e on s.StudentID=e.StudentID
join Courses c on e.CourseID=c.CourseID
```

The results pane displays the data returned by the query:

	StudentID	FirstName	LastName	CourseID	CourseName	Grade
1	1	John	Doe	2	Data Structures	A
2	2	Jane	Smith	3	Database Management Systems	B+
3	3	Robert	Brown	2	Data Structures	A-
4	4	Emily	Jones	3	Database Management Systems	B
5	2	Jane	Smith	2	Data Structures	A
6	5	Michael	Davis	1	Introduction to SQL	B+
7	6	Linda	Wilson	4	Algorithms	A
8	7	James	Taylor	5	Operating Systems	B
9	8	Sarah	Lee	6	Web Development	A-
10	9	David	Martin	7	Computer Networks	B+
11	10	Susan	Clark	1	Introduction to SQL	A
12	1	John	Doe	3	Database Management Systems	B
13	2	Jane	Smith	4	Algorithms	A-
14	3	Robert	Brown	5	Operating Systems	B+
15	4	Emily	Jones	6	Web Development	A

## Query 33

Find the average age of students enrolled in each course. List the CourseID, CourseName, and AverageAge.

	CourseID	CourseName	AverageAge
1	1	Introduction to SQL	24
2	2	Data Structures	23
3	3	Database Management Systems	23
4	4	Algorithms	24
5	5	Operating Systems	22
6	6	Web Development	22
7	7	Computer Networks	24

## Query 34

Find the highest and lowest grade received by students in each course. List the CourseID, CourseName, HighestGrade, and LowestGrade.

	CourseID	CourseName	HighestGrade	LowestGrade
1	1	Introduction to SQL	B+	A
2	2	Data Structures	A-	A
3	3	Database Management Systems	B+	B
4	4	Algorithms	A-	A
5	5	Operating Systems	B+	B
6	6	Web Development	A-	A
7	7	Computer Networks	B+	B+

## Query 35

Calculate the average grade of students enrolled in each course. List the CourseID, CourseName, and AvgGrade

```
Select e.CourseID ,c.CourseName,avg(  
CASE e.Grade  
    when 'A' Then 4.0  
    when 'A-' then 3.7  
    when 'B+' then 3.3  
    when 'B' then 3.0  
    when 'B-' then 2.7  
    when 'C+' then 2.3  
    when 'C' then 2.0  
    when 'C-' then 1.7  
    when 'D+' then 1.3  
    when 'D' then 1.0  
    when 'F' then 0.0  
End  
)as avg_grade  
from Enrollments e  
join Courses c on c.CourseID=e.CourseID  
Group by c.CourseName,e.CourseID
```

CourseID	CourseName	avg_grade
1	Introduction to SQL	3.650000
2	Data Structures	3.900000
3	Database Management Systems	3.100000
4	Algorithms	3.850000
5	Operating Systems	3.150000
6	Web Development	3.850000
7	Computer Networks	3.300000

## Query 37

Find the total grades for students in each department. List the Department and TotalGrades

	TotalGrades	Department
1	32	Computer Science
2	18	Information Technology

## Query 38

List the FirstName, LastName, CourseName, and ProfessorName for each enrollment.

```
Select s.FirstName, s.LastName, p.FirstName, p.LastName, c.CourseName  
from Students s  
join Enrollments e on s.StudentID=e.StudentID  
join Courses c on e.CourseID=c.CourseID  
join CourseAssignments ca on ca.ProfessorID=c.CourseID  
join Professors p on ca.ProfessorID=p.ProfessorID  
group by p.FirstName, p.LastName, c.CourseName, s.FirstName, s.LastName
```

	FirstName	LastName	FirstName	LastName	CourseName
1	Michael	Davis	Dr. Alice	Johnson	Introduction to SQL
2	Susan	Clark	Dr. Alice	Johnson	Introduction to SQL
3	Jane	Smith	Dr. Bob	Miller	Data Structures
4	John	Doe	Dr. Bob	Miller	Data Structures
5	Robert	Brown	Dr. Bob	Miller	Data Structures
6	Emily	Jones	Dr. Carol	Williams	Database Management Systems
7	Jane	Smith	Dr. Carol	Williams	Database Management Systems
8	John	Doe	Dr. Carol	Williams	Database Management Systems
9	Jane	Smith	Dr. David	Jones	Algorithms
10	Linda	Wilson	Dr. David	Jones	Algorithms

# Thank You!