

1814ict/2814ict/7003ict/1011ICT: Data Management/ Database Design/ Applied Computing

Topic 4.4: Subquery, Index, View & Security

(Chapter 3, 7, 8)

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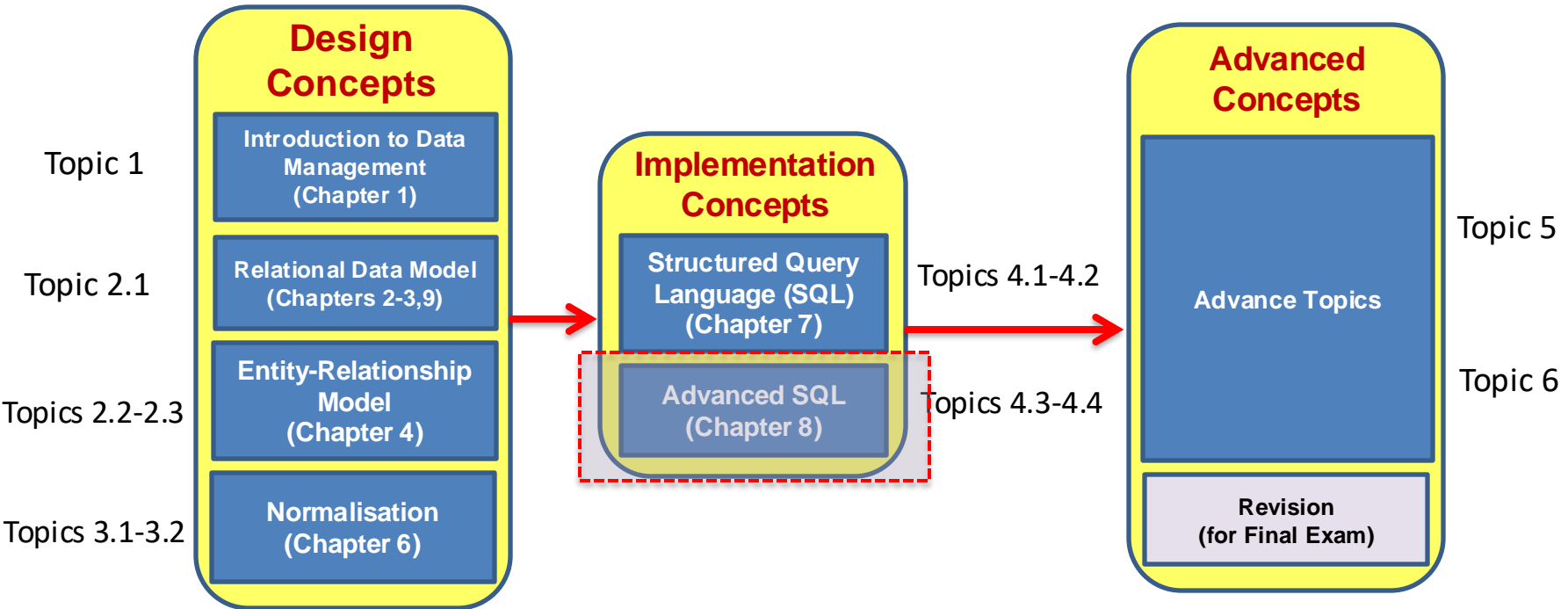
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Course bigger picture

- Chapter references are to textbook *Database Systems: Design, Implementation, & Management* - By Carlos Coronel and Steven Morris



Learning Outcomes

At the end of this lecture students will be able to know:

- How to use & retrieve data using [Subquery](#)
- Understand & use [Index](#), [View](#) & [Security](#)

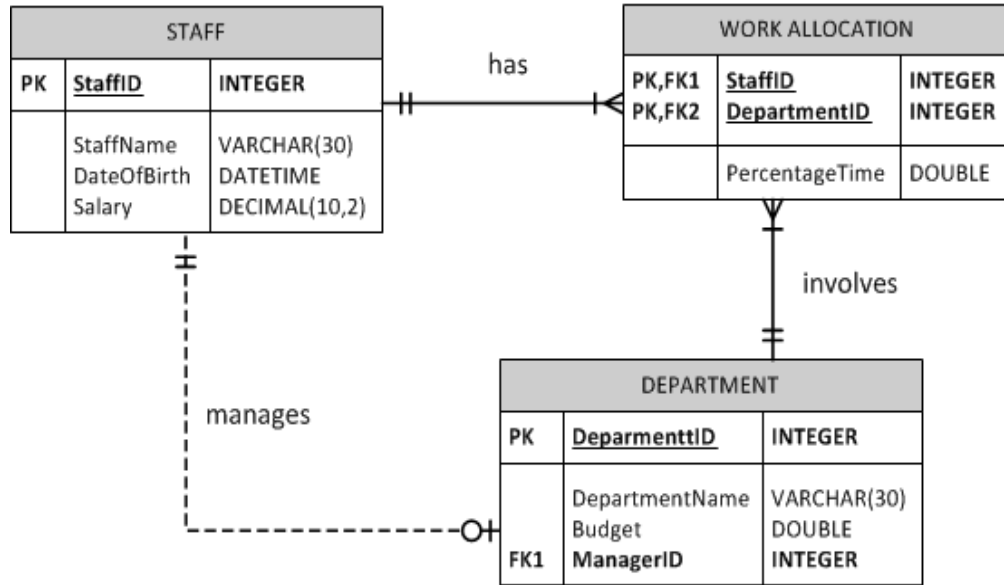
Content

- What is a **subquery**, its importance
- How to **use a subquery**
- What is an **Index**, how to use it
- What is a **View**, how to use it
- How to **Grant** and **Remove** access

Outcomes 1 to 2

Sample database

ERD (Physical model) and Relation Schema



Business rule:

- An employee may work in several departments, with the percentage of time spent in each department being recorded in the **WORK ALLOCATION** table

STAFF(StaffID, StaffName, DateOfBirth, Salary)

DEPARTMENT(DepartmentID, DepartmentName, Budget, ManagerID)

WORK ALLOCATION(StaffID, DepartmentID, PercentageTime)

Topic 4.2 database

- From [Topic 4.1](#), updated with more data

Staff table

StaffID	StaffName	DateOfBirth	Salary
1	Buffy Winters	1987-09-15	27000.00
2	Teddy Bear	1983-12-03	87125.02
3	John Smith	1972-09-20	25000.00
4	Jane Doe	1969-01-25	55000.00
5	Jacek Jones	1984-10-19	35000.00
6	Mohammad Awrangjeb	1977-11-21	35000.00
7	Rupam Deb	1980-10-21	55000.00
8	Md Polash	1981-11-25	38000.00
9	Teddy Bear	1983-12-03	87125.02
10	Fred Smith	1956-06-30	25125.02

Department table

DepartmentID	DepartmentName	Budget	ManagerID
1	Sales	5005000	2
2	Marketing	509000	1
3	Finance	650000	5
4	Accounting	360000	3
5	Human Resource	550000	7

WorkAllocation table

StaffID	DepartmentID	PercentageTime
1	2	0.7
1	5	0.3
2	1	1
3	2	0.3
3	3	0.2
3	4	0.5
4	4	0.3
4	5	0.7
5	3	0.7
5	4	0.3
6	3	0.4
6	4	0.3
6	5	0.3
7	5	1
8	2	0.4
8	3	0.6
9	4	0.5
9	5	0.5
10	1	0.4
10	3	0.2
10	4	0.2
10	5	0.1

Recap from Topic 4.3

Select Statement

- **General Syntax**

SELECT [**ALL** | **DISTINCT** | **DISTINCTROW**] select_expr [, select_expr ...]

FROM table_references

[**WHERE** where_condition]

[**GROUP BY** {col_name | expr | position}]

[**HAVING** where_condition]

[**ORDER BY** {col_name | expr | position} [ASC | DESC], ...]

[**LIMIT** {[offset,] row_count | row_count OFFSET offset}]

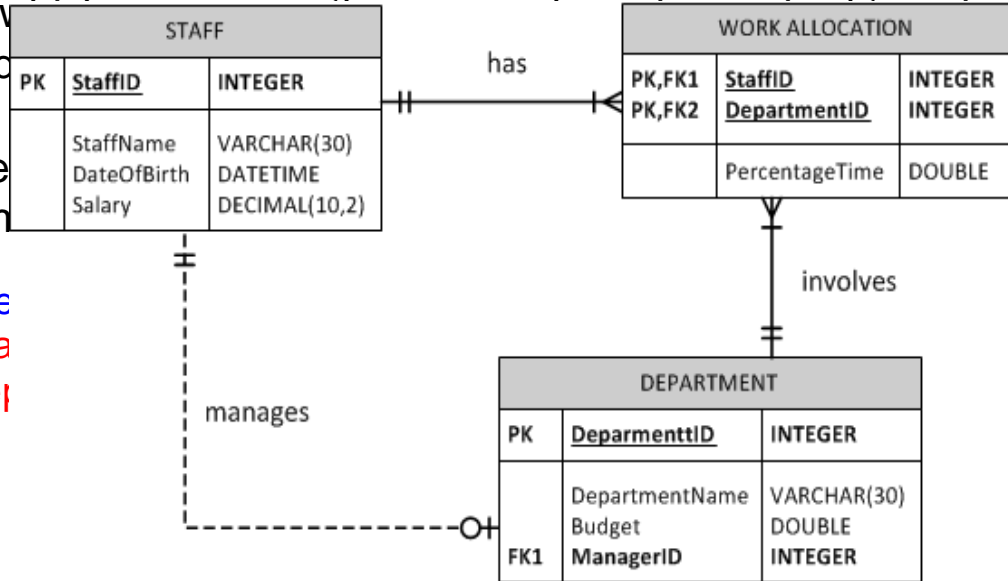
Natural/Equi Join

- Are the most common join type in SQL
- Also called *simple joins* or *inner joins*.
- To join n tables together, you need $n-1$ join conditions in WHERE clause
 - e.g. join four tables, three join conditions are required
 - This rule may not apply if your table has a primary key made up of more than one attribute, in which case the primary key will naturally identify each row.

The required

- Find the manager name and its manger ID & name

SELECT De
FROM depa
WHERE dep



entName	ManagerID	StaffName
	2	Teddy Bear
	1	Buffy Winters
	5	Jacek Jones
g	3	John Smith
resource	7	Rupam Deb

Join: more tables and ORDER BY

- Show the staff name and department name along with the time fraction he/she is working in a department.

```
SELECT S.StaffID, S.StaffName, D.DepartmentID, D.DepartmentName,
       WA.PercentageTime
FROM department AS D
JOIN staff AS S ON S.StaffID = WA.StaffID
JOIN work_allocation AS WA ON WA.DepartmentID = D.DepartmentID
WHERE S.StaffID = WA.StaffID
AND D.DepartmentID = WA.DepartmentID
```

STAFF		
PK	StaffID	INTEGER
	StaffName	VARCHAR(30)
	DateOfBirth	DATETIME
	Salary	DECIMAL(10,2)

has

StaffID	StaffName	DepartmentID	DepartmentName	PercentageTime
2	Teddy Bear	1	Sales	1
10	Fred Smith	1	Sales	0.4
1	Buffy Winters	2	Marketing	0.7
3	John Smith	2	Marketing	0.3
8	Mad Deb	2	Marketing	0.4
		3	Finance	0.2
		3	Finance	0.7
		3	Finance	0.4
		3	Finance	0.6
		3	Finance	0.2
		4	Accounting	0.5
		4	Accounting	0.3
		4	Accounting	0.3
		4	Accounting	0.3
		4	Accounting	0.5
		4	Accounting	0.2
		5	Human Resource	0.3
		5	Human Resource	0.7
		5	Human Resource	0.3
		5	Human Resource	1
		5	Human Resource	0.5
		5	Human Resource	0.1

WORK ALLOCATION		
PK,FK1	StaffID	INTEGER
PK,FK2	DepartmentID	INTEGER
	PercentageTime	DOUBLE

involves

DEPARTMENT		
PK	DepartmentID	INTEGER
	DepartmentName	VARCHAR(30)
	Budget	DOUBLE
FK1	ManagerID	INTEGER

manages

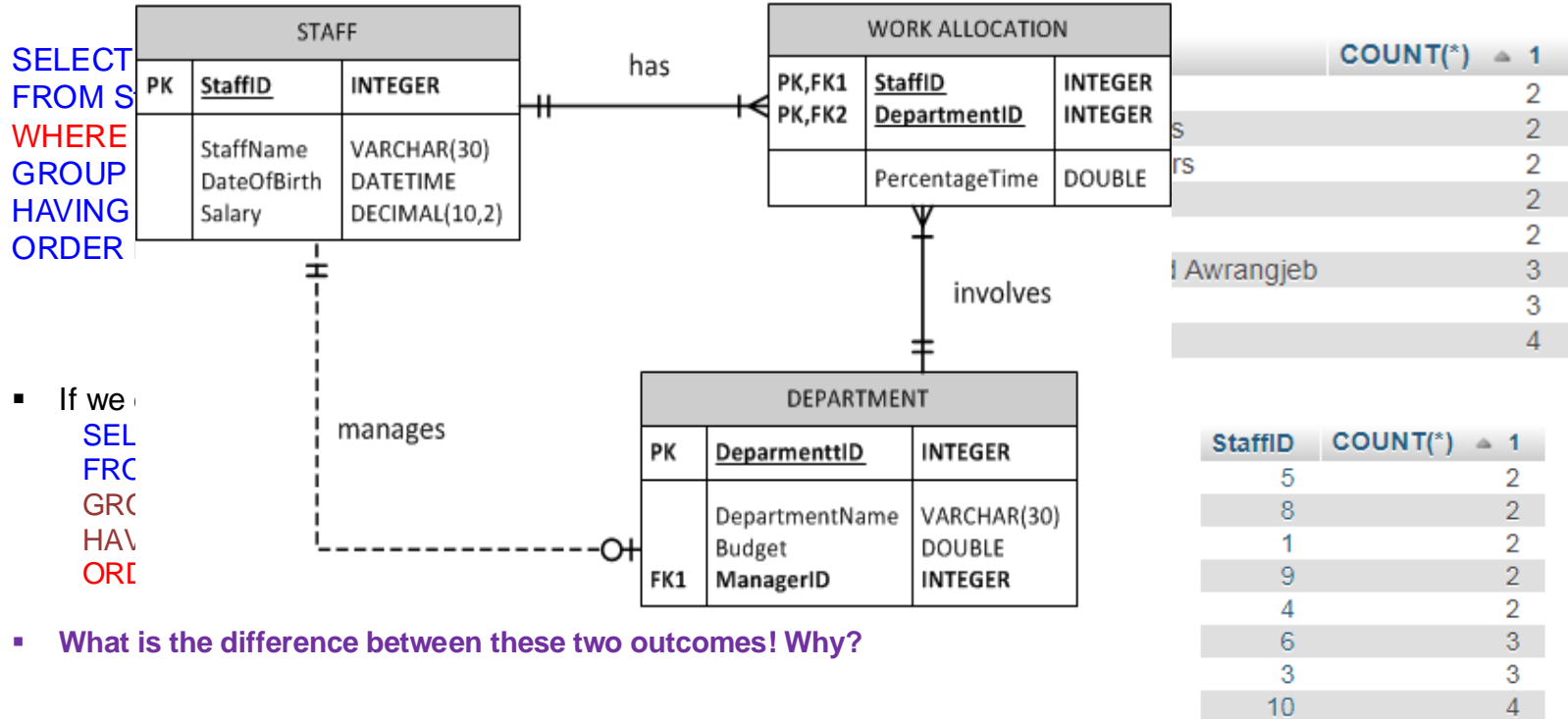
- Find each department he/she works in the above in descending order of PercentageTime

```
SELECT D.DepartmentID, D.DepartmentName, S.StaffName, WA.PercentageTime
FROM department AS D
JOIN staff AS S ON S.StaffID = WA.StaffID
JOIN work_allocation AS WA ON WA.DepartmentID = D.DepartmentID
WHERE D.DepartmentID = WA.DepartmentID
AND S.StaffID = WA.StaffID
AND D.DepartmentID = WA.DepartmentID
ORDER BY PercentageTime DESC;
```

DepartmentID	DepartmentName	ManagerID	StaffName	PercentageTime
1	Sales	2	Teddy Bear	1
5	Human Resource	7	Rupam Deb	1
3	Finance	5	Jacek Jones	0.7
2	Marketing	1	Buffy Winters	0.7
4	Accounting	3	John Smith	0.5

Join: GROUP BY and ORDER BY

- Find the staff who works in at least 2 departments. Show your output in ascending order of number of departments each staff work in. Include staff IDs and names in your output.



- If we
SEL
FRC
GRC
HAV
ORI
- What is the difference between these two outcomes! Why?

Thank you