



Bringing British  
Education to You  
[www.nccedu.com](http://www.nccedu.com)

Database Design and  
Development

Topic 12:  
Module Overview

V1.0

© NCC Education Limited

---

---

---

---

---

---

---


---

Module Overview Topic 12 - 12.2

Scope and Coverage

*This topic will cover:*

- Module overview



Bringing British  
Education to You  
[www.nccedu.com](http://www.nccedu.com)

V1.0

© NCC Education Limited

---

---

---

---

---

---

---


---

Module Overview Topic 12 - 12.3

Learning Outcomes

*By the end of this topic, students will be able to:*

- Summarise the key module topics
- Give an outline of the knowledge needed about each topic for assessment purposes



Bringing British  
Education to You  
[www.nccedu.com](http://www.nccedu.com)

V1.0

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.4

Overview of Module

Topic 1	Introduction to the Module
	Key concepts in databases and database development
Topic 2	Enhancing Design 1
Topic 3	Enhancing Design 2
Topic 4	Data Retrieval 1
Topic 5	Data Retrieval 2
Topic 6	Physical Design 1
Topic 7	Physical Design 2
Topic 8	Physical Design 3
Topic 9	Physical Design 4
Topic 10	Distributed Databases
Topic 11	Data Warehouses
Topic 12	Summary

V1.0

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.5

Database System in Detail

The diagram illustrates the components and interactions of a database system. On the left, three 'User' boxes are shown, each connected to an application box: 'Customer Processing Application', 'Rental Processing Application', and 'Other Application'. These application boxes send 'Application Requests' to a central 'DBMS Database Management System' box. The DBMS box then sends 'Data' to a 'Database' box on the right. The Database box contains 'METADATA' and 'DATA' sections. A text box explains that the DBMS serves as an intermediary between the user and the database by translating user requests into complex code. A note at the bottom states that application programs can be written in a programming language like Visual Basic or C++, or created through a DBMS utility like Access's forms wizard.

DBMS serves as intermediary between user and the database by translating user requests into the complex code required to fulfill those requests

Application programs might be written in a programming Language, such as Visual Basic or C++, or it might be created through a DBMS utility e.g. Access's forms wizard.

V1.0

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.6

Common Types of Database Systems

- Transaction Processing Systems
- Management Information Systems
- Data Warehouses
- Distributed Databases

V1.0

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---


---

Module Overview Topic 12 - 12.7

Activity: Metadata

- What is *metadata*?
- What are data-types?
- Define metadata for an entity in:
  - Student record system
  - Car hire system
  - Holiday booking system

V1.0

Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---


---

Module Overview Topic 12 - 12.8

Key Concepts of Relational Model

- Relations and tables
- Attribute
- Domain
- Tuples and rows
- Primary Key
- Foreign Key

V1.0

Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---


---

Module Overview Topic 12 - 12.9

Phases of Database Design

- *Conceptual* database design
- *Logical* database design
- *Physical* database design

V1.0

Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.10

## Database Design and Our Topics

Topic 1	Introduction to the Module
	Key concepts in databases and database development
Topic 2	Enhancing Design 1 CONCEPTUAL AND LOGICAL
Topic 3	Enhancing Design 2 CONCEPTUAL AND LOGICAL
Topic 4	Data Retrieval 1
Topic 5	Data Retrieval 2
Topic 6	Physical Design 1 PHYSICAL
Topic 7	Physical Design 2 PHYSICAL
Topic 8	Physical Design 3 PHYSICAL
Topic 9	Physical Design 4 PHYSICAL
Topic 10	Distributed Databases
Topic 11	Data Warehouses
Topic 12	Summary

V1.0

Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.11

## Properties of a Relation

- Relation Named
- Atomic values in cells
- Attribute Named
- Attribute value drawn from a domain
- No duplicate tuples (rows)
- No significance to order of tuples
- No significance to order of attributes

V1.0

Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.12

## Functional Dependence

- $A \rightarrow B$
- This is the notation
- If we know the value of A then we will know the value of B

V1.0

Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.13

Customer Order Sheet for Art Supply Shop

Customer Order Sheet for an Art Supplier

Customer Number: 37

Customer Name: Jagpal Singh

Customer Type Code: RC

Customer Type Description: Retail Customer

Item Number	Item Name	Supplier ID	Price	Supplier Name	Quantity
099	Basic Paint Set	S1	£3	Smith and Co	1
0100	Sable Brush Set	S2	£3.50	Acro	1
0101	Extended Colour Set	S1	£3.75	Smith and Co	3
098	Metallic Paint Set	S1	£3.99	Smith and Co	1
078	Mixed Brush Set	S2	£3.99	Acro	2

V1.0

NCC

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.14

Logical Design

- Step One: Create and check ER model
- Step Two: Map ER Model to tables

V1.0

NCC

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.15

Logical Design Step One - 1

- Step One: Create and check ER mode
  - 1.1 Identify entities
  - 1.2 Identify relationships
  - 1.3 Identify and associate attributes with entities
  - 1.4 Determine attribute domains
  - 1.5 Determine candidate, primary and alternative key attributes

V1.0

NCC

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.16

Logical Design Step One - 2

- Step One: Create and check ER mode
- 1.6 Specialise/Generalise entities (optional step, not covered here)
- 1.7 Check model for redundancy
- 1.8 Check model supports user transactions
- 1.9 Review model with user

V1.0

NCC

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.17

Step 1.9 Review Model with User

V1.0

NCC

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---

---

Module Overview Topic 12 - 12.18

Objectives of SQL

- Create the database and relation structures
- Perform basic tasks such as inserts, updates and deletes
- Simple and complex queries

*Structured Query Language*

V1.0

NCC

Bringing British Education to You

www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---


---

---

Module Overview Topic 12 - 12.19

## Data Definition Language DDL

- For defining database structures and controlling access to data
  - CREATE TABLE, CREATE INDEX , CREATE SEQUENCE , GRANT ACCESS etc.
- Data Manipulation Language DML
  - For retrieving and updating data
    - SELECT, INSERT, UPDATE, DELETE

 Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

---

---

---


---

---

Module Overview Topic 12 - 12.20

## Data Manipulation Language DML

- For retrieving and updating data
- SELECT
- INSERT
- UPDATE
- DELETE

 Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

---

---

---


---

---

Module Overview Topic 12 - 12.21

## The Join Operation

- Used to retrieve data from more than one table
- Simple join
- Multi-table join
- Outer-join

 Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

---

---

---

---

---

### Step 3

- 3.1 Design Base Tables (covered in this lecture)
- 3.2 Design representations of derived data (covered in Unit 7)
- 3.3 Design remaining business rules (covered in Unit (Unit 8))

---

---

---

---

---

---

### Step 4

- 4.1 Analyse transactions (covered in Unit 9)
- 4.2 Choose file organisations (covered in Unit 9)
- 4.3 Choose indexes (covered in Unit 9)

---

---

---

---

---

---

## What is Derived Data?

- A column whose value can be found by examining the values of other columns

---

---

---

---

---


---



Module Overview Topic 12 - 12.25

Representation of Derived Data

- Not always represented in the data model
- Represented when there is a danger of losing the information
- Derived attributes shown with a ‘/’ in front

Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

---

---


---

---

Module Overview Topic 12 - 12.26

Types of Constraints

- Entity integrity
- Referential integrity
- Propagation constraints
- Domain constraints
- Table constraints

Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

---

---


---

---

Module Overview Topic 12 - 12.27

Transactions

- The units of work in a database system.
- Transactions can be made up of one or more operations. Operations are usually defined as:
  - CREATE or INPUT
  - RETRIEVE
  - UPDATE
  - DELETE

Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

**CRUD or IRUD**

---

---

---

---

---


---

---

Module Overview Topic 12 - 12.28

Transaction/ Relations	A	B	C	D	E	F	G	H
Customer	C	R					R U	D
Order		C			R U			
OrderItem		C			C R U D	R D		
Item		R	C					
Supplier				C				

V1.0

 Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---


---

Module Overview Topic 12 - 12.29

### Distributed Database Definition

- A database system that is split over more than one site
- This might involve *fragmentation*
- This might involve *replication*

V1.0

 Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---

---


---

Module Overview Topic 12 - 12.30

### Advantages of Distributed Data

- Emulating organisational structure
- Greater Control
- Improved availability
- Greater reliability
- Better performance
- Easier growth

V1.0

 Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---

---


---

---

Module Overview Topic 12 - 12.31

Disadvantages of Distributed Databases

- Complexity
- Cost
- Security
- Integrity control more difficult
- Lack of standards
- Lack of experience
- Database design more complex

Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

---

---

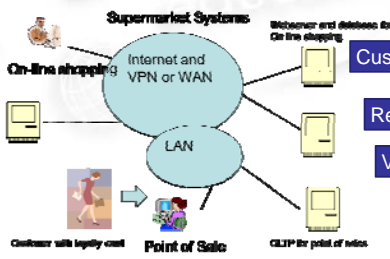
---

---

---

Module Overview Topic 12 - 12.32

Need for Data Warehouse



Supermarket Systems

Internet and VPN or WAN

On-line shopping

Web browser and database for on-line shopping

Customer with loyalty card

Point of Sale

CLIP for point of sales


Sales Trends

Customer Buying habits

Regional variations

Variations by time

Goods generating profit

Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

---

---

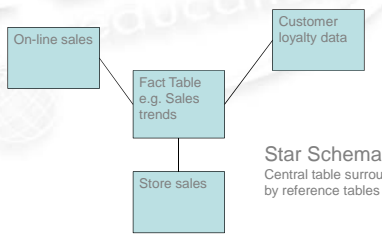
---

---

---

Module Overview Topic 12 - 12.33

Star Schema



On-line sales


Fact Table e.g. Sales trends

Customer loyalty data

Store sales

Star Schema

Central table surrounded by reference tables

Bringing British Education to You  
www.nccedu.com

V1.0

© NCC Education Limited

---

---

---

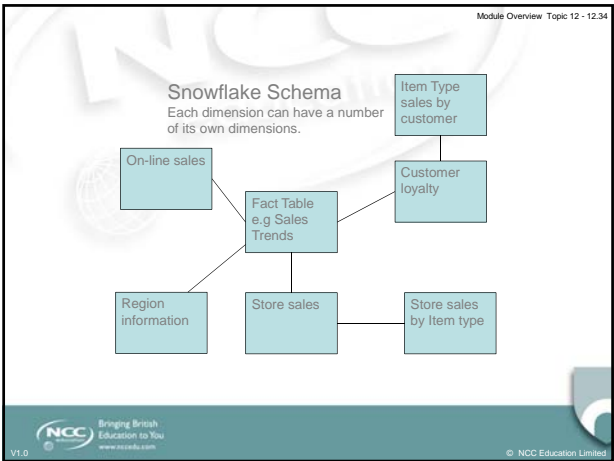
---

---

---

---

---



---

---

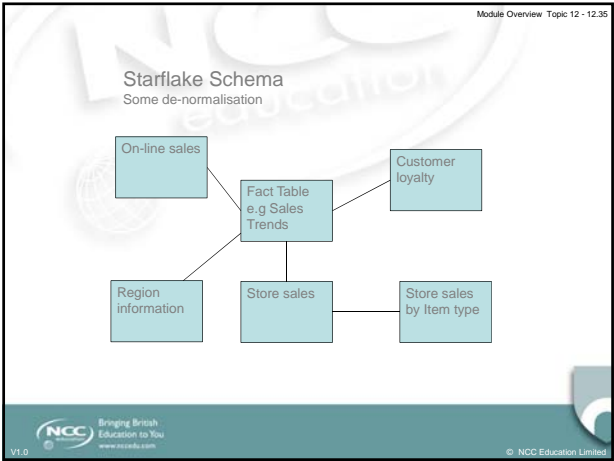
---

---

---

---

---



---

---

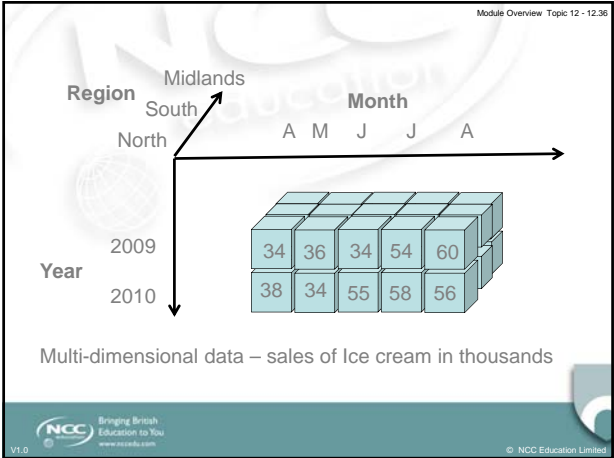
---

---

---

---

---



---

---

---

---

---

---

---


Module Overview Topic 12 - 12.37

# Learning Outcomes

*By the end of this topic, students will be able to:*

- Summarise the key module topics
- Give an outline of the knowledge needed about each topic for assessment purposes

Have we met them?

 Bringing British Education to You  
www.nccedu.com

© NCC Education Limited

---

---

---

---

---


---


---

Module Overview Topic 12 - 12.38

# Topic 12 – Module Overview

*Any Questions?*

 Bringing British Education to You  
www.nccedu.com



V1.0

© NCC Education Limited

---

---

---

---

---

---

---