

Course Syllabus for Next-Gen Engagement Program – Batch II

Course Title: Database Design

Timeline: July 28 – August 31 2025 (5weeks)

In-class hours: 3h/week (15h in total)

Prepared by: NEXT-GEN Engagement Team

1. Course description

Welcome to **Database Design**!

This course teaches students the essentials of database systems, mainly with an eye on relational approaches to the subject. Main concepts to be learned by students include how to build a relational schema, SQL commands (DDL and DML), filtering data, and functions involving joins and aggregates. Participants in the course will gain knowledge from trainer and practice through practical activities that deal with multiple aspects of databases.

2. Course Learning Outcomes

By the end of the course, you should gain the following outcomes:

<i>Knowledge</i>
<ul style="list-style-type: none"> - Understand the concepts of relational database design - Recognize the role and structure of database - Define and explain key SQL concepts including DDL, DML, filtering, joins, and aggregate functions
<i>Skills</i>
<ul style="list-style-type: none"> - Design relational databases with proper schema - Apply SQL commands to create and manipulate databases - Perform complex queries using filters, joins, and aggregate functions
<i>Attitudes</i>
<ul style="list-style-type: none"> - Demonstrate attention to detail when designing database structures - Show willingness to collaborate and solve data-related problems - Display curiosity and self-motivation in exploring real world database applications

3. Course sessions

What we will go through each week

W1: Introduction to database and Relational Database design		
S1	Learning	Database Overview <ul style="list-style-type: none"> What is a database? Types of databases
S2	Learning	Introduction <ul style="list-style-type: none"> Introduction to SQL and relational database Entities, attribute, and relationships Quiz
W2: Relational Schema		
S1	Learning	Relational Schema Design and Data Modeling <ul style="list-style-type: none"> Entity, relationship, and relational model Primary, foreign, and composite keys Database normalization (basic)
S2	Practice	Relational Schema Design <ul style="list-style-type: none"> Identify entities, attributes, and relationships from real-world scenarios Design ER diagrams Define primary, foreign, and composite keys in table structure Normalize tables (Optional)
W3: SQL Basics – DDL & DML		
S1	Learning	SQL Basic Queries <ul style="list-style-type: none"> Data Definition Language (DDL): CREATE, ALTER, DROP Data Manipulation Language (DML): INSERT, UPDATE, DELETE
S2	Practice	Writing and Executing SQL Statements <ul style="list-style-type: none"> Create, modify, and delete tables using DDL commands Insert, update, and delete data using DML commands

		<ul style="list-style-type: none"> Execute queries to populate and modify a sample database
W4: Data Filtering & Querying		
S1	Practice	SELECT Statements and Filtering <ul style="list-style-type: none"> Write SELECT queries to retrieve specific columns and rows Use WHERE clause with logical operators (AND, OR, NOT) Apply ORDER BY to sort results Use LIMIT (or TOP) to restrict the number of rows returned
S2	Practice	Advanced Filtering and Sorting <ul style="list-style-type: none"> Combine multiple filtering conditions Sort by multiple columns Practice filtering on numeric, text, and date fields
W5: Joins and Aggregate Functions		
S1	Practice	Joins and Aggregates <ul style="list-style-type: none"> Retrieve combined data from multiple tables using INNER JOIN, LEFT JOIN, RIGHT JOIN Use aggregate functions: SUM(), AVG(), COUNT() to summarize data Apply GROUP BY to categorize results Use HAVING to filter grouped results
S2	Practice	Complex Queries <ul style="list-style-type: none"> Write complex queries combining joins, filtering, grouping, and aggregation Analyze and interpret results from multiple-table queries

**** Quiz:** Trainer can design their own quiz (Kahoot, Quizzes, etc.)

**** This subject to be change according to each class**

Resource

W1: Introduction to database and Relational Database design

Geeks for geeks – What is database?

<https://www.geeksforgeeks.org/what-is-database/>

Geeks for geeks – What is SQL?

<https://www.geeksforgeeks.org/what-is-sql/>

Geeks for geeks – Introduction of ER model

<https://www.geeksforgeeks.org/dbms/introduction-of-er-model/>

W2: Relational Schema

Geeks for geeks – Type of keys in relational model

<https://www.geeksforgeeks.org/dbms/types-of-keys-in-relational-model-candidate-super-primary-alternate-and-foreign/>

Geeks for geeks – Relational model in DBMS

<https://www.geeksforgeeks.org/dbms/relational-model-in-dbms/>

Geeks for geeks – Introduction of Database Normalization

<https://www.geeksforgeeks.org/dbms/introduction-of-database-normalization/>

W3: SQL Basics – DDL & DML

Geeks for geeks – DDL Full Form - Data Definition Language

<https://www.geeksforgeeks.org/ddl-full-form/>

Geeks for geeks – SQL Commands

<https://www.geeksforgeeks.org/sql/sql-ddl-dql-dml-dcl-tcl-commands/>

Geeks for geeks – DML Full Form - Data Manipulation Language

<https://www.geeksforgeeks.org/dbms/dml-full-form/>

W4: Data Filtering & Querying

W3schools – SQL Select Statement

https://www.w3schools.com/sql/sql_select.asp

W3school – SQL Where clause

https://www.w3schools.com/sql/sql_where.asp

W3school – SQL Order by key word

https://www.w3schools.com/sql/sql_orderby.asp

W3school – MySQL Limit clause

https://www.w3schools.com/mysql/mysql_limit.asp

W5: Joins and Aggregate Functions

W3school – SQL Join

https://www.w3schools.com/sql/sql_join.asp

Geeks for geeks – SQL join

<https://www.geeksforgeeks.org/sql-join-set-1-inner-left-right-and-full-joins/>

Geeks for geeks – SQL Aggregate function

<https://www.geeksforgeeks.org/aggregate-functions-in-sql/>

YouTube - Database management system

https://youtube.com/playlist?list=PLBlnK6fEyqRi_CUQ-FXxgzKQ1dwr_ZJWZ&si=o4vVGxTw2vwY24Y5

Practice Exercise

W3school – SQL exercise

https://www.w3schools.com/sql/sql_exercises.asp

Wise Owl – Simple queries

<https://www.wiseowl.co.uk/sql/exercises/standard/simple-queries/>

Hacker Rank – SQL

<https://www.hackerrank.com/domains/sql>

w3resource - Oracle SQL Queries: Basic Exercises with Solution

<https://www.w3resource.com/oracle-exercises/basic/>

Leet code – Database practice

<https://leetcode.com/problemset/database/>

Sample database:

<https://www.mysqltutorial.org/getting-started-with-mysql/mysql-sample-database/>

In .zip file

- Banking System database
- Dummy HR
- Northwind Database