# SQL for Data Analytics - Comprehensive Learning Roadmap

A detailed course designed to take you from SQL fundamentals to advanced real-world data analytics use cases.

## Phase 1 — SQL Fundamentals (Weeks 1–2)

Goal: Get comfortable with SQL basics so you can query and filter data.

Topics:

* Introduction to SQL & Relational Databases  
  - What SQL is and why it matters in analytics.  
  - Understanding tables, rows, columns, relationships.
* Basic SELECT Queries  
  - SELECT, FROM  
  - Column aliases
* Filtering Data  
  - WHERE clause  
  - Comparison operators (=, <, >, <>, BETWEEN, IN, LIKE)
* Sorting Data  
  - ORDER BY (ascending/descending)
* Limiting Results  
  - TOP (SQL Server) / LIMIT (other databases)
* Basic Functions  
  - String functions (CONCAT, SUBSTRING)  
  - Numeric functions (ROUND, ABS)  
  - Date functions (GETDATE, DATEADD)

Real-world focus: Extract and filter sales data from a company database for quick reports.

## Phase 2 — Intermediate SQL (Weeks 3–4)

Goal: Build queries for grouped summaries and combine data across tables.

Topics:

* Aggregate Functions  
  - SUM(), AVG(), COUNT(), MIN(), MAX()
* Grouping Data  
  - GROUP BY  
  - Filtering groups with HAVING
* Joins  
  - INNER JOIN  
  - LEFT JOIN  
  - RIGHT JOIN  
  - FULL OUTER JOIN  
  - Cross joins
* NULL Handling  
  - IS NULL, COALESCE()
* Subqueries  
  - Single-value subqueries  
  - IN and EXISTS subqueries

Real-world focus:  
- Combine customer and order tables to create sales by region reports.  
- Find customers with no purchases.

## Phase 3 — Advanced SQL (Weeks 5–6)

Goal: Handle complex analytics queries with ranking, time-based calculations, and performance considerations.

Topics:

* Window Functions  
  - ROW\_NUMBER(), RANK(), DENSE\_RANK()  
  - Running totals with SUM() OVER  
  - LAG() & LEAD() for previous/next row comparisons
* Advanced Aggregations  
  - GROUPING SETS, CUBE, ROLLUP
* Conditional Logic  
  - CASE WHEN
* Common Table Expressions (CTEs)  
  - Recursive and non-recursive
* Set Operations  
  - UNION, INTERSECT, EXCEPT
* Performance Basics  
  - Index usage basics  
  - Query execution plans

Real-world focus:  
- Rank top 5 products in each category by revenue.  
- Calculate month-over-month sales growth.  
- Find customer churn patterns.

## Phase 4 — SQL for Data Analytics (Weeks 7–8)

Goal: Use SQL for real-world analytics workflows.

Topics:

* Data Cleaning in SQL  
  - Handling missing data  
  - Removing duplicates  
  - Standardizing formats
* Exploratory Data Analysis (EDA)  
  - Descriptive statistics in SQL  
  - Detecting outliers
* Time Series Analysis in SQL  
  - Date truncation (DATEPART, FORMAT)  
  - Rolling averages
* Customer Segmentation  
  - RFM (Recency, Frequency, Monetary) analysis in SQL
* KPI Dashboards with SQL  
  - Creating aggregated views for BI tools

Real-world focus:  
- Build a monthly sales performance dashboard directly from SQL.  
- Create churn risk reports for marketing.

## Phase 5 — Real-World Projects (Weeks 9–10)

Goal: Simulate analytics projects end-to-end using SQL.

Project Ideas:

* E-commerce Sales Analytics  
  - Track top-selling products, revenue trends, customer demographics.
* Marketing Campaign Effectiveness  
  - Pre- and post-campaign comparisons.
* Financial Transaction Analysis  
  - Fraud detection rules using SQL.
* HR Analytics  
  - Employee turnover trends, hiring patterns.

## Phase 6 — Beyond SQL (Optional Add-ons)

* Integration with Excel/Power BI/Tableau
* Stored Procedures & Functions for reusable queries
* Data Modeling for analytics databases
* SQL with Python (pandas & sqlalchemy) for hybrid workflows

## Learning Strategy

• Daily practice: 30–60 min writing queries.  
• Weekly mini-project: Apply what you learned to a sample dataset.  
• Capstone project: A real-world dataset (like Kaggle’s sales data) analyzed end-to-end in SQL.