

Power BI

Master Data Visualization & Business Intelligence with Microsoft Power BI — your comprehensive guide from raw data to actionable insights.

Course Overview

What You'll Learn

This course covers the full Power BI ecosystem — from foundational concepts to advanced analytics. Here's your learning roadmap:

01

Foundations

Business intelligence concepts, Power BI components, and interface navigation

02

Data Preparation

Import, connect, transform, and model your data with Power Query

03

Analytics & DAX

Write powerful expressions, measures, and time intelligence formulas

04

Visualization & Deployment

Design dashboards, publish to the cloud, and share with your organization



Chapter 1

Introduction to Power BI

Understanding the foundation of modern business intelligence and where Power BI fits in the enterprise analytics landscape.

What Is Business Intelligence?

The Core Idea

Business Intelligence (BI) is the process of collecting, transforming, and analyzing raw business data to support smarter decision-making. Rather than relying on gut instinct, BI empowers organizations to act on evidence.

BI spans data collection, storage, analysis, and visual reporting — turning scattered information into strategic advantage.

Why It Matters

- **Faster decisions** — Real-time data replaces slow, manual reporting cycles
- **Unified data view** — Consolidate data from multiple systems into one source of truth
- **Competitive edge** — Organizations that leverage BI outperform peers by identifying trends earlier

The Power BI Ecosystem

Power BI is not a single tool — it is a suite of interconnected components designed to cover every stage of the analytics workflow.



Power BI Desktop

A free Windows application for building reports. This is where you connect to data, transform it, build data models, write DAX, and design rich visualizations.



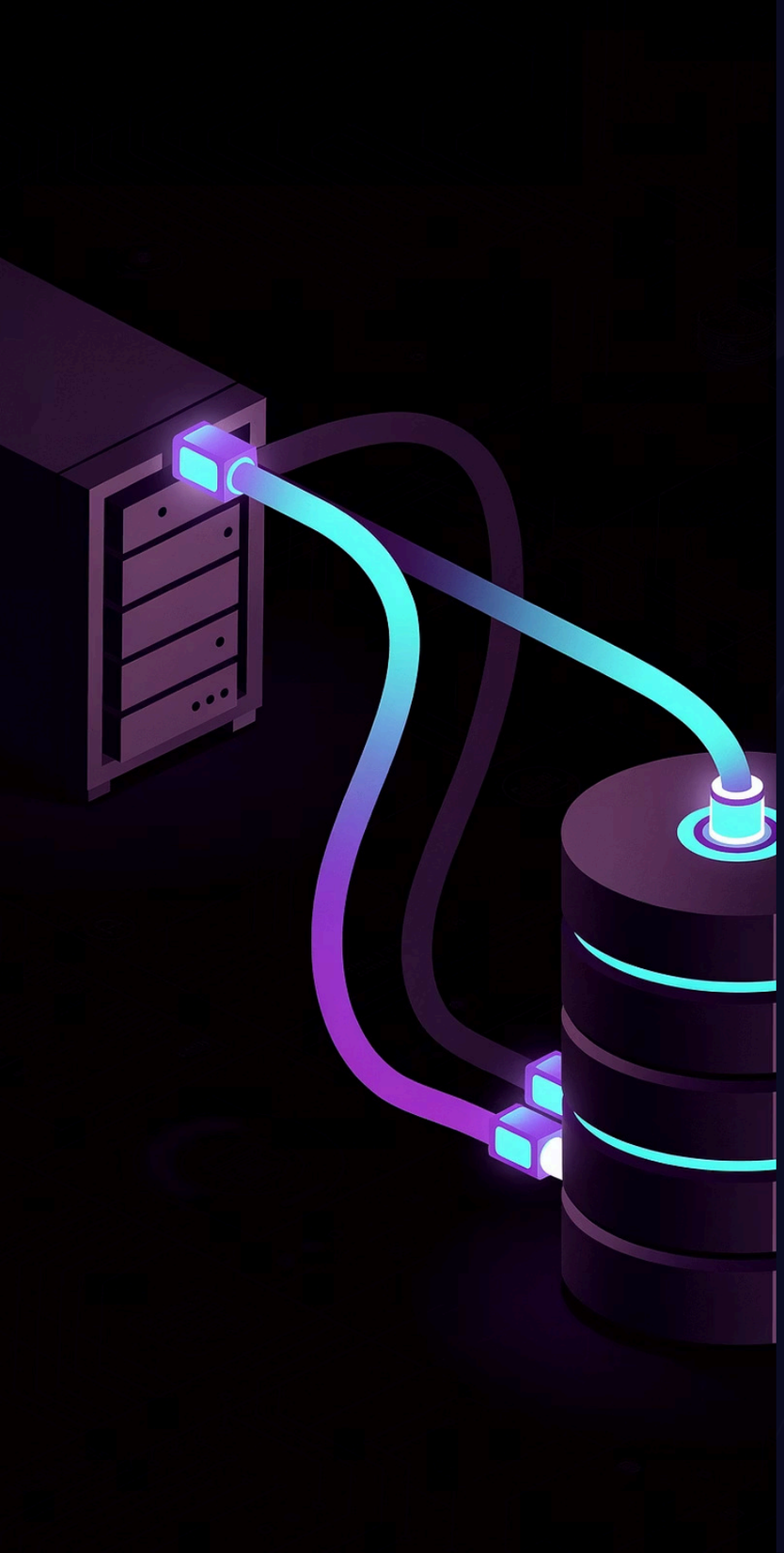
Power BI Service

A cloud-based platform (app.powerbi.com) for publishing, sharing, and collaborating on reports and dashboards. Supports scheduled refresh and workspace management.



Power BI Mobile

Native iOS and Android apps that allow stakeholders to view and interact with reports anywhere, anytime — keeping decision-makers connected to live data.



Chapter 2

Data Import & Connectivity

Power BI connects to hundreds of data sources. Learning to import and refresh data correctly is the first step to building reliable reports.

Connecting to Your Data

Common Data Sources

📊 Excel & CSV

Import flat files directly. Handle headers, skip rows, and select specific sheets or ranges.

🗄️ SQL Server

Connect live or import via DirectQuery. Authenticate with Windows or SQL credentials.

🌐 Web & APIs

Pull data from public URLs, REST APIs, or OData feeds for live, up-to-date datasets.

Load & Refresh Options

Power BI offers flexible refresh strategies to keep your data current:

Import Mode

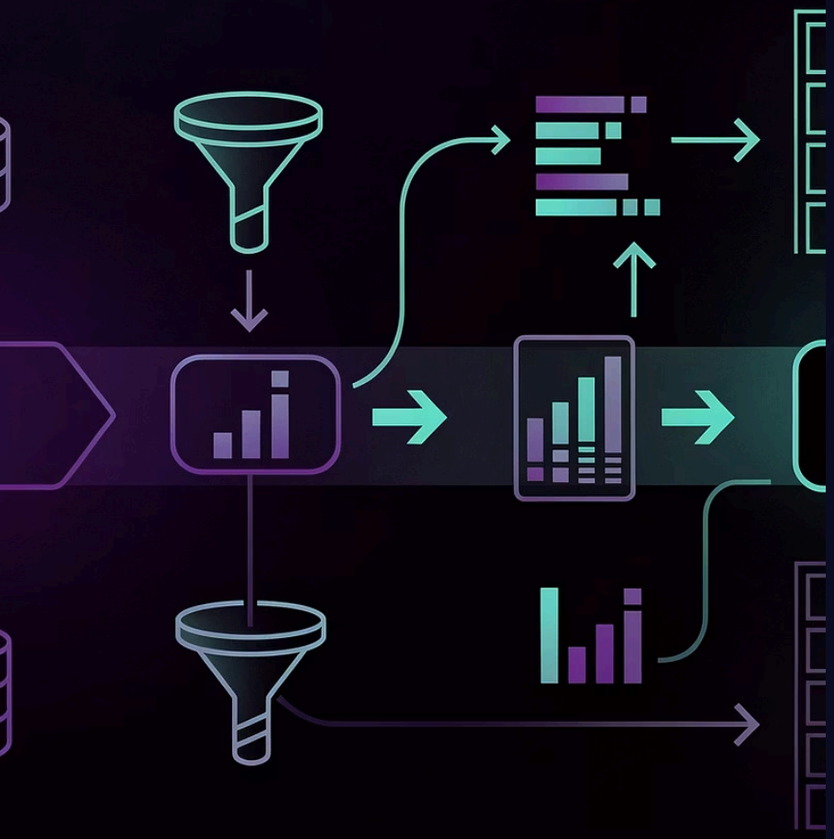
Data is cached in Power BI for fast performance. Refresh on a schedule via the Service.

DirectQuery

Queries run live against the source — ideal for large datasets that can't be imported.

Scheduled Refresh

Automate daily or hourly refreshes via Power BI Service to keep reports current.



Chapter 3

Data Transformation with Power Query

Before you can analyze data, you need to clean and shape it. Power Query is Power BI's built-in ETL engine — a no-code interface for transforming raw data into analysis-ready tables.

Key Power Query Transformations

Power Query records every transformation step, creating a reproducible, auditable data preparation pipeline. Here are the essential operations every analyst must master:



Clean Data

Remove duplicates, eliminate errors, replace null values, and trim whitespace to ensure data integrity before analysis.



Split & Merge Columns

Separate a full name into first/last, or combine city and state fields. Control delimiters and output column names.



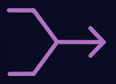
Change Data Types

Ensure numeric fields aren't stored as text. Assign correct types — text, whole number, decimal, date — for accurate calculations.



Filter & Sort

Remove irrelevant rows early in the pipeline — filter by date ranges, values, or conditions — and sort for predictable output.



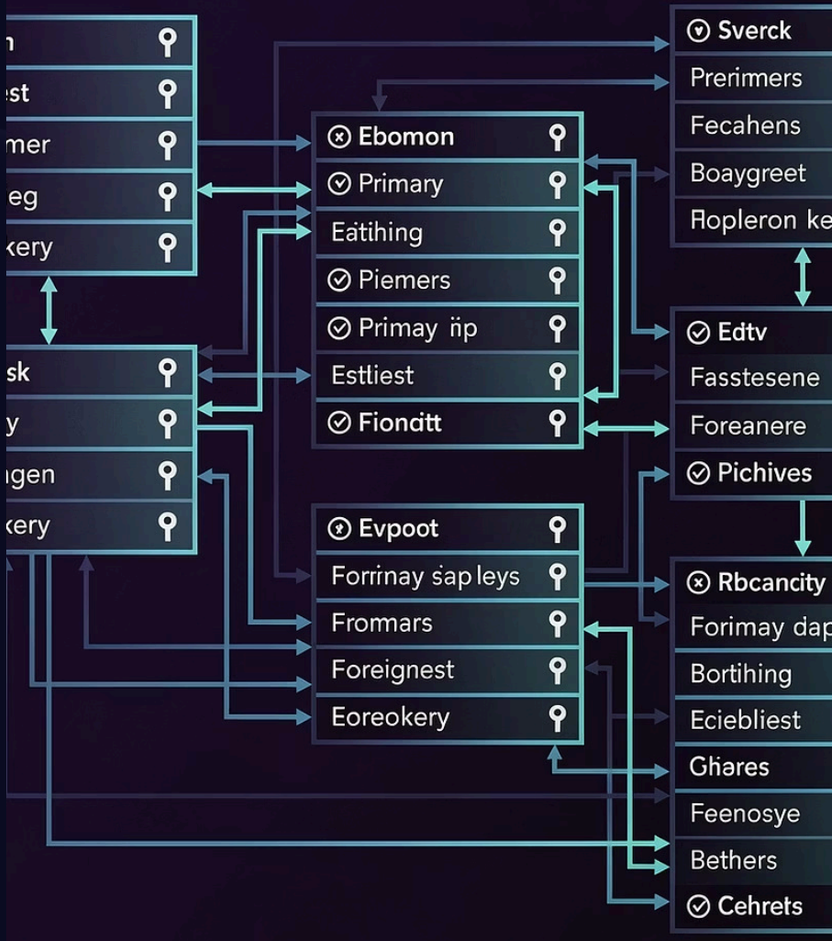
Append & Merge Queries

Stack tables from multiple sources vertically (append) or join tables horizontally on matching keys (merge) like a SQL JOIN.

Chapter 4

Data Modeling

A well-structured data model is the backbone of every high-performing Power BI report. Proper modeling enables faster queries, cleaner DAX, and more accurate results.



Building a Robust Data Model

Tables & Relationships

Every Power BI model consists of tables linked by **relationships** — defined on matching columns called **primary keys** (unique identifier in one table) and **foreign keys** (matching value in another table).

Relationship types include:

- **One-to-Many (1:*)** — Most common. One customer has many orders.
- **Many-to-One (*:1)** — Mirror of 1:Many, direction matters for filters.
- **Many-to-Many (*:*)** — Use carefully; can cause ambiguity.

The Star Schema

The **star schema** is the gold standard for Power BI data models. It consists of:

- **Fact Table** — Contains measurable, transactional data (sales, revenue, quantity)
- **Dimension Tables** — Descriptive context: customers, products, dates, regions

Star schemas maximize performance, simplify DAX formulas, and make reports easier to maintain. Always aim for a star schema when designing your model.

Chapter 5

DAX — Data Analysis Expressions

DAX is the formula language of Power BI. It powers calculated columns, measures, and advanced analytics — making it the most important skill to master for serious Power BI work.



Calculated Columns vs. Measures

Calculated Columns

Computed row-by-row and stored in the data model. They use the current row context and are evaluated at data refresh time.

Use when: You need a new column that will be used for filtering, grouping, or as a slicer value.

Example: `Profit = Sales[Revenue] - Sales[Cost]`

Measures

Calculated dynamically at query time based on filter context. They are not stored in the model — they are computed on the fly.

Use when: You need an aggregation that responds to slicers, filters, or visual context.

Example: `Total Sales = SUM(Sales[Revenue])`

💡 **Best Practice:** Prefer measures over calculated columns wherever possible. Measures are more flexible and keep your model lean.

Essential DAX Functions

Mastering these DAX functions gives you the foundation to answer virtually any business question in Power BI.



Aggregation Functions

`SUM()`, `COUNT()`, `AVERAGE()`, `MIN()`, `MAX()` — Compute totals, counts, and statistics across a column, respecting the active filter context.



Logical Functions

`IF()`, `AND()`, `OR()`, `SWITCH()` — Add conditional logic to measures and columns. Essential for categorization and segmentation.



CALCULATE & FILTER

`CALCULATE()` is the most powerful DAX function — it evaluates an expression in a **modified filter context**. Combine with `FILTER()` to create targeted, conditional aggregations like YTD or same-period-last-year.



Time Intelligence

`TOTALYTD()`, `SAMEPERIODLASTYEAR()`, `DATEADD()` — Perform period-over-period comparisons, rolling totals, and year-to-date calculations with minimal code.

Chapter 6

Data Visualization

Choosing the right visual for your data is as important as the data itself. Power BI offers a rich library of built-in visuals — each designed for a specific type of insight.



The Power BI Visual Library



Charts — Bar, Line & Pie

Use **bar/column charts** for comparisons across categories, **line charts** for trends over time, and **pie/donut charts** for proportional breakdowns. Match the chart type to the story you're telling.



Cards & KPI Visuals

Card visuals display a single key metric in large, prominent text — perfect for total revenue or customer count. **KPI visuals** add a target value and trend indicator, making performance tracking immediate.



Slicers & Filters

Slicers are on-canvas filter controls — dropdowns, lists, or date ranges — that allow report viewers to interactively segment data without editing the report.



Map Visuals

Plot data geographically using **Bing Maps** or **Azure Maps** integrations. Bubble maps show magnitude; filled maps (choropleths) show regional intensity. Ideal for sales territory or regional performance analysis.



Chapter 7

Dashboard & Report Design

A technically accurate report means nothing if users can't understand or interact with it. Great dashboard design combines visual clarity with intuitive interactivity.

Designing Interactive Reports

Formatting & Themes

Apply consistent fonts, colors, and branding using **Power BI Themes** (JSON-based configuration). Use whitespace intentionally — don't overcrowd your canvas. Align visuals to a grid for a polished, professional look.

Drill Down & Drill Through

Drill down lets users expand hierarchy levels within a visual (Year → Quarter → Month). **Drill through** navigates to a detail page filtered to the selected data point — essential for executive-to-detail workflows.

Bookmarks & Buttons

Bookmarks capture the state of a report — visible visuals, filter selections, and scroll position. Combined with **buttons**, they enable powerful UX patterns:

- Toggle between two chart views without changing pages
- Create custom navigation menus
- Build "reset filters" buttons for end users
- Design guided storytelling experiences

These features transform a static report into a dynamic, app-like experience.



Chapter 8

Power BI Service

The Power BI Service is your cloud hub for publishing, distributing, and governing reports at scale — enabling organization-wide data collaboration.

From Desktop to the Cloud



Once published to the Power BI Service, reports become collaborative assets. **Workspaces** act as project folders where teams build and manage content together. **Apps** bundle related reports and dashboards into a polished, branded portal for end users — separating the development experience from the consumption experience. **Scheduled refresh** ensures data stays current without manual intervention, running up to 8 times per day on shared capacity.

Chapter 9

Advanced Features

Once you've mastered the fundamentals, Power BI's advanced capabilities unlock enterprise-grade security, predictive analytics, and AI-driven insights.



Row-Level Security & Parameters

Row-Level Security (RLS)

RLS restricts data access at the row level based on the identity of the user viewing the report. A sales manager sees only their region's data — even from the same published report.

How to implement:

- Define roles in Power BI Desktop using DAX filter rules
- Assign Azure AD users or groups to each role in the Service
- Test using the "View as Role" feature before publishing

Parameters & What-If Analysis

Parameters allow report builders to create dynamic, configurable queries — for example, letting users select the number of top N products to display.

What-If Analysis uses a numeric parameter slicer combined with a DAX measure to simulate scenarios — "What if we increase price by 10%?" — without changing underlying data.

Conditional Formatting

Dynamically color table cells, font, or data bars based on value thresholds — instantly drawing attention to outliers and performance gaps.

AI-Powered Visuals

Power BI includes built-in AI visuals that surface insights automatically — no data science background required.

🔍 Key Influencers

Automatically analyzes which factors most significantly drive a selected metric up or down. For example: "What drives customer churn?" Power BI identifies the top contributing variables and ranks them by impact.

🌳 Decomposition Tree

An interactive visual that lets users drill into a metric across multiple dimensions in any order. Explore total sales by region, then by product category, then by quarter — on the fly, without pre-building the hierarchy.

📈 Smart Narrative

Automatically generates natural language summaries of your visuals. Power BI reads your data and writes a written explanation of key trends, outliers, and highlights — updated dynamically as filters change.



Chapter 10

Projects & Case Studies

Apply everything you've learned by building real-world Power BI dashboards. These capstone projects simulate actual business scenarios across multiple industries and functions.

Capstone Projects Overview



Sales Dashboard

Track revenue, units sold, and sales rep performance. Build YTD comparisons with time intelligence and regional breakdowns using map visuals.



Profit Analysis

Analyze gross margin, cost of goods sold, and profitability by product line. Use CALCULATE and FILTER to isolate segments.



HR Dashboard

Visualize headcount, attrition rates, tenure, and department-level breakdowns. Apply RLS so managers see only their team's data.



Marketing Dashboard

Measure campaign ROI, lead conversion rates, and channel performance. Use Key Influencers to identify top-performing acquisition channels.



Real-Time Reports

Connect to streaming data sources to build live operational dashboards — perfect for call centers, logistics, or manufacturing floor monitoring.



Your Power BI Journey Starts Now

📥 Import & Connect

Master data sources and refresh strategies

🔧 Transform & Model

Clean data and build star schema models

📐 DAX & Analytics

Write measures that answer real business questions

📊 Visualize & Deploy

Design, publish, and share enterprise-grade reports

💡 **Pro Tip:** The fastest way to master Power BI is to work with data from your own organization. Every concept in this course becomes 10x more meaningful when applied to a real business problem you care about solving.