Unit 5. (Data Modelling)

Data Analysis Tools: Pivot Tables and Pivot Charts, Data Validation (Dropdowns, Input Messages, Error Alerts), What-If Analysis: Goal Seek, Scenario Manager, Data **Tables Charts and Dashboards:** Creating Interactive Dashboards, Using slicers with Pivot Tables Combo Charts and Sparklines. **Productivity Tips:** Using Named Ranges, Freeze Panes, Split View.

Data Modelling:-

Data Modelling is the process of **organizing data in a clear and structured way** so that it can be easily stored, understood, and used in a database.

It shows **what data is needed**, **how the data is related**, and **how it should be stored**. Data modelling works like a **plan or blueprint** before creating a database.

Data modelling helps to:

- Avoid duplicate data
- Maintain data accuracy
- Store data properly
- Retrieve data easily

Data Analysis Tools:

Data Analysis Tools are software tools or features used to **collect, organize, analyze, and interpret data** in order to find useful information and make better decisions.

In simple words, **data analysis tools help us understand data** by summarizing it, comparing it, and showing it in an easy-to-read form.

Why Data Analysis Tools are Used

- To analyze large amounts of data easily
- To find patterns, trends, and results
- To make correct decisions
- To present data clearly using charts and reports

Examples of Data Analysis Tools

- **Pivot Tables** – Summarize large data quickly
- **Charts and Graphs** – Show data visually
- **Data Validation** – Controls correct data entry
- **What-If Analysis** – Predict results by changing values
- **Dashboards** – Display key information on one screen

Conditional Formatting in MS Excel

Conditional Formatting in MS Excel is a powerful feature used to **automatically format cells based on certain conditions or rules**. It helps users **highlight important data, identify trends, compare values, and detect errors** easily. By applying colors, icons, or data bars, conditional formatting makes large data sets more **visual, clear, and easy to analyze**.

1. Custom Rules

Custom rules allow users to create their own conditions using formulas or logical comparisons. These rules are useful when default options are not sufficient.

- User-defined conditions
- Uses formulas like >, <, =, IF
- Highlights specific data
- Helps find errors or exceptions
- Flexible and powerful

Example:
Highlight marks **below 35** in red.

2. Color Scales

Color Scales apply **different colors** to cells based on their values. They show data variation using a gradient of colors.

- Uses color gradients
- Highlights high and low values

- Easy to identify trends
- Automatically adjusts colors
- Common in marks and sales analysis

Example:
Green for highest marks, red for lowest.

3. Icon Sets

Icon Sets display **symbols like arrows, stars, or traffic lights** to represent values visually.

- Uses icons instead of numbers
- Shows performance levels
- Easy visual comparison
- Useful in dashboards
- Improves decision making

Example:
Green arrow = good performance
Red arrow = poor performance

4. Data Bars

Data Bars add **horizontal bars inside cells** based on cell values. The bar length represents the value size.

- Shows values graphically
- Longer bar = higher value
- Works within cells
- Easy to compare data
- Saves space

Example:
Sales report with bar length showing sales amount.

Pivot Tables :-

A **Pivot Table** is a powerful **data analysis tool** used in spreadsheet applications like MS Excel to **summarize, analyze, and organize large amounts of data** quickly and easily.

It allows users to rearrange (pivot) data by dragging and dropping fields into rows, columns, values, and filters. Pivot tables can automatically perform calculations such as **sum, average, count, minimum, and maximum**.

Pivot tables help in identifying **patterns, trends, and comparisons** in data without using complex formulas. They are widely used in business, education, and research for data analysis and reporting.

How to Use a Pivot Table

Step 1: Prepare Data

- Enter data in **rows and columns**
- Each column must have a **heading**
- No empty rows or columns

Step 2: Select the Data

- Click on **any cell** inside the data table
- Or select the entire data range

Step 3: Insert Pivot Table

- Go to **Insert** tab
- Click **Pivot Table**
- Choose **From Table/Range**
- Click **OK**

Step 4: Arrange Fields

You will see **Pivot Table Fields** panel:

- Drag **Student** → Rows
- Drag **Subject** → Columns
- Drag **Marks** → Values

Excel will automatically show **total marks**.

Step 5: Analyze Data

- Use **Filters** to view specific data
- Change calculations (Sum → Average, Count)
- Create **Pivot Charts** for visualization

Pivot Charts:-

A **Pivot Chart** is a **graphical representation of a Pivot Table**. It is used to **visualize summarized data** in the form of charts like column, bar, line, or pie charts.

In simple words, **pivot charts show pivot table data in picture form**, making it easy to understand and compare.

Why Pivot Charts are Used

- To understand data visually
- To compare values easily
- To identify trends and patterns
- To make reports more attractive
- Pivot charts help present pivot table data in graphical form for better understanding and analysis.

Types of Pivot Charts

- Column Chart
- Bar Chart
- Line Chart
- Pie Chart
- Area Chart

How to Create a Pivot Chart:-

Step 1: Prepare Data

Make sure your data is in **table format** with headings.

Step 2: Create a Pivot Table

1. Select any cell in the data
2. Go to **Insert → Pivot Table**
3. Click **OK**

Step 3: Arrange Pivot Table Fields

- Drag **Student** → Rows
- Drag **Subject** → Columns

- Drag **Marks** → Values

Now the pivot table is ready.

Step 4: Insert Pivot Chart

1. Click anywhere inside the **Pivot Table**
2. Go to **Insert → Pivot Chart**
3. Choose chart type (Column / Bar / Line / Pie)
4. Click **OK**

Step 5: Customize the Pivot Chart

- Add **Chart Title**
- Use **Filters or Slicers**
- Change chart type if needed
- Resize and format the chart

Data Validation:-

Data Validation is a feature in **MS Excel** that **controls what type of data can be entered into a cell**.

It ensures that the data entered is **correct, valid, and follows specific rules**, helping to **avoid mistakes and errors** in spreadsheets.

Why is Data Validation Important?

- Prevents **wrong data entry**
- Maintains **data accuracy and consistency**
- Saves time by **reducing corrections**
- Helps in creating **dropdown lists** for easier data entry
- Useful for **data analysis and reporting**

Types of Data Validation in MS Excel

Data Validation in Excel allows you to control what type of data can be entered into a cell. There are **7 main types**:

1. Whole Number

- **What it does:** Allows only integer numbers in a cell.
- **Where to use:** Marks, student IDs, quantity of items.
- **Example:** Enter marks between 0 and 100.
- **Steps:**
    1. Select cell → Data → Data Validation
    2. Allow → Whole Number
    3. Set Minimum = 0, Maximum = 100

Now, entering 105 or -5 will show an error.

2. Decimal

- **What it does:** Allows decimal numbers (with fractions).
- **Where to use:** Prices, percentages, measurements.
- **Example:** Product price must be between 10.5 and 999.9
- **Steps:**
    1. Select cell → Data → Data Validation
    2. Allow → Decimal
    3. Set Minimum = 10.5, Maximum = 999.9

3. List

- **What it does:** Creates a **dropdown list** of allowed values.
- **Where to use:** Subjects, departments, yes/no options.
- **Example:** Subjects = Python, Java, Django
- **Steps:**
    1. Select cell → Data → Data Validation
    2. Allow → List
    3. Source → Python, Java, Django

Users can **only select from the list**, not type other values.

4. Date

- **What it does:** Allows only dates within a specified range.
- **Where to use:** Admission dates, joining dates, deadlines.
- **Example:** Admission date must be between 01-01-2025 and 31-12-2025
- **Steps:**
    1. Select cell → Data → Data Validation
    2. Allow → Date
    3. Start date = 01-01-2025, End date = 31-12-2025

5. Time

- **What it does:** Allows only time entries within a specific range.
- **Where to use:** Class schedules, office hours, appointment timings.
- **Example:** Class time between 09:00 AM and 05:00 PM
- **Steps:**
    1. Select cell → Data → Data Validation
    2. Allow → Time
    3. Start time = 09:00, End time = 17:00

6. Text Length

- **What it does:** Restricts the **number of characters** entered in a cell.
- **Where to use:** Student IDs, phone numbers, codes.
- **Example:** Student ID must be **exactly 5 digits**
- **Steps:**
    1. Select cell → Data → Data Validation
    2. Allow → Text Length
    3. Equal to = 5

Entering more or less than 5 characters will show an error.

7. Custom

- **What it does:** Allows you to create a **custom rule using formulas**.
- **Where to use:** Advanced validations based on conditions.
- **Example:** Only even numbers allowed → Formula: =MOD(A1,2)=0
- **Steps:**
    1. Select cell → Data → Data Validation
    2. Allow → Custom
    3. Formula → =MOD(A1,2)=0

What-If Analysis

What-If Analysis in Excel helps you explore how changing input values affects formula outcomes, using tools like **Scenarios** (named sets of inputs for multiple variables), **Data Tables** (one or two variables across many values), and **Goal Seek** (finding an input for a specific result) to test possibilities without altering original data, ideal for budgeting, forecasting, and decision-making.

Why is What-If Analysis Used?

What-If Analysis is used to:

- Predict future results
- Compare different possibilities
- Make better decisions
- Analyze best-case, worst-case, and average situations
- Understand how input values affect output

Types of What-If Analysis in MS Excel

There are **three main types** of What-If Analysis:

1.Goal Seek

Goal Seek is used when you know the **final result**, but you want to find the **input value** required to achieve that result.

Excel works **backward** to calculate the required value.

Example

- A student wants **75 total marks** to pass.
- Internal marks = 25
- Goal: Find how many marks are needed in the final exam.

Steps

1. Go to **Data → What-If Analysis → Goal Seek**
2. Set Cell → Result cell
3. To Value → Desired result (75)
4. By Changing Cell → Input cell (exam marks)

Use

- Finding required marks
- Required profit
- Required sales or percentage

2. Scenario Manager

Scenario Manager is used to **compare multiple situations (scenarios)** using different input values.

Each scenario shows a **different possible outcome**.

Example

A business compares:

- **Best Case** – High sales, low expenses
- **Worst Case** – Low sales, high expenses
- **Average Case** – Normal sales and expenses

Excel displays results for all scenarios.

Steps

1. Go to **Data → What-If Analysis → Scenario Manager**
2. Click **Add**
3. Enter scenario name

4. Enter changing values
5. Click **Show** to view results

Use

- Business planning
- Budget analysis
- Salary calculations.

3. Data Tables

Data Tables show how **changing one or two input values** affects the result **at the same time**.

Types

- **One-Variable Data Table**
- **Two-Variable Data Table**

Example

- Changing **interest rate**
- Changing **loan period**
- Viewing different EMI values

Use

- Loan calculations
- Interest and EMI comparison
- Profit and cost analysis

Charts and Dashboards:-

Charts and Dashboards are important data analysis and visualization tools used in MS Excel to present large amounts of data in a **clear, visual, and meaningful way**. They help users understand trends, comparisons, and performance quickly and support effective decision making.

1. Charts

A **chart** is a **visual representation of data**. Instead of reading numbers in rows and columns, charts show data in the form of **bars, lines, or slices**, which makes understanding faster and easier.

Why Charts are Used

- To compare values easily
- To identify trends and patterns
- To present data clearly
- To make reports attractive

Common Types of Charts

- **Column Chart** – Used for comparing values (e.g., student marks)
- **Bar Chart** – Horizontal comparison
- **Line Chart** – Shows growth or trend over time
- **Pie Chart** – Shows percentage or share

Example:
A column chart showing marks of students in different subjects.

2. Dashboards

A **dashboard** is a **single screen or page** that shows **important information, charts, and summaries together**.

Dashboard = Multiple charts + key data on one screen

Why Dashboards are Important

- Gives a **quick overview** of data
- Helps in **decision making**
- Saves time
- Easy to monitor performance

Example:
A college dashboard showing:

- Total students
- Pass percentage

- Subject-wise results
- Top performers

3. Interactive Dashboards

An **interactive dashboard** allows users to **change or filter data** and see updated results instantly.

How Interactivity is Added

- Using **Pivot Tables**
- Using **Pivot Charts**
- Using **Slicers**

Steps to Create an Interactive Dashboard

1. Prepare clean data
2. Create Pivot Tables
3. Insert Pivot Charts
4. Add Slicers
5. Arrange charts neatly on one worksheet

When slicers are used, all charts update automatically.

4. Using Slicers with Pivot Tables

Slicer is a visual filtering tool used in **MS Excel** with **Pivot Tables, Pivot Charts, and Tables**. It allows users to filter data by clicking buttons instead of using drop-down menus. Slicers make data analysis faster, interactive, and easy to understand, especially in dashboards and reports.

Why Slicers are Used

- Easy and fast filtering
- User-friendly
- Improves dashboard interaction

Example

If a slicer has subjects:

- Python

- Java
- Django

Clicking “Python” will show **only Python data** in the Pivot Table and charts.

5. Combo Charts

Combo Charts (Combination Charts) in MS Excel are charts that combine two different chart types into a single chart. They are used when we want to compare different kinds of data or data with different scales together. For example, we can show sales using a column chart and profit using a line chart in the same graph. Combo charts make data comparison easier and help in better data visualization.

Why Combo Charts are Used

- To compare two related values
- To show data and trend together

Example:

- Column chart shows **Sales**
- Line chart shows **Profit**

This makes comparison very easy.

6. Sparklines

Sparklines are small, simple charts that are placed inside a single cell in MS Excel. They are used to show trends and patterns in data in a compact and easy-to-understand visual form. Unlike normal charts, sparklines do not have axes, labels, or legends. They are mainly used in reports and dashboards to give a quick visual summary of data and help users understand changes over time at a glance.

Types of Sparklines

- **Line Sparkline** – Shows trend
- **Column Sparkline** – Shows variation
- **Win/Loss Sparkline** – Shows positive or negative values

Why Sparklines are Used

- Save space

- Show trends quickly
- Useful in reports and dashboards

Example:
Showing monthly performance of a student inside one cell.

7. Advantages of Charts and Dashboards

- Easy to understand large data
- Quick decision making
- Attractive presentation
- Interactive and user-friendly
- Saves time and effort

Productivity Tips in MS Excel:-

Productivity tips in MS Excel help users work faster, more accurately, and efficiently. Features like **Named Ranges, Freeze Panes, and Split View** are very useful when working with large datasets. These tools reduce errors, improve readability, and make data analysis easier. They are commonly used in offices, education, accounting, and data analysis tasks.

1. Named Ranges

A **Named Range** in Excel allows users to give a meaningful name to a cell or a range of cells instead of using cell references like A1:B10. This makes formulas easier to understand and reduces confusion.

- Assigns names to cells or ranges
- Makes formulas simple and readable
- Reduces formula errors
- Easy to use in functions and charts
- Useful in large worksheets

Example:
Instead of =SUM(A1:A10), use =SUM(Sales)

2. Freeze Panes

Freeze Panes is used to lock specific rows or columns so that they remain visible while scrolling through large worksheets. It helps in viewing headings or important labels at all times.

- Keeps rows or columns visible
- Useful for large data tables
- Commonly used to freeze header rows
- Improves data readability
- Saves time while scrolling

Types:

- Freeze Top Row
- Freeze First Column
- Freeze Panes (custom)

3. Split View

Split View divides the worksheet into two or four panes, allowing users to view different parts of the same worksheet at the same time. This is helpful when comparing data from different sections.

- Splits worksheet into multiple panes
- Helps compare distant data
- Allows independent scrolling
- Useful for analysis and checking data
- Easy to enable and disable

Differences between Named Ranges, Freeze Panes, and Split View:-

Feature	Named Ranges	Freeze Panes	Split View
Meaning	Gives a name to a cell or range of cells	Locks selected rows or columns	Divides worksheet into multiple panes
Purpose	Simplifies formulas and references	Keeps headings visible while scrolling	View different parts of same sheet

Main Use	Used in formulas and functions	Used for large data tables	Used for comparison and analysis
Effect on Data	Does not change data	Does not change data	Does not change data
Scrolling	Normal scrolling	Frozen rows/columns stay fixed	Each pane scrolls independently
Visibility	Improves formula readability	Improves data readability	Improves data comparison
Example	=SUM(Sales)	Freezing top row	Comparing top and bottom data
Common Usage	Formulas, charts	Reports, mark sheets	Analysis, checking data