

MET's Institute of Technology Polytechnic(B.Tech)
Bhujbal Knowledge City

Data Engineering Lab

List of Practical

Experiment No.	Experiment Based On	Title of Experiment
01	Excel	To study and demonstrate fundamentals in Microsoft excel.
02		To study and demonstrate Entering and editing text and formulas.
03	Advanced Excel	To study and demonstrate working with basic excel functions, modifying an excel worksheet.
04		To study and demonstrate data formatting in an excel worksheet.
05	Power BI	To study and demonstrate introduction to Power BI, basic charts in Power BI, working with maps, Tables and Matrix in Power BI
06		To study and demonstrate other charts in Power BI, cards and filters, slicers in Power BI, Advanced charts in Power BI.
07		To study and demonstrate objects in Power BI, Power BI service introduction, power query [text, Date functions].
08		To study and demonstrate Number functions, append files, merge files, conditional columns, power query [imp topics, M language introduction].
09	Tableau	To study and demonstrate Introduction to Tableau, Data in Tableau, Sets, sorting and filtering in Tableau, parameters.
10		To study and demonstrate Groups, folders and hierarchies, marks card, views and highlighting, formatting in Tableau.
11		To study and demonstrate Lines and bands, Tableau worksheets, charts in Tableau part -1, calculated fields.
12		To study and demonstrate charts in Tableau part -2, aggregation and granularity, database functions, box and whisker plot, time series and forecasting.

Date of Performance : Date of Completion :

Experiment No. : 01

Title : To Study and Demonstrate fundamentals in Microsoft excel

Theory :

[illegible]

1. Basic Operations:

- Creating and saving workbooks
- Entering and editing data
- Basic calculations (sum, average, count)
- Formatting cells (number, text, date)

2. Functions:

- SUM, AVERAGE, COUNT, MAX, MIN
- IF, IFERROR, IFBLANK
- VLOOKUP, INDEX/MATCH

- Basic charting (columns, lines, pie)

3. Data Management:

- Sorting and filtering data
- Creating and managing tables
- Data validation (drop-down lists, input restrictions)
- Basic pivot tables

4. Formulas and Functions:

- Relative and absolute references
- Basic formula writing (e.g., =A1+B1)
- Using named ranges and references
- Array formulas

5. Charts and Graphs:

- Creating and customizing charts
- Using different chart types (e.g., bar, line, pie)
- Adding titles, labels, and legends

6. Data Analysis:

- Using conditional formatting
- Creating and managing scenarios
- Basic data analysis (e.g., trend analysis, goal seek)

7. Shortcuts and Productivity:

- Basic keyboard shortcuts (e.g., Ctrl+S, Ctrl+C)
- Using the Quick Access Toolbar
- Customizing the Excel interface

To demonstrate these fundamentals, you can create a sample workbook that showcases each of these skills.

For example:

- 1) Create a table with sample data and demonstrate sorting, filtering, and data validation.

Write Steps :

- 2) Write formulas to calculate sums, averages, and counts, and demonstrate how to use named ranges and references.

Write Steps :

- 3) Create a chart to visualize data and customize it with titles, labels, and legends.

Write Steps :

- 4) Use conditional formatting to highlight important data points.

Write Steps :

5) Create a pivot table to summarize and analyze data.

Write Steps :

Conclusion :

CA(15)	Attendance(15)	Performance (10)	Oral(10)	Out of (50)
Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)				

Date of Performance : Date of Completion :

Experiment No. : 02

Title : To study and demonstrate Entering and editing text and formulas.

Theory :

[illegible]

Entering Text:

1. Open a new Excel workbook or select a cell in an existing workbook.
2. Type a text string (e.g., "Hello, World!") into the selected cell.
3. Press Enter to confirm the entry.
4. Observe how the text is displayed in the cell.
5. Experiment with different font styles, sizes, and colors using the Home tab.

Entering Formulas:

1. Select a cell where you want to enter a formula.
2. Type an equals sign (=) to indicate the start of a formula.
3. Enter a simple arithmetic operation (e.g., =2+2).
4. Press Enter to confirm the formula.
5. Observe the calculated result in the cell.
6. Experiment with different formulas, such as:
 - Basic arithmetic (e.g., =3*4, =10/2)
 - Using cell references (e.g., =A1+B1)
 - Using functions (e.g., =SUM(A1:A10), =AVERAGE(B1:B10))

Demonstration Tips:

- Use a sample workbook to demonstrate entering text and formulas.
- Highlight the cell where you're entering the text or formula.
- Use the formula bar to show the formula as you enter it.
- Use the "Evaluate Formula" tool (Formulas tab > Evaluate Formula) to step through the calculation process.
- Use different formatting options (e.g., number formatting, conditional formatting) to enhance the display of results.

Best Practices:

- Always start a formula with an equals sign (=).
- Use cell references instead of hardcoding values.
- Use functions to simplify calculations and reduce errors.
- Use parentheses to group calculations and follow the order of operations (PEMDAS).

Explain stepwise process to evaluate the formulas

Conclusion :

CA(15)	Attendance(15)	Performance (10)	Oral(10)	Out of (50)
Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)				

Experiment No. : 03

Date of Performance :

Date of Completion :

Title : To study and demonstrate working with basic excel functions, modifying an excel worksheet.

Theory :

Basic Excel Functions:

1. SUM: Calculates the sum of a range of cells.

Syntax: =SUM(range)

Example: =SUM(A1:A10)

2. AVERAGE: Calculates the average of a range of cells.

Syntax: =AVERAGE(range)

Example: =AVERAGE(A1:A10)

3. COUNT: Counts the number of cells in a range.

Syntax: =COUNT(range)

Example: =COUNT(A1:A10)

4. MAX/MIN: Finds the maximum/minimum value in a range.

Syntax: =MAX(range) / =MIN(range)

Example: =MAX(A1:A10) / =MIN(A1:A10)

5. IF: Tests a condition and returns a value.

Syntax: =IF(logical_test, [value_if_true], [value_if_false])

Example: =IF(A1>10, "Greater than 10", "Less than or equal to 10")

Modifying an Excel Worksheet:

Inserting/Deleting Rows and Columns:

1. Insert Row: Right-click on row number > Insert

2. Delete Row: Right-click on row number > Delete

3. Insert Column: Right-click on column letter > Insert

4. Delete Column: Right-click on column letter > Delete

Formatting Cells:

1. Number Formatting: Select cells > Home tab > Number group

2. Text Formatting: Select cells > Home tab > Font group

3. Border Formatting: Select cells > Home tab > Border group

Basic Excel Operations:

1. Copy/Paste: Ctrl+C / Ctrl+V

2. Cut: Ctrl+X

3. Undo/Redo: Ctrl+Z / Ctrl+Y

4. Sort/Filter: Data tab > Sort & Filter group

Demonstration Exercise:

Create a sample worksheet with the following data:

Name	Age	Score
Sandip	25	60
Mangesh	30	70
Kunal	28	75

Demonstrate the following:

1. Calculate the sum of scores using SUM function.
2. Calculate the average age using AVERAGE function.
3. Count the number of students using COUNT function.
4. Find the maximum score using MAX function.
5. Use IF function to determine if a student's score is greater than 80.
6. Insert a new row and column.
7. Format cells using number, text, and border formatting.
8. Sort and filter data.

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Conclusion :

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<p align="center">Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)</p>				

Experiment No. : 04

Date of Performance :

Date of Completion :

Title : To study and demonstrate data formatting in an excel worksheet.

Theory :

Data Formatting Options:

1. Number Formatting:

- Decimal places
- Currency
- Percentage
- Date/Time

2. Text Formatting:

- Font
- Size
- Color
- Alignment

3. Border Formatting:

- Style
- Color
- Width

4. Fill Formatting:

- Background color
- Pattern

Formatting Tools:

1. Home Tab:

- Number group
- Font group
- Alignment group
- Border group

2. Format Cells Dialog Box:

- Ctrl+1 (or right-click on cell > Format Cells)

Demonstration Exercise:

Exercise : Create a sample worksheet with the following data:

Employee	Salary	Department	Hire Date
ABC	50000	Sales	2020-01-01
XYZ	60000	Marketing	2019-06-01
PQR	45000	Purchase	2021-03-01

Demonstrate the following formatting techniques:

Number Formatting:

1. Format Salary column to currency (\$).
2. Format Hire Date column to date (MM/DD/YYYY).

Text Formatting:

1. Change font to Arial.
2. Increase font size to 12.
3. Center-align Employee column.

Border Formatting:

1. Add a border around the entire table.
2. Change border style to double.

Fill Formatting:

1. Fill Department column with a light gray background.

Conditional Formatting:

1. Highlight cells in Salary column > \$50,000.

Conclusion :

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<p align="center">Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)</p>				

Date of Performance :
Date of Completion :

Theory :

[illegible]

1. Column Chart
2. Bar Chart
3. Line Chart

4. Pie Chart

5. Scatter Plot

Working with Maps:

1. Map visualization

2. Geocoding:

- Latitude and Longitude
- Address

3. Map controls:

- Zoom
- Pan
- Drill-down

4. Map layers:

- Bubble map
- Heatmap
- Region map

Tables and Matrix in Power BI:

1. Table visualization

2. Matrix visualization

3. Configuring tables and matrices:

- Adding fields
- Sorting and filtering
- Grouping and aggregating

4. Interactive features:

- Drill-down
- Expand/collapse

Demonstration Exercise:

Use the built-in sample dataset "Retail Analysis" to demonstrate:

1. Creating a column chart to show sales by region
2. Creating a map to display sales by location
3. Creating a table to show top-selling products
4. Creating a matrix to show sales by product category and region

Conclusion :

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<p align="center">Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)</p>				

Experiment No. : 06

Date of Performance :

Date of Completion :

Title : To study and demonstrate other charts in Power BI, cards and filters, slicers in Power BI, Advanced charts in Power BI.

Theory :

Other Charts in Power BI:

1. Area Chart: Displays cumulative totals over time.
2. Waterfall Chart: Shows how an initial value changes through a series of positive or negative values.
3. Donut Chart: Similar to a pie chart, but with a hollow center.
4. Treemap: Displays hierarchical data as a set of nested rectangles.
5. Sunburst Chart: Displays hierarchical data as a set of concentric rings.

Cards in Power BI:

1. Single-number card: Displays a single value.
2. Multi-row card: Displays multiple values.
3. KPI card: Displays a key performance indicator.

Filters in Power BI:

1. Page-level filters: Apply to entire report.
2. Report-level filters: Apply to specific visuals.
3. Visual-level filters: Apply to individual visuals.
4. Filter types:
 - Basic filtering (e.g., equals, greater than)
 - Advanced filtering (e.g., top N, bottom N)

Slicers in Power BI:

1. Basic slicers: Filter data using a single column.
2. Hierarchical slicers: Filter data using multiple columns.
3. Date slicers: Filter data using date ranges.
4. Slicer types:

- Dropdown
- List
- Range

Advanced Charts in Power BI:

1. Gauges: Display progress toward a goal.
2. KPIs: Display key performance indicators.
3. Scatter Plot with Play Axis: Animates data over time.
4. ArcGIS Maps: Integrates with Esri ArcGIS.
5. Q&A: Natural language query interface.

Demonstration Exercise:

Use the built-in sample dataset "Retail Analysis" to demonstrate:

1. Creating an area chart to show sales over time.
2. Creating a waterfall chart to show profit margins.
3. Creating a treemap to display product categories.
4. Creating a KPI card to display sales targets.
5. Applying filters and slicers to analyze data.

[illegible]

Conclusion :

CA(15)	Attendance(15)	Performance (10)	Oral(10)	Out of (50)
Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)				

Experiment No. : 07

Date of Performance :

Date of Completion :

Title : To study and demonstrate objects in Power BI, Power BI service introduction, power query [text, Date functions].

Theory :

Objects in Power BI

1. Visualizations: Tables, Matrices, Charts, Maps, etc.
2. Slicers: Dropdown, List, Range, Date
3. Filters: Page-level, Report-level, Visual-level
4. Buttons: Interactive elements for actions
5. Images: Logos, Icons, Backgrounds
6. Text Boxes: Custom text elements
7. Shapes: Rectangles, Circles, Arrows

Power BI Service Introduction

1. Cloud-based business analytics service
2. Publish reports from Power BI Desktop
3. Share reports with others
4. Real-time data refresh
5. Collaborate with colleagues
6. Secure and scalable

Power Query Text Functions

1. LEFT: Extract leftmost characters
2. RIGHT: Extract rightmost characters
3. MID: Extract middle characters
4. FIND: Search for text
5. REPLACE: Replace text
6. LOWER/UPPER: Convert case
7. TRIM: Remove whitespace

Power Query Date Functions

1. TODAY: Current date
2. NOW: Current date and time
3. DATE: Create date from year, month, day
4. DATEADD: Add days, months, years
5. DATEDIFF: Calculate date difference
6. DATEFORMAT: Format date
7. YEAR/MONTH/DAY: Extract date components

Demonstration Exercise

Use the built-in sample dataset "Retail Analysis" to demonstrate:

1. Creating visualizations (tables, charts, maps)
2. Adding slicers and filters
3. Using text functions (LEFT, RIGHT, FIND)
4. Using date functions (TODAY, DATEADD, DATEDIFF)
5. Publishing report to Power BI Service
6. Sharing report with others

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Experiment No. : 08

Date of Performance :

Date of Completion :

Title : To study and demonstrate Number functions, append files, merge files, conditional columns, power query [imp topics, M language introduction].

Theory :

Number Functions in Power Query

1. ABS: Absolute value
2. INT: Integer part
3. ROUND: Round to nearest integer
4. FLOOR: Round down
5. CEILING: Round up
6. MOD: Modulus (remainder)
7. DIVIDE: Divide with error handling

Appending Files in Power Query

1. Append Queries: Combine multiple queries
2. Append Files: Combine multiple files
3. Append Folders: Combine files from multiple folders

Merging Files in Power Query

1. Merge Queries: Combine two queries
2. Inner Join: Return matching rows
3. Left Join: Return all left table rows
4. Right Join: Return all right table rows
5. Full Outer Join: Return all rows

Conditional Columns in Power Query

1. IF: Test condition and return value
2. IFERROR: Test error and return value
3. SWITCH: Test multiple conditions
4. AND/OR/NOT: Logical operators

Power Query Important Topics

1. Data Types: Text, Number, Date, etc.
2. Data Validation: Error handling and data cleaning
3. Group By: Aggregate data
4. Pivot: Rotate data
5. Unpivot: Transform data

M Language Introduction

- ## Demonstration Exercise

1. Using number functions (ABS, INT, ROUND)
2. Appending files (combine sales data from multiple regions)
3. Merging files (combine customer data from multiple sources)
4. Creating conditional columns (IF, IFERROR, SWITCH)
5. Using Power Query important topics (Group By, Pivot, Unpivot)
6. Writing M language scripts (variables, functions, error handling)

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Date of Performance :
Date of Completion :

Theory :

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Data in Tableau

1. Connecting to data sources:

- Excel
- SQL databases
- Cloud storage
- Big data

2. Data types:

- Dimensions
- Measures
- Dates

3. Data preparation:

- Cleaning
- Transforming
- Aggregating

Sets in Tableau

1. Creating sets:

- Static sets
- Dynamic sets

2. Using sets:

- Filtering
- Sorting
- Grouping

3. Set operations:

- Union
- Intersection
- Difference

Sorting and Filtering in Tableau

1. Sorting:

- Ascending
- Descending
- Custom sorting

2. Filtering:

- Quick filters
- Filter actions
- Data filtering

3. Filter types:

- Dimension filters
- Measure filters
- Date filters

Parameters in Tableau

1. Creating parameters:

- String parameters
- Integer parameters
- Date parameters

2. Using parameters:

- Filtering
- Sorting
- Calculations

3. Parameter controls:

- Dropdowns
- Sliders
- Text boxes

Demonstration Exercise

Use the built-in sample dataset "Superstore" to demonstrate:

1. Connecting to data

2. Creating sets

3. Sorting and filtering

4. Using parameters

5. Building visualizations:

- Bar charts
- Line charts
- Maps

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CA(15)	Attendance(15)	Performance (10)	Oral(10)	Out of (50)
Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)				

Experiment No. : 10

Date of Performance :

Date of Completion :

Title : To study and demonstrate Groups, folders and hierarchies, marks card, views and highlighting, formatting in Tableau.

Theory :

Groups, Folders and Hierarchies

1. Creating groups:

- Dragging fields to Groups pane
- Right-clicking on fields to create groups

2. Creating folders:

- Organizing fields into folders
- Dragging fields to Folders pane

3. Creating hierarchies:

- Dragging fields to Hierarchies pane
- Creating drill-down capabilities

Marks Card

1. Introduction to Marks Card

2. Using Marks Card to:

- Change mark types (e.g., bars, lines, maps)
- Add color, size, and shape to marks
- Create interactive dashboards

Views and Highlighting

1. Creating views:

- Sheet views
- Dashboard views
- Story views

2. Highlighting:

- Using highlight tables
- Creating interactive highlighting
- Customizing highlight colors

Formatting

1. Introduction to formatting
2. Formatting options:
 - Colors
 - Fonts
 - Alignment
 - Borders
3. Formatting tools:
 - Format pane
 - Quick format options

Demonstration Exercise

Use the built-in sample dataset "Superstore" to demonstrate:

1. Creating groups and folders
2. Building hierarchies
3. Using Marks Card to customize visualization
4. Creating views and highlighting
5. Formatting dashboards

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Experiment No. : 11

Date of Performance :

Date of Completion :

Title : To study and demonstrate Lines and bands, Tableau worksheets, charts in Tableau part -1, calculated fields.

Theory :

Lines and Bands

1. Line Charts: Show trends over time
2. Area Charts: Display cumulative values
3. Band Charts: Highlight ranges or thresholds
4. Trend Lines: Analyze data patterns
5. Reference Lines: Compare values

Tableau Worksheets

1. Creating Worksheets: Dragging fields to Columns and Rows shelves
2. Worksheet Types: Table, Chart, Map, etc.
3. Worksheet Layout: Adjusting size, position, and spacing
4. Worksheet Interactions: Filtering, sorting, and drilling down

Charts in Tableau (Part 1)

1. Bar Charts: Compare categorical values
2. Column Charts: Display values over time
3. Pie Charts: Show proportional values
4. Scatter Plots: Analyze relationships between variables
5. Bubble Charts: Display three-dimensional data

Calculated Fields

1. Introduction to Calculated Fields
2. Basic Calculations: SUM, AVERAGE, COUNT
3. Advanced Calculations: IF, CASE, DATE functions
4. Using Calculated Fields in Visualizations
5. Best Practices for Calculated Fields

Demonstration Exercise

Use the built-in sample dataset to demonstrate:

1. Creating line and area charts
2. Building band charts
3. Creating worksheets with various chart types
4. Writing calculated fields for analysis
5. Using calculated fields in visualizations

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Name & Signature of Subject Teacher (Prof. Mahesh B. Sonje)				

Experiment No. : 12

Date of Performance :

Date of Completion :

Title : To study and demonstrate charts in Tableau part -2, aggregation and granularity, database functions, box and whisker plot, time series and forecasting.

Theory :

Charts in Tableau (Part 2)

1. Waterfall Charts: Show cumulative values
2. Treemap Charts: Display hierarchical data
3. Heatmap Charts: Analyze relationships between variables
4. Scatter Plot Matrix: Examine multiple relationships
5. Bullet Charts: Compare actual vs. target values

Aggregation and Granularity

1. Aggregation Levels: Sum, Average, Count, etc.
2. Granularity: Changing data detail level
3. Grouping and Hierarchy: Organizing data
4. Data Density: Managing data visualization

Database Functions

1. Data Extraction: Connecting to databases
2. Data Filtering: Selecting relevant data
3. Data Aggregation: Grouping and summarizing data
4. Data Joining: Combining data sources
5. Data Blending: Merging data sources

Box and Whisker Plot

1. Understanding Box Plots: Visualizing distribution
2. Creating Box Plots: Displaying median and quartiles
3. Interpreting Box Plots: Analyzing data spread

Time Series and Forecasting

- ## Demonstration Exercise

1. Creating waterfall and treemap charts
2. Adjusting aggregation and granularity levels
3. Using database functions for data analysis
4. Creating box and whisker plots
5. Analyzing time series data and forecasting sales

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