



Gyanmanjari
Innovative University

Syllabus
Gyanmanjari Diploma Engineering College
Semester-3 (Diploma)

Subject: Business Intelligence and Data Visualization– DET2CE13111

Type of course: Skill Enhancement Courses (SEC).

Prerequisite: Basic programming fundamentals, logical and problem-solving skills, mathematical logic, familiarity with Microsoft Excel, and a general understanding of computer components and data handling.

Rationale:

This course focuses on turning raw data into actionable insights using Power BI. Basic programming fundamentals help students write DAX and M expressions, while logical and problem-solving skills enable them to translate business questions into KPIs and debug issues. Mathematical logic supports aggregations, comparisons, and time-intelligence calculations. Familiarity with Open office accelerates understanding of tabular analysis and formula-based thinking. Finally, a general understanding of computer components and data handling prepares students to work with varied data sources effectively. These prerequisites ensure learners can concentrate on applying Power BI for business productivity rather than revisiting foundational skills.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P	C	SEE	CCE	
0	0	4	2	50	50	100

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; CCE-Continuous and Comprehensive Evaluation.



Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	Power BI Fundamentals, Project Planning and Dataset Design <u>Theory Topics:</u> Power BI overview, Business Intelligence concepts and use cases, Power BI deployment modes (Corporate BI, Self-Service BI, Self-Service Visualization), choosing a deployment mode, project discovery and requirement gathering, Power BI project lifecycle and deliverables, Power BI roles (dataset designer, report author, admin), collaboration and project templates, Power BI licensing basics (Free/Pro/Premium—awareness), dataset design process (selecting business process, declaring grain, identifying dimensions and facts), data warehouse bus matrix basics, data profiling concepts, dataset planning and source assessment, Import vs DirectQuery modes (trade-offs and selection criteria), sample project scoping and analysis, governance and best practices for self-service BI. <u>Practical:</u> 1. Install and set up Power BI Desktop, verify installation, and explore the interface layout. 2. Create a new Power BI project file and navigate through views (Report, Data, Model). 3. Compare Power BI deployment modes by preparing a short presentation on Corporate BI vs Self-Service BI. 4. Explore sample datasets and perform project discovery by identifying key business questions. 5. Assign project roles (Dataset Designer, Report Author, Admin) in a mock project scenario. 6. Review Power BI licensing options (Free, Pro, Premium) and prepare a comparison table highlighting features. 7. Design a simple dataset schema by identifying dimensions and facts from a case study (e.g., Sales or HR). 8. Draft a basic Power BI project template including objectives, data sources, and intended reports. 9. Perform a preliminary data profiling exercise (check null values, duplicates, and data types) using sample data in Power BI. 10. Demonstrate dataset planning by choosing between Import mode and DirectQuery mode for a given case study and justify the choice.	12	20%



Examination Method:

Sr. No.	Evaluation Method	SEE	CCE
1	Business Intelligence Project Planning Analyse a business scenario and prepare the requirements, data sources, KPIs, users, roles, and basic Power BI project structure.	10	-
2	Business Intelligence Project Setup and Decision-Making Analyse the given requirements and select a suitable Power BI data connection mode with proper justification.	-	10
Total		10	10

Examination Style:**1. Business Intelligence Project Planning (10 Marks):**

- Students will complete two practical assessment tasks carrying 5 marks each using Power BI. In the first task, students will analyse a given business scenario and prepare the project requirements by identifying the business problem, intended users, key questions, expected KPIs, possible data sources, project roles, and expected outcomes. In the second task, students will create a basic Power BI project structure by selecting suitable data sources, identifying the dataset structure, choosing an appropriate BI approach, and preparing the required project components in Power BI. The completed work will be evaluated through practical performance in Power BI.

2. Business Intelligence Project Setup and Decision-Making (10 Marks):

- Students will complete two compulsory practical questions carrying 5 marks each during the Semester End Examination. In the first question, students will analyse a given business scenario and create a basic Power BI project by connecting the provided data, identifying the required dataset structure, and preparing the initial project setup. In the second question, students will study the given requirements and select a suitable BI approach, licensing option, and data connection mode with proper justification. The completed work will be evaluated through practical performance in Power BI during the examination.



2	Data Connection, Cleaning and Transformation with Power Query <u><i>Theory Topics:</i></u> Data connection concepts in Power BI; supported data sources such as Excel, CSV, Web, Folder, and basic databases; data loading workflow in Power BI Desktop; introduction to Power Query Editor; difference between loading data directly and transforming data before loading; understanding data types and their role in analysis; basic data profiling using column quality, column distribution, and column profile; handling missing values, duplicates, blank rows, incorrect data types, unwanted columns, and inconsistent values; basic data cleaning operations such as remove rows/columns, replace values, split/merge columns, rename columns, change data types, and trim/clean text; filtering and sorting data; combining data using append and merge queries; understanding applied steps and common transformation errors; basic awareness of Power Query M code; best practices for preparing clean datasets for visualization and reporting. <u><i>Practical:</i></u> 11. Connect Power BI to multiple data sources (Excel, CSV, SQL Server) and test authentication methods. 12. Import a raw dataset into Power BI and observe the data structure before applying transformations. 13. Open Power Query Editor and explore query settings, applied steps, column tools, and data preview options. 14. Identify and correct incorrect data types such as date, number, text, and currency fields. 15. Perform basic data profiling by checking column quality, column distribution, null values, duplicate records, and inconsistent entries. 16. Clean a raw dataset by removing blank rows, unwanted columns, duplicate records, and unnecessary values. 17. Apply common transformation operations such as rename columns, replace values, trim text, clean text, split columns, and merge columns. 18. Filter and sort data in Power Query based on given business conditions. 19. Combine two or more datasets using append queries and observe the effect on records. 20. Merge related datasets using a common key column and verify the correctness of matching records. 21. Create simple calculated columns in Power Query using existing fields. 22. Review applied steps and correct transformation errors caused by wrong data type, missing column, or incorrect step order.	12	20%
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23. Prepare a clean final dataset suitable for dashboard creation and load it into Power BI.
24. Save the transformed Power BI file and submit it with a short note explaining the cleaning steps performed.

Examination Method:

Sr. No.	Evaluation Method	SEE	CCE
1	Power Query Data Cleaning and Integration Clean and transform a raw dataset, combine multiple data sources using append or merge, and load the final dataset into Power BI.	10	-
2	Data Preparation and Quality Management Identify data quality issues using Power Query profiling tools and prepare a clean, analysis-ready dataset.	-	10
Total		10	10

Examination Style:

1. Power Query Data Cleaning and Integration (10 Marks):

- Students will complete two compulsory practical questions carrying 5 marks each during the Semester End Examination. In the first question, students will examine a given raw dataset and correct data quality issues and transformation errors using Power Query Editor. In the second question, students will combine the provided data sources using appropriate append or merge operations, create the required transformed fields, verify the accuracy of the combined data, and load the final dataset into Power BI. The completed work will be evaluated through practical performance in Power BI during the examination.

2. Data Preparation and Quality Management (10 Marks):

- Students will complete two practical assessment tasks carrying 5 marks each using Power BI. In the first task, students will connect and import a given raw dataset, examine its structure, and use Power Query profiling features to identify data quality problems. In the second task, students will apply suitable cleaning and transformation steps to correct the identified problems and prepare an analysis-ready dataset. The completed work will be evaluated through practical performance in Power BI.



3	Data Connection, Cleaning and Transformation with Power Query <u>Theory Topics:</u> Introduction to data modelling in Power BI; importance of structured datasets for accurate reporting; understanding tables, columns, records, keys, and relationships; concept of primary key and foreign key; types of relationships such as one-to-one, one-to-many, and many-to-many; basic understanding of fact tables and dimension tables; introduction to star schema at beginner level; creating and managing relationships in Model View; understanding relationship direction and its effect on report output; difference between calculated columns and measures; introduction to DAX for basic calculations; commonly used DAX functions such as SUM, COUNT, AVERAGE, MIN, MAX, DISTINCTCOUNT, IF, and basic CALCULATE awareness; creating simple KPIs using DAX; understanding common data modeling mistakes such as wrong relationships, duplicate keys, and incorrect aggregation; best practices for naming tables, fields, and measures for clean report development. <u>Practical:</u> 25. Import two or more related tables such as Sales, Customers, and Products into Power BI, identify common key fields, and create proper relationships between the tables in Model View. 26. Identify primary key and foreign key columns from the given datasets. 27. Create relationships between related tables using Model View in Power BI. 28. Demonstrate one-to-many relationship using a simple Sales and Product dataset. 29. Identify and correct common relationship issues such as missing key columns, duplicate key values, and inactive relationships. 30. Create a basic star schema model by arranging fact and dimension tables properly. 31. Modify relationship direction and observe its effect on report output. 32. Create calculated columns using simple DAX expressions. 33. Use basic IF condition in DAX to create category-based outputs. 34. Create simple visuals using DAX measures and verify whether the results are accurate. 35. Identify and fix incorrect aggregation issues caused by wrong relationships or unsuitable field selection. 36. Organize tables, columns, and measures using proper naming conventions before dashboard development.	12	20%
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Examination Method:

Sr. No.	Evaluation Method	SEE	CCE
1	Data Model Correction and DAX Application Correct a given Power BI data model and create the required calculated columns, DAX measures, and KPIs.	10	-
2	Active Learning Activity (ALA): Data Model and KPI Design Design a structured Power BI data model with relationships, DAX calculations, KPIs, and suitable visuals.	-	10
Total		10	10

Examination Style:**1. Active Learning Activity (ALA): Data Model and KPI Design (10 Marks):**

- Students will select a suitable real-world dataset and create a structured data model in Power BI by identifying key fields, arranging fact and dimension tables, creating appropriate relationships, and applying proper naming conventions. Students will also create basic calculated columns, DAX measures, and meaningful KPIs and display the results using suitable visuals. Students must prepare a PDF containing the project overview, screenshots of the model, DAX calculations, KPI outputs, and a brief explanation of the work performed and submit it through the GMIU Web Portal.

2. Data Model Correction and DAX Application (10 Marks):

- Students will complete two compulsory practical questions carrying 5 marks each during the Semester End Examination. In the first question, students will examine a given Power BI model and correct issues related to keys, relationships, table structure, filter direction, or aggregation. In the second question, students will create the required calculated columns, DAX measures, and business KPIs from the provided dataset and verify the results using suitable visuals. The completed work will be evaluated through practical performance in Power BI during the examination.

	Data Visualization and Interactive Dashboard Design in Power BI <u>Theory Topics:</u> Introduction to data visualization in Power BI; importance of visual representation in business decision-making; understanding different types of visuals such as bar chart, column chart, line chart, pie chart, donut chart, table, matrix, card, KPI, gauge, map, slicer, and filter; selecting suitable visuals based on data type and business requirement; basic chart formatting and customization; use of slicers and filters for interactive reporting; understanding drill-down, drill-through, bookmarks, buttons, and page navigation at basic level; dashboard layout planning and report page organization; principles of effective dashboard design such as clarity, consistency, readability, alignment, spacing, and color usage; introduction to data storytelling and insight presentation; identifying misleading visuals and common design mistakes; creating mobile-friendly and user-friendly reports; best practices for designing clean, interactive, and decision-focused Power BI dashboards. <u>Practical:</u>		
4	37. Create basic visuals in Power BI such as bar chart, column chart, line chart, pie chart, donut chart, table, matrix, card, KPI, gauge, and map using a given dataset. 38. Select appropriate visuals for different business questions such as sales comparison, trend analysis, category-wise performance, and target achievement. 39. Format charts by changing titles, labels, legends, colors, data values, background, borders, and visual size. 40. Create card and KPI visuals to display important business indicators such as Total Sales, Total Profit, Total Orders, and Average Sales. 41. Add slicers and filters to make reports interactive based on category, region, date, product, or customer segment. 42. Create a multi-page report by organizing visuals according to business requirements. 43. Apply drill-down and drill-through features to analyze data from summary level to detailed level. 44. Use buttons, bookmarks, and page navigation to improve user interaction in a Power BI report. 45. Design a clean dashboard layout using proper alignment, spacing, grouping, and visual hierarchy. 46. Create a basic data storytelling report by arranging visuals in a logical flow from overview to detailed insights. 47. Identify and correct misleading visuals caused by wrong chart selection, poor scaling, unnecessary colors, or incorrect aggregation.	12	20%

48. Create a mobile-friendly report layout using Power BI mobile layout view.
49. Review an existing dashboard and suggest improvements based on clarity, readability, usability, and decision-making value.
50. Publish or export the final dashboard/report as per instruction and submit the Power BI file with a short dashboard explanation.

Examination Method:

Sr. No.	Evaluation Method	SEE	CCE
1	Dashboard Development and Design Improvement Develop an interactive Power BI dashboard and improve a poorly designed report for better clarity, usability, and insights.	10	-
2	Active Learning Activity (ALA): Interactive Dashboard Design and Storytelling Create an interactive, mobile-friendly Power BI dashboard using suitable visuals, KPIs, filters, navigation, and storytelling techniques.	-	10
Total		10	10

Examination Style:**1. Active Learning Activity (ALA): Interactive Dashboard Design and Storytelling (10 Marks):**

- Students will use a suitable cleaned and modelled dataset to create an interactive Power BI dashboard that presents useful information in a clear storytelling flow. The dashboard must include appropriate visuals, important KPI indicators, filters, user interaction features, a well-organized layout, and a mobile-friendly view. Students must prepare a PDF containing the dashboard overview, screenshots of the report pages, key insights, interaction features, and a brief explanation of the design decisions and submit it through the GMIU Web Portal.

2. Dashboard Development and Design Improvement (10 Marks):

- Students will complete two compulsory practical questions carrying 5 marks each during the Semester End Examination. In the first question, students will create an interactive dashboard from the provided dataset by selecting suitable visuals, applying proper formatting, organizing the report layout, and adding the required filters and navigation features. In the second question, students will examine a poorly designed Power BI report and improve its visual selection, readability.



	interaction, layout, and overall usability while presenting meaningful insights from the corrected dashboard. The completed work will be evaluated through practical performance in Power BI during the examination.		
5	Interactive Dashboard Design and Data Storytelling in Power BI <u>Theory Topics:</u> Introduction to Power BI Service and its role after report development; difference between Power BI Desktop and Power BI Service; publishing reports from Power BI Desktop to Power BI Service; basic understanding of workspaces, reports, dashboards, datasets, and apps; sharing reports and dashboards with selected users; exporting reports to PDF or PowerPoint; basic concept of data refresh and scheduled refresh; awareness of gateway for on-premise data sources; introduction to collaboration features such as comments and shared access; basic security awareness including permissions, access control, and Row-Level Security; responsible use of organizational data and privacy practices; report documentation and version management; preparation of final Power BI project covering data source, cleaning steps, relationships, DAX KPIs, visuals, interactions, insights, and project explanation; dashboard presentation through viva or demonstration; best practices for professional Power BI report delivery and final project submission. <u>Practical:</u> 1. Publish a completed Power BI report from Power BI Desktop to Power BI Service. 2. Explore the Power BI Service interface and identify reports, dashboards, datasets, workspaces, and apps. 3. Create a basic workspace and organize the published report and dataset inside it. 4. Export a Power BI report into PDF or PowerPoint format for presentation and documentation. 5. Share a report or dashboard with selected users and observe basic permission options. 6. Create a simple dashboard in Power BI Service by pinning important visuals from a published report. 7. Demonstrate basic data refresh settings and explain when scheduled refresh is required. 8. Explain the use of gateway for on-premise data sources using a simple practical scenario. 9. Demonstrate basic security awareness by deciding view/edit access for different users in a given case. 0. Create a simple Row-Level Security awareness example such as region-wise or department-wise data access.	12	20%

61. Prepare report documentation including data source, cleaning steps, relationships, DAX measures, visuals used, and dashboard purpose..
62. Create a final Power BI capstone project using a real dataset covering data import, cleaning, modeling, DAX KPIs, visualization, interaction, and publishing/exporting.
63. Present the final dashboard with explanation of business problem, KPIs, key insights, user interaction features, and decision-making value.
64. Improve the final project based on feedback related to design, accuracy, usability, and presentation quality.

Examination Method:

Sr. No.	Evaluation Method	SEE	CCE
1	Power BI Service and Final Project Delivery Publish and manage a Power BI report in Power BI Service, configure basic access settings, and present the completed project with key insights.	10	-
2	Active Learning Activity (ALA): Power BI Project Publishing and Documentation Develop, publish, and document a complete Power BI project, including workspace organization, dashboard creation, sharing, security, and project insights.	-	10
Total		10	10

Examination Style:**I. Active Learning Activity (ALA): Power BI Project Publishing and Documentation (10 Marks):**

- Students will develop a complete Power BI project using a suitable real-world dataset and perform the full workflow from data preparation to dashboard development. They will publish the completed report to Power BI Service, organize it in a workspace, create a dashboard, configure basic sharing and security settings, and prepare professional project documentation. Students must submit a PDF containing the project overview, important screenshots, dashboard insights, publishing process, access settings, and final project explanation through the GMIU Web Portal.



	2. Power BI Service and Final Project Delivery (10 Marks): Students will complete two compulsory practical questions carrying 5 marks each during the Semester End Examination. In the first question, students will publish a provided Power BI report, organize it in Power BI Service, configure the required sharing or security settings, and demonstrate suitable refresh or gateway awareness. In the second question, students will complete and improve a given Power BI project by applying the required changes, exporting the final report, and presenting its purpose, major insights, and decision-making value. The completed work will be evaluated through practical performance in Power BI during the examination.		
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Suggested Specification:

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	10%	15%	30%	15%	10%	20%

Course Outcome:

After learning the course the students should be able to:	
CO1	Explain BI concepts, Power BI components, and project requirements.
CO2	Apply Power Query to connect, clean, and transform data.
CO3	Develop data models and DAX measures for business KPIs.
CO4	Design interactive Power BI dashboards using visuals and filters.
CO5	Publish and present Power BI projects with basic sharing and security.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] Brett Powell, *Mastering Microsoft Power BI*, Packt Publishing, 2nd Edition, 2022.
- [2] Daniil Maslyuk, *Mastering DAX: Power BI, Excel, and Analysis Services*, Microsoft Press, 2021.
- [3] Reza Rad & Leila Etaati, *Pro Power BI Architecture: Sharing, Security, and Deployment Options for Microsoft Power BI Solutions*, Apress, 2019.
- [4] Greg Deckler, *Learn Power BI: A Beginner's Guide to Developing Interactive Business Intelligence Solutions Using Microsoft Power BI*, Packt Publishing, 2nd Edition, 2022.
- [5] Philip Seamark, *Beginning DAX with Power BI*, Apress, 2018.



Suggested Rubrics:**Suggested Assessment Guidelines****Module-1: Power BI Fundamentals, Project Planning and Dataset Design**

Business Intelligence Project Planning (10 Marks)		
Criteria	Description	Marks
Business Problem and Requirement Analysis	Clear identification of the business problem, intended users, key business questions, project requirements, and expected outcomes from the given scenario.	03
KPI and Data Source Identification	Appropriate identification of measurable KPIs, required data fields, and suitable data sources according to the business requirements.	03
Project Structure and Implementation Planning	Logical preparation of the Power BI project structure, including dataset organization, project roles, required components, and proposed implementation approach.	04
Total		10

Business Intelligence Project Setup and Decision-Making (10 Marks)		
Criteria	Description	Marks
Project Setup and Data Preparation	Correct connection of the provided data source and preparation of the initial Power BI project with an appropriate dataset structure.	03
BI Approach and Connection-Mode Selection	Appropriate selection of the BI approach and data connection mode, such as Import or DirectQuery, according to the given requirements.	03
Decision Analysis and Justification	Clear justification of the selected connection mode, licensing option, and BI approach based on data size, performance, refresh requirements, security, and usability.	04
Total		10

Module-2: Data Connection, Cleaning and Integration Using Power Query

Power Query Data Cleaning and Integration (10 Marks)		
Criteria	Description	Marks
Data Quality Issue Identification	Correct identification of missing values, duplicates, incorrect data types, inconsistent values, unwanted fields, and transformation errors in the provided dataset.	03
Data Cleaning and Transformation	Accurate application of suitable Power Query operations to clean, format, filter, restructure, and create the required transformed fields.	03
Data Integration and Validation	Correct use of append or merge operations to combine data sources, verify the accuracy of the integrated data, and load the final dataset into Power BI.	04
Total		10

Data Preparation and Quality Management (10 Marks)		
Criteria	Description	Marks
Data Connection and Structure Analysis	Correct connection and import of the provided dataset with an accurate understanding of its fields, data types, and overall structure.	03
Data Profiling and Quality Assessment	Effective use of column quality, column distribution, and column profile features to identify data quality problems.	03
Data Cleaning and Readiness Verification	Appropriate correction of identified data issues and preparation of a clean, consistent, and analysis-ready dataset.	04
Total		10

Module-2: Data Connection, Cleaning and Integration Using Power Query

Power Query Data Cleaning and Integration (10 Marks)		
Criteria	Description	Marks
Data Quality Issue Identification	Correct identification of missing values, duplicates, incorrect data types, inconsistent values, unwanted fields, and transformation errors in the provided dataset.	03
Data Cleaning and Transformation	Accurate application of suitable Power Query operations to clean, format, filter, restructure, and create the required transformed fields.	03
Data Integration and Validation	Correct use of append or merge operations to combine data sources, verify the accuracy of the integrated data, and load the final dataset into Power BI.	04
Total		10

Data Preparation and Quality Management (10 Marks)		
Criteria	Description	Marks
Data Connection and Structure Analysis	Correct connection and import of the provided dataset with an accurate understanding of its fields, data types, and overall structure.	03
Data Profiling and Quality Assessment	Effective use of column quality, column distribution, and column profile features to identify data quality problems.	03
Data Cleaning and Readiness Verification	Appropriate correction of identified data issues and preparation of a clean, consistent, and analysis-ready dataset.	04
Total		10



Module-3: Data Modelling, DAX Calculations and KPI Development in Power BI

Data Model Correction and DAX Application (10 Marks)		
Criteria	Description	Marks
Data Model Analysis and Correction	Correct identification and resolution of issues related to primary and foreign keys, table structure, relationships, cardinality, and filter direction in the given Power BI model.	03
Calculated Columns and DAX Measures	Accurate creation of the required calculated columns and DAX measures using suitable formulas according to the given business requirements.	03
KPI Development and Result Verification	Correct creation of meaningful business KPIs and verification of calculated results using appropriate Power BI visuals.	04
Total		10

Module-4: Interactive Dashboard Design and Data Storytelling in Power BI

Dashboard Development and Design Improvement (10 Marks)		
Criteria	Description	Marks
Dashboard Development and Visual Selection	Correct selection and creation of suitable visuals, KPI indicators, slicers, and filters according to the provided dataset and business requirements.	03
Formatting, Layout and Interactivity	Effective application of formatting, alignment, spacing, visual hierarchy, drill-down, drill-through, bookmarks, buttons, and page navigation features.	03
Report Improvement and Insight Presentation	Accurate identification and correction of design issues in the given report to improve readability, usability, interaction, and presentation of meaningful business insights.	04
Total		10

Module-5: Power BI Service, Publishing and Final Project Delivery

Power BI Service and Final Project Delivery (10 Marks)		
Criteria	Description	Marks
Report Publishing and Workspace Management	Correct publishing of the provided Power BI report and appropriate organization of the report, dataset, and dashboard within Power BI Service.	03
Sharing, Security and Refresh Configuration	Proper configuration of basic sharing or access settings with suitable understanding of security, scheduled refresh, and gateway requirements.	03
Project Completion and Insight Presentation	Accurate completion and improvement of the given Power BI project, export of the final report, and clear presentation of its purpose, major insights, and decision-making value.	04
Total		10

