**Module Title:** Data Insights and Visualization  
**Level:** 7  
**Credit:** 10  
**Delivery Mode:** Lab-based workshops, lectures, group projects, e-learning  
**Assessment Method:** Applied portfolio, executive summary report, practical data visualization project

**Session 1: Foundations of Data Analysis, Python Fundamentals, and Data Ethics**

**Learning Outcomes Addressed:** LO1, LO4

**Topics Covered:**

* Course overview, module aims, and learning outcomes
* The data revolution in business and career pathways
* Data types: structured vs unstructured data
* Data quality and integrity dimensions
* Python environment setup (Python, Jupyter Notebooks)
* Essential libraries (pandas, numpy, matplotlib, seaborn)
* Python data structures and operations
* Reading/writing data files
* **Data Ethics & Governance:** informed consent, GDPR, fairness, bias in AI

**Hands-on:**

* Load and inspect sample datasets
* Identify data quality issues
* Ethics case study: privacy and bias in data visualization

**Deliverables:** Python environment setup, data ethics reflection, basic Python exercises

**Session 2: Data Preparation, Cleaning and Wrangling**

**Learning Outcomes Addressed:** LO1, LO4

**Topics Covered:**

* Data profiling and quality assessment
* Handling missing, duplicate, inconsistent data
* Data wrangling: type conversions, standardizing formats
* Reshaping and merging datasets (pivot, join)
* Aggregation techniques
* **Outlier detection** (Z-score, IQR, winsorization)
* Feature engineering: derived variables, binning, categorization
* Text preprocessing fundamentals (tokenization, cleaning)

**Deliverables:** Cleaned dataset, data preparation documentation

**Session 3: Exploratory Data Analysis (EDA) and Pattern Discovery**

**Learning Outcomes Addressed:** LO1, LO3

**Topics Covered:**

* Descriptive statistics (central tendency, dispersion)
* Univariate and bivariate analysis
* Visualizing distributions: histograms, boxplots, violin plots
* Correlation analysis and heatmaps
* Relationship exploration: scatter plots, regression lines
* Intro to multivariate EDA: PCA and clustering basics
* **Time Series EDA:** trends, seasonality, decomposition

**Deliverables:** EDA report, preliminary business insights document

**Session 4: Statistical Analysis, Modeling and Decision Interpretation**

**Learning Outcomes Addressed:** LO1, LO3

**Topics Covered:**

* Inferential statistics: hypothesis testing, p-values, confidence intervals
* Practical A/B testing and business scenario analysis
* Regression modeling (simple, multiple) using Python (scikit-learn, statsmodels)
* Model evaluation: R², RMSE, cross-validation
* **Time Series Analysis:** ARIMA model basics
* Communicating statistical results for business decisions

**Deliverables:** Statistical analysis report, business decision insights

**Session 5: Power BI Fundamentals and Business Intelligence Concepts**

**Learning Outcomes Addressed:** LO2, LO5

**Topics Covered:**

* Power BI ecosystem overview (Desktop, Service, Mobile)
* Data modeling principles: star vs snowflake schema
* Power Query transformations and M language basics
* Data model relationships and cardinality
* Introduction to DAX (SUM, AVERAGE, COUNT, calculated columns vs measures)

**Deliverables:** Basic Power BI data model, initial DAX calculations

**Session 6: Advanced Power BI, Dashboards, and Interactivity Design**

**Learning Outcomes Addressed:** LO2, LO5

**Topics Covered:**

* Advanced DAX measures (CALCULATE, time intelligence, ranking)
* Dashboard best practices: chart selection, accessibility, layout principles
* Interactive dashboards: slicers, drill-throughs, bookmarks
* Conditional formatting, mobile responsiveness
* **Custom visuals integration** (marketplace and bespoke options)

**Deliverables:** Interactive dashboard prototype, design documentation

**Session 7: Advanced Visualization, Geospatial Analytics, and Data Storytelling**

**Learning Outcomes Addressed:** LO2, LO3, LO5

**Topics Covered:**

* Advanced Python visualizations (Matplotlib, Seaborn)
* Geospatial visualization (Power BI Maps, Folium, Geopandas)
* Specialized charts: waterfall, funnel, custom visuals
* Narrative structures for data storytelling
* Audience-centric communication techniques
* Executive summary creation with actionable insights
* **Case-based ethics review:** misleading visualization detection exercise

**Deliverables:** Visualization portfolio, data storytelling framework

**Session 8: Applied Business Intelligence Project and Integration**

**Learning Outcomes Addressed:** LO3, LO5

**Topics Covered:**

* Industry case studies: retail, healthcare, finance analytics applications
* Business problem-solving frameworks (SWOT, KPI benchmarks)
* Building analytics narratives for stakeholders
* ROI estimation, decision support techniques
* Final project presentation techniques, peer review sessions
* Career pathways and continuous learning resources

**Deliverables:** Final project presentation, peer feedback report, career plan

**Continuous Assessment and Checkpoints:**

| **Checkpoint** | **Deliverable** |
| --- | --- |
| Session 2 | Clean dataset submission |
| Session 4 | Statistical analysis draft report |
| Session 6 | Dashboard prototype presentation |
| Session 8 | Final project presentation & report |

Weekly: Practical challenges, discussion board participation, and peer reviews.

**New Enhancements:**

* Text data preprocessing (Session 2)
* Unstructured data analysis intro (Session 2-3)
* Business problem-solving frameworks (Session 8)
* Ethical data storytelling case review (Session 7)
* Complementary visual tools exposure: R/ggplot2 optional reading
* Career resources and continuous learning pathways (Session 8)