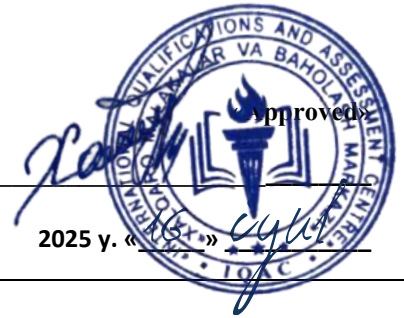
INTERNATIONAL QUALIFICATIONS

AND ASSESSMENT CENTRE (IQAC)



Programme	LEVEL 5 EXTENDED DIPLOMA IN DATA SCIENCE		
Unit Number/ Unit Title	UNIT 10 ADVANCED DATA ANALYTICS		
Cohort Code:	L05ADA-U10		
Unit Level	Level 5		
Total GLH	Total qualification time 200/ Total Guided learning hours 90/ Self-guided learning hours 110		
Credits	20 CATS/ 10 ECTS		
Lecturer			
Start Date		**End Date**	

Unit Aims	This module aims to extend students' knowledge and skills in advanced data analytics techniques and their application in complex data scenarios.
Differentiation Strategies *(e.g. planned activities or support for individual learners according to their needs)*	The total number of students to be in the lesson is approximately 20. This is a multicultural group of students predominantly between the ages of 24 – 45, with numerous ethnic, gender, and creed background. These are UK academic level 5 students; hence it is assumed that they have practical, theoretical, or technological knowledge and understanding of a subject or field of work to find ways forward in broadly defined, complex contexts. These students must be able to generate information, evaluate, synthesise the use information from a variety of sources. Various approaches to addressing the various identified students needs will be adopted throughout the lesson. Such will include:- 1. Progressive tasks 2. Digital resources 3. Verbal support 4. Variable outcomes

	5. Collaborative learning 6. Ongoing assessment 7. Flexible-pace learning
Equality & Diversity	Variety of teaching techniques will be employed to ensure that the needs of each individual learner are met.
Safeguarding & Prevent	Safeguarding policies and the Prevent duty are strictly observed to ensure the safety, well-being, and inclusivity of all students and staff.
Health & Safety	SIRM H&S policies will be maintained.
Learning Resources	**Teaching and Learning Materials** • James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). An Introduction to Statistical Learning: With Applications in R. Springer. • Kuhn, M., & Johnson, K. (2013). Applied Predictive Modeling. Springer. • Shmueli, G., Bruce, P. C., & Patel, N. R. (2019). Data Mining for Business Analytics: Concepts, Techniques, and Applications in R. Wiley.

Learning Outcome	Assessment Criteria
LO1. 1. Understand advanced data analytics concepts.	1.1 Define advanced statistical techniques and their application in data analytics. 1.2 Explain machine learning algorithms for advanced analytics.
LO2. 2. Develop skills in analyzing complex data sets.	2.1 Apply multivariate analysis techniques to complex data. 2.2 Implement predictive analytics models using advanced algorithms.
LO3. 3. Apply advanced analytics to business intelligence.	3.1 Evaluate the impact of advanced analytics on decision-making processes. 3.2 Communicate insights from advanced analytics effectively to stakeholders

No	Learning Outcome / Topic	Learning and Teaching Activities	Which assessment criteria does the session relate to?	Day/month/year/ signature
1.	**Introduction to Advanced Data Analytics**	**Introduction to Advanced Data Analytics** Evolution, key concepts, and business applications	LO1: Advanced Analytics Concepts	
2.	**Advanced Statistical Techniques**	**Advanced Statistical Techniques** Bayesian inference, Markov chains, Monte Carlo simulations	LO1: Advanced Analytics Concepts	
3.	**Time Series Forecasting**	**Time Series Forecasting** ARIMA, SARIMA, Prophet, and LSTM networks	LO1: Advanced Analytics Concepts	
4.	**Multivariate Analysis**	**Multivariate Analysis** MANOVA, factor analysis, principal component analysis (PCA)	LO1: Advanced Analytics Concepts	
5.	**Advanced Machine Learning Overview**	**Advanced Machine Learning Overview** Ensemble methods, neural networks, and reinforcement learning Feature selection, extraction, and embedding techniques	LO1: Advanced Analytics Concepts	
6.	**Big Data Analytics**	**Big Data Analytics** Hadoop, Spark, and distributed computing	LO2: Complex Data Analysis	
7.	**Graph Analytics**	**Graph Analytics** Network analysis, centrality measures, community detection	LO2: Complex Data Analysis	
8.	Half-Term Exam	- Review of LO1 topics - Practice questions and mock assessment - **Half-term assessment** based on LO1 (theory)	LO1 LO2	

9.	**Natural Language Processing (NLP) for Analytics**	**Natural Language Processing (NLP) for Analytics** Topic modeling, sentiment analysis, transformers	LO2: Complex Data Analysis	
10.	**Anomaly Detection**	**Anomaly Detection** Isolation forests, autoencoders, and clustering-based methods	LO2: Complex Data Analysis	
11.	**Feature Engineering for High-Dimensional Data**	**Feature Engineering for High-Dimensional Data** Feature selection, extraction, and embedding techniques	LO2: Complex Data Analysis	
12.	**Advanced Regression Models**	**Advanced Regression Models** Polynomial regression, LASSO, Ridge, Elastic Net	LO3: Predictive & Prescriptive Analytics	
13.	**Classification Algorithms**	**Classification Algorithms** XGBoost, LightGBM, CatBoost, and stacked models	LO3: Predictive & Prescriptive Analytics	
14.	Final Exam Preparation & Review	- Comprehensive review of all learning outcomes - Practice questions and revision of key topics		
15.	Final Exam	- **Final-term assessment** covering all learning outcomes (theory and practical elements)		
16.	Feedback & Reflection	- Review of final exam - Individual feedback on performance - Reflective discussion on key learning points		
17.	**Deep Learning for Predictive Analytics**	**Deep Learning for Predictive Analytics** CNNs for structured data, RNNs for sequential data	LO3: Predictive & Prescriptive Analytics	
18.	**Prescriptive Analytics**	**Prescriptive Analytics** Optimization techniques, decision trees for business rules	LO3: Predictive & Prescriptive Analytics	

19.	**Causal Inference**	**Causal Inference** Difference-in-differences, instrumental variables	LO3: Predictive & Prescriptive Analytics	
20.	**Advanced Data Visualization**	**Advanced Data Visualization** Interactive dashboards (Tableau, Power BI), geospatial analytics	LO4: Business Intelligence & Decision-Making	
21.	**A/B Testing & Experimentation**	**A/B Testing & Experimentation** Bayesian A/B testing, multi-armed bandits	LO4: Business Intelligence & Decision-Making	
22.	**Customer Analytics**	**Customer Analytics** Churn prediction, lifetime value (LTV) modeling	LO4: Business Intelligence & Decision-Making	
23.	Half-Term Exam	**Project** End-to-end advanced analytics solution for a real-world problem		
24.	**Supply Chain & Operations Analytics**	**Supply Chain & Operations Analytics** Demand forecasting, inventory optimization	LO4: Business Intelligence & Decision-Making	
25.	**Financial Analytics**	**Financial Analytics** Risk modeling, fraud detection, algorithmic trading	LO4: Business Intelligence & Decision-Making	
26.	**Storytelling with Data**	**Storytelling with Data** Framing insights for executives and non-technical audiences	LO5: Communication & Stakeholder Engagement	
27.	**Effective Reporting**	**Effective Reporting** Structuring reports, executive summaries, and slide decks	LO5: Communication & Stakeholder Engagement	
28.	**Ethical Considerations in Advanced Analytics**	**Ethical Considerations in Advanced Analytics** Bias, fairness, and interpretability	LO5: Communication & Stakeholder Engagement	
29.	Final Exam Preparation & Review	LO1, LO2, LO3, LO4	LO1, LO2, LO3, LO4	
30.	Final Exam		LO1, LO2, LO3, LO4	