INTERNATIONAL QUALIFICATIONS

AND ASSESSMENT CENTRE (IQAC)

«Approved»

2025 y. «16» cylat

Programme	**Level 6 Diploma in Artificial Intelligence**		
Unit Number/ Unit Title	UNIT 3 CLOUD COMPUTING AND DATA ENGINEERING		
Cohort Code:	L06CCDE-U3		
Unit Level	6		
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 unit explores cloud infrastructure, services (IaaS, PaaS), and orchestration tools relevant to AI workflows. Learners will configure distributed systems, containerized environments, and CI/CD pipelines while handling large-scale AI data pipelines securely in the cloud.
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** • White, T. (2015). Hadoop: The Definitive Guide. • Garman, J. (2017). AWS Certified Solutions Architect Official Study Guide. • O'Reilly (2021). Designing Data-Intensive Applications. • MLOps Practitioners Guide. Google Cloud.

Learning Outcome	Assessment Criteria
LO1. 1. Understand cloud service models and architectures.	1.1 Compare IaaS, PaaS, SaaS for AI deployment. 1.2 Assess cloud providers (AWS, GCP, Azure).
LO2. 2. Manage data pipelines using cloud-native tools.	2.1 Use services like AWS Glue or GCP Dataflow. 2.2 Automate data ingestion, transformation, and loading.
LO3. 3. Deploy containerized ML systems.	3.1 Use Docker and Kubernetes for ML model deployment. 3.2 Configure scalable infrastructure for training/inference.
LO4. 4. Implement CI/CD pipelines for AI workflows.	4.1 Automate model training, testing, and deployment. 4.2 Use GitHub Actions or Jenkins in MLOps.
LO5. 5. Secure cloud-based AI systems.	5.1 Apply IAM, encryption, and monitoring. 5.2 Perform security audits and compliance reviews.

No	Learning Outcome / Topic	Learning and Teaching Activities	Which assessment criteria does the session relate to?	Day/month/year/ signature
1.	**Cloud Service Models**	**Cloud Service Models** IaaS vs. PaaS vs. SaaS for AI (e.g., SageMaker vs. Vertex AI)	LO1: Cloud Fundamentals for AI	
2.	**Cloud Provider Comparison**	**Cloud Provider Comparison** AWS vs. Azure vs. GCP: AI/ML service ecosystems	LO1: Cloud Fundamentals for AI	
3.	**Cloud Architecture Patterns**	**Cloud Architecture Patterns** Serverless (Lambda), microservices, hybrid cloud	LO1: Cloud Fundamentals for AI	
4.	**Cost Optimization Strategies**	**Cost Optimization Strategies** Spot instances, auto-scaling, reserved capacity	LO1: Cloud Fundamentals for AI	
5.	**Multi-Cloud AI Deployments**	**Multi-Cloud AI Deployments** Challenges and solutions	LO1: Cloud Fundamentals for AI	
6.	**Data Pipeline Fundamentals**	**Data Pipeline Fundamentals** ETL vs. ELT, batch vs. streaming	LO2: Data Engineering in the Cloud	
7.	**AWS Data Tools**	**AWS Data Tools** Glue (Spark), Kinesis, Athena hands-on lab	LO2: Data Engineering in the Cloud	
8.	Half-Term Exam	- Review of LO1 topics - Practice questions and mock assessment - **Half-term assessment** based on LO1 (theory)	LO1 LO2	
9.	**GCP Data Solutions**	**GCP Data Solutions** Dataflow (Apache Beam), BigQuery, Pub/Sub	LO2: Data Engineering in the Cloud	
10.	**Azure Data Services**	**Azure Data Services** Data Factory, Synapse Analytics, Event Hubs	LO2: Data Engineering in the Cloud	
11.	**Orchestration Tools**	**Orchestration Tools** Airflow vs. Step Functions vs. Cloud Composer	LO2: Data Engineering in the Cloud	
12.	**Docker for ML**	**Docker for ML** Containerizing models, dependency management	LO3: Containerized ML Systems	

13.	**Kubernetes Core Concepts**	**Kubernetes Core Concepts** Pods, deployments, services (kubectl basics)	LO3: Containerized ML Systems	
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.	**ML on Kubernetes**	**ML on Kubernetes** Kubeflow, Seldon Core for model serving	LO3: Containerized ML Systems	
18.	**Auto-scaling ML Workloads**	**Auto-scaling ML Workloads** HPA (Horizontal Pod Autoscaler), cluster scaling	LO3: Containerized ML Systems	
19.	**Hybrid Deployment Case Study**	**Hybrid Deployment Case Study** On-prem + cloud inference architectures	LO3: Containerized ML Systems	
20.	**CI/CD Fundamentals**	**CI/CD Fundamentals** Testing, versioning, and deployment automation	LO4: CI/CD for AI (MLOps)	
21.	**GitHub Actions for ML and Jenkins in MLOps**	**GitHub Actions for ML** Automated model retraining pipelines **Jenkins in MLOps** Building Jenkins pipelines for model deployment	LO4: CI/CD for AI (MLOps)	
22.	**Model Registry & Versioning**	**Model Registry & Versioning** MLflow, AWS SageMaker Model Registry	LO4: CI/CD for AI (MLOps)	
23.	Half-Term Exam	**Capstone Project** End-to-end secure ML pipeline on cloud		
24.	**Canary Deployments**	**Canary Deployments** Traffic splitting, A/B testing models	LO4: CI/CD for AI (MLOps)	
25.	**IAM & Access Control**	**IAM & Access Control** Role-based permissions, service accounts	LO5: Cloud Security for AI	

26.	**Data Protection**	**Data Protection** Encryption at rest/in-transit (KMS, HSM)	LO5: Cloud Security for AI	
27.	**Monitoring & Logging**	**Monitoring & Logging** CloudWatch, Stackdriver, SIEM integration	LO5: Cloud Security for AI	
28.	**Compliance Standards**	**Compliance Standards** HIPAA, GDPR, SOC2 for AI systems	LO5: Cloud Security for AI	
29.	Final Exam Preparation & Review	LO1, LO2, LO3, LO4	LO1, LO2, LO3, LO4	
30.	Final Exam		LO1, LO2, LO3, LO4	