Development of Cloud Applications

Requirements

later

LECTURE STRUCTURE

L1 – Introduction to Cloud Computing

- Cloud service models (IaaS, PaaS, SaaS)
- Deployment models (public, private, hybrid)
- Shared responsibility model
- Overview of Azure ecosystem

L2 – Cloud Architecture Principles

- 12-Factor App methodology
- Stateless vs stateful services
- Horizontal scaling
- REST architecture basics

L3 – Designing Cloud Applications

- Microservices vs monolith
- API-first design
- OpenAPI specification
- Basic system design patterns

L4 – Containers and Virtualization

- Containers vs VMs
- Docker architecture
- Images, containers, volumes, networks
- Multi-stage builds

L5 – Cloud Deployment Models in Azure

- Azure App Service
- Azure Container Apps
- Azure Storage (Blob, Table)
- Azure SQL Database

L6 – DevOps & CI/CD Fundamentals

- Git workflow
- GitHub Actions basics
- Build pipelines
- Infrastructure as Code concept

L7 – Security & Identity in Cloud

- Authentication vs Authorization
- OAuth2 / JWT basics
- Azure Active Directory fundamentals
- Secret management

L8 – Cloud Databases & Storage

- Relational vs NoSQL
- Azure SQL vs Cosmos DB
- Data consistency models
- Migration basics

L9 – Serverless Architectures

- Event-driven systems
- Azure Functions
- Triggers & bindings
- Use cases

L10 – Observability & Monitoring

- Logging principles
- Metrics vs traces
- Azure Monitor & Application Insights
- Health checks

L11 – Scalability & Performance

- Load balancing
- Caching strategies
- CDN basics
- Cost optimization

L12 – Resilience & Reliability

- Retry patterns
- Circuit breaker
- SLA/SLO basics
- Backup strategies

L13 – Cloud-Native Trends & Final Architecture Review

- Kubernetes overview
- Infrastructure as Code (Bicep/Terraform intro)
- Edge computing basics
- Final project architectural consultation

LECTURE STRUCTURE	LAB STRUCTURE
L1 – Introduction to Cloud Computing * *Cloud service models (IaaS, PaaS, SaaS)* * *Deployment models (public, private, hybrid)* * *Shared responsibility model* * *Overview of Azure ecosystem*	**Lab 1 – Environment Setup** * *Azure student subscription activation* * *Install Azure CLI* * *GitHub repo creation* * *CodeSandbox project setup*
L2 – Cloud Architecture Principles * *12-Factor App methodology* * *Stateless vs stateful services* * *Horizontal scaling* * *REST architecture basics*	**Lab 2 – Building a REST API** * *Node.js / Express API* * *CRUD endpoints* * *Environment variables* * *Local testing with Postman*
L3 – Designing Cloud Applications * *Microservices vs monolith* * *API-first design* * *OpenAPI specification* * *Basic system design patterns*	**Lab 3 – Containerization** * *Writing Dockerfile* * *Building images* * *Running containers locally* * *Docker Compose basics*
L4 – Containers and Virtualization * *Containers vs VMs* * *Docker architecture* * *Images, containers, volumes, networks* * *Multi-stage builds*	**Lab 4 – Azure Deployment (PaaS)** * *Deploy to Azure App Service* * *Configure environment variables* * *Connect to Azure SQL (free tier)*
L5 – Cloud Deployment Models in Azure * *Azure App Service* * *Azure Container Apps* * *Azure Storage (Blob, Table)* * *Azure SQL Database*	**Lab 5 – Persistent Storage** * *Azure SQL or Azure Storage* * *Data modeling* * *Basic migrations*
L6 – DevOps & CI/CD Fundamentals * *Git workflow* * *GitHub Actions basics* * *Build pipelines* * *Infrastructure as Code concept*	**Lab 6 – CI/CD** * *GitHub Actions workflow* * *Automated build & deploy* * *Versioning strategy*
L7 – Security & Identity in Cloud * *Authentication vs Authorization* * *OAuth2 / JWT basics* * *Azure Active Directory fundamentals* * *Secret management*	**Lab 7 – Midterm Project Checkpoint** * *Architecture review* * *Code review* * *Deployment validation*
L8 – Cloud Databases & Storage * *Relational vs NoSQL* * *Azure SQL vs Cosmos DB* * *Data consistency models* * *Migration basics*	**Lab 8 – Authentication** * *JWT implementation* * *Role-based authorization* * *Secure endpoints*
L9 – Serverless Architectures * *Event-driven systems* * *Azure Functions* * *Triggers & bindings* * *Use cases*	**Lab 9 – Serverless Extension** * *Azure Function integration* * *Event-based processing*
L10 – Observability & Monitoring * *Logging principles* * *Metrics vs traces* * *Azure Monitor & Application Insights* * *Health checks*	**Lab 10 – Monitoring & Logging** * *Enable Application Insights* * *Logging middleware* * *Analyze telemetry*

LECTURE STRUCTURE	LAB STRUCTURE
L11 – Scalability & Performance * *Load balancing* * *Caching strategies* * *CDN basics* * *Cost optimization*	**Lab 11 – Scaling & Performance** * *Load testing (basic tools)* * *Scaling App Service* * *Caching layer (Redis concept demo)*
L12 – Resilience & Reliability * *Retry patterns* * *Circuit breaker* * *SLA/SLO basics* * *Backup strategies*	**Lab 12 – Infrastructure as Code** * *Simple Bicep template* * *Automated provisioning*
L13 – Cloud-Native Trends & Final Architecture Review * *Kubernetes overview* * *Infrastructure as Code (Bicep/Terraform intro)* * *Edge computing basics* * *Final project architectural consultation*	**Lab 13 – Final Project Presentation** * *Live deployment demo* * *Architecture explanation* * *Peer review*