ACC: ACC 3

ACC Bucket: Full Stack Development - 3

Course: Cloud and Application Development

OVERALL COURSE OBJECTIVES: To cultivate software development and DevOps skills that enable participants to design, develop, and deploy scalable and seamless applications using containerization tools, Kubernetes, microservices, serverless technologies, and full-stack development practices, fostering an understanding of dynamic user experience, CI/CD pipelines, and cloud-based solutions to remain competitive in the evolving tech industry.

LEARNING OUTCOMES: On successful completion of the course the students shall be able to:

1. Develop and scale cloud-native applications using containerization tools such as Docker, Kubernetes, Red Hat, OpenShift, and Istio, promoting fluid movement between different platforms.
2. Utilize Kubernetes command line interface (CLI) to manipulate objects and manage workloads efficiently in a Kubernetes cluster.
3. Create microservices using various methodologies and build REST APIs using Python and Flask, reducing the complexity and enhancing the scalability of larger applications.
4. Develop serverless applications and deploy them on cloud platforms such as the IBM Cloud Code Engine, eliminating the need for managing underlying infrastructure.
5. Design dynamic user experiences, develop frontend pages, add user administration, build actions for database operations, and create backend services for full stack application development.
6. Implement continuous Integration and Deployment (CI/CD) pipelines to automate updates and manage containerized deployment of applications.

COURSE CONTENT:

Module 1: Introduction to Containers w/ Docker, Kubernetes & OpenShift [13 Hours]

This beginner course on containers is an excellent way to advance your software engineering career, with a primary focus on tools and technologies like Docker, container registries, Kubernetes, Red Hat, OpenShift, and Istio which are essential for creating cloud native applications. The course addresses why over 70% of Fortune 100 companies use containerized applications, highlighting the convenience of seamlessly moving applications across platforms. Knowledge areas include Docker objects, Dockerfile commands, Kubernetes CLI, management of workloads in a Kubernetes cluster, and differences between OpenShift and Kubernetes, among others. Hands-on, browser-based labs are conducted weekly to facilitate practical application of the learned content. Upon completion of this course, students will be able to construct a container image and deploy and scale it on the cloud using OpenShift. The skills learned in this course are beneficial for numerous roles in software development, cloud system engineering, DevOps, and more.

Sub-Topics
Containers and Containerization
Kubernetes Basics

Managing Applications with Kubernetes
The Kubernetes Ecosystem: OpenShift, Istio, etc.

Formative Assessments:
4 graded quizzes and 1 Peer-review assignment.

Module 2: Application Development using Microservices and Serverless [24 Hours]

The course focuses on microservices architecture, which decomposes monolithic applications into independently maintainable and scalable pieces, a technique embraced by top software organizations globally due to its multiple advantages. It also explores the rising popularity of serverless architecture, which enables app operation without managing the underlying infrastructure. The course content involves the creation of microservices using various techniques, formulating REST APIs using Python and Flask, and an introduction to serverless applications, with practical application on IBM Cloud Code Engine. Several hands-on labs are incorporated for participants to apply their learned content. The final project entails the construction of a front-end application comprising several microservices, deployed on the Cloud using serverless.

Sub-Topics
Introduction to MicroServices
Introduction to API Gateway
Serverless Reference Architecture and Use Cases
OpenShift Essentials/Working with OpenShift and Istio
ORM: MicroServices w/ Serverless

Formative Assessments:
3 quizzes and 1 peer-review assignment.

Module 3: Full Stack Application Development Capstone Project [33 Hours]

This second course of the AI Product Management Specialization by Duke University's Pratt School of Engineering focuses on the practical aspects of managing machine learning projects. The course walks through the key steps of a ML project from how to identify good opportunities for ML through data collection, model building, deployment, and monitoring and maintenance of production systems. Participants will learn about the data science process and how to apply the process to organize ML efforts, as well as the key considerations and decisions in designing ML systems.\n\nAt the conclusion of this course, you should be able to:\n1) Identify opportunities to apply ML to solve problems for users\n2) Apply the data science process to organize ML projects\n3) Evaluate the key technology decisions to make in ML system design\n4) Lead ML projects from ideation through production using best practices

Sub-Topics
Dynamic Pages, Static Pages and User Management Application
Node.js Mongo DB dockerized server Overview
CI/CD, Containerize & Deploy to Kubernetes
Enhancement of Car Dealership Portal

Formative Assessments:
4 quizzes and 1 peer-review assignment.

ASSESSMENT:

For summative assessments, Coursera will provide question banks for which exams can be conducted on the Coursera platform or the faculty will create their own assessments.

Note: If a Course or Specialization becomes unavailable prior to the end of the Term, Coursera may replace such Course or Specialization with a reasonable alternative Course or Specialization.