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PURDUE
UNIVERSITY®

Post Graduate Program in **DevOps**



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COURSE 1

DevOps Fundamentals

M1 - Introduction to Software Development and DevOps

- Overview of Software Development Life Cycle (SDLC)
- Benefits of SDLC
- Types of SDLC
- Waterfall Model
- Iterative Model
- Agile Development Model
- Challenges with Traditional Development Models
- How DevOps helps solve various Industry Problems
- Agile with DevOps
- Agile vs DevOps
- DevOps Market Trends

M2 - DevOps Lifecycle and Tools

- Source Code Management
- Continuous Integration
- Continuous Testing
- Continuous Deployment
- Configuration Management
- Continuous Monitoring
- DevOps Tools

M3 - Introduction to DevOps on Cloud

- Introduction to Cloud Computing
- Infrastructure as Code (IaC)
- Overview of Cloud Services for DevOps
- AWS DevOps
- Azure DevOps
- Google Cloud
- Managing basic Services
- Creating Instances on Cloud

M4 - Linux Fundamentals for DevOps

- Why Linux?
- Basic Linux Commands for DevOps
- Files and Directories
- User Management
- System Management
- Software Management
- Creating a Simple Shell Script
- YAML Fundamentals

COURSE 2

Source Code Management using GIT

M1 - Getting Started With Git

- Version Control System
- Need for VCS (Version Control System)
- What is a VCS?
- Types of VCS
- Centralized
- Distributed
- Introduction to Git
- What is Git?
- Need for Git
- Use-cases
- Getting started with Git
- Git Terminology
- Configuring Git
- Command-line options
- Environment Variables
- Configuration Files
- Using git config Tool
- System Level Configuration



- Global Level Configuration
- Local Level Configuration
- Configuration Commands
- list, unset, get, edit, etc.
- Client Vs Server Configuration"

M2 - Working With Git Repositories

- Overview of GitHub
- Git Repositories
- Local and Remote Repositories
- Working With Remote Reositories
- Initializing a Repository
- Cloning a Repository
- Displaying remotes
- Adding a Remote
- Fetching and Pulling from Remotes
- Pushing to Remote
- Inspecting a Remote
- Renaming and Removing a Remote
- Forking a Repository
- Git File Life Cycle



- Recording changes to Repository
- Checking Status
- Tracking Files
- Staging Files
- Viewing Staged and Unstaged Changes
- Committing Changes
- Checking the Commit History
- Removing Files
- Moving Files
- Undoing Things - Reset, Checkout, Restore

M3 - Branching and Merging in Git

- Branching in Git
- What is a Branch?
- Benefits of Branching
- Internal management of Branches
- Git Storage Strategy
- Object
- Head
- Origin Master
- Types of Branches



- Switching between branches and different commits
- Deleting Branches
- Two-way merge and Three-way merge
- Merge Conflicts
- Resolving Merge Conflict
- Merging Strategies
- Resolve, Recursive, Octopus, Ours, Subtree, Fast Forward
- Merging and Rebasing
- What is Merging?
- What is Rebasing?
- How does Rebasing Work?
- Advantages of Rebasing
- Merging Vs Rebasing
- Git Tags
- What is a Tag?
- Types of Tags
- Operations on Tags

M4 - Git Workflows

- What is a Git Workflow?
- Advantages of a Workflow
- Different types of Workflows in Git
- Centralized Workflow
- Feature Branch Workflow
- Gitflow Workflow
- Forking Workflow

M5 - Using Git in IDE

- Git Plugins with Eclipse
- Install Eclipse IDE
- Install IntelliJ IDE
- Configure Git plugin with Eclipse
- Work with Git using Eclipse
- Work with Git Workflow on Eclipse IDE
- Explore GitHub UI Options"

M6 - Git Server Administration

- Git Server setup
- User Management
- Access Control for SSH and HTTP access
- SSH vs HTTPS -differences between the HTTPS and SSH Authentication Strategies
- Using our system's terminal to generate a public and private SSH keypair that will allow us to use SSH authentication to log into our remote GitHub repository
- Using our newly generated GitHub key in order to set up SSH authentication to ease the process of pushing upto GitHub from our local system
- GitLab
- Installation
- Administration
- Working using GitLab

COURSE 3

Continuous Integration using Jenkins

M1 - Introduction to Continuous Integration

- Introduction to continuous integration (CI)
- Need for CI
- Use-cases
- Advantages of CI
- Overview of Jenkins
- Features of Jenkins
- Applications of Jenkins/Use-cases
- Getting Started with Jenkins
- Jenkins Architecture and terms of Jenkins
- Overview of Jenkins UI
- Configuring Jenkins: Configure System, Environment Variables, URL
- Creating a Jenkins Job
- Configuring a Jenkins job

M2 - Jenkins Plugins

- Introduction to Plugins
- Need for Plugins
- What is a Plugin?
- Adding Plugins to Jenkins
- Commonly used plugins
- List common plugins e.g. Git, Docker, Jira, Maven, Slack Integration, Kubernetes, Pipeline, Amazon EC2, Performance, Performance Publisher
- Configuring Jenkins to work with
- Git and GitHub
- Maven
- Overview of Maven
- Why to Use Maven?
- What is Maven?
- Maven Vs Gradle Vs Ant
- Working of Maven
- Maven Build Life Cycle
- Creating a Jenkins Build and Jenkins workspace
- Configure Jenkins to check for source code changes periodically
- Working with Maven Build Jobs"

M3 - Build Jobs and Jenkins Security

- Jenkins Pipeline
- Jenkind Continuous Delivery Pipeline
- Pipeline Concepts
- Pipeline Syntax
- Example/(s)
- Build Jobs
- Creating a Freestyle Build Job
- Introduction to Build Triggers and Build Steps
- Pre-and Post-Build Actions: Adding properties and properties files
- Running Your New Build Job
- Parameterized Builds
- Distributed Builds
- Setting Up Email Notifications
- Securing Jenkins
- Access Control
- Disabling Security

M4 - Metrics to Improve Quality

- Looking for foul Code through Code Coverage
- Activating and usage of PMD Jenkins plugin
- Activating and usage of Findbugs Jenkins plugin
- Verifying HTML Validity
- Reporting with JavaNCSS
- Jenkins with Gradle script build system
- Jenkins with shell script build system

M5 - Managing and Monitoring Jenkins

- Managing Jenkins
- Gathering System Information
- User Management
- Monitoring Jenkins
- Plugins for Reporting
- Plugins for Code Analysis
- Server Maintenance
- Backup Plugin
- Managing Plugins
- Installing, Uninstalling and Updating Plugins
- Remote Testing

M6 - Automated and Continuous Deployment

- Deployment Overview
- Automated Deployment
- Continuous Deployment
- Deploying an application to an application server
- Install and configure Tomcat
- Deployment of Simple Java web application using Tomcat
- Jenkins Build Pipeline
- Parallel Jenkins Build
- Archive generated Artifacts
- Jenkins integrations (GitHub, slack, Custom API)
- Scaling Jenkins"

M7 - Jenkins Pipeline

- Overview of Pipeline as code
- Overview of Pipeline Plugin
- Automated Jenkins Pipeline

COURSE 4

Configuration Management using Ansible

M1 - Introduction to Configuration Management

- Introduction to Configuration Management (CM)
- Need for CM
- Use-cases
- What is infrastructure Orchestration?
- Infrastructure as Code
- Overview of Ansible
- Features
- Ansible Vs Others
- Configuring Ansible
- Ansible Architecture
- Inventory Management
- Build/create Ansible Inventory Files
- Ansible Modules
- Ansible Roles directory structure
- Create Ansible Tasks
- Write Ansible AD-HOC Commands
- System Facts

M2 - Servier Provisiong using Ansible CLI and Playbooks

- Ansible CLI
- What is Ansible playbook?
- Organizing Tasks in Playbook
- Introduction to YAML
- Writing a Playbook
- Using Variables in Playbooks
- Variables at runtime using ansible Facts
- Use handlers and Flow Control in Ansible scripts

M3 - Ansible Modules and Roles

- What are Ansible modules
- Using modules in Playbook
- Introduction to Ansible roles
- Using roles in Ansible Playbook.
- Configure Jinja2 templates
- Define, execute and manage roles
- Manage inclusions or task and roles into another role

M4 - Ansible on Cloud

- Launch EC2 Instance on AWS (REHL or CENTOS)
- Install Ansible on AWS.
- Preparing Ansible to work with AWS
- Module support for Docker interaction

M5 - Automating Continuous Integration

- Project based on Git, Jenkins and Ansible

M6 - Infrastructure Automation using Terraform

- Introduction to Terraform
- Why to Use Terraform?
- What is Terraform?
- Use-cases
- Terraform Vs Others
- Using Terraform
- Terraform HCL
- Building an Infrastructure
- Updating an Infrastructure
- Destroying an Infrastructure
- Variables



- Software and Server Provisioning
- Attributes
- Remote State
- Modules
- Configuration Management using Ansible and Terraform

COURSE 5

Continuous Deployment using Docker

M1 - Introduction to Containerization

- Containerization
- History of Containers
- Namespaces and Cgroups
- Containers vs Virtual Machines
- Types of Containers
- Introduction to Docker
- Docker Architecture
- Container Lifecycle
- Docker CE vs Docker EE
- Configuring Logging Drivers
- Docker Terminology



- Port Binding
- Detached vs Foreground Mode
- Docker CLI
- Docker Exec
- Restart Policy

M2 - Image Management and Registry

- Dockerfile
- Dockerfile Instructions
- Build Context
- Docker Image
- Docker Registry

M3 - Storage in Docker

- Docker Storage
- Types of Persistent Storage
- Volumes
- Bind Mounts
- tmpfs Mount
- Storage Drivers
- Device Mapper
- Docker Clean Up

M4 - Container Orchestration using Docker

- Docker Compose
- Docker Swarm
- Docker Service
- Service Placement
- Rolling Update and Rollback
- Docker Stack

M5 - Networking and Security

- Docker Networking
- Network Drivers
- Bridge Network
- Overlay Network
- Host and Macvlan
- Docker Security
- Docker Content Trust
- Securing the Docker Daemon

M6 - Docker EE

- Docker Enterprise
- Universal Control Plane (UCP)
- UCP Architecture
- Access Control in UCP
- Docker Trusted Registry (DTR)

COURSE 6

Container Orchestration using Kubernetes

M1 - Introduction to Container Orchestration

- Containerization Recap
- What is Container Orchestration?
- Managing Containers at scale
- Container Orchestration Tools
- Advantages of Orchestration
- Introduction to Kubernetes
- Kubernetes Architecture

M2 - Kubernetes Architecture and Core Concepts

- Kubernetes Core Concepts
- Node Status and Node Lease
- Kubectl common commands
- Understanding Pods
- Configure network on cluster nodes
- Pod Networking Concepts
- Setting up a cluster - Kubernetes Certificates

M3 - Kubernetes Services and Scheduling

- Services and Controllers
- Service Networking
- Deploy and configure network Load Balancer
- Primitives necessary for self-healing apps
- Effects of resource limiting on pod scheduling
- Configure Kubernetes Scheduler
- Running multiple Schedulers

M4 - Kubernetes Controllers

- ReplicaSet and ReplicationController
- DaemonSets
- Deployments
- Rolling updates and Rollbacks
- Scaling applications
- Ingress

M5 - Storage in Kubernetes

- PersistentVolume and PersistentVolumeClaim
- Access modes for volumes
- Primitives for PersistentVolumeClaim
- Secrets and ConfigMaps in your pods
- Storage classes
- Headless services
- StatefulSets

M6 - Securing and Troubleshooting the Cluster

- Authentication
- Authorization
- Kubernetes security primitives
- Configure Network Policies
- Security Contexts
- ETCD Operations
- Jobs
- Helm Charts
- Troubleshooting application failures
- Troubleshooting cluster failure

M7 - CI/CD using Jenkins X

- What is Jenkins X?
- Setting up EKS with Jenkins X
- Quickstart projects
- Kubernetes Cluster with Jenkins X

M8 - CI/CD using Jenkins X Part-2

- Full Pipeline with Jenkins-X P

COURSE 7

Continuous Monitoring and DevOps on AWS

M1 - Continuous Monitoring using Prometheus

- Introduction to Continuous Monitoring
- Getting started with Prometheus and Grafana
- Prometheus Architecture
- Prometheus Configuration
- Monitoring Servers with Prometheus
- Pushing Metrics
- Client Libraries and Exporters
- Querying
- Service Discovery
- Introduction to alerting
- Setting up alerting system

M2 - Prometheus Security and Use Cases

- Prometheus Storage
- Prometheus Security
- Grafana Provisioning
- Monitoring a Web Application
- Scraping Kubernetes with Prometheus
- Consul Integration with Prometheus
- EC2 Auto Discovery

M3 - Continuous Monitoring using Nagios XI

- Introduction to Nagios XI
- Nagios Architecture
- Setting up and Configuring Nagios XI
- Managing Users, Components, and Plugins
- Dashboards
- Monitoring using Nagios XI
- Views
- Scheduled Reporting
- Advanced Visualization
- Capacity Planning
- Audit Logging

M4 - Log Server 2.0 and alerting in Nagios

- Log-server 2.0 architecture
- Log-server 2.0 interface
- Alerting on Data
- Setting up Alerting system
- Configuring Inputs, Outputs, and Filters
- Global Settings
- Auto Discovery
- Notifications

M5 - SDLC automation using AWS

- Important Phases Involved In AWS DevOps
- AWS CodeCommit
- Versioning in CodeCommit
- Working of AWS CodeCommit
- AWS CodePipeline
- Working of AWS CodePipeline
- Concepts of CodePipeline
- Input and Output Artifacts
- AWS CodeBuild
- Working of AWS CodeBuild
- AWS CodeDeploy
- Primary Components
- Deployment Workflow: On A Lambda Platform and
On EC2 Platform
- Application Specification File
- Deployment Types: In-Place Deployment and
Blue/Green Deployment
- AWS CodeStar
- Working of AWS CodeStar"

M6 - Automating Infrastructure using CloudFormation

- Infrastructure As Code
- CloudFormation
- CloudFormation template
- Working of CloudFormation
- Advanced CloudFormation Concepts
- Nesting
- Wait Conditions and Wait Handlers
- Helper Scripts
- Custom Resources
- Intrinsic Functions & Conditions
- Update Stack: Direct Update, Update Behaviour,
Change Sets, Stack policy
- CloudFormation Resource Deletion Policy
- CloudFormation Troubleshoots
- CloudFormation Best Practises"

M7 - Application Deployment using Elastic Beanstalk

- Elastic Beanstalk
- Concepts Of Elastic Beanstalk
- Permissions
- Introduction To Containers



- Application environment components
- Container V/s VM
- Docker: Docker File, Docker Image, Docker Container
- Docker In Beanstalk
- Deployment Options
- Comparing The Deployment Methods
- Classification Of Platform Updates
- Configuration files
- Alarms And Notification
- Troubleshooting
- Beanstalk V/s CloudFormation"

M8 - Application deployment and Orchestration using ECS, ECR and EKS

- ECS Introduction
- Need for ECS
- ECS Cluster
- ECS Task Definition
- ECS Service
- ECS Service with load balancer
- Deploy an application over ECS cluster
- ECR Introduction

- Need for ECR
- Push an image to ECR
- EKS
- Need for EKS
- EKS Cluster
- Deploy webapp with MySql on EKS Kubernetes Cluster
- Autoscaling of cluster using AWS EKS