DevOps Syllabus

1. Introduction [15 Min]
    - Course Features and Tools
    - What is DevOps?
    - A brief overview of the history of DevOps
2. DevOps Culture [15 Min]
    - The Goals of DevOps
    - DevOps vs Traditional Silos
3. DevOps Concepts and Practises [45 Min]
    - Build Automation
    - Continuous Integration
    - Continuous Delivery and Continuous Deployment
    - Infrastructure as Code
    - Configuration Management
    - Container Orchestration
    - Monitoring
    - Microservices
4. DevOps Tools [45 Min]
    - Introduction to DevOps Tools
    - Tools for Building Automation and Continuous Integration
    - Tools for Configuration Management
    - Tools for Virtualization and Containerization
    - Tools for Monitoring
    - Tools for Orchestration

Source Code Management

5. Git Basics /The Basics of Using Git [1 Hr 30 Min]
    - Understanding the Git Filesystem
    - Creating a Local Repository (Empty)
    - Basic Configuration of Git
    - Adding Files to Project
    - The Status of your project
    - Committing to Git
    - Ignoring Certain File Types
    - HOL: Creating Local Repositories with Git and Adding/Checking in Files
6. Tags, Branching, Merging and Reverting [45 Min]
    - Using Tags
    - Using Branches
    - Merging Branches
    - Rebasing
    - Reverting a Commit
    - Using the 'diff' Command
7. Git's Logs and Auditing [15 Min]
    - Using Git's Logs
8. Cloning Repositories [1 Hr]
    - Cloning Local Repositories
    - Cloning Remote Repositories over HTTPS, SSH
    - Forking
    - HOL: Securing Your Github Account with SSH Keys
    - HOL: Cloning a Remote GitHub Repository
9. Push, Pull, and Tracking emoteRepositories [30 Min]
    - Tracking Remote Repositories

- Pushing to Remote Repositories
- Pull Requests

10. Git Branching Strategy [30 Min]
    - What is a branching strategy?
    - Why you need a branching strategy
    - What are some common Git branching strategies?
        - GitFlow
        - GitHub Flow
        - GitLab Flow
        - Trunk-based Development

Build Automation and Continuous Integration

11. Build Automation [2 Hr]
    - Introducing Build Automation
    - Build Automation Tools
        - gradle
        - npm
        - make
        - Packer
    - HOL: Creating Build Automation with Gradle
    - HOL: Automate AMI image creation with Packer
12. Continuous Integration & Jenkins Pipelines [3 Hr]
    - CI Overview
    - Installing Jenkins
    - Scripted vs. Declarative Pipelines
        - Scripted Pipelines
        - Declarative Pipelines
        - Groovy and DSL
    - Jenkinsfile Basics
    - Upstream, Downstream, and Triggers
        - Artifacts and Fingerprints
        - Linking Jobs
        - Automating Jobs
        - HOL: Linking Jobs in Jenkins
        - HOL: Building multibranch build job with dependency between multiple job FreeStyle Jobs
        - Basic Job Structure
        - Parameters
        - Notifications
        - HOL: Building a Freestyle Job in Jenkins
    - Agents and Distributed Builds
        - Setting up a Build Agent
        - Distributing a Build
            - HOL: Distributing a Jenkins Build Jenkins on the Command Line
        - Using the Jenkins API
        - Using the Jenkins CLI
13. Continuous Delivery and Continuous Deployment [3 Hr]
    - What is Continuous Delivery and Continuous Deployment?
    - Continuous Delivery vs. Continuous Deployment
    - Bringing CI and CD (and CD) Together
    - Continuous Delivery Release Automation
        - Automated Deployment
        - Configuration Management

- HOL: Implementing Automated Deployment Through a Jenkins Pipeline HOL: Provide Continuous Delivery with GitHub and Terraform Cloud for AWS

Infrastructure Automation

14. DevOps Tools for Infrastructure Automation [30 Min]
    - Infrastructure Provisioning
    - Configuration Management
    - Continuous Integration/Deployment
    - Config/Secret Management
    - Logging and Monitoring
15. Understanding Infrastructure as a Code [30 Min]
    - IaC and Its Benefits
    - Cloud Agnostic IaC with Terraform
16. IaC with Terraform [6 Hr]
    - What is the Terraform Workflow?
    - Terraform Key Concepts: Plan, Apply, and Destroy
    - Resource Addressing in Terraform: Understanding Terraform Code Terraform Fundamentals
        - Terraform State
        - Terraform Variables and Outputs
        - Terraform Provisioners
    - HOL: Deploying a VM in AWS Using the Terraform Workflow
    - HOL: Using Terraform Provisioner to Setup an Nginx Proxy on AWS Terraform Modules
        - Accessing and Using Terraform Modules
        - Interacting with Terraform Module Inputs and Outputs
    - HOL: Building and Testing a Basic Terraform Module
    - Built-in Funtions and Dynamics Blocks
        - Terraform Built-in Functions
        - Terraform Dynamic Blocks
    - HOL: Using Terraform Dynamic Blocks and Built-in Functions to Deploy to AWS
17. Configuration Management with Ansible [6 Hr]
    - What is Configuration Management?
    - What is Ansible?
    - Installation and Configuration
        - HOL: Deploying Ansible
        - HOL: Getting Started with Ansible
        - HOL: Ad-Hoc Ansible Commands
        - HOL: Working with Ansible Inventories
    - Ansible Tasks
    - Plays and Playbooks
        - HOL: Ansible Playbooks: The Basics
            - HOL: Working with Ansible Templates, Variables, and Facts
        - HOL: Deploying Services Using Ansible
        - HOL: Advanced Features in Ansible Playbooks
    - Roles
        - HOL: Working with Ansible Roles
    - Ansible Vault
        - HOL: Working with Confidential Data in Ansible
    - Building Playbooks for Jenkins Master Setup
    - Building Playbooks for Jenkins Worker Setup
    - Building Jinja2 Templates for Ansible Playbooks
    - Containers and Orchestration

18. Docker Community Edition Installation and Configuration [2 Hr]
    - Installing Docker Community Edition
    - Docker Basics
        - Docker Commands
        - Creating Containers
        - Exposing Container Ports
        - Executing Container Commands
        - Docker Logging
    - Networking
    - Storage and Volumes
    - Selecting a Storage Driver
    - Running a Container
    - Namespaces and Cgroups
    - HOL: Installing and Configuring the Docker Engine
19. Image Creation, Management, and Registry [3 Hr]
    - Introduction to Docker Images
    - The Compoments of a Dockerfile
    - More Dockerfile Directives
    - Building Efficient Images
    - Managing Images
    - Flattening a Docker Image to a Single Layer
    - Introduction to Docker Registries
    - Using Docker Registries
    - HOL: Creating Your Own Docker Image
    - HOL: Building a Private Docker Registry
    - HOL: Building Cross-platform Images Using Multi-Stage Build
20. Docker Compose [2 Hr]
    - Introduction to Docker Service
    - Compose Commands
    - Creating a Compose File
    - Using Volumes and Networking with Compose
    - HOL: Building a Microservices with Docker Compose
21. Kubernetes - Container Orchestrator [10 Hr]
    - Kubernetes Fundamentals
        - Kubernetes Fundamentals Intro
        - Exploring Kubernetes Architecture
        - Kubernetes Objects
    - Kubernetes Networking
    - Kubernetes Networking Basics
    - Kubernetes Service Fundamentals
    - Service Types
    - Kubernetes Storage
        - Kubernetes Storage Big Picture
        - Persistent Volumes and Persistent Volume Claims
        - Storage Classes
    - Kubernetes Deployments
    - Scaling Applications Automatically
        - Horizontal Pod Autoscaler
        - Cluster Autoscaler
    - RBAC and Admission Control
    - HOL: Working with Kubernetes Namespace
    - HOL: Managing Kubernetes Applications With Deployments
    - HOL: Exposing Kubernetes Pods Using Services
    - HOL: Using Kubernetes Services with DNS

- HOL: Using Kubernetes Ingress
- HOL: Managing Container Storage With Kubernetes Volumes HOL: Using PersistentVolumes in Kubernetes
- Troubleshooting
    - Kubernetes Troubleshooting Overview
    - Checking Cluster and Node Logs
    - Checking Containers Logs
    - Troubleshooting Kubernetes Networking Issues
- HOL: Troubleshooting a Broken Kubernetes Cluster
- HOL: Troubleshooting a Broker Kubernetes Application
- Monitoring and Logging

22. Monitoring with Prometheus and Graphana [7 Hr]
    - Monitoring Basics
        - Push or Pull
        - Service Discovery
        - HOL: Setting Up Prometheus and Adding Endpoints
    - Infrastructure Monitoring
        - Using the Node Exporter
        - CPU Metrics
        - Memory Metrics
        - Disk Metrics
        - File System Metrics
        - Networking Metrics
        - Load Metrics
        - Using cAdvisor to Monitor Containers
        - HOL: Monitoring Infrastructure and Containers with Prometheus Application Monitoring
        - Using a Client Library
        - Counters
        - Gauges
        - Summaries and Histograms
        - HOL: Application Monitoring with Prometheus
    - Managing Alerts
        - Recording Rules
        - Alerting Rules
        - Using Alertmanager
        - Silences
        - HOL: Using Alertmanager with Prometheus
    - Visualization
        - Adding a Dashboard
        - Building a Panel
        - HOL: Using Grafana to Visualize Prometheus Data
    - DevOps and the Cloud [8 Hr]
    - DevOps and the Cloud
    - DevOps and Google Cloud Platform
        - HOL: Running Microservice in GKS using Helm
    - DevOps and Microsoft Azure
    - DevOps and Amazon Web Services
        - AWS Services
        - Identity and Access Management (IAM)
        - Serverless Architecture
            - Computing with Lambda
            - Running Containers in ECS
        - Application Monitoring with CloudWatch

    - Elastic Load Balancing(ELB)
        - Using Application Load Balancers
    - High Availability and Scaling
        - Ec2 Instance Auto Scaling
    - HOL: Triggering AWS Lambda from Amazon SQS
    - HOL: Create and Assume Roles in AWS
    - HOL: User Application Load Balancers for Web Servers
    - HOL: Implement Advanced CloudWatch Monitoring for a Web Server
      HOL: Work with AWS VPC Flow Logs for Network Monitoring

23. Modern Software Development [4hr]
    - RESTful APIs
    - What is REST
    - Requests and Responses
    - HTTP Verbs
    - Headers
    - Paths
    - Status Codes
    - Examples
    - HOL: Build Simple Restful Api With Python and Flask
    - HOL: Curling Kubernetes API Requests
    - Service Oriented Architecture
    - What is SOA?
    - SOA Principles
    - SOA Manifesto
    - Monolithic vs. SOA vs. Microservices
    - Microservices
    - What are Microservices?
    - Microservices vs. Monolith
    - What do Microservices look like?
    - Containers and Microservices
    - HOL: Deploying Microservice Application to Kubernetes
    - HOL: Building a Microservice with Docker Compose
    - Agile
    - What is Agile?
    - The Manifest for Agile Development
    - Test Driven Development
    - What is Test Driven Development?
    - TDD Steps
    - Serverless Technologies
    - Defining Serverless
        - Comparing Multi-Tier and Serverless
        - Serverless Benefits
        - Serverless Drawbacks
        - Understanding API Gateways
    - Serverless Technologies
        - AWS Lambda
        - Azure Functions
        - Google Cloud Functions