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## DevOps E. Degree Syllabus

### 1) DevOps Introduction

- ❖ Software Development Life Cycles (SDLC)
  - Waterfall Model
- ❖ Agile Methodology
  - Scrum Model
- ❖ What is DevOps?
- ❖ Why DevOps? Automation
- ❖ DevOps Importance
- ❖ DevOps Model
- ❖ DevOps Life cycle
- ❖ Market Trend and Career Scope for DevOps
- ❖ DevOps Tools

### 2) Linux – 3

- ❖ Installing Pre-requisite software's (SSH Tools and FTP Tools) in Desktop/Laptop.
- ❖ Create an account in AWS.
- ❖ Create EC2 Instance in AWS.
- ❖ Understand Linux Command Line.
  - Linux File/Directory structure.
  - Linux Commands

mkdir	cat	service	userdel	Uname
Is	head	uptime	groupdel	cat /etc/*releases
tree	Tail	last	crontab	watch
cd	more	ps	ssh	netstat
pwd	less	kill	scp	exit/logout/ctrl+d
rmdir	sort	top	rsync	Uname
touch	tr	sar	ssh-keygen	cat /etc/*releases

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find	sed	zip	ssh-cpy-id	watch
umask	grep	unzip	awk	netstat
chmod	who	tar	cut	exit/logout/ctrl+d
chown	w	useradd	free	Uname
chgrp	whoami	passwd	dmidecode	Uname
cp	whereis	chage	mail	cat /etc/*releases
mv	date	groupadd	clear	watch
rm	df	usermod	cal	netstat
file	du	id	wget	exit/logout/ctrl+d
WC	hostname	lid	tee	Uname
In	ipconfig	SU	script	cat /etc/*releases
vim	man	sudo	ping	watch
nano	help	users	telnet	netstat
echo	info	groups	history	exit/logout/ctrl+d

## 2. Shell Scripting - 1 – 2 weeks - 40 commands 7%

- Introduction
- What is Shell?
- Types of Shells
- What is Shell Scripting?
- First Shell Script program
- File Naming Conventions
- Comments
- Variables
- Command line Arguments
- Escape Characters
- String
- Arithmetic Operations
- User Interaction using read command
- Input and Output Redirection
- Control commands - if
- Control commands - for
- Control commands - while loop
- Control commands - Switch case
- Functions
- Pipe

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### 3) Git and GitHub - Versioning - Developers – 10 hours

- What is Git?
- What is the VCS?
- What is SCM?
- What is Branch?
- What is Tag?
- Git Administration.
- Git commands
- Working with git as a Developer perspective
- SSH Key generation
- PAT creation
- Cloning Repositories
- Merging Branches
- Branching strategy
- Best practices for Releases/Code commits in any VCS

### 4) Maven – 4 hours

- Introduction
- Features & Benefits of Maven
- Installation (Maven Environment Setup)
- Directory Structure
- Content of pom.xml
- Maven Repositories
- Maven Life Cycles
- Executing some Examples
- Maven Multi Modules
  - Parent pom
  - Child pom
  - Maven Profiles

### 5) Tomcat / JBoss /

- Introduction
  - Difference between App server and Web server
  - Understanding of Web Servers, App Servers and DataBase Servers
  - Installation (In Windows - Extraction, In Linux Installation)
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- Directory structure
  - Start the Tomcat server
  - Users creation
  - Stop the server
  - Roles
  - Port number change
  - Application Deployment
    - Through Admin Console
    - Copy artifact into webapps folder
  - Tomcat Tuning
  - Data source Creation

## 6) Apache HTTP Server

- Introduction
- Installation
- Directory Structure
- Start the HTTP server
- Deploy the web static application.

## 7) SonarQube

- Introduction
- Pre-Requisites
- Architecture
- Installation
- Change the Port Number
- Execution
- Administration
  - Users Creation (Normal User and Administrator)
  - Project Creation
  - Project deletion
  - Token Generation
  - Create Quality Profiles
  - Create Quality Gates
  - Configure Email settings

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## 8) Nexus

- Introduction
- Installation
  - Password and Email change for Admin User
  - Email server Configuration
  - Port Number Change
  - Context root change
- Nexus Directory structure
- Create the Repositories
- Integrate the Maven with Nexus
- Create Users

## 9) Jenkins

- **Introduction**
    - Continuous Integration (CI)
    - Continuous Delivery (CD)
    - Continuous Deployment (CD)
  - **Installation**
    - In Linux Server
  - **Create the Maven Project using Freestyle Project type**
    - Integrate Maven software if not done.
    - Integrate Nexus with Jenkins
    - Integrate SonarQube with Jenkins
    - Deploy the App into Tomcat
      - Through "Deploy to container" plugin
      - Through Script - SSH Agent Plugin
    - Configure Email Functionality
    - Poll SCM
    - Build Periodically
    - Git Web Hooks
    - Discard Old Build
    - Disable this project
    - Delete workspace before build starts
    - Add timestamps to the Console Output
    - JACOCO plugin
  - **Jenkins Directory structure**
  - **Create the Maven Project using Maven Project type**
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- **Plugin Management**

- Safe Restart
- Next Build Number
- Email Extension
- SonarQube Scanner
- Schedule Build
- Artifactory Plugin
- Cloud Foundry
- Blue Ocean
- Deploy to container
- Deploy WebLogic
- Maven Integration
- JACOC
- SSH Agent
- Publish Over SSH

- Thin Backup
- Build Name Setter
- Convert To Pipeline

- **External Plugins Installation**

- Urban Code Deploy

- **Port Number Change**

- **Build with parameters**

- **Create View**

- **Jenkins Security**

- Create Users (Default Admin)
- Provide the specific access Jenkins
- Provide the access to specific access to specific projects

- **Create the Pipeline Project Jobs**

- <http://localhost:8080/env-vars.html/>

- **Create the Multibranch Pipeline Project Jobs**

- **Create Master/Slave**

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- **Jenkins Backup**
  - **Jenkins Migration**
  - **Optional Topics**
    - Jenkins Home Directory Change in RHEL 7.5 Version
    - Jenkins CLI
    - Integrate the Urban Code Deploy server with Jenkins
    - Deploy the App into IBM Cloud
    - Slack integration

## 10) **Docker – 18 hours**

- Docker Introduction
- Containerization Vs Virtualization
- Docker Vs Virtual Machine
- Docker Installation
- Dockerfile
- Docker Image
- Docker Container
- Docker Adhoc Commands
- Docker Networks
- Docker Volumes
- Docker Keywords
- Dockerfile Creation
- Docker Images creation
- Docker Images save to Dockerhub
- Docker Private Repo
- Docker Compose
- Docker Swarm

## 11) **Kubernetes - 27 hours - CKA**

- Kubernetes Introduction
  - Architecture
  - Kubernetes Cluster (Self-Managed) Setup Using Kubeadm.
  - Kubernetes Namespace
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- Kubernetes Objects
    - POD
    - Replication Controller
    - Replica Set
    - Daemon Set
    - Deployment
      - Rolling Update Recreate
      - Blue Green
    - Stateful Set
    - Service
      - ❖ ClusterIP
      - ❖ NodePort
      - ❖ Load Balancers
    - Volumes
    - Persistent Volume
    - Persistent Volume Claim
    - Dynamic Volumes
    - Config Maps & Secrets
  - HPA & Metrics Server
  - Kubernetes Cluster Setup in AWS Using KOPS
  - EKS Kubernetes Cluster Setup Using Terraform
  - Load balancer Service
    - ❖ Network LB
    - ❖ Application LB
    - ❖ HAProxy
  - Ingress Controller & Resource
  - Liveness & Readiness probes
  - Kubernetes RBAC
  - Kubernetes & Jenkins Integration
  - Kubernetes Dashboard Setup
  - Helm
  - Monitor Kubernetes Using Prometheus And Grafana.

## 12) Ansible

- Introduction
  - Architecture
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- ssh-key generation
  - Copy SSH Key
  - Ansible adhoc Commands
  - Ansible Playbooks
  - Execution of Ansible Playbooks
  - Ansible Modules
  - Ansible Variables, Group/Host Variables
  - Loops & Conditions
  - Roles
  - Ansible Vault
  - Ansible Galaxy
  - Dynamic Inventory

### 13) AWS

- Cloud & AWS – Cloud Infrastructure Engineer
  - ❖ Managed and Self-Managed Infrastructures
  - ❖ IaaS
  - ❖ PaaS
  - ❖ SaaS
- Elastic Compute Cloud (EC2)
  - Introduction to Amazon EC2
  - Launch Our First EC2 Instance - Part 1
  - Launch Our First EC2 Instance - Part 2
  - How to use Putty (Windows Users Only)
  - Security Groups
  - EC2 Instance User Data.
  - Summary of EC2 Section
  - Amazon Machine Instance (AMI)
  - Elastic IP (EIP)
- EBS
  - Volumes
  - Snapshots
- EFS

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- Simple Storage Service (S3)
    - S3 Essentials
    - Creating S3 Buckets Using The Console and CLI
    - S3 Storage Options and Types
    - Create an S3 Website
    - S3 Version Control
    - Cross Region Replication
    - S3 Lifecycle Management & Glacier
    - S3 – Security, Snowball & S3 Summary
  - Elastic Block Store (ELB)
    - What is ELB and it's uses
    - ELB Policies and it's benefits
    - How to launch ELB with N nodes and other concepts on ELB.
  - Auto Scaling
    - Launch Configurations
    - Scaling Polices
    - Demo with Dynamic Scaling
    - Integrate Autoscaling with ELB.
  - Virtual Private Cloud (VPC)
    - VPC Overview
    - Building our own custom VPC
    - Build A Custom VPC - Part 2
    - Network Address Translation (NAT)
    - Access Control Lists (ACLs)
    - Custom VPC's
    - VPC Clean Up
    - VPC Summary
  - Identity Access Management (IAM)
    - Introduction of IAM
    - Users
    - Groups
    - Roles
    - Policies
    - Permissions
  - AWS CLI Setup

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## 15) Monitoring Tools (New Relic)

- Introduction
- Creating Synthetic Monitors
  - Ping
  - Simple Browser
  - Scripted Browser
  - API Test
- Creating Channels
- Creating Alerts
- Integrating with Slack

### Addon Tools

16) MySQL

17) Cloud Foundry

18) IBM Cloud

## 19. Infrastructure as a code (IaaS) with Terraform

- ❖ What is Terraform
- ❖ Importance of Terraform over other IaaS tools
- ❖ Terraform installation on Windows and Linux
- ❖ Infrastructure automation using Terraform and Ansible

## 20. Projects

1. Jenkins integration with GitHub, Maven, SonarQube, Nexus and Tomcat for an e-commerce client
  2. Jenkins integration with GitHub, Maven, SonarQube, Nexus and Docker for an e-commerce client
  3. **Jenkins integration with Maven, SonarQube, Ansible and Docker**
  4. **Jenkins integration with Maven, SonarQube, Docker and Docker Swarm**
  5. **Jenkins integration with Maven, SonarQube, Docker and Kubernetes**
  6. **Infrastructure automation using Terraform and Ansible**
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