Suggested Teaching Guidelines for

Advanced Software Development Methodologies – *PG-DAC February 2019*

Duration: 46 class room hours + 44 lab hours (**90hrs**)

Objective: To reinforce knowledge of Advanced Software development Methodologies.

Prerequisites: Fundamentals of Computers

Evaluation method: Theory exam– 40% weightage
Lab exam – 40% weightage
Internal exam– 20% weightage

List of Books / Other training material

Test Book:

1. Software Engineering by Chandramouli

Reference:

1. Software engineering by Ian Sommerville
2. Agile Project Management with Scrum by Ken Schwaber
3. The Mythical Man-Month: Essays on Software Engineering by Frederick P. Brooks Jr.
4. User Stories Applied: For Agile Software Development 2016 by Mike Cohn
5. Continuous Delivery, Integration, and Deployment with DevOps: Dive into the core DevOps strategies by Sricharan Vadapalli

Software Engineering

Session 1

Lecture

- Introduction to software engineering
- Importance of Software engineering
- Software Development Life Cycle

Assignment –Lab

- Prepare software requirement specification for web application

Session 2 ,3

- Design and Architectural Engineering
    a. Characteristics of Good Design
    b. Function Oriented vs Object Oriented System
    c. Modularity, Cohesion, Coupling, Layering
    d. Design Models
    e. UML
- Object Oriented Analysis and Design

Session 4

Lecture

- Introduction to Agile development model
- Agile development components
- Benefits of Agile
- Introduction to Atlassian Jira
    o Add Project

- Add Tasks and sub-tasks
- Create sprints with tasks

Session 5
Lecture

- Introduction to different tools used for agile web development
- Case study of developing web application using agile methodology

Assignment –Lab

- Create different sprints in Atlassian Jira for different features

DevOps

Session 1
Lecture

- Introduction to DevOps
- DevOps ecosystem
- DevOps phases

Lab

- Read about DevOps Tools

Session 2
Lecture

- Introduction to Microservices
- Microservice Architecture
- Fragmentation of business requirement
- Deployment pattern
- API gateway
- Service Discovery
- Database Management for Microservices

Lab

- Create micro-services

Session 3 and 4
Lecture

- Introduction to containerisation
- Introduction to docker
- Creating docker images using Dockerfile
- Container life cycle

Lab

- Install and configure docker
- Create docker image using Dockerfile
- Start docker container
- Connect to docker container
- Copy the website code to the container
- Use docker management commands to
  - List the images
  - List the containers
  - Start and stop container
  - Remove container and image

Session 5 and 6

Lecture

- Introduction to YAML
- Introduction to Docker Swarm and Docker Stack
- Introduction to Kubenetes
- Creating Kubernetes cluster
- Creating service in Kubernetes
- Deploying an application using dashboard
- Introduction to Istio Service Mesh

Lab

- Configure Kubernetes
- Configure Kubernetes Dashboard
- Setup a Kubernetes cluster
- Access application using Kubernetes service
- Deploy the website using Dashboard

Session 7

Lecture

- Introduction to delivery pipeline
- Introduction to Jenkins
- Jenkins management
- Adding slave node to Jenkins
- Building a delivery pipeline
- Selenium integration with Jenkins
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Lab

- Install and configure Jenkins
- Build a pipeline job using Jenkins
- Create a maven project for TestNG
- Add TestNG test suite in the project
- Integrate it with Jenkins

Git

Session 1

Lecture

- Developing an application in a team
- Issues developers face when working in a team
- Introduction to code versioning system
- History of code versioning system
    - Different tools available for versioning
    - Software development workflow

Session 2

Lecture

- Introduction to git
- Introduction git repository and git structure
- Adding code to git

- Creating and merging different git branches

Assignment –Lab

- Create a local git repository
- Commit the initial code
- Update the code
- Use git commands to
    - Get the updated files
    - List the changes
    - Create branch
    - Merge branch

Session 3

Lecture

- Introduction to GitHub
- Pushing and pulling the code to remote repository
- Creating pull requests
- Reviewing code and merging the branches on GitHub

Assignment –Lab

- Create a repository on GitHub
- Push the local changes to GitHub
- Pull the code from GitHub
- Create and checkout a branch
- Add a new feature, commit and push changes to GitHub
- Create a pull request
- Review the changes on GitHub and merge the branch into the main branch

Testing

Session 1

Lecture

- Introduction to software testing
- Why testing code is important
- Verification and validation
- Quality Assurance vs Quality Control vs Testing
- Principles of software testing

Assignment –Lab

- Read more testing concepts used in the industry

Session 2

Lecture

- Introduction to STLC and V Model
- Types of testing: manual and automation
- Tools used for automation testing
- Introduction to testing methods: white-box, black-box and grey-box
- Introduction to functional testing: (* students are supposed to learn the concepts)
- Introduction to non-functional testing: (* students are supposed to learn the concepts)

Assignment –Lab

- Create a test plan for project
- Document the use cases
- Create test case document for different sprints (designed in SE)

Session 3 and 4

Lecture

- Introduction to Selenium (use Eclipse IDE)
- Load web driver
- Create selense commands
    - locators: by ID, name, class, tag name, XPath
- Add interactions
    - text box
    - radio button selection
    - check box selection
    - drop down item selection
    - keyboard actions
    - mouse actions
    - multi select

Assignment –Lab

- Download and configure Selenium
- Create a test suit
- Add commands and interactions

Session 5

Lecture

- Introduction to TestNG
- Introduction to TestNG annotations
    - BeforeSuite, AfterSuite, BeforeClass, AfterClass, BeforeTest, AfterTest
    - BeforeGroups, AfterGroups, BeforeMethod, AfterMethod
    - DataProvider, Factory, Parameters, Test
- HTML test result reporting

Assignment –Lab

- Download and configure TestNG
- Create test suit
- Add TestNG annotations

Cloud

Session 1

Lecture

- Introduction to Cloud
- Introduction to Virtualization
- Virtualization types: type1, type2
- Containerisation
- Cloud Computing, Cloud SPI Model, Cloud Computing Types (Public, Private and Hybrid), Cloud Security (SLA and IAM).
- Virtualization, Hardware Virtualization, Para-Virtualization, Cloning, Snapshot and Template
- Containerization, Operating System Virtualization

Assignment –Lab

- Create and configure VM using VBox
- Deploy code on VM

Session 2

Lecture

- Cloud architecture
- Service models: IaaS, PaaS, SaaS
- Deployment models: Private, Public, Hybrid
- Services provided by Cloud (Compute, Database, Developer Tools, Storage, Media, Mobile, Web, Security, Integration etc.)
- Cloud development best practices

Assignment –Lab

- Exploring various services provided by cloud providers like App Services, Web apps, API Apps, Search, Database Servers on VMs, VM Scale Sets, Bot Services and other cloud applications.

Session 3

Lecture

- Introduction to AWS
- Services provided by AWS: EC2, Lambda, S3

Assignment –Lab

- Create AWS EC2 instance
- Create AWS Lambda
- Create AWS S3 bucket
- Create AWS VPC