Suggested Teaching Guidelines for

IT Infrastructure and Management PG-DITISS September 2022

Duration: 40 Classroom hours + 46 Lab hours (86 Hrs)
Objective: To introduce the student to Concepts of ITIL and Data center management.
Evaluation Method: Theory exam – 40% weightage
Lab exam - 40% weightage
Internal assessment – 20% weightage

List of Books / Other training material

Courseware: No specific courseware for modules, faculty may share some course materials.

Introduction to ITIL
Session 1:
Service Strategy

- General strategy
- Competition and market space
- Service provider types
- Service management as a strategic asset
- Key process activities,
- Financial management
- Service portfolio management
- Demand management
- Key roles and responsibilities of staff

Session 2:
Service Design

- Design of architecture, processes, policies, documentation, and allowing for future business requirements
- Service Design Package (SDP)
- Service catalog management
- Service level management
- Designing for capacity management
- IT service continuity
- Information Security

Session 3:
Service Transition

- Service Asset and Configuration Management
- Transition Planning and Support
- Release and deployment management
- Change Management
- Knowledge Management
- key roles of staff

Session 4:
Service Operation

- Balancing conflicting goals (e.g. reliability Vs cost etc)
- Event management
- Incident management
- Problem management
- Event fulfillment
- Asset management
- Service desk
- Technical and application management
- Key roles and responsibilities for staff

Session 5:
Continual Service Improvement (CSI)

- Training and awareness
- Ongoing scheduling
- Roles created
- Ownership assigned
- Activities identified to be successful

Data Center Management
Session 6:
Introduction

- Data Center Architecture, Requirements & prerequisites
- Required Physical Area for Equipment and Unoccupied Space
- Required power to run all the devices
- Required cooling and HVAC
- Required weight
- Required Network bandwidth
- Budget Constraints
- Selecting a Geographic Location
- Safe from Natural hazards & Manmade disasters
- Availability of local technical talent
- Abundant and Inexpensive Utilities Such as Power and Water
- Selecting and Existing building
- Characteristics of an Outstanding Design
- Guidelines for Planning a Data Center
- Data Centre structures
- Raised Floor Design and Deployment
- Design and Plan against Vandalism

Session 7: Infrastructure in a data center

- Modular Cabling Design
- Points of Distribution
- ISP Network Infrastructure and WAN Links
- Network Operations Center and Monitoring
- Data center physical security, Logical security, and cleaning
- Reasons for data center Consolidation
- Consolidation opportunity
- Server consolidation
- Storage Consolidation
- Network Consolidation
- Service Consolidation
- Process Consolidation
- Staff Consolidation
- Data Consolidation phases
- Datacenter Servers
- Server Capacity Planning
- Disaster Recovery

Session 8:
Server Security

- Data Center Security Guidelines
- Internet Security Guidelines
- Internet security
- Source Security Issues
- Best Practices for System Administration
- System Administration Work Automation

DevOps

Session 9:

- Introduction of virtualization
- Virtualization types: type1, type2
- Virtualization, Hardware Virtualization, Para-Virtualization, Cloning, Snapshot, andTemplate
- Operating System Virtualization
- Cluster Architecture
- Cluster Requirements

Assignment –Lab

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

Session 10: Storage Area Network

- Configuring a SAN (FreeNAS)
- Using SAN for high availability
- ZFS Volume Configuration
- IP-Based Storage Communication
- Object Storage services

Session 11:

- Introduction to Cloud
- Cloud Computing, Cloud SPI Model, Cloud Computing Deployment Model (Public, Private, and Hybrid), Cloud Security (SLA and IAM).
- Cloud architecture
- Service models: IaaS, PaaS, SaaS
- Services provided by Cloud (Compute, Database, Developer Tools, Storage, Media, Mobile, Web, Security, Integration, etc.)
- Cloud development best practices
- Introduction to Openstack
- HCI & Its Comparison to cloud
- SDN

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.
- HCI Mandatory & Optional
- Virtual Network configuration using SDN

Session 12:

- Cloud API integration
- DC/DR Migration
- DC/DR Storage Synchronization
- Bootstrapping Chef/puppet Server
- Migration of physical servers to clouds

Session 13:

- Centralized logging
- Nagios
- Prometheus Next Gen NMS
- Identifying bottlenecks
- Auto-scaling Auto-rebuilding cloud instances
- Updating servers without downtime
- Auto-healing
- Cloud Enable Data Center Case Study

Lab Assignment:

- Configuring Nagios on Linux server and adding Linux client for monitoring.
- Configuring Nagios on Linux server and adding Windows client for monitoring.

Session 14:

- What is Agile?
- Agile methodologies: Scrum and Kanban
- What is Lean?
- Implementation of Lean
- Lean and Agile in DevOps

Session 15 & 16:

- Introduction to DevOps
- DevOps ecosystem
- DevOps phases
- CAMS model, Kaizen, Immutable deployment
- CI/CD Pipelines
- IAM, LXC, Docker, KVM

Lab Assignment:

- Create an httpd container running on port 8000. Name the container as web5. Do not map any directory. Create an “index.html” file & copy this file inside the container and check if the website displays your webpage. Again, modify the “index.html” file and copy it inside the container, and check if the website is updated or not.
- Create a C program(exe). Test the program on-base machine. Then create an image using Dockerfile to execute this exe program. Give image name as “Name: v1”.
- Try the above with a program that requires user input.

Session 17: Github and Jenkins

- Introduction
    - Why Git?
    - Core Concepts
    - Going Command Line
- Basic Git workflow with Github
    - Welcome to GitHub
    - Setup the Project Folder
    - Git Configuration (User Name and Email)
    - Copy the Repository from GitHub to Your Local Computer (git clone)
    - The First Commit
    - Publishing Changes back to GitHub (push)
- Introduction of Jenkins
- CI/CD pipeline using Jenkins.

Lab Assignment:

- Create a C program to take input from the user and test it. Then create an image using Dockerfile. Test image by the running container. Then push the image to the docker hub repository. Then also export the image in a “cprog-back.tar” file.
- Create a CI/CD pipeline using Jenkins, Docker, and GitHub to automate the web by using the NGINX image.
- Create a CI/CD pipeline using Jenkins, Docker, and GitHub to automate the web by using the httpd image.

Session 18:

- Introduction to AWS
- Services provided by AWS: EC2, Lambda, S3
- Introduction Virtual Private Cloud (VPC) Setup

Assignment –Lab

- Create AWS EC2 instance
- Create AWS Lambda
- Create AWS S3 bucket
- Create AWS VPC
- Create a new VPC by the name ditiss-lab with public & private subnet. Assign network address as 172.20.0.0/16. Assign 172.20.5.0/24 to the public and 172.20.10.0/24 to the private subnet. Create one instance and connect to a private subnet. Create one instance and connect to the public subnet. Install httpd on the private instance and check with curl from the public connected instance.

Session 19 & 20:

- Version Control system
- Infrastructure as Code
- Containerization with Docker
- Container Orchestration: Kubernetes, Dockerswam
- Micro Service Deployment

Lab Assignments:

- Create a new docker image using NGINX. Push it to docker hub. Create a service on Dockerswarm. Keep initial replicas as 1 and then increase the replicas to 10. Reduce the replicas to 2. Create a new image by modifying “index.html”. Push to docker hub and then update the service for a new image.
- Configure a Linux as a Master node using Kubernetes and make 2 to 3 worker node clusters.