

Government of Pakistan

National Vocational and Technical Training Commission

**Prime Minister Hunarmand Pakistan Program,
"Skills for All"**



Course Contents/ Lesson Plan

Course Title: Cloud Computing

Duration: 6 Months

Trainer Name	
Course Title	Cloud Computing
Objective of Course	<p>Employable skills and hands on practice for Cloud Computing</p> <p>The aim for the team of staff responsible for delivery of the advanced IT curriculum is to provide knowledge and develop skills related to the IT. The course will allow participants to gain a comprehensive understanding of all the aspects. It will also develop the participant’s ability to act in a professional and responsible manner.</p> <p>Teaching staff will provide the technical knowledge and abilities required to solve tasks and problems that are goal-oriented. They will use participant-centered, practically oriented methods. They will also develop a program of practical assessment that reflects the learning outcomes stated in the curriculum. Trainees of the IT curriculum will also develop their willingness and ability as individuals to clarify issues, as well as think through and assess development opportunities.</p> <p>Teaching staff will also support trainees in developing characteristics such as self-reliance, reliability, responsibility, a sense of duty and a willingness and ability to criticize and accept criticism well and to adapt their future behavior accordingly.</p> <p>Teaching staff also use the IT curriculum to address the development of professional competence. Trainees will acquire the ability to work in a professional environment.</p> <p>By the end of this course, the trainees should gain the following competencies:</p> <ul style="list-style-type: none"> • Understanding of Cloud Computing Architecture <ul style="list-style-type: none"> • Distinguish between traditional and cloud computing models in terms of business value. • Learn fundamental concepts of cloud computing. • Identify technical challenges and mitigation measures involved in cloud computing. • Understand latest digitization trends associated with cloud computing. • Design and build enterprise-to-carrier grade private and public cloud. Learning focus would be on following: - <ul style="list-style-type: none"> • Understand various types of virtualization (compute, storage

	<p>and network)</p> <ul style="list-style-type: none"> • Identify leading hypervisor manufacturers. • Learn the fundamentals concepts and deployment of vSphere virtual infrastructure. • Understand architecture, components and deployment of OpenStack orchestration layer. • Security threats and challenges in private and public cloud buildup. • Understand design principles in securing your cloud. • Security management in cloud including identity and access management, next generation security protection and application programming interface (API) based security. • Learn about advanced load balancing architecture in cloud. • Identify common cloud attack vectors and remediating controls. • Learn Off the Shelf Cloud Solutions like Microsoft Azure, Amazon Web Services (AWS) and Huawei cloud: - <ul style="list-style-type: none"> • Detailed understanding of Microsoft Azure Cloud. • Cover the fundamentals of AWS architectural principles and services. Deep dive into individual elements like IAM, S3, Cloud front, Storage Gateway, Snowball, EC2, Cloud watch, CLI, Lambda, Route 53, RDS, Dynamo DB, Redshift, ElastiCache, Aurora, VPC, SQS, SNS, Elastic Transcoder, Kinesis, API Gateway etc. • Learn about Huawei Cloud computing solutions like Fusion Sphere, Fusion Access etc. • Understand cloud security, risk and governance.
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<p>Learning Outcome of the Course</p>	<p>By the end of this course, the trainees should gain the following competencies:</p> <ul style="list-style-type: none"> • Understanding of Cloud Computing Architecture <ul style="list-style-type: none"> • Distinguish between traditional and cloud computing models in terms of business value. • Learn fundamental concepts of cloud computing. • Identify technical challenges and mitigation measures involved in cloud computing. • Understand latest digitization trends associated with cloud computing. • Design and build enterprise-to-carrier grade private and public cloud. Learning focus would be on following: - <ul style="list-style-type: none"> • Understand various types of virtualization (compute, storage and network) • Identify leading hypervisor manufacturers. • Learn the fundamentals concepts and deployment of vSphere virtual infrastructure. • Understand architecture, components and deployment of OpenStack orchestration layer. • Security threats and challenges in private and public cloud buildup. • Understand design principles in securing your cloud. • Security management in cloud including identity and access management, next generation security protection and application programming interface (API) based security. • Learn about advanced load balancing architecture in cloud. • Identify common cloud attack vectors and remediating controls. • Learn Off the Shelf Cloud Solutions like Microsoft Azure, Amazon Web Services (AWS) and Huawei cloud: - <ul style="list-style-type: none"> • Detailed understanding of Microsoft Azure Cloud. • Cover the fundamentals of AWS architectural principles and services. Deep dive into individual elements like IAM, S3, Cloud front, Storage Gateway, Snowball, EC2, Cloud watch, CLI,
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	<p>Lambda, Route 53, RDS, Dynamo DB, Redshift, ElastiCache, Aurora, VPC, SQS, SNS, Elastic Transcoder, Kinesis, API Gateway etc.</p> <ul style="list-style-type: none">• Learn about Huawei Cloud computing solutions like Fusion Sphere, Fusion Access etc.• Understand cloud security, risk and governance.
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Course Execution Plan	Total Duration of Course: 6 Months (26 Weeks)
	Class Hours: 4 Hours per day
	Theory: 20% Practical: 80%
	Weekly Hours: 20 Hours Per week
	Total Contact Hours: 520 Hours
Companies Offering Jobs in the respective trade	<ol style="list-style-type: none"> 1. Telecommunication 2. Education sector (public and private) 3. Freelancing 4. Finance and Banking 5. Health Care 6. Government Institutes 7. Software Houses 8. All Private Institutes who are managing their IT infrastructure
Job Opportunities	<p>As businesses increasingly adopt Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS) offerings, the leading cloud providers are growing more competitive. Cloud computing is one of the popular technologies with high demand for qualified professionals. IT jobs are expected to rise for buildup and maintenance of cloud networks. There are also opportunities for start-up entrepreneurship due to the high demand in the market in following designated jobs;</p> <ul style="list-style-type: none"> • Cloud Architect / Infrastructure Engineers • Full stack developer • Data engineer • DevOps engineer • System Administrator • Cloud Security Architect • Cloud Security Engineer • IT Support Officer • Manager / Assistant Manager IT
No of Students	
Learning Place	Classroom / Lab
Instructional Resources	Learning Material: <ul style="list-style-type: none"> • For Students

	<ul style="list-style-type: none"> • https://www.vmware.com/support/pubs/ • https://docs.openstack.org • https://www.f5.com/services/resources • https://docs.fortinet.com/ • https://www.cisco.com/c/en/us/tech • https://docs.microsoft.com/en-us/azure/ • https://www.microsoft.com/mcp/ • https://docs.aws.amazon.com/ • https://support.huawei.com/enterprise/en/doc <ul style="list-style-type: none"> • For Instructor <ul style="list-style-type: none"> • https://app.linuxacademy.com/ • https://www.coursera.org/ • https://www.microsoft.com/mct/ • https://admin.microsoft.com/Adminportal/Home#/homepage • https://support.huawei.com/learning/ • https://mylearn.vmware.com • https://www.netacad.com/courses/ <p>Online Free Tiers for Labs:</p> <ul style="list-style-type: none"> • https://login.microsoftonline.com/common • https://portal.aws.amazon.com/billing/signup • https://docs.openstack.org/training_labs/
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Scheduled Week	Module Title	Learning Units	Remarks
Week 1	<ul style="list-style-type: none"> ➤ Introduction ➤ Module 1: Introduction to Cloud Computing ➤ Module 2: Delivering services from the cloud ➤ Module 3: Introduction to Virtualization - the Backbone Technology of Cloud Computing ➤ Module 4: vSphere Virtual Infrastructure ➤ Module 5: Installing vSphere Components 	<ul style="list-style-type: none"> • Motivational Lecture • Course Introduction • Success stories • Job market • Course Applications • Institute/work ethics <p>Introduction to Cloud Computing</p> <ul style="list-style-type: none"> • Review Traditional Computing Challenges and Concerns • Cloud Computing Concept, 	

		<p>History, and Definitions</p> <ul style="list-style-type: none"> • Cloud Reference Architecture • Advantages of Cloud Business Model <p>Delivering services from the cloud</p> <ul style="list-style-type: none"> • Differentiating types of clouds: public, private and hybrid • Categorizing service types • Comparing vendor cloud products: Amazon, Google, Microsoft and others <p>Introduction to Virtualization - the Backbone Technology of Cloud Computing</p> <ul style="list-style-type: none"> • Virtualization: Definition, Concepts, History, and Relationship to Cloud Computing • Virtualization: Benefits, Challenges, Risks, and Suitability to Organizations • Hypervisor: Role and Purpose in Virtualization and Various Hypervisor Types • Virtualization: Terminologies and the different Types of Virtualization <p>vSphere Virtual Infrastructure</p> <ul style="list-style-type: none"> • Overview of vSphere virtual infrastructure • Define the files and components of virtual machines • Describe the benefits of using virtual machines • Explain the similarities and differences between physical architectures and virtual 	
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		<p>architectures</p> <ul style="list-style-type: none"> • Define the purpose of ESXi • Define the purpose of vCenter Server <p>Installing vSphere Components</p> <ul style="list-style-type: none"> • Installation of ESXi • Configuring ESXi services 	
<p>Week 2</p>	<ul style="list-style-type: none"> ➤ Module 6: Compute Virtualization ➤ Module 7: Network Basics for Cloud Computing ➤ Module 8: Creating Virtual Machines ➤ Module 9: Configuring and Managing Virtual Networks. 	<p>Compute Virtualization</p> <ul style="list-style-type: none"> • Introduction to Compute Virtualization <p>Network Basics for Cloud Computing</p> <ul style="list-style-type: none"> • Network Architecture for Virtualization • Physical Network for Virtualization <p>Creating Virtual Machines in vSphere</p> <ul style="list-style-type: none"> • Identify the files that make up a virtual machine • Discuss the latest virtual machine hardware and its features • Describe virtual machine CPU, memory, disk, and network resource usage • Explain the importance of VMware Tools™ • Discuss PCI pass-through, Direct I/O, remote direct memory access, and NVMe • Deploy and configure virtual 	

		<p>machines and templates</p> <ul style="list-style-type: none"> • Identify virtual machine disk format <p>Configuring and Managing Virtual Networks</p> <ul style="list-style-type: none"> • Describe, create, and manage standard switches • Configure virtual switch security and load-balancing policies • Contrast and compare vSphere distributed switches and standard switches • Describe the virtual switch connection types • Describe the new TCP/IP stack architecture • Use VLANs with standard switch 	
<p>Week 3</p>	<ul style="list-style-type: none"> ➤ Module 10: Storage Virtualization Basics ➤ Module 11: Configuring and Managing Virtual Storage 	<p>Storage Virtualization Basics</p> <ul style="list-style-type: none"> • Storage Architecture for Virtualization • Physical Disk Types and Related Techniques • Centralized Storage vs. Distributed Storage • Virtualized Storage vs. Non-Virtualized Storage • Introduction to VM Disks <p>Configuring and Managing Virtual Storage</p> <ul style="list-style-type: none"> • Introduce storage protocols and storage device types • Discuss ESXi hosts using iSCSI, 	

		<p>NFS, and Fibre Channel storage</p> <ul style="list-style-type: none"> • Create and manage VMFS and NFS datastores • Describe the new features of VMFS 6.7 • Describe guest file encryption 	
<p>Week 4</p>	<ul style="list-style-type: none"> ➤ Module 12: Cloud Computing Emerging Trends/Technologies ➤ Module 13: Role of Cloud in Digital transformation ➤ Module 14: vCenter Server Architecture 	<p>Cloud Computing Emerging Trends/Technologies</p> <ul style="list-style-type: none"> • Software Defined Networking (SDN) • Network Functions Virtualization (NFV) • Bring Your Own Device (BYOD) and MDM <p>Role of Cloud in Digital transformation</p> <ul style="list-style-type: none"> • Big Data and Big Data Analytics, Hadoop, NoSQL databases, their characteristics and types. • Internet of Things (IoT) and its types. • Integration of cloud computing and DevOps <p>vCenter Server Architecture</p> <ul style="list-style-type: none"> • Overview • Deploy and configure vCenter Server Appliance • Use vSphere Web Client • Backup and restore vCenter Server • vCenter Server permissions and roles • vSphere HA architectures and 	

		<p>features</p> <ul style="list-style-type: none"> • vSphere authentication proxy • Manage vCenter Server inventory objects and licenses • Access and navigate the new vSphere clients 	
<p>Week 5</p>	<ul style="list-style-type: none"> ➤ Module 15: OpenStack Architecture ➤ Module 16: OpenStack Deployment ➤ Module 17: Virtual Machine Management 	<p>OpenStack Architecture</p> <ul style="list-style-type: none"> • OpenStack Overview & Components • OpenStack Dashboard Management • Authentication Management <p>OpenStack Deployment</p> <ul style="list-style-type: none"> • Compute, Storage and Network Management • OpenStack Orchestration Management • Image Management <p>Virtual Machine Management</p> <ul style="list-style-type: none"> • Use templates and cloning to deploy new virtual machines • Modify and manage virtual machines • Clone a virtual machine • Upgrade virtual machine hardware to version 12 • Remove virtual machines from the vCenter Server inventory and datastore • Customize a new virtual machine using customization specification files 	

		<ul style="list-style-type: none"> • Perform vSphere vMotion and vSphere Storage vMotion migrations • Create and manage virtual machine snapshots • Create, clone, and export vApps • Introduce the types of content libraries and how to deploy and use them 	
Week 6	<ul style="list-style-type: none"> ➤ Module 18: Security Threats and Challenges in Cloud Computing ➤ Module 19: Architectural Concepts of Cloud Security and Design Requirements ➤ Module 20: vSphere HA, vSphere Fault Tolerance, and Protecting Data 	<p>Security Threats and Challenges in Cloud Computing</p> <ul style="list-style-type: none"> • Security and Compliance in Cloud • Physical Security and Cloud Computing <p>Architectural Concepts of Cloud Security and Design Requirements</p> <ul style="list-style-type: none"> • Describe cloud security reference architecture • Understand design principles of secure cloud computing <p>vSphere HA, vSphere Fault Tolerance, and Protecting Data</p> <ul style="list-style-type: none"> • Explain the vSphere HA architecture • Configure and manage a vSphere HA cluster • Use vSphere HA advanced parameters • Define cluster-wide restart ordering capabilities • Enforce infrastructural or intra-app dependencies during 	

		<p>failover</p> <ul style="list-style-type: none"> • Describe vSphere HA heartbeat networks and datastore heartbeats • Introduce vSphere Fault Tolerance • Enable vSphere Fault Tolerance on virtual machines • Examine enhanced consolidation of vSphere Fault Tolerance virtual machines • Introduce vSphere Replication • Use vSphere Data Protection to back up and restore data 	
<p>Week 7</p>	<ul style="list-style-type: none"> ➤ Module 21: Security Management in Cloud Computing ➤ Module 22: Introduction to Microsoft Azure Cloud 	<p>Security Management in Cloud Computing</p> <ul style="list-style-type: none"> • Identity and Access Management • Data Classification • Data Security Lifecycle <p>Introduction to Microsoft Azure Cloud</p> <ul style="list-style-type: none"> • Azure Foundations • Azure Marketplace • Azure Portal • Azure CLI • Cloud Shell • Lab: Creating a Free Azure Account • Footprint and Structure 	

		<ul style="list-style-type: none"> • Azure Services • Compute • Networking • Storage • Web and Mobile • Databases • Data and Analytics • Enterprise Integration • Security and Identity • Monitoring and Management 	
<p>Week 8</p>	<ul style="list-style-type: none"> ➤ Module 23: Network Security Management in Cloud ➤ Module 24: Next Generation Security using NGFW in Cloud ➤ Module 25: Azure Architecture ➤ Module 26: Compute - Azure 	<p>Network Security Management in Cloud</p> <ul style="list-style-type: none"> • Network Security Management in the Cloud • Vulnerability, Patch Management, and Pen-Testing <p>Next Generation Security using NGFW in Cloud</p> <ul style="list-style-type: none"> • Evolution • Deployment Models • Initial Setup / Boot strapping <p>Azure Architecture</p> <ul style="list-style-type: none"> • Introduction • Regions and Availability Zones • Resource Groups and Azure Resource Manager • Lab: Creating Azure 	

		<p style="text-align: center;">Resources</p> <p>Compute - Azure</p> <ul style="list-style-type: none"> • Introduction • Virtual Machines • Scale Sets • App Service • Azure Container Instances • Azure Kubernetes Service • Functions • Lab: Azure App Services 	
<p>Week 9</p>	<ul style="list-style-type: none"> ➤ Module 27: Next Generation Security using NGFW in Cloud ➤ Module 28: Networking – Azure 	<p>Next Generation Security using NGFW in Cloud</p> <ul style="list-style-type: none"> • NGFW Traffic flow • NGFW Access Policy Components • Firewall Deployment Modes • Virtualization <p>Networking – Azure</p> <ul style="list-style-type: none"> • Introduction • Virtual Network • Load Balancer • VPN Gateway • Application Gateway • Content Delivery Network • Lab: Creating a Virtual Network Connection • Demo: Create Network in Azure Portal 	

		<ul style="list-style-type: none"> • IP Addressing • Demo: Private DNS • Demo: Public DNS • Demo: Static Private and Public IP 	
Week 10	<ul style="list-style-type: none"> ➤ Module 29: Next Generation Security using NGFW in Cloud ➤ Module 30: Security – Azure ➤ Module 31: Azure Solutions 	<p>Next Generation Security using NGFW in Cloud</p> <ul style="list-style-type: none"> • High Availability Features • Clustering • Modular Policy Framework • Filtering based on Networks / Ports • Filtering based on Web URLs <p>Security – Azure</p> <ul style="list-style-type: none"> • Introduction • Securing Network Connectivity • Azure Security Center • Key Vault • Azure Information Protection • Advanced Threat Protection • Lab: Azure Key Vault <p>Azure Solutions</p> <ul style="list-style-type: none"> • Introduction • Internet of Things • Big Data • Artificial Intelligence • Serverless • DevOps 	

		<ul style="list-style-type: none"> • Lab: Using Azure AI 	
Week 11	<ul style="list-style-type: none"> ➤ Module 32: Next Generation Security using NGFW in Cloud ➤ Module 33: Authentication and Authorization – Azure ➤ Module 34: Database - Azure 	<p>Next Generation Security using NGFW in Cloud</p> <ul style="list-style-type: none"> • Filtering based on Applications (AVC) • File Blocking • SSL Decryption • Advanced Malware Protection (AMP) • Security Intelligence • Correlation Policy • Intrusion Detection and Prevention (IPS) • SNORT Rules <p>Authentication and Authorization – Azure</p> <ul style="list-style-type: none"> • Introduction • Identity Services • Azure Active Directory • Multi-Factor Authentication • Lab: Azure Active Directory • Demo: Create Azure AD Tenant • Demo: Create Users and Groups • Demo: Self-Service Password Reset <p>Database - Azure</p> <ul style="list-style-type: none"> • Introduction • Cosmos DB • Azure SQL • Azure Database for MySQL 	

		<ul style="list-style-type: none"> • Azure Database for PostgreSQL • Database Migration Services • Lab: Creating Cosmos DB 	
Week 12	<ul style="list-style-type: none"> ➤ Module 35: Advanced Cloud Security Management Practices ➤ Module 36: Connectivity between Virtual Networks – Azure ➤ Module 37: Create and Configure Network Security Group (NSG) – Azure 	<p>Advanced Cloud Security Management Practices</p> <ul style="list-style-type: none"> • Application Programming Interface API based Security <p>Connectivity between Virtual Networks – Azure</p> <ul style="list-style-type: none"> • Hybrid Connectivity Options • Routes and VNET Peering • Routing and Peering • Hybrid Scenarios <p>Create and Configure Network Security Group (NSG) – Azure</p> <ul style="list-style-type: none"> • Network Security Groups • Demo: Network Security Groups 	
Week 13	<ul style="list-style-type: none"> ➤ Module 38: Load Balancing in Cloud ➤ Module 39: Advanced Load Balancing Architecture in Cloud ➤ Module 40: Storage – Azure 	<p>Load Balancing in Cloud</p> <ul style="list-style-type: none"> • BIG-IP initial setup (licensing, provisioning, and network configuration) • BIG-IP local traffic configuration objects <p>Advanced Load Balancing Architecture in Cloud</p> <ul style="list-style-type: none"> • Using dynamic load balancing methods • Modifying traffic behavior with persistence (including SSL, SIP, universal, and destination address affinity persistence) 	

		<ul style="list-style-type: none"> Monitoring application health with Layer 3, Layer 4, and Layer 7 monitors (including transparent, scripted, and external monitors) <p>Storage – Azure</p> <ul style="list-style-type: none"> Introduction Blob Disk File Archive Lab: Creating a Storage Account Manage Azure VM Storage VM Storage Overview Demo: Add Disk Disk Caching Demo: Disk Caching 	
<p>Week 14</p>	<ul style="list-style-type: none"> ➤ Module 41: Advanced Load Balancing Architecture in Cloud ➤ Module 42: High Availability for Load Balancers in Cloud ➤ Module 43: Privacy, Compliance and Trust ➤ Module 44: Manage Azure Subscriptions 	<p>Advanced Load Balancing Architecture in Cloud</p> <ul style="list-style-type: none"> Processing traffic with virtual servers (including network, forwarding, and reject virtual servers) Processing traffic with SNATs (including SNAT pools and SNATs as listeners) <p>High Availability for Load Balancers in Cloud</p> <ul style="list-style-type: none"> Configuring high availability (including active/standby and N+1 sync failover device groups, 	

		<p>connection and persistence mirroring, and sync-only device groups)</p> <ul style="list-style-type: none"> • Customizing application delivery with iRules and local traffic policies <p>Privacy, Compliance and Trust</p> <ul style="list-style-type: none"> • Introduction • Governance • Azure Monitor • Azure Service Health • Compliance • Privacy • Trust • Lab: Using Azure Monitor <p>Manage Azure Subscriptions</p> <ul style="list-style-type: none"> • Intro to Accounts and Subscriptions • Azure Trial Account Creation • Demo: Quotas, Cost, Tagging • Demo: Billing Alerts • Demo: Subscription Policies 	
Week 15	Mid-Term Assignment/Exam		
Week 16	<ul style="list-style-type: none"> ➤ Module 45: Cloud Security, Risk and Governance ➤ Module 46: Analyze Resource Utilization and Consumption ➤ Module 47: Amazon Web Services (AWS) 	<p>Cloud Security, Risk and Governance</p> <ul style="list-style-type: none"> • Risk and Governance Definitions • Impact of Cloud Service Models • Impact of Cloud Deployment Models 	

		<ul style="list-style-type: none"> • Risk Management and Governance <p>Analyze Resource Utilization and Consumption</p> <ul style="list-style-type: none"> • Overview of Monitoring Capabilities in Azure • Demo: Azure Monitor and Alerts • Demo: Storage Diagnostics • Log Analytics Overview • Demo: Log Analytics <p>Amazon Web Services (AWS)</p> <ul style="list-style-type: none"> • Introduction to AWS • AWS Marketplace / Why should one learn AWS? • History of AWS • AWS - 10,000 Foot Overview <ul style="list-style-type: none"> • Networking & Compute • Storage, Databases, Migration & Analytics • Security, Management Tools, Application Services, Developer Tools, Mobile Services & IoT • AI & Messaging • Signing up to AWS 	
Week 17	<ul style="list-style-type: none"> ➤ Module 48: Manage Resource Groups ➤ Module 49: Create and Configure Storage Accounts ➤ Module 50: Identity Access Management & S3 - AWS 	<p>Manage Resource Groups</p> <ul style="list-style-type: none"> • Demo: Resource Groups and Tagging • Resource Locks • Demo: Resource Locks 	

		<ul style="list-style-type: none"> • Azure Policies • Demo: Azure Policies • Demo: Move Resources between Resource Groups <p>Create and Configure Storage Accounts</p> <ul style="list-style-type: none"> • Storage Account Overview • Demo: Storage Account Portal • Demo: Azure Storage Explorer • Demo: AZ Copy • Manage Permissions • Demo: Shared Access Signatures • Storage Keys • Custom Domains <p>Identity Access Management & S3 - AWS</p> <ul style="list-style-type: none"> • IAM & S3 Overview • IAM Lab • Creating a Billing Alarm • Creation of S3 Bucket • S3 Security & Encryption • S3 Version Control • CloudFront Overview • Snowball Overview 	
Week 18	<ul style="list-style-type: none"> ➤ Module 51: Import and Export Data to Azure ➤ Module 52: Configure Azure Files ➤ Module 53: EC2 – AWS 	<p>Import and Export Data to Azure</p> <ul style="list-style-type: none"> • Import/Export Service 	

	<p>➤ Module 54: Databases on AWS</p>	<ul style="list-style-type: none">• CDN• Demo: CDN <p>Configure Azure Files</p> <ul style="list-style-type: none">• Demo: Azure Files• Demo: Azure File Sync <p>EC2 – AWS</p> <ul style="list-style-type: none">• Exploration of EC2 101• Security Groups Basics• EBS 101• Volumes & Snapshots• CloudWatch 101• AWS Command Line• Elastic File System• EC2 Placement Groups <p>Databases on AWS</p> <ul style="list-style-type: none">• Exploration of Databases 101• Creation of RDS Instance• RDS Backups, Multi-AZ & Read Replicas• DynamoDB• Redshift• Aurora• Elasicache	
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<p>Week 19</p>	<ul style="list-style-type: none"> ➤ Module 55: VM Availability – Azure ➤ Module 56: VM Scale Sets ➤ Module 57: Route53 – AWS 	<p>VM Availability – Azure</p> <ul style="list-style-type: none"> • VM Availability Overview • Demo: Availability Sets • Availability Zones <p>VM Scale Sets</p> <ul style="list-style-type: none"> • VM Scaling Overview • Demo: VM Scale Sets <p>Route53 – AWS</p> <ul style="list-style-type: none"> • DNS 101 • Route53 - Register a Domain Name Lab • Route53 Routing Policies Available on AWS • Simple Routing Policy Lab • Weighted Routing Policy Lab • Latency Routing Policy • Failover Routing Policy • Geolocation Routing Policy 	
<p>Week 20</p>	<ul style="list-style-type: none"> ➤ Module 58: Azure Resource Manager (ARM) ➤ Module 59: Virtual Private Cloud (VPCs) - AWS ➤ Module 60: High Availability (HA) - AWS 	<p>Azure Resource Manager (ARM)</p> <ul style="list-style-type: none"> • ARM Templates Overview • Demo: Query Resource Providers with PowerShell and Azure CLI • Demo: ARM Templates 	

		<ul style="list-style-type: none"> • ARM Functions plus Linking Templates • Demo: ARM Count Loops • Demo: Save Deployment as ARM Template <p>Virtual Private Cloud (VPCs) - AWS</p> <ul style="list-style-type: none"> • Introduction to VPCs • Build A Custom VPC • Network Address Translation (NAT) • Access Control Lists (ACL) • Custom VPCs and ELBs • VPC Flow Logs • Bastions • Direct Connect • VPC End Points <p>High Availability (HA) - AWS</p> <ul style="list-style-type: none"> • HA Architecture • Load Balancers Theory • Load Balancers and Health Checks Lab • Autoscaling Groups Lab 	
Week 21	Employable Project/Assignment (6 weeks i.e. 21-26) in addition of regular classes. OR On job training (2 weeks)	<ul style="list-style-type: none"> • Guidelines to the Trainees for selection of students employable project like final year project (FYP) • Assign Independent project to each Trainee • A project based on trainee's 	

		<p>aptitude and acquired skills.</p> <ul style="list-style-type: none"> ● Designed by keeping in view the emerging trends in the local market as well as across the globe. ● The project idea may be based on Entrepreneur. ● Leading to the successful employment. ● The duration of the project will be 6 weeks ● Ideas may be generated via different sites such as: https://1000projects.org/ https://nevonprojects.com/ https://www.freestudentprojects.com/ https://technofizi.net/best-computer-science-and-engineering-cse-project-topics-ideas-for-students/ ● Final viva/assessment will be conducted on project assignments. ● At the end of session the project will be presented in skills competition ● The skill competition will be conducted on zonal, regional and National level. ● The project will be presented in front of Industrialists for commercialization ● The best business idea will be placed in NAVTTC business incubation center for commercialization. <p>-----</p> <p style="text-align: center;">OR</p> <p>On job training for 2 weeks:</p> <ul style="list-style-type: none"> ● Aims to provide 2 weeks industrial training to the Trainees as part of overall training program ● Ideal for the manufacturing trades ● As an alternate to the projects that involve expensive equipment ● Focuses on increasing Trainee's motivation, productivity, efficiency and quick learning approach. 	
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Week 22	<ul style="list-style-type: none"> ➤ Module 61: Application - AWS ➤ Module 62: Serverless – AWS ➤ Module 63: Networking – AWS ➤ Module 64: Security – AWS 	<p>Application - AWS</p> <ul style="list-style-type: none"> • Applications • SQS • SNS • Elastic Transcoder • API Gateway <p>Serverless - AWS</p> <ul style="list-style-type: none"> • Serverless • Lambda Concepts • Building a Serverless Webpage <p>Networking – AWS</p> <ul style="list-style-type: none"> • Introduction to Networking • Network to VPC Connectivity • VPC to VPC Connectivity • Internet Gateways • Routing • Enhanced Networking • Route • CloudFront • Elastic Load Balancers <p>Security – AWS</p> <ul style="list-style-type: none"> • Concepts • Multi-Account Management • Network Controls and Security Groups • AWS Directory Services 	

		<ul style="list-style-type: none"> • Credentials and Access Management • Encryption • Distributed Denial of Service Attacks • IDS and IPS • Service Catalog 	
Week 23	<ul style="list-style-type: none"> ➤ Module 65: Architecting to Scale – AWS ➤ Module 66: Business Continuity - AWS ➤ Module 67: Deployment and Operations Management - AWS 	<p>Architecting to Scale – AWS</p> <ul style="list-style-type: none"> • Concepts • Auto-Scaling • Kinesis • DynamoDB Scaling • Simple Workflow Service <p>Business Continuity - AWS</p> <ul style="list-style-type: none"> • Introduction • Concepts • AWS Continuum of HA • Storage HA Options • Compute HA Options • Database HA Options • Network HA Options <p>Deployment and Operations Management - AWS</p> <ul style="list-style-type: none"> • Introduction • Types of Deployments • Continuous Integration and Deployment • Elastic Beanstalk • CloudFormation 	

		<ul style="list-style-type: none"> • Elastic Container Service • API Gateway • Management Tools 	
Week 24	➤ Module 68: Huawei Cloud Computing Solutions (Fusion Sphere)	Huawei Cloud Computing Solutions <ul style="list-style-type: none"> • Fusion Sphere- Overview • Fusion Compute Product Introduction • Fusion Compute Compute/Storage/Network virtualization • Fusion compute VM Provisioning and Management • Fusion Compute Maintenance and troubleshooting 	
Week 25	➤ Module 69: Huawei Cloud Computing Solutions (Fusion Access)	Huawei Cloud Computing Solutions <ul style="list-style-type: none"> • Fusion Access – Overview • Fusion Access Component Introduction • Fusion Access Service Provisioning • Fusion Access O&M and Management • Fusion Access troubleshooting 	
Week 26	Entrepreneurship and Final Assessment in project	<ul style="list-style-type: none"> • Introduction • Fundamentals of Business Development • Entrepreneurship • Startup Funding • Business Incubation and Acceleration • Business Value Statement • Business Model Canvas • Sales and Marketing Strategies • How to Reach Customers and Engage CxOs 	

		<ul style="list-style-type: none"> • Stakeholders Power Grid • RACI Model, SWOT Analysis, PEST Analysis • SMART Objectives • OKRs • Cost Management (OPEX, CAPEX, ROCE etc.) 	
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List of Machinery / Equipment

Sr. No	Name of item as per curriculum	Quantity physically available at the training location
1	Computers Minimum Corei5 <ul style="list-style-type: none"> • LCD Display 17" with built in speakers 	25
2	DSL Internet Connection (Minimum 1 MB)	Available on every PC
3	Accessories/Devices <ul style="list-style-type: none"> • Connectors • Multimedia • Printer (NW printer) • Audio/visual aid • White Board • Pin Board • Flip Chart Board 	25 each
4	Wires, data cables, power plugs, power supply	For every PC
5	UPS	Available
6	Generator / Solar Backup	Available

7	Air Conditioner (2 Tons)	Available
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1. Software List

Sr. No	Software Name
1.	MS Office 2016 (Installed on each PC)
2.	Operating System (Windows, Linux or other Operating Systems)
3.	vSphere
4.	ESXi , vCenter
5.	Emulated Virtual Environment Next Generation (EVE-NG)
6.	VM Workstation
7.	AD Connect for Hybrid connect
8.	Fusion Sphere
9.	Fusion Access

2. Minimum Qualification of Teachers / Instructor

The qualification of teachers / instructor of this course should be minimum of **bachelors in Engineering / Computer science with minimum 5 years of instructional experience** in relevant trade.

3. Supportive Notes

Teaching Learning Material

Books Name	Author
Mastering VMware vSphere 6.7: Effectively deploy, manage, and monitor your virtual datacenter with VMware vSphere	Martin Gavanda
AZ-900 Microsoft Azure Fundamentals	Tim Warner

Hands-On Cloud Administration in Azure	Mustafa Toroman
AWS Certified Solution Architect Associate	Elias Khnaser