



# Model Curriculum

**QF Name: Cloud Infrastructure Analyst**

**QF Code: SSC/Q8304**

**QF Version: 2.0**

**NSQF Level: 6**

**Model Curriculum Version: 2.0**

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## Training Parameters

<b>Sector</b>	<b>IT-ITeS</b>
<b>Sub-Sector</b>	<b>Future Skills</b>
<b>Occupation</b>	<b>Cloud Computing</b>
<b>Country</b>	<b>India</b>
<b>NSQF Level</b>	<b>6</b>
<b>Aligned to NCO/ISCO/ISIC Code</b>	<b>NCO-2015/ 3513.0301</b>
<b>Minimum Educational Qualification and Experience</b>	<p>Post-Graduate/M.Tech (Engineering/ Technology/ Computer Science).</p> <p>OR</p> <p>Graduate (Engineering/ Technology/ Statistics/ Mathematics/Computer Science/ Physical Sciences) with 1 Year of relevant full-time work experience in Cloud Computing. The full-time experience would include work, internship and apprenticeship undertaken post completion of regular graduation.</p> <p>OR</p> <p>Diploma (Engineering/ Technology/ Statistics/ Mathematics/Computer Science/ Physical Sciences) with 3 year of relevant full-time work experience in Cloud Computing. The full-time experience would include work, internship and apprenticeship undertaken post completion of diploma.</p> <p>OR</p> <p>Candidates trained in QFs of lower NSQF levels (for eg. level 5 Cloud Administrator) in Cloud Computing shall also be considered eligible</p> <p>OR</p> <p>Candidates trained in QFs of lower NSQF levels (for eg. level 5, Associate blockchain architect) in other technologies shall also be considered eligible with additional 1 year of relevant full-time work or learning experience in Cloud Computing</p> <p><b>AND</b></p> <p>Knowledge of one of the tools Development Language and SDKs, Integrated Development Environment, Continuous Integration/Delivery tools, Configuration Management Tools, Container Management &amp; Orchestration tools, Network Monitoring Software, Program Testing Software, Backup or Recovery Software (as further mentioned above in detail,</p>

	under Section 14: Indicative list of training tools required to deliver the qualification).
Pre-Requisite License or Training	NA
Minimum Job Entry Age	21 years
Last Reviewed On	30 December, 2021
Next Review Date	30 December, 2024
NSQC Approval Date	30 December 2021
QF Version	2.0
Model Curriculum Creation Date	30 December 2021
Model Curriculum Valid Up to Date	30 December , 2024
Model Curriculum Version	1.0
Minimum Duration of the Course	550 hours
Maximum Duration of the Course	550 hours

## Program Overview

This section summarizes the end objectives of the program along with its duration.

### Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills.

#### Compulsory:

- Describe cloud computing and its basic concepts.
- Use development tools, frameworks, platforms, libraries and for programming on the cloud.
- Discuss the fundamentals of enterprise architecture.
- Provision cloud infrastructure as per the solution architecture and ensure that it is secure and scalable by using appropriate technologies such as containers, load-balancing solutions, auto-scaling services etc.
- Maintain and upgrade compute, network and storage systems and ensure that the deployed systems are backed up with an appropriate recovery plan.
- Secure and automate the overall cloud management process by using scripts, containers, and configuration management tools.

- Plan and securely migrate application and data to cloud platforms by following standard operating procedure and using appropriate migration tools.
- Design and integrate IT systems with cloud platforms by defining the process flow and using secure APIs.
- Apply different approaches to build and maintain client satisfaction.
- Apply the principles of persuasive communication for negotiations and discussions.
- Apply different approaches to build rapport and collaborate with stakeholders.
- Apply different approaches to maintain a good work ethic and demonstrate professional conduct.
- Identify best practices to maintain an inclusive, and environmentally sustainable workplace.

## Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QF.

NOS and Module Details	Theory Duration (In Hours)	Practical/OJT Duration (In Hours)	Total Duration (In Hours)
<i>Module 1 (Bridge Module): Basics of cloud computing and regulatory standards</i>	10:00	04:00	14:00
<i>Module 2 (Bridge Module): Development Tools and Usage</i>	04:00	08:00	12:00
<i>Module 3 (Bridge Module): Basics of Architecture</i>	03:00	01:00	04:00
<b>SSC/N8313 – Provision, configure, test, and deploy cloud infrastructure NOS Version No. 2 NSQF Level 6</b>	<b>35:00</b>	<b>70:00</b>	<b>105:00</b>
Module 4: Build Cloud Infrastructure	35:00	70:00	105:00
<b>SSC/N8314 – Maintain compute, network, and storage systems deployed on the cloud and ensure backup and recovery NOS Version No. 2 NSQF Level 6</b>	<b>25:00</b>	<b>50:00</b>	<b>75:00</b>
Module 5: Manage and Maintain Cloud Systems	25:00	50:00	75:00
<b>SSC/N8315 – Automate cloud infrastructure management NOS Version No. 2 NSQF Level 6</b>	<b>25:00</b>	<b>50:00</b>	<b>75:00</b>
Module 6: Infrastructure Automation	25:00	50:00	75:00
<b>SSC/N8316 – Migrate legacy/on-premises/cloud applications and data to new cloud platforms</b>	<b>33:00</b>	<b>70:00</b>	<b>103:00</b>

<b>NOS Version No. 2 NSQF Level 6</b>			
Module 7: Cloud Migration	33:00	70:00	103:00
<b>SSC/N8317 – Integrate cloud infrastructure with existing IT systems NOS Version No. 2 NSQF Level 6</b>	<b>33:00</b>	<b>69:00</b>	<b>102:00</b>
Module 8: Cloud Systems Integration	33:00	69:00	102:00
<b>SSC/N9007 – Build and maintain client satisfaction NOS Version No. 3 NSQF Level 6</b>	<b>04:00</b>	<b>08:00</b>	<b>12:00</b>
Module 9: Client relationship management	04:00	08:00	12:00
<b>SSC/N9010 – Convince others to take appropriate action in different situations NOS Version No. 2 NSQF Level 6</b>	<b>04:00</b>	<b>08:00</b>	<b>12:00</b>
Module 10: Persuasive Communication	04:00	08:00	12:00
<b>SSC/N9012 - Manage and collaborate with stakeholders for project success NOS Version No. 2 NSQF Level 6</b>	<b>04:00</b>	<b>08:00</b>	<b>12:00</b>
Module 11: Stakeholder Management	04:00	08:00	12:00
<b>SSC/N9013 – Inculcate strong work ethic in line with organizational code of conduct NOS Version No. 2 NSQF Level 5</b>	<b>04:00</b>	<b>08:00</b>	<b>12:00</b>
Module 12: Work Ethic and Code of Conduct	04:00	08:00	12:00
<b>SSC/N9014 – Maintain an inclusive, environmentally sustainable workplace NOS Version No. 1 NSQF Level 5</b>	<b>04:00</b>	<b>08:00</b>	<b>12:00</b>
Module 13: Inclusive and environmentally sustainable workplaces	04:00	08:00	12:00
<b>Total Duration</b>	<b>188:00</b>	<b>362:00</b>	<b>550:00</b>

# Module Details

## Module 1: Basics of cloud computing and regulatory standards

### Bridge Module

#### Terminal Outcomes:

- Explain cloud computing and its basic concepts.
- Describe the use cases of cloud computing.
- Describe the regulations, standards and compliance mechanisms associated with cloud computing.

Duration (in Hours): 10:00	Duration (in Hours): 04:00
Theory – Key Learning Outcomes	Practical/OJT – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Explain the term “cloud computing” and provide an overview of its essential characteristics.</li> <li>• Discuss the evolution of cloud computing and the significance of cloud computing in the IT landscape.</li> <li>• Examine the key business drivers for the adoption of cloud technologies.</li> <li>• List the use cases and applications of cloud technologies across various industry verticals.</li> <li>• Explain the types of cloud deployment models (such as private cloud, public cloud, hybrid cloud, multi-cloud, etc.).</li> <li>• Explain the types of cloud service models (such as SaaS, PaaS, IaaS, etc.).</li> <li>• Explain basic concepts of cloud computing such as virtualization, scalability, data separation, cloud security controls, etc.</li> <li>• Outline popular cloud computing tools/platforms.</li> <li>• Study the regulations, standards, and laws governing cloud computing environment in an organization.</li> <li>• Outline the general principles and basic concepts of data management standards across the globe.</li> <li>• Evaluate various compliance mechanisms associated with cloud computing.</li> </ul>	<ul style="list-style-type: none"> <li>• Create a cloud account to work hands-on with various cloud services.</li> <li>• Demonstrate the differences among various cloud deployment models as well as cloud service models using appropriate platforms.</li> </ul>
<b>Classroom Aids:</b>	
<ul style="list-style-type: none"> <li>• Whiteboard and Markers</li> </ul>	

- LCD Projector and Laptop for presentations

### **Tools, Equipment and Other Requirements**

Labs equipped with the following:

- PCs/Laptops
- Chart paper and sketch pens
- Internet with Wi-Fi (Min 2 Mbps dedicated)

Tools and Programming Languages:

- Cloud computing platforms such as Microsoft Azure, Amazon (AWS, Virtual private cloud, etc.), Rackspace, IBM (Public cloud, Bluemix, Relay, etc.)



## Module 2: Development Tools and Usage

### Bridge Module

#### Terminal Outcomes:

- Outline all the important tools and platforms required to perform programming in cloud environment.
- Use development tools, frameworks, platforms, libraries, and packages for programming on the cloud.

<b>Duration (in Hours): 04:00</b>	<b>Duration (in Hours): 08:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Evaluate the programming concepts applicable to cloud computing.</li> <li>• Discuss popular tools/platforms used for programming in cloud environment.</li> <li>• Describe the procedure to assess software development needs and changes.</li> <li>• Discuss coding principles and best practices.</li> </ul>	<ul style="list-style-type: none"> <li>• Use appropriate tools for building, debugging, testing, tuning, and maintaining programs.</li> <li>• Use scripting languages to automate tasks and write simple programs in cloud environment.</li> <li>• Use various cloud computing platforms and services.</li> <li>• Configure operating system components.</li> </ul>
<b>Classroom Aids:</b>	
<ul style="list-style-type: none"> <li>• Whiteboard and Markers</li> <li>• LCD Projector and Laptop for presentations</li> </ul>	
<b>Tools, Equipment and Other Requirements</b>	
Labs equipped with the following:	
<ul style="list-style-type: none"> <li>• PCs/Laptops</li> <li>• Chart paper and sketch pens</li> <li>• Internet with Wi-Fi (Min 2 Mbps dedicated)</li> </ul>	
Tools and Programming Languages:	
<ul style="list-style-type: none"> <li>• Cloud computing platforms such as Microsoft Azure, Amazon (AWS, Virtual private cloud, etc.), Rackspace, IBM (Public cloud, Bluemix, Relay, etc.)</li> <li>• Programming languages such as Java, C#, Python, etc.</li> </ul>	

## Module 3: Basics of Architecture

### Bridge Module

#### Terminal Outcomes:

- Outline principles, methods, and approaches of enterprise architecture.
- Describe success factors for various enterprise architect approaches.

<b>Duration (in Hours): 03:00</b>	<b>Duration (in Hours): 01:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the principles, methods and popular frameworks related to enterprise architecture.</li> <li>• Identify critical success factors for common enterprise architect approaches.</li> <li>• Recognize the standards and regulations applicable to enterprise architecture.</li> <li>• Evaluate alternative systems architectures based on organizational strategy and enterprise requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Create and analyze enterprise architecture models using suitable tools.</li> <li>• Measure the KPIs defined for the sample architecture.</li> </ul>
<b>Classroom Aids:</b>	
<ul style="list-style-type: none"> <li>• Whiteboard and Markers</li> <li>• LCD Projector and Laptop for presentations</li> </ul>	
<b>Tools, Equipment and Other Requirements</b>	
Labs equipped with the following: <ul style="list-style-type: none"> <li>• PCs/Laptops</li> <li>• Chart paper and sketch pens</li> <li>• Internet with Wi-Fi (Min 2 Mbps dedicated)</li> </ul> Tools and Programming Languages: <ul style="list-style-type: none"> <li>• Enterprise architecture tools such as Orbus iServer, Bizdesign, Adoit, Hopex, etc.</li> <li>• Architecture design tools such as Cloudkraft, Gliffy, Microsoft Visio, SmartDraw, etc.</li> </ul>	

## Module 4: Build Cloud Infrastructure

Mapped to SSC/N8313 (Version No. 2)

### Terminal Outcomes:

- Explain how to provision cloud infrastructure as per the solution architecture.
- Ensure scalability and security of the solution by using appropriate technologies such as containers, load-balancing solutions, auto-scaling services, etc.
- Analyze and resolve issues and failures relating to network and provisioning of cloud infrastructure.

<b>Duration (in Hours): 35:00</b>	<b>Duration (in Hours): 70:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Study sample solution architectures and discuss how to interpret a solution architecture.</li> <li>• Explain the parameters used to define the capacity requirements for cloud implementation.</li> <li>• Discuss the principles and best practices to deploy and integrate Cloud computing services with the enterprise IT infrastructure.</li> <li>• Explain the concept of self-service infrastructure provisioning in Cloud computing.</li> <li>• Discuss popular cloud configuration tools and their features.</li> <li>• Explain the practice of Infrastructure as Code.</li> <li>• Describe containers and discuss popular container orchestration platforms.</li> <li>• Discuss how to scale cloud systems horizontally by using load balancing and multi-routing tools.</li> <li>• Describe interoperability and discuss various open standards available to facilitate interoperability.</li> <li>• Discuss security protocols and standards to be implemented to make the cloud infrastructure secure.</li> <li>• Explain how to manage network requirements for cloud implementation.</li> <li>• Discuss the importance of various stakeholders and standards/guidelines for implementing cloud architecture.</li> </ul>	<ul style="list-style-type: none"> <li>• Build a platform/environment to host and support various services, processes, and tools for cloud infrastructure as per solution architecture.</li> <li>• Demonstrate how to manage and provision a technology stack using scripts and configuration management tools.</li> <li>• Demonstrate how to configure systems using cloud configuration tools.</li> <li>• Demonstrate how to create containers using container orchestration platforms.</li> <li>• Demonstrate how to test if the desired infrastructure is deployed as expected</li> <li>• Demonstrate how to implement security features and other supporting tools/processes in sample cloud systems.</li> <li>• Demonstrate how to troubleshoot and resolve issues related to network infrastructure malfunctioning and provisioning of compute and storage systems.</li> </ul>
<b>Classroom Aids:</b>	

- Whiteboard and Markers
- LCD Projector and Laptop for presentations

### Tools, Equipment and Other Requirements

Labs equipped with the following:

- PCs/Laptops
- Chart paper and sketch pens
- Internet with Wi-Fi (Min 2 Mbps dedicated)

Tools and Programming Languages:

- Cloud computing platforms such as Microsoft Azure, Amazon (AWS, Virtual private cloud, etc.), Rackspace, IBM (Public cloud, Bluemix, Relay, etc.)
- CI/CD tools such as Jenkins, CircleCI, GtiLab etc.
- Configuration Management Tools such as Puppet, Chef, Ansible, etc.
- Infrastructure management tools such as Openstack, VmWare vCloud Suite, AWS Outpost, Azure Stack, Google Anthos etc.
- Programming languages such as Java, C#, Python, etc.

## Module 5: Manage and Maintain Cloud Systems

Mapped to SSC/N8314 (Version No. 1)

### Terminal Outcomes:

- Manage configurations, patches, upgrades, and refreshes in deployed cloud systems.
- Describe how to implement procedures for backup & recovery of systems.
- Describe how to implement DevSecOps principles in cloud systems and use automated solutions for their deployment and management.

Duration (in Hours): 25:00	Duration (in Hours): 50:00
Theory – Key Learning Outcomes	Practical/OJT – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Describe common configurations for compute, storage, and network systems for deployment on cloud.</li> <li>• Explain the procedure and best practices implement and maintain:               <ul style="list-style-type: none"> <li>– deployment configurations</li> <li>– patches, updates, upgrades, and refreshes</li> </ul> </li> <li>• Explain the methods to test new cloud deployments configurations for bugs and errors</li> <li>• Examine how network provisioning and maintenance is managed using network tools provided by cloud vendors.</li> <li>• Explain how to consult with cloud vendors while updating or refreshing network systems</li> <li>• Explain the frameworks to create a disaster recovery plan for IT systems, applications, and data</li> <li>• Discuss the procedure to recover affected systems and restore normal operations</li> <li>• Discuss popular cloud monitoring tools available to monitor issues related to operations and provisioning of cloud systems.</li> <li>• Explain the principles of DevSecOps.</li> <li>• Describe continuous integration and continuous delivery/deployment.</li> <li>• Discuss how to auto-scale cloud infrastructure using auto-scaling tools.</li> <li>• Discuss the importance of various stakeholders in deploying and maintaining cloud systems.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to configure sample cloud deployments as per requirements.</li> <li>• Assess sample deployment configurations for bugs and errors and provide resolution for stable and secure functioning.</li> <li>• Develop automated scripts for provisioning and deployment of sample cloud systems.</li> <li>• Demonstrate how to implement updates, upgrades, patches, and refreshes in sample cloud systems.</li> <li>• Perform network maintenance activities in sample cloud systems.</li> <li>• Demonstrate how to incorporate security protocols across deployed systems.</li> <li>• Create a disaster recovery and backup of sample systems deployed on cloud using appropriate tools.</li> <li>• Demonstrate the implementation of DevSecOps and (Continuous Integration/ Continuous Deployment) CI/CD cycle using suitable tools.</li> <li>• Use automated solutions to scale up and resolve issues relating operation and provisioning sample of cloud systems.</li> </ul>
<b>Classroom Aids:</b>	

- Whiteboard and Markers
- LCD Projector and Laptop for presentations

### Tools, Equipment and Other Requirements

Labs equipped with the following:

- PCs/Laptops
- Chart paper and sketch pens
- Internet with Wi-Fi (Min 2 Mbps dedicated)

Tools and Programming Languages:

- Cloud computing platforms such as Microsoft Azure, Amazon (AWS, Virtual private cloud, etc.), Rackspace, IBM (Public cloud, Bluemix, Relay, etc.)
- CI/CD tools such as Jenkins, CircleCI, GtiLab etc.
- Configuration Management Tools such as Puppet, Chef, Ansible, etc.
- Infrastructure management tools such as Openstack, VmWare vCloud Suite, AWS Outpost, Azure Stack, Google Anthos etc.
- Backup/ recovery tools such as AWS Backup, AWS Snow Family, AWS Cloud Endure Disaster Recovery, Azure Backup, Oracle Data Guard, etc.
- Programming languages such as Java, C#, Python, etc.

## Module 6: Infrastructure Automation

Mapped to SSC/N8315 (Version No. 2)

### Terminal Outcomes:

- Explain automation and orchestration processes
- Use suitable automation tools for managing cloud infrastructure.

Duration (in Hours): 25:00	Duration (in Hours): 50:00
Theory – Key Learning Outcomes	Practical/OJT – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Describe the practice of Infrastructure as Code (IAC).</li> <li>• Discuss how to standardize operating procedures for deploying systems on the cloud.</li> <li>• Describe cloud automation and cloud orchestration.</li> <li>• Describe the ways to automate the systems provisioning and release process using configuration management tools and scripts</li> <li>• Describe how to orchestrate automated processes involved in the process of cloud release and provisioning</li> <li>• Explain how to create and configure container using container orchestration tools</li> <li>• Discuss common security protocols to be incorporated in automated processes.</li> <li>• Discuss the importance of various stakeholders and best practices/guidelines in process automation.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to integrate automated tools with existing systems deployed on cloud.</li> <li>• Demonstrate the use of automated tools for: <ul style="list-style-type: none"> <li>– infrastructure configuration</li> <li>– systems deployment and management</li> <li>– container creation</li> </ul> </li> <li>• Use load balancing tools to scale up sample cloud systems.</li> <li>• Use container orchestration tools to automate container deployment.</li> <li>• Demonstrate how to implement security features in sample automation processes.</li> </ul>
Classroom Aids:	
<ul style="list-style-type: none"> <li>• Whiteboard and Markers</li> <li>• LCD Projector and Laptop for presentations</li> </ul>	
Tools, Equipment and Other Requirements	
<p>Labs equipped with the following:</p> <ul style="list-style-type: none"> <li>• PCs/Laptops</li> <li>• Chart paper and sketch pens</li> <li>• Internet with Wi-Fi (Min 2 Mbps dedicated)</li> </ul> <p>Tools and Programming Languages:</p> <ul style="list-style-type: none"> <li>• Cloud computing platforms such as Microsoft Azure, Amazon (AWS, Virtual private cloud, etc.), Rackspace, IBM (Public cloud, Bluemix, Relay, etc.)</li> <li>• CI/CD tools such as Jenkins, CircleCI, GtiLab etc.</li> <li>• Configuration Management Tools such as Puppet, Chef, Ansible, etc.</li> <li>• Infrastructure management tools such as Openstack, VmWare vCloud Suite, AWS Outpost, Azure Stack, Google Anthos etc.</li> <li>• Programming languages such as Java, C#, Python, etc.</li> </ul>	

## Module 7: Cloud Migration

*Mapped to SSC/N8316 (Version No. 2)*

### Terminal Outcomes:

- Develop migration plan, Standard Operating Procedures (SOPs), and rollback plan for cloud migration.
- Drive infrastructure migration to cloud by implementing desired changes and configurations in various cloud infrastructure components.

Duration (in Hours): 33:00	Duration (in Hours): 70:00
Theory – Key Learning Outcomes	Practical/OJT – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Describe migration plan and its key components.</li> <li>• Examine sample application source code and components to determine remediations and changes required before migrating the application to cloud.</li> <li>• Explain how to define migration bundles and their migration sequence.</li> <li>• Describe fallback/ rollback plan and its key components.</li> <li>• Discuss the procedure and best practices to configure and provision storage, compute, and network systems on the cloud for migration.</li> <li>• Explain migration traffic and the guidelines manage it.</li> <li>• Discuss popular for migration to cloud.</li> <li>• Study key components in an operations runbook that defines the standards operating procedures for migrating workloads to cloud.</li> <li>• Describe the ways to verify the integrity of database and other storage information migrated to cloud.</li> <li>• Explain how to define business rules to validate successful migrations.</li> <li>• Explain how to identify regulatory and compliance standards applicable to the migrated workload.</li> <li>• Discuss ways to ensure the security of workload before, during and after migration.</li> <li>• Discuss the importance of various stakeholders in migrating infrastructure to cloud.</li> </ul>	<ul style="list-style-type: none"> <li>• Apply suitable changes to application source code and components for migrating sample application to cloud.</li> <li>• Analyse and implement required features of the business needs such as provisioning of storage disks, virtual storage devices, and computing systems on the cloud.</li> <li>• Create a migration plan for sample cloud systems.</li> <li>• Demonstrate how to configure servers, storage and network for migration to cloud platforms using appropriate tools.</li> <li>• Demonstrate how to migrate server, storage, and databases to new cloud environments.</li> <li>• Develop SOPs and fallback/rollback for sample cloud migration process for smooth transition.</li> </ul>
<b>Classroom Aids:</b>	



- Whiteboard and Markers
- LCD Projector and Laptop for presentations

### Tools, Equipment and Other Requirements

Labs equipped with the following:

- PCs/Laptops
- Chart paper and sketch pens
- Internet with Wi-Fi (Min 2 Mbps dedicated)

Tools and Programming Languages:

- Cloud computing platforms such as Microsoft Azure, Amazon (AWS, Virtual private cloud, etc.), Rackspace, IBM (Public cloud, Bluemix, Relay, etc.)
- CI/CD tools such as Jenkins, CircleCI, GtiLab etc.
- Configuration Management Tools such as Puppet, Chef, Ansible, etc.
- Infrastructure management tools such as Openstack, VmWare vCloud Suite, AWS Outpost, Azure Stack, Google Anthos etc.
- Migration tools such as AWS Migration Hub, AWS Database Migration Service, Azure Migrate, Azure Database Migration Service, Centerprise Data Integrator, IBM InfoSphere, Google Migrate for Compute Engine, etc.
- Backup/ recovery tools such as AWS Backup, AWS Snow Family, AWS Cloud Endure Disaster Recovery, Azure Backup, Oracle Data Guard, etc.
- Programming languages such as Java, C#, Python, etc.

## Module 8: Cloud Systems Integration

Mapped to SSC/N8317 (Version No. 2)

### Terminal Outcomes:

- Define integration activities and map process flows.
- Integrate various components of IT and cloud systems such as data, APIs, and applications.
- Carry out unit testing and system testing for successful integration.

<b>Duration (in Hours): 33:00</b>	<b>Duration (in Hours): 69:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the ways to capture the systems integration requirements.</li> <li>• Discuss various methods usually employed to gather user requirements from relevant stakeholder.</li> <li>• Discuss how to capture users, roles, and permissions to the deployed systems</li> <li>• Explain Business Requirement Document (BRD) and its key components.</li> <li>• Explain how to map the flow of data between different systems and sub-systems.</li> <li>• Describe the ways to integrate data between systems, while maintaining the integrity of the data.</li> <li>• Explain upstream and downstream application integration points and discuss how to map them.</li> <li>• Discuss popular off-the-shelf APIs available for integrating sub-systems.</li> <li>• Explain how to build secure APIs to integrate systems and sub-systems.</li> <li>• Describe various unit tests to verify successful integration</li> <li>• Explain how to create test cases to verify desired systems performance</li> <li>• Discuss the importance of various stakeholders and best practices/guidelines in systems integration.</li> </ul>	<ul style="list-style-type: none"> <li>• Create a BRD for sample cloud systems and capture the integration requirements.</li> <li>• Create a plan to integrate legacy/on-premises systems to cloud systems.</li> <li>• Demonstrate data migration in sample systems using suitable tools.</li> <li>• Demonstrate the use of APIs in systems integration.</li> <li>• Develop test cases for unit, systems and security testing of sample systems and run them.</li> <li>• Automate testing using suitable tools.</li> </ul>
<b>Classroom Aids:</b>	
<ul style="list-style-type: none"> <li>• Whiteboard and Markers</li> <li>• LCD Projector and Laptop for presentations</li> </ul>	
<b>Tools, Equipment and Other Requirements</b>	

Labs equipped with the following:

- PCs/Laptops
- Chart paper and sketch pens
- Internet with Wi-Fi (Min 2 Mbps dedicated)

Tools and Programming Languages:

- Cloud computing platforms such as Microsoft Azure, Amazon (AWS, Virtual private cloud, etc.), Rackspace, IBM (Public cloud, Bluemix, Relay, etc.)
- Programming languages such as Java, C#, Python, etc.
- Documentation tools such as MS Word and MS PowerPoint

## Module 9: Client relationship management

Mapped to SSC/N9007 (Version No. 3)

### Terminal Outcomes:

- Define requirements stated by the client.
- Describe the techniques to manage client priorities and expectations.

<b>Duration (in Hours): 04:00</b>	<b>Duration (in Hours): 08:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Discuss the ways to handle client requirements and their priorities.</li> <li>• Discuss the importance of timely communications and responses with client.</li> <li>• Explain importance of client deliverables management.</li> <li>• Discuss the importance of continuously incorporating client feedback.</li> <li>• Illustrate the techniques to work on the client feedback.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate methods to gather client requirements.</li> <li>• Apply different approaches to manage client expectations, including priorities and performance expectations.</li> <li>• Demonstrate the effective communication and good working relationships with clients.</li> </ul>
<b>Classroom Aids:</b>	
<ul style="list-style-type: none"> <li>• Whiteboard and Markers</li> <li>• Chart paper and sketch pens</li> <li>• LCD Projector and Laptop for presentations</li> </ul>	
<b>Tools, Equipment and Other Requirements :</b>	
<p>Labs equipped with the following:</p> <p>PCs/Laptops            Internet with Wi-Fi (Min 2 Mbps Dedicated)</p> <p>Tools and Programming Languages:</p> <ul style="list-style-type: none"> <li>• CRM Software such as Oracle CRM, SAP CRM, Zoho CRM, etc.</li> </ul>	

## Module 10: Persuasive Communication

Mapped to SSC/N9010 (Version No. 2)

### Terminal Outcomes:

- Evaluate the principles of persuasive communication, credibility and trust
- Discuss methods to persuade groups of people to build consensus

<b>Duration (in Hours): 04:00</b>	<b>Duration (in Hours): 08:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Discuss the principles of persuasive communication, credibility, and trust</li> <li>• Discuss the differences between persuasion and manipulation</li> <li>• Discuss the importance of listening to people in order to persuade them</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the use of evidence to support arguments</li> <li>• Frame goals by finding common ground with those to be persuaded</li> <li>• Apply visual and verbal communication techniques to influence perspectives and change behaviours</li> </ul>
<b>Classroom Aids:</b>	
<ul style="list-style-type: none"> <li>• Whiteboard and Markers</li> <li>• Chart paper and sketch pens</li> <li>• LCD Projector and Laptop for presentations</li> </ul>	
<b>Tools, Equipment and Other Requirements :</b>	
Labs equipped with the following: <ul style="list-style-type: none"> <li>• PCs/Laptops</li> <li>• Internet with Wi-Fi (Min 2 Mbps Dedicated)</li> </ul>	

## Module 11: Stakeholder Management

Mapped to SSC/N9012 (Version No. 2)

### Terminal Outcomes:

- Apply different approaches to build rapport and collaborate with stakeholders.

<b>Duration (in Hours): 04:00</b>	<b>Duration (in Hours): 08:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Describe the principles of stakeholder relationship management.</li> <li>• Explain ways to collaborate with various stakeholders and manage a wide range of situations.</li> <li>• Explain ways to improve one-on-one communication and build rapport with various stakeholders.</li> <li>• Explain conflict resolution techniques.</li> <li>• Describe the fundamentals of negotiations such as negotiating positions, BATNA (Best Alternative to a Negotiated Agreement) and integrative and distributive negotiations.</li> </ul>	<ul style="list-style-type: none"> <li>• Apply the principles of stakeholder relationship management to collaborate with various stakeholders.</li> <li>• Demonstrate the ways to understand stakeholder needs and manage expectations effectively.</li> <li>• Apply effective persuasion and negotiation techniques to deal with challenging behaviours.</li> <li>• Apply strategies to gain stakeholder cooperation and support for project success.</li> <li>• Apply conflict resolution techniques to handle difficult situations.</li> </ul>
<b>Classroom Aids:</b>	
<ul style="list-style-type: none"> <li>• Whiteboard and markers</li> <li>• Chart paper and sketch pens</li> <li>• LCD Projector and Laptop for presentations</li> </ul>	
<b>Tools, Equipment and Other Requirements</b>	
Labs equipped with the following: <ul style="list-style-type: none"> <li>• PCs/Laptops</li> <li>• Internet with Wi-Fi (Min 2 Mbps Dedicated)</li> </ul>	

## Module 12: Work Ethic and Code of Conduct

*Mapped to SSC/N9013 (Version no.2)*

### Terminal Outcomes:

- Apply different approaches to maintain work ethic and demonstrate professional conduct

<b>Duration (in Hours): 04:00</b>	<b>Duration (in Hours): 08:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical/OJT – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Discuss the importance of organizational codes of conduct.</li> <li>• Describe the guidelines commonly observed by organizations pertaining to dressing, hygiene, cleanliness, data, Intellectual Property, use of company resources, etc.</li> <li>• Explain employee rights and obligations with respect to harassment, privacy, and technology policies.</li> <li>• Explain the meaning of work ethics and professionalism.</li> <li>• Discuss the significance and impact of maintaining work ethics.</li> <li>• Explain how to handle unethical conduct at the workplace.</li> <li>• Describe whistleblowing policies relevant to the workplace.</li> </ul>	<ul style="list-style-type: none"> <li>• Apply the approaches of moral decision making at the workplace.</li> <li>• Demonstrate the ways to maintain professional conduct and work etiquette.</li> <li>• Demonstrate how to handle unethical conduct at the workplace.</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard and Markers	
Chart paper and sketch pens	
LCD Projector and Laptop for presentations	
<b>Tools, Equipment and Other Requirements</b>	
Labs equipped with the following:	
Internet with Wi-Fi (Min 2 Mbps Dedicated)	

## Module 13: Inclusive and environmentally sustainable workplaces

*Mapped to SSC/N9014 (Version No.1)*

### Terminal Outcomes:

- Illustrate sustainable practices at workplace for energy efficiency and waste management.
- Apply different approaches to maintain gender equality and increase inclusiveness for PwD.

Duration (in Hours): 04:00	Duration (in Hours): 08:00
Theory – Key Learning Outcomes	Practical/OJT – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Describe different approaches for efficient energy resource utilisation and waste management.</li> <li>• Describe the importance of following the diversity policies.</li> <li>• Identify stereotypes and prejudices associated with people with disabilities and the negative consequences of prejudice and stereotypes.</li> <li>• Discuss the importance of promoting, sharing, and implementing gender equality and PwD sensitivity guidelines at organization level.</li> </ul>	<ul style="list-style-type: none"> <li>• Practice the segregation of recyclable, non-recyclable and hazardous waste generated.</li> <li>• Demonstrate different methods of energy resource use optimization and conservation.</li> <li>• Demonstrate essential communication methods in line with gender inclusiveness and PwD sensitivity.</li> </ul>
<b>Classroom Aids:</b>	
Whiteboard and Markers	
Chart paper and sketch pens	
LCD Projector and Laptop for presentations	
<b>Tools, Equipment and Other Requirements</b>	
Labs equipped with the following:	
PCs/Laptops	
Internet with Wi-Fi (Min 2 Mbps Dedicated)	



# Annexure

## Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
Graduate	Science/Computer Science/Electronics and Engineering /Information Technology	5 years of full-time experience in cloud infrastructure analyst or related roles	The full-time experience would include work, internship and apprenticeship undertaken post completion of regular graduation	1 year of full-time experience in cloud infrastructure analyst or related roles		

Trainer Certification	
Domain Certification	Platform Certification
Certified for Job Role: “Cloud Infrastructure Analyst” mapped to QF: “SSC/Q8304, V2.0”. Minimum accepted score is 80%	Recommended that the trainer is certified for the Job role “Trainer” mapped to the Qualification file “MEP/Q2601, V1.0”. Minimum accepted score is 80% aggregate

## Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
Graduate	Science/Computer Science/Electronics and Engineering /Information Technology	5 years of full-time experience in cloud infrastructure analyst or related roles	The full-time experience would include work, internship and apprenticeship undertaken post completion of regular graduation	1 year of full-time experience in cloud infrastructure analyst or related roles		

Assessor Certification	
Domain Certification	Platform Certification
Certified for Job Role: “Cloud Infrastructure Analyst” mapped to QF: “SSC/Q8304, V2.0”. Minimum accepted score is 80%	Recommended that the assessor is certified for the Job role “Assessor” mapped to the Qualification file “MEP/Q2701, V1.0”. Minimum accepted score is 80% aggregate

## Assessment Strategy

This section includes the processes involved in identifying, gathering and interpreting information to evaluate the learner on the required competencies of the program.

### Assessment System Overview

A uniform assessment of job candidates as per industry standards facilitates progress of the industry by filtering employable individuals while simultaneously providing candidates with an analysis of personal strengths and weaknesses.

### Assessment Criteria

Criteria for assessment for each Qualification file will be created by the Sector Skill Council (SSC). Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical/OJT for each PC.

The assessment for the theory part will be based on a knowledge bank of questions created by the SSC. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

Guidelines for Assessment			
Testing Environment	Tasks and Functions	Productivity	Teamwork
<ul style="list-style-type: none"> <li>Carry out assessments under realistic work pressures that are found in the normal industry workplace (or simulated workplace).</li> <li>Ensure that the range of materials, equipment and tools that learners use are current and of the type routinely found in the normal industry workplace (or simulated workplace) environments.</li> </ul>	<ul style="list-style-type: none"> <li>Assess that all tasks and functions are completed in a way, and to a timescale, that is acceptable in the normal industry workplace.</li> <li>Assign workplace (or simulated workplace) responsibilities that enable learners to meet the requirements of the NOS.</li> </ul>	<ul style="list-style-type: none"> <li>Productivity levels must be checked to ensure that it reflects those that are found in the work situation being replicated.</li> </ul>	<ul style="list-style-type: none"> <li>Provide situations that allow learners to interact with the range of personnel and contractors found in the normal industry workplace (or simulated workplace).</li> </ul>

### Assessment Quality Assurance framework

NASSCOM provides two assessment frameworks NAC and NAC-Tech.

## **NAC (NASSCOM Assessment of Competence)**

NAC follows a test matrix to assess Speaking & Listening, Analytical, Quantitative, Writing, and Keyboard skills of candidates appearing for assessment.

### **NAC-Tech**

NAC-Tech test matrix includes assessment of Communication, Reading, Analytical, Logical Reasoning, Work Management, Computer Fundamentals, Operating Systems, RDBMS, SDLC, Algorithms & Programming Fundamentals, and System Architecture skills.

### **Methods of Validation**

To pass a QF, a trainee should score an average of 70% across generic NOS' and a minimum of 70% for each technical NOS. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification file.

### **Method of assessment documentation and access**

The assessment agency will upload the result of assessment in the portal. The data will not be accessible for change by the assessment agency after the upload. The assessment data will be validated by SSC assessment team. After upload, only SSC can access this data.

## Recommended Supplemental Readings

The learning modules covered in the Model Curriculum for Cloud Infrastructure Analyst are designed to meet the expected outcomes as per the QF. While the modules aligned to NOS are focused on technical/ behavioral competencies, bridge modules cover the prerequisite/ preparatory topics that are indispensable to complete the course. However, to provide additional QF specific knowledge to the learners, the following supplemental readings on related topics are recommended. These readings will equip the learners with an understanding of advanced or ancillary concepts to take up more complex tasks as listed in the QF.

QF	Recommended Supplemental Reading
<b>SSC/Q8304: Cloud Infrastructure Analyst</b>	<ol style="list-style-type: none"> <li>1. Virtual Infrastructure</li> <li>2. Operation system Virtualization</li> <li>3. Hardware Virtualization</li> <li>4. Server Virtualization</li> <li>5. Storage virtualization</li> <li>6. Transition to Omni-cloud</li> <li>7. Optimization loops</li> <li>8. Edge Computing Deployments</li> </ol>

## References

## Glossary

Term	Description
<b>Key Learning Outcome</b>	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical/OJT application).
<b>Training Outcome</b>	Training outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of the training</b> .
<b>Terminal Outcome</b>	Terminal outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of a module</b> . A set of terminal outcomes help to achieve the training outcome.
<b>National Occupational Standard</b>	National Occupational Standard specify the standard of performance an individual must achieve when carrying out a function in the workplace
<b>Persons with Disability</b>	Persons with Disability are those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.

## Acronyms and Abbreviations

Term	Description
QF	Qualification file
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
SSC	Skill Sectors Councils
NASSCOM	National Association of Software & Service Companies
NCO	National Classification of Occupations
ISO	International Organization for Standardization
SLA	Service Level Agreement
IT	Information Technology
RDBMS	Relational Database Management System
SDLC	Software Development Life Cycle
CRM	Customer Relationship Management
PC	Performance Criteria
PwD	Persons with Disability
SOP	Standard Operating Procedure
KPI	Key Performance Indicator
IAC	Infrastructure as Code
CI/CD	Continuous Integration/Continuous Deployment