# Model Curriculum

**QP Name: Software Developer Associate**

**QP Code: SSC/Q0511**

**QP Version: 1.0**

**NSQF Level: 3**

**Model Curriculum Version: 1.0**

IT-ITeS Sector Skills Council NASSCOM | Plot No – 7,8,9 & 10, Sector 126, Noida, UP.
Pin code: 201303

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# Training Parameters

| | |
|---|---|
| **Sector** | IT-ITeS |
| **Sub-Sector** | IT Services |
| **Occupation** | Application Development |
| **Country** | India |
| **NSQF Level** | 5 |
| **Aligned to NCO/ISCO/ISIC Code** | NCO-2015/ 2512.0204 |
| **Minimum Educational Qualification and Experience** | 12th grade pass<br>OR<br>10th Grade Pass with 2 years of relevant experience*<br>OR<br>NSQF Level 2 with 3-year relevant experience*<br><br>*Relevant Experience: Computer Operation |
| **Pre-Requisite License or Training** | NA |
| **Minimum Job Entry Age** | 15 Years |
| **Last Reviewed On** | 15-02-2023 |
| **Next Review Date** | 15-08-2023 |
| **NSQC Approval Date** | 15-02-2023 |
| **QP Version** | 1.0 |
| **Model Curriculum Creation Date** | 15-02-2023 |
| **Model Curriculum Valid Up to Date** | 15-08-2023 |
| **Model Curriculum Version** | 1.0 |
| **Minimum Duration of the Course** | 210 Hours |
| **Maximum Duration of the Course** | 210 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.

- Implement appropriate standards to assist in performing software construction as per specifications.
- Identify software development needs and changes.
- Design algorithms to solve problems and execute test cases to convert them into code.
- Evaluate the various software testing methodology and identify the correct one to deploy.
- Analyze software designs for already built products or services.
- Build data base skills including DBMS, data design for predevelopment process.
- Categorize between UML and Object-Oriented Design.
- Discuss about manual and automated testing of software components.
- Demonstrate application of suitable Unit Test Cases to validate the process of testing.
- Demonstrate effective communication and collaboration with colleagues.
- Apply measures to maintain standards of health and safety at the workplace.
- Use different approaches to effectively manage and share data and information.
- Develop strong relationships at the workplace through effective communication and conflict management.
- Identify best practices to maintain an inclusive, environmentally sustainable workplace.

## Compulsory Modules

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

| NOS and Module Details | Theory Duration (In Hours) | Practical Duration (In Hours) | On-the-Job Training Duration (Mandatory) | On-the-Job Training Duration (Recommended) | Total Duration (In Hours) |
|---|---|---|---|---|---|
| **SSC/N0502 Develop software code to specification. NOS Version No. 2 NSQF Level 3** | **54:00** | **96:00** | **00:00** | **00:00** | **150:00** |
| Module 1: Process of Software Development | 09:00 | 36:00 | 00:00 | 00:00 | 45:00 |
| Module 2: Process of Application Development | 20:00 | 30:00 | 00:00 | 00:00 | 50:00 |
| Module 3: Concept of Software Testing | 25:00 | 30:00 | 00:00 | 00:00 | 55:00 |
| **Employability Skills (60 Hours)** | **24:00** | **36:00** | **00:00** | **00:00** | **60:00** |
| Module 4: Introduction to Employability Skills | 00:30 | 01:00 | 00:00 | 00:00 | 01:30 |

| | | | | | |
|---|---|---|---|---|---|
| Module 5: Constitutional values - Citizenship | 00:30 | 01:00 | 00:00 | 00:00 | 01:30 |
| Module 6: Becoming a Professional in the 21st Century | 01:00 | 01:30 | 00:00 | 00:00 | 02:30 |
| Module 7: Basic English Skills | 04:00 | 06:00 | 00:00 | 00:00 | 10:00 |
| Module 8: Career Development & Goal Setting | 01:00 | 01:00 | 00:00 | 00:00 | 02:00 |
| Module 9: Communication Skills | 02:00 | 03:00 | 00:00 | 00:00 | 05:00 |
| Module 10: Diversity & Inclusion | 01:00 | 01:30 | 00:00 | 00:00 | 02:30 |
| Module 11: Financial and Legal Literacy | 02:00 | 03:00 | 00:00 | 00:00 | 05:00 |
| Module 12: Essential Digital Skills | 04:00 | 06:00 | 00:00 | 00:00 | 10:00 |
| Module 13: Entrepreneurship | 03:00 | 04:00 | 00:00 | 00:00 | 07:00 |
| Module 14: Customer Service | 02:00 | 03:00 | 00:00 | 00:00 | 05:00 |
| Module 15: Getting ready for apprenticeship & Jobs. | 03:00 | 05:00 | 00:00 | 00:00 | 08:00 |
| **Total Duration** | **78:00** | **132:00** | **00:00** | **00:00** | **210:00** |

# Module Details

## Module 1: Process of Software Development
*Mapped to SSC/N0502, v2.0*

**Training Outcomes:**

- Discuss best practices for documenting business processes and major functionalities of an application.
- Design testing strategies to identify and correct semantic errors in programs.

| **Duration**: *09:00(In Hours)* | **Duration**: *36:00(In Hours)* |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • List the phases of software development lifecycle.<br>• Discuss the differences between top down and bottom-up design approaches. | • Analyse users' needs to design, test, and develop software as per requirement<br>• Categorize each piece of an application or system and plan how the pieces will work together.<br>• Design testing strategies like unit, integration, regression, system, alpha, beta testing, etc. to identify and correct semantic errors in programs.<br>• Test a variety of models and diagrams that show customers, the software code needed for an application.<br>• Construct a roadmap for every aspect of an application or system as a reference for future maintenance and upgrades. |
| **Classroom Aids:** | |
| Whiteboard and Markers<br>Chart paper and sketch pens<br>LCD Projector and Laptop for presentations | |
| **Tools, Equipment and Other Requirements:** | |
| Labs equipped with the following:<br>PCs/Laptops<br>Internet with Wi-Fi (Min 2 Mbps Dedicated)<br>Microphone / voice system for lecture and class activities<br>Computer Lab with 1:1 PC: trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client, and chat tools | |

## Module 2: Process of Application Development
*Mapped to SSC/N0502, v2.0*

**Training Outcomes:**

- Categorize between UML and Object-Oriented Design.
- Evaluate the various software testing methodology used in application development.
- Examine various UML diagrams to determine process suitability.

| **Duration**: *20:00(In Hours)* | **Duration**: *30:00(In Hours)* |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| <ul><li>List software quality attributes and characteristics of a good SRS.</li><li>Discuss the primary differences between custom application development and rapid application development.</li></ul> | <ul><li>Categorize the process of top-down approach and bottom-up approach for developing an application.</li><li>Test Data Flow Diagrams (DFD), Structure Charts, HIPO, etc., for structured analysis.</li><li>Develop a decision table based on number of conditions that may affect the development process.</li><li>Categorize between UML and Object-Oriented Design.</li><li>Examine various UML diagrams i.e. Class, Object, Use Case Sequence, Collaboration, etc., to identify the suitability.</li><li>Construct a class diagram of an Order System of an application prior to development.</li></ul> |
| **Classroom Aids:** | |
| Whiteboard and Markers<br>Chart paper and sketch pens<br>LCD Projector and Laptop for presentations | |
| **Tools, Equipment and Other Requirements:** | |
| Labs equipped with the following:<br>PCs/Laptops<br>Internet with Wi-Fi (Min 2 Mbps Dedicated)<br>Microphone / voice system for lecture and class activities<br>Computer Lab with 1:1 PC: trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client, and chat tools | |

## Module 3: Concept of Software Testing
*Mapped to SSC/N0502, v2.0*

**Training Outcomes:**

- Discuss about manual and automated testing of software components.
- Demonstrate application of suitable Unit Test Cases to validate the process of testing.

| **Duration**: *25:00(In Hours)* | **Duration**: *30:00(In Hours)* |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| <ul><li>Discuss validation and verification components covered under software testing.</li><li>Discuss about manual and automated testing of software components.</li><li>List the components of a test plan.</li><li>Discuss the suitability of solutions/ workarounds, where available.</li></ul> | <ul><li>Utilize reusable components, code generation tools and unit testing tools to identify anomalies.</li><li>Design the conversion process of technical specifications into code to meet the requirements.</li><li>Create appropriate Unit Test Cases (UTCs).</li><li>Test and re-develop the code and UTCs to fix identified defects.</li><li>Execute UTCs and document the results for best practice.</li></ul> |
| **Classroom Aids:** | |
| Whiteboard and Markers<br>Chart paper and sketch pens<br>LCD Projector and Laptop for presentations | |
| **Tools, Equipment and Other Requirements:** | |
| Labs equipped with the following:<br>PCs/Laptops<br>Internet with Wi-Fi (Min 2 Mbps Dedicated)<br>Microphone / voice system for lecture and class activities<br>Computer Lab with 1:1 PC: trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client, and chat tools | |

## Module 4: Introduction to Employability Skills
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*

**Key Learning Outcomes:**
- Discuss the Employability Skills required for jobs in various industries
- List different learning and employability related GOI and private portals and their usage

**Duration:1.5 Hours (0.5 Theory + 1 Practical)**

## Module 5: Constitutional values - Citizenship
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*

**Key Learning Outcomes:**
- Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
- Show how to practice different environmentally sustainable practices

**Duration:1.5 Hours (0.5 Theory + 1 Practical)**

## Module 6: Becoming a Professional in the 21st Century
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*

**Key Learning Outcomes:**
- Discuss importance of relevant 21st century skills.
- Exhibit 21st century skills like Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
- Describe the benefits of continuous learning

**Duration:2.5 Hours (1 Theory + 1.5 Practical)**

## Module 7: Basic English Skills
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*

**Key Learning Outcomes:**
- Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
- Read and interpret text written in basic English
- Write a short note/paragraph / letter/e -mail using basic English

**Duration: 10 Hours (4 Theory + 6 Practical)**

## Module 8: Career Development and Goal Setting
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*

**Key Learning Outcomes:**
- Create a career development plan with well-defined short- and long-term goals

**Duration: 2 Hours (1 Theory + 1 Practical)**

## Module 9: Communication skills
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*
**Key Learning Outcomes:**
- Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
- Explain the importance of active listening for effective communication
- Discuss the significance of working collaboratively with others in a team

**Duration: 5 Hours (2 Theory + 3 Practical)**


## Module 10: Diversity and Inclusion
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*
**Key Learning Outcomes:**
- Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
- Discuss the significance of escalating sexual harassment issues as per POSH

**Duration: 2.5 Hours (1 Theory+ 1.5 Practical)**


## Module 11: Financial and Digital Literacy
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*
**Key Learning Outcomes:**
- Outline the importance of selecting the right financial institution, product, and service
- Demonstrate how to carry out offline and online financial transactions, safely and securely

**Duration: 5 Hours (2 Theory+ 3 Practical)**


## Module 12: Essential Digital Skills
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*
**Key Learning Outcomes:**
- Describe the role of digital technology in today's life
- Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
- Discuss the significance of displaying responsible online behaviour while browsing, using various social media platforms, e-mails, etc., safely and securely
- Create sample word documents, excel sheets and presentations using basic features
- utilize virtual collaboration tools to work effectively

**Duration: 10 Hours (4 Theory+ 6 Practical)**

## Module 13: Entrepreneurship
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*
**Key Learning Outcomes:**
- Explain the types of entrepreneurship and enterprises
- Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
- Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
- Create a sample business plan, for the selected business opportunity

**Duration: 7 Hours (3 Theory+ 4 Practical)**

## Module 14: Customer Service
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*
**Key Learning Outcomes:**
- Describe the significance of analysing different types and needs of customers
- Explain the significance of identifying customer needs and responding to them in a professional manner.
- Discuss the significance of maintaining hygiene and dressing appropriately

**Duration: 5 Hours (2 Theory+ 3 Practical)**

## Module 15: Getting Ready for Apprenticeship and Jobs
*Mapped to NOS DGT/VSQ/N0102 (Version No. 1)*
**Key Learning Outcomes:**
- Create a professional Curriculum Vitae (CV)
- Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
- Discuss the significance of maintaining hygiene and confidence during an interview
- Perform a mock interview
- List the steps for searching and registering for apprenticeship opportunities

**Duration: 8 Hours (3 Theory+ 5 Practical)**

# Annexure

## Trainer Requirements

<table>
<tr><th colspan="7">Trainer Prerequisites</th></tr>
<tr><th rowspan="2">Minimum Educational Qualification</th><th rowspan="2">Specialization</th><th colspan="2">Relevant Industry Experience</th><th colspan="2">Training Experience</th><th rowspan="2">Remarks</th></tr>
<tr><th>Years</th><th>Specialization</th><th>Years</th><th>Specialization</th></tr>
<tr><td>Minimum Bachelor's Degree in Engineering/ Technology/ Science/ Computer Science or any graduate course.</td><td>Preferred Master's Degree in Engineering/ Technology/ Computer Science</td><td>Minimum 2 years' experience in software development domain.</td><td></td><td>1 year preferred</td><td>Minimum 2 years' experience in the Application development industry.</td><td>Certification in relevant software competencies: Software Development Certifications in C++, Embedded, C#, C, Java, etc., is an added advantage.</td></tr>
</table>

<table>
<tr><th colspan="2">Trainer Certification</th></tr>
<tr><th>Domain Certification</th><th>Platform Certification</th></tr>
<tr><td>Minimum accepted score in SSC Assessment is 80% per NOS being taught in "SSC/Q0511, V 1.0"</td><td>Recommended that the trainer is certified for the Job role "Trainer (VET and Skills)" mapped to the Qualification Pack "MEP/Q2601,V2".<br><br>Minimum accepted score is 80% aggregate</td></tr>
</table>

## Assessor/Proctor Requirements

| Assessor/Proctor Prerequisites | | | | | |
|---|---|---|---|---|---|
| **Minimum Educational Qualification** | **Specialization** | **Relevant Industry Experience** | | **Training/Assessment Experience** | | **Remarks** |
| | | *Years* | *Specialization* | *Years* | *Specialization* | |
| Graduate in any discipline | | 2 | | 1-2 | | |

| Assessor/Proctor Certification | |
|---|---|
| **Domain Certification** | **Platform Certification** |
| Not Applicable | |

## 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 Pack will be created by the Sector Skill Council. 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 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** |
| • Carry out assessments under realistic work pressures that are found in the normal industry workplace (or simulated workplace).<br>• 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. | • Assess that all tasks and functions are completed in a way, and to a timescale, that is acceptable in the normal industry workplace.<br>• Assign workplace (or simulated workplace) responsibilities that enable learners to meet the requirements of the NOS. | • Productivity levels must be checked to ensure that it reflects those that are found in the work situation being replicated. | • Provide situations that allow learners to interact with the range of personnel and contractors found in the normal industry workplace (or simulated workplace). |

**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 a minimum aggregate of 70% across qualification. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

**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.

# References

## Glossary

| Term | Description |
| --- | --- |
| Key Learning Outcome | 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 application). |
| Training Outcome | Training outcome is a statement of what a learner will know, understand and be able to do **upon the completion of the training**. |
| Terminal Outcome | Terminal outcome is a statement of what a learner will know, understand and be able to do **upon the completion of a module.** A set of terminal outcomes help to achieve the training outcome. |
| National Occupational Standard | National Occupational Standard specify the standard of performance an individual must achieve when carrying out a function in the workplace |
| Persons With Disability | 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. |
| Integrated Development Environment | An integrated development environment is a software application that provides comprehensive facilities to computer programmers for software development. |

## Acronyms and Abbreviations

| Term | Description |
|---|---|
| QP | Qualification Pack |
| 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 |
| PwD | Persons with Disability |
| IDE | Integrated Development Environment |