

# **Bachelor of Vocation (B. Voc.) in Software Technologies**

**Year of Implementation:** Academic Year 2019-20

**Date of Approval by Academic Council :** 10th May 2019

## **Overview and Structure**

### **About the Programme**

The B. Voc. (Software Technologies) programme aims to create trained manpower with the requisite practical skills and capabilities for various well-defined job roles and mold students into competent young and highly productive professionals.

The skill-based courses adopted from Sector Skill Council are suitably complemented by well-thought out courses in general education to provide additional knowledge. In addition to professional development the courses offered also aim at inculcating values and attitudes conducive to good citizenship. The outcome is a unique programme that offers students a flexible, new-age avenue for higher education.

### **Programme Aim**

The aim of the Programme is to develop skilled professionals in the area of Software Technologies

### **Programme Objectives:**

As per revised OA23.1.1

### **Programme Specific Objectives:**

- (i) To provide judicious mix of knowledge and skills in the areas of Software Technologies, Development & Application, and General Education.
- (ii) To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- (iii) To provide industry oriented education in Software Technologies that prepares individual to transition into a broad range of career options at each exit point, including continually upgrading professional, communication, analytic, and technical skills.
- (iv) To ensure that students obtain adequate knowledge, skills and competencies, who after successfully completing courses of
  - a. Certificate in Software Technologies is industry ready to be employed as Junior Software Developer.
  - b. Diploma in Software Technologies is industry ready to be employed as Web Developer.
  - c. Advanced - Diploma in Software Technologies are industry ready to be employed as Media Developer and Master Trainer for Junior Software Developer.
  - d. Degree in Software Technologies is ready for transition into a broad range of options: industry (*software/application developer, and Associate-Desktop Publishing*), government, professionals, entrepreneurs and in professional education.
- (v) To provide foundation to graduates to pursue professional careers and take up higher learning courses such as MBA, MCA, MCM, as well as research.

**Duration and NSQF level of the Programme:** As per revised OA23.1.3

The duration of the Programme shall be as given in the table below

Nomenclature	Duration	NSQF Level
Certificate	One Semester	Level 4
Diploma	Two Semesters	Level 5
Advanced Diploma	Four Semesters	Level 6
B. Voc Degree	Six Semesters	Level 7

**Intake Capacity:** 40

**Eligibility:** As per revised OA23.1.4

**Admission and Fee Criteria:** As per revised OA23.1.5

**Programme Structure:** As per revised OA23.2

**Scheme of Examination:** As per revised OA 23.3

**Verification and Revaluation:** As per revised OA-23.4

**Award of Certificate, Diploma, Advanced Diploma and B.Voc. Degree:**

As per revised OA-23.5

**Certificate in Software Technologies (Semester I)**

After successfully completing the courses of Semester-I, the students are expected to acquire the skills to be employable as **Junior Software Developer**

NSQF Level / Semester	Course Code	Course Title	Course Credits		Marks
Level 4 / Semester I	General Education				
	STG101	Fundamentals of Computers and Programming	Theory	3	75
	STG102	Web Designing Concepts	Theory	3	75
	STG103	Quantitative Techniques	Theory	2	50
	STG104	Environmental Studies – I	Theory	2	50
	STP101	Software Laboratory – I	Practical	2	50
	Skill Development Qualification Pack & On-Job-Training (OJT)				
	STS101	Junior Software Developer(SSC/Q0508)	Theory	7	600
			Practical & OJT	11	
Semester Total				30	900

**Diploma in Software Technologies (Semester II)**

After successfully completing the courses of Semester-II, the students are expected to acquire the skills to be employable as **Web Developer**

NSQF Level / Semester	Course Code	Course Title	Course Credits		Marks
Level 5 / Semester II	General Education				
	STG201	OOPS with Java	Theory	3	75
	STG202	Graphics Desiging	Theory	3	75
	STG203	E-Commerce	Theory	2	50
	STG204	Environmental Studies - II	Theory	2	50
	STP201	Software Laboratory - II	Practical	2	50
	Skill Development				
	Qualification Pack & On-Job-Training (OJT)				
	STS201	Web Developer (SSC/Q0503)	Theory	7	700
Practical & OJT			11		
Semester Total				30	1000

**Advanced Diploma in Software Technologies (Semester III)**

After successfully completing the courses of Semester-III, the students are expected to acquire the skills to be employable as **Media Developer**

NSQF Level / Semester	Course Code	Course Title	Course Credits		Marks
Level 6 / Semester-III	General Education				
	STG301	Data Structures	Theory	3	75
	STG302	Audio and Visual Media	Theory	3	75
	STG303	Reasoning Techniques	Theory	4	100
	STP301	Software Laboratory - III	Practical	2	50
	Skill Development Qualification Pack & On-Job-Training (OJT)				
	STS301	Media Developer (SSC/Q0504)	Theory	7	700
			Practical & OJT	11	
Semester Total				30	1000

**Advanced Diploma in Software Technologies (Semester IV)**

After successfully completing the courses of Semester-IV, the students are expected to acquire the skills to be employable as **Master Trainer for Junior Software Developer**

NSQF Level / Semester	Course Code	Course Title	Course Credits		Marks
Level 6 / Semester-IV	General Education				
	STG401	Python Programming	Theory	3	75
	STG402	Software Engineering & Testing	Theory	3	75
	STG403	Creative Thinking	Theory	4	100
	STP401	Software Laboratory - IV	Practical	2	50
	Skill Development				
	Qualification Pack & On-Job-Training (OJT)				
	STS401	Master Trainer for Junior Software Developer - (SSC/Q0509)	Theory	7	700
			Practical & OJT	11	
Total				30	1000

**B. Voc. Degree in Software Technologies (Semester V)**

After successfully completing the courses of Semester-V, the students are expected to acquire the skills to be employable as **User Interface (UI) Developer**

NSQF Level / Semester	Course Code	Course Title	Course Credits		Marks
Level 7 / Semester- V	General Education				
	STG501	Mobile Application Development	Theory	3	75
	STG502	Human Computer Interaction	Theory	3	75
	STG503	Advanced Quantitative Techniques	Theory	4	100
	STP501	Software Laboratory - V	Practical	2	50
	Skill Development Qualification Pack & On-Job-Training (OJT)				
	STS501	UI Developer - (SSC/Q0502)	Theory	7	800
			Practical & OJT	11	
	Total				30

**B. Voc. Degree in Software Technologies (Semester VI)**

After successfully completing the courses of Semester-VI, the students are expected to acquire the skills to be employable as **Software Developer/ Associate – Desktop Publishing**

NSQF Level / Semester	Course Code	Course Title	Course Credits		Marks
Level 7 / Semester- VI	General Education				
	STG601	E1: Advanced Graphics Designing	Theory - Elective	3	75
		E2: RDBMS			
	STG602	Computer Networks	Theory	3	75
	STG603	Entrepreneurship Development	Theory	4	100
	STP601	Software Laboratory - VI	Practical	2	50
	Skill Development Qualification Pack (Any One) & On-Job-Training (OJT)				
	STS601	Software Developer - (SSC/Q0501)	Theory	7	700
		Associate-Desktop Publishing - (SSC/Q2702)			
		Practical & OJT	11		
Total				30	1000

# B. Voc. in Software Technologies

## Syllabus (Semester – I)

**Course Title:** Fundamentals of Computers & Programming  
**Course Code:** STG101  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisite Courses:** None

- Course objectives:**
- To enhance the students’ understanding of information technology
  - To have a thorough understanding of the basic computer structure & Storage
  - To have understanding of basic concepts of operating system.
  - To introduce the basic concepts of programming

- Learning Outcome:**
- After successful completion of this course, the student will
- Be aware of the components of IT System and Binary Number System
  - Explain the basics of Computer architecture and Memory Subsystem.
  - Explain basic operating system & storage management concepts
  - Explain the basic concepts of programming

**Syllabus**

1.	Information Technology Basics	05 Lectures
	Information Technology : Definition and components; Data & Information- Definition, Types of data, Data Representation - Coding Schemes(ASCII and UNICODE); Software – Definition, Categories of Software, Applications of Information Technology in various sectors, Internet Applications and Emerging Technologies	
2.	Introduction To Programming Concepts	15 Lectures
	Basic Programming Concepts, Steps Involved in Computer Programming – Problem Definition – Outlining The Solution – Algorithms & Flowchart, Types of Errors in programming, Translators, Interpreter & compilers, Languages Types, Programming approaches, Features of good algorithm and programming	
	Developing algorithm, flow charts and pseudo code of different types of problems.	
	Understanding variables, basic Operators, Understanding blocks, Data Types Declaring and using data types: int, float etc. Basic Input and Output	
3.	Number Systems	08 Lectures
	Number Systems: Decimal to binary conversion and vice versa Binary number representation (signed, 1’s Complement and 2’s complement), Binary Arithmetic - addition, subtraction, Multiplication, Division, Binary to octal, hexadecimal conversion and vice versa. Floating point representation.	
4.	Computer Technology	07 Lectures
	Basic elements of a computer system: Processor, Main Memory, I/O Modules, System Bus Function and structure of a computer, Interconnection of components, Performance of a computer. Overview of Princeton (Von Neumann) and Harvard architecture.	
	Memory Subsystem: Characteristics of memory system, the memory hierarchy, Types of ROM & RAM, Cache memory unit - Concept of cache memory, Organization of a cache memory unit	
5.	Introduction to Operating System & Storage Management	10 Lectures

	<p>Operating Systems: Definition &amp; Functions, Operating system Structure, operating system operations, Relationship between Kernel, OS, and Hardware, Operating system services, System calls, Types of system calls.</p> <p>Storage Management: File System, Concepts, File Organization and Access Methods, Directory and Disk Structure. Secondary Storage Structure - Overview, disk structure, Disk attachment, Disk scheduling</p>
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**Recommended Text Books:**

1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals, BPB Publications
2. A. Silberchatz, Galvin, Gagne, Operating System Concepts, Wiley publication, 8thEdition
3. V. Rajaraman, Computer Fundamentals, PHI Learning, 6<sup>th</sup> edition

**Recommended Reference Books:**

1. ITL Education Solutions Limited, Introduction to Information Technology, Pearson Education
2. M. Morris Mano, Computer System Architecture, Pearson Education, 3<sup>rd</sup> Edition, 2008
3. William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall, 6<sup>th</sup> Edition
4. R.G. Dromey, How to solve it by Computers, Pearson Education

**Course Title:** Web Designing Concepts  
**Course Code:** STG102  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisite Courses:** None

**Course objectives:**

To acquire skills in developing web applications using latest tools and technology in web designing and good user interfaces covering important design principles such as learn ability, visibility, error prevention, efficiency and graphic design

**Learning Outcomes:**

On completion of the course the student will be able to

- To setup up and use a web server for testing and deploying web applications
- To be able to design simple static web pages using html tags
- To apply styling using standardized pure CSS
- To write client side scripts to validate and perform client side processing using a scripting language
- To use DOM concepts for client side scripting
- Implementation of user interfaces following design principles and using technologies such as HTML, CSS, JavaScript and JQuery.

**Syllabus**

1.	<b>Web Design Principles – Overview</b>	<b>06 Lectures</b>
	Basic principles involved in developing a web site, Planning process, rules of web designing, designing a navigation bar, Page design, Home Page Layout, Design Concept –learnability, visibility, error prevention, efficiency, graphic design. Design Patterns for GUI – View tree, Listener, Widget, and Model-View-Controller, Approaches to GUI programming – Procedural, Declarative, and Direct Manipulation. Web UI – HTML, JavaScript, JQuery. Brief History of Internet, what is World Wide Web, Why create a website, Web Standards	
2.	<b>Structure and Style with HTML and CSS</b>	
	<b>A. HTML</b>	<b>5 Lectures</b>
	Introduction. The development process, basic HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, simple HTML forms, web site structure, Meta tags, Character entities, Unicode fonts.	
	<b>B. HTML5</b>	<b>5 Lectures</b>
	Introduction, New Elements, Canvas, SVG, Drag/Drop, Geolocation, Video, Audio, Input types, form elements, form attributes, semantic, web storage, app cache, web workers, SSE	
	<b>C. CSS</b>	<b>5 Lectures</b>
	Introduction – Syntax, inline, internal and external style, Id & Class, Backgrounds, Text, Fonts, Links, Lists, Tables. CSS Box Model – Border, Outline, Margin, Padding. Advanced - Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types, Attribute Selectors.	
	<b>D. CSS3</b>	<b>5 Lectures</b>
	Introduction, Borders, Backgrounds, Gradients, Text Effects, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations, Multiple Columns.	
3.	<b>Javascript</b>	<b>10 Lectures</b>
	Introduction - What is JavaScript, Understanding Events, JavaScript Example, and External JavaScript. Basic Elements – Comment, Variable, Global Variable, Data Types, Operators, If Statement, Switch, Loop: for and while, Function. JavaScript Objects – objects, Array.	



	Browser Object Model - Browser Objects, Window Object, Document Object – getElementById, getElementsByName, getElementsByTagName, innerHTML property, inner Text property. Validation- form validation, email validation.	
<b>4.</b>	<b>Introducing jQuery</b>	<b>05 Lectures</b>
	<b>JQuery</b> : Introduction - Syntax, Selectors, Events. Effects- Hide/Show, Fade, Slide, Animate, stop(), Callback, Chaining. HTML/CSS- Add, Remove, CSS Classes, css(), Dimensions, slider. Traversing, ancestors, descendants, siblings, filtering.	
<b>5.</b>	<b>Introducing XML</b>	<b>04 Lectures</b>
	Introduction to XML , Need , Features ,XML namespaces , XML DTD ,XML Schemas XML Sheets , Types of XML Packages	

**Recommended Text Books:**

1. Elisabeth Robson, Eric Freeman, —Head First HTML and CSS, O'Reilly
2. Kogent Learning Solutions Inc., —HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and JQuery, Pearson Education.

**Recommended Reference Books:**

1. Steven M. Jacobs, Ben Shneiderman, —Designing the User Interface: Strategies for effective human-computer interaction, 5th Edition, Pearson Education
2. Kogent Learning Solutions Inc. HTML 5 in simple steps Dreamtech Press
3. Ivan Bayross, —HTML 5 and CSS 3 Made Simple, BPB publication

**Course Title:** Quantitative Techniques  
**Course Code:** STG103  
**Marks:** 50

**Type:** General Theory  
**Credits:** 02  
**Hours:** 30

**Prerequisite Courses:** None

**Course objectives:**

To build quantitative aptitude that are essential requirement in understanding various concepts and to solve problems effectively.

**Learning Outcomes:**

On successful completion of the course, the students will be able to

- Create, solve and interpret basic data and quantitative models.
- Make sound arguments based on quantitative aptitude and/or careful analysis of data.
- Exhibit critical thinking by developing and expressing sound arguments from given premises to related conclusions
- Effectively communicate the substance and meaning of mathematical problems and their solutions.

**Syllabus:**

1.	Module I	10 Lectures
	Number System, Progressions, Averages, Allegations, Percentage, ratio & proportion	
2.	Module II	10 Lectures
	Profit & loss, discount, simple and compound interest, Time and Work, Time and distance, population growth and depreciation of value of articles	
3.	Module III	10 Lectures
	Mensuration, Cartesian Coordinate System, functions, inequalities, quadratic equations	

**Recommended Text Books:**

1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, 8<sup>th</sup> edition, McGraw Hill Education (India) Private Ltd.
2. R S Aggarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing; Revised edition (21 February 2017)

**Prerequisite Courses:** None

- Course objectives:**
- To provide students with basic knowledge of environment and its aspects.
  - To sensitize students about environmental issues.

- Learning Outcomes:**
- On successful completion of the course, the students will be able to
- Explain the various aspects of Environment.
  - Develop perspectives around environmental issues.
  - Take practical steps to conserve the environment and ecosystem

**Syllabus:**

1.	Environment and Natural Systems	18 Lectures
	Environment: Meaning, Significance, natural resources and alternatives. Man-Nature relation and interaction with respect to Food, Clothing, Shelter and Occupation Ecosystem: Concept, Structure, Functions, Components (producers, consumers, decomposers), Energy flow in an ecosystem, Ecological succession; Ecological niche (concept); major ecosystems in brief Biodiversity: meaning, hotspots of biodiversity in India, threats to biodiversity; bio geographical classification of India; Conservation (Case studies); genetically modified foods Role of the individual in conservation of natural resources.	
2.	Environmental Degradation and Environmental Pollution	12 Lectures
	Environmental Degradation: Meaning; Degradation of Urban Land, Forest and Agricultural Land due to natural causes and human interference. Environmental pollution: Types of Environmental Pollution: Water, Air, Marine, Land, Noise, Thermal Pollution; for each type of pollution - meaning, Quality standards (where applicable), sources of pollution, pollutants, effects	

- Recommended Text Books:**
1. Mahua Basu, S. Xavier, Fundamental of Environmental Studies, Edition 2016 Cambridge University
  2. N. Balsubramanya, Gurudeep, Chatwal , Environmental Studies , Himalaya Publication.
  3. Singh, Anoop Kumar, Environmental Management in mining areas, Ishwar Books

- Recommended References:**
1. S.C. Santra, Environmental Science, New Book Agency Pvt Ltd. Kolkata.
  2. Shinde, Pendse, Donge, Environmental Education, Sheth Publication.
  3. Dr. Vijay Kumar, Environmental Studies Text Book, Himalaya Publication.
  4. Kumari Veena, Environmental Pollution and Health Hazard, Ishwar Book
  5. Singh Chandrama Prakash and Kuter, Sustainable Development and Environment

**Course Title:** Software Laboratory – I

**Course Code:** STP101

**Marks:** 50

**Type:** General Practical

**Credits:** 02

**Hours:** 60

**Course objectives:**

- To identify the various hardware and software components of a PC
- To trouble-shoot basic.
- To apply the concepts and understanding of algorithm, flowchart and pseudo code design
- To implement web designing concepts and principles such as HTML, CSS, JavaScript and JQuery and develop web pages

**Learning Outcome:**

After successful completion of this course, the student will be able to

- Identify the components of a PC
- Troubleshoot basic hardware and software problems
- Explain the basic commands of Windows and Linux
- Design efficient algorithm and pseudo-code
- Implement the concepts learnt in Web Designing course

**List of suggested Practical:**

*A student shall complete practical of minimum 20 Hours and 28 Hours duration from **Section A** and **Section B** respectively.*

**Section A** - Based on STG101

1. Exploring the Functions and Components of a PC [06 Lectures]
  - a. Recognizing PC components
  - b. Identifying BIOS ROM, Accessing BIOS via the CMOS Setup Program, Configuring and Clearing CMOS Setup Program Passwords, Configuring BIOS Setting
  - c. Identifying Internal Expansion Slots, Installing Expansion Cards, Managing Hardware with Device Manager, Removing and Labeling Components and Cables, Removing a Motherboard, Identifying Motherboard Features.
  - d. Troubleshooting Hard Drive Installations, Configuring Multiple Displays.
  - e. Replacing and Upgrading RAM, Adjusting Power Management to Optimize Battery Life
  - f. PC fault finding techniques
2. Exploring Linux / Windows Operating System [04 Lectures]
  - a. Demo/Review of Installing, Partitioning and formatting disk, Installing applications device drivers, creating, modifying and deleting user accounts
  - b. Study of basic OS commands.
  - c. Writing algorithms & designing flowcharts of at least 08 different types of problems. [14 Lectures]

## **Section B** - Based on STG102

1. Create a HTML page with the following : [04 Lectures]
  - a. title heading paragraph emphasis strong and image elements
  - b. complex HTML table
  - c. simple HTML Form covering major form elements
  - d. Embed Video in an HTML page
2. Using CSS do the following : [08 Lectures]
  - a. Create a Navigation bar (with dropdown) with CSS
  - b. Create a CSS Grid
  - c. Create a CSS3 based button
  - d. make an image rounded shape
  - e. Create a CSS based sticky footer
  - f. Create CSS3 Corner Ribbon
  - g. Create CSS3 blurry text effect
  - h. Create image cross fade with CSS3 transition
  - i. Set style for link hover active and visited states of hyperlink
3. Write JavaScript functions to : [10 Lectures]
  - a. accept a string as a parameter and converts the first letter of each word of the string in upper case
  - b. Check whether a given credit card number is valid or not.
  - c. Check whether a given value is a valid url or not.
  - d. Check whether a given email addresses is valid or not.
  - e. print an integer with commas as thousands separators
  - f. Remove items from a dropdown list.
4. Use JQuery to : [08 Lectures]
  - a. Disable buttons
  - b. Make textbox read only
  - c. Uncheck check boxes
  - d. Confirm again
  - e. Sort
  - f. Switch rows and columns
5. Introduction to angular JS/reactjs, Json [06 Lectures]

*A mini project combining all the technologies learnt using a front-end development framework such as bootstrap is recommended.*

**Recommended Text Books:** *As mentioned in STG101 and STG102*

**Course Title:** SSC/Q0508 Junior Software Developer

**Course Code:** STS101

**Marks:** 600

**Type:** Skill (Theory, Practical, & OJT)

**Credits:** 18 (Theory-7, Practical & OJT-11)

**Hours:** 440

**Prerequisite Courses:** None

**Course/Package objectives:**

To enable students to:

- Demonstrate basic computer and internet, aptitude for analyzing information and making logical conclusions
- Design algorithms to solve problems and convert them into code using the appropriate programming language constructs
- Read and execute a test case and record the outcome in the appropriate format
- Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time
- Understand various job roles and work activities of a “Junior Software Developer”.
- Provide an opportunity to work on innovative, thought-provoking industry based projects
- Gain new technical and professional development skills, and give the student an opportunity to establish an interest in industrial/commercial activities.
- Develop constructive work habits
- Utilize and strengthen their communication skills and build healthy work relationships
- Determine what professional and personal competencies they need to develop and address in their transition to professional life
- Maintain a healthy, safe and secure working environment

**Learning Outcomes:**

Students will have competencies and skills as mentioned in the Model Curriculum of JUNIOR SOFTWARE DEVELOPER designed by NASSCOM (REFERENCE ID: SSC/Q0508, version 1.0)

**Package Syllabus** (Adopted Model Curriculum of Nasscom)

- *Lecture Hours and Marks Distribution as per Nasscom standard mentioned in Model Curriculum*
- *Unit Contents as mentioned in the courseware designed by Nasscom for Junior Software Developer*

1.	<b>Introduction</b>
	Unit 1.1 – Introduction to IT-ITeS Sector Unit 1.2 – Introduction to the Training Program
2.	<b>Core Skills</b>
	Unit 2.1 – Communication Skills Unit 2.2 – Team Work
3.	<b>Basic of IT (SSC/N0506)</b>
	Unit 3.1 – Basic Computer Skills Unit 3.2 – Internet
4.	<b>Assist in Performing Software Construction and Software Testing Entry-Level Tasks in the It Services Industry (SSC/N0506)</b>
	Unit 4.1 – C Programming Unit 4.2 – Analyze Various Concepts of PHP Unit 4.3 – Introduction to MYSQL Unit 4.4 – SQL using Oracle
5.	<b>Manage Work to Meet Requirements (SSC/N9001)</b>

	Unit 5.1 – Self and Work Management
<b>6.</b>	<b>Work Effectively with Colleagues (SSC/N9002)</b>
	Unit 6.1 – Team Work and Communication 211
<b>7.</b>	<b>Maintain a Healthy, Safe and Secure Working Environment (SSC/N9003)</b>
	Unit 7.1 – Hazards at Workplace Unit 7.2 – Dealing with Emergencies
<b>8.</b>	<b>Data and Information Management (SSC/N9004)</b>
	Unit 8.1 – Provide Data /information in Standard Formats
<b>9.</b>	<b>Develop your Knowledge, Skills and Competence (SSC/N9005)</b>
	Unit 9.1 – Learning and Self Development
<b>10.</b>	<b>Employability &amp; Entrepreneurship Skills</b>
	Unit 10.1 – Personal Strengths & Value Systems Unit 10.2 – Digital Literacy: A Recap Unit 10.3 – Money Matters Unit 10.4 – Preparing for Employment & Self Employment Unit 10.5 – Understanding Entrepreneurship Unit 10.6 – Preparing to be an Entrepreneur

#### **On-Job-Training (OJT) Component (Compulsory)**

It is required by a student to carry-out and complete OJT in the relevant industry or working environment and in the relevant skill area (Junior Software Developer).

- **Duration of OJT:** Minimum 45 Hours
- A Student need to submit the detailed report of the OJT along with the ‘Certificate of Completion’.

#### **Recommended Text Books:**

Nasscom courseware module for Junior Software Developer

#### **Qualification Pack Hyperlink:**

[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0508\\_Junior-Software-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0508_Junior-Software-Developer.pdf)

# Syllabus

## B. Voc. in Software Technologies (Semester – II)

**Course Title:** Java Programming

**Course Code:** STG201

**Marks:** 75

**Type:** General Theory

**Credits:** 03

**Hours:** 45

**Prerequisite Courses:** None

### Course Objective:

- To learn and implement the concepts of java and object oriented programming, exception & file handling, threading, applets, swing and jdbc.

### Learning Outcomes:

On completion of the course students will

- Become acquainted with the concepts of java & objected orientation.
- Explain the concept of exception handling, multithreading, & interface design.
- Design and develop the Object Oriented working modules using AWT, Swing, multithreading, and Jdbc constructs

### Syllabus

1.	<b>Introduction to Java &amp; Object-Oriented Paradigm</b>	<b>07 Lectures</b>
	<b>Introduction to Java:</b> Features of Java, JDK Environment, Java and Internet. <b>Object Oriented Programming Concept:</b> Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between OOP & OOC <b>Java Programming Fundamental:</b> Structure of java program, Data types, Constants, Variables, Operators, Keywords, Naming Convention, Decision Making (if, switch), Looping(for, while),Type Casting	
2.	<b>Classes, Objects, and Packages in Java</b>	<b>12 Lectures</b>
	<b>Classes and Objects:</b> Creating Classes and objects, Memory allocation for objects, Constructor, Use of Inheritance, Use of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes <b>Arrays and Strings Classes:</b> Arrays, Creating an array, Types of Arrays, String class Methods, String Buffer methods. <b>Abstract Class, Interface and Packages:</b> Modifiers and Access Control, Abstract classes and methods, Interfaces, Interfaces versus Abstract Classes, Packages Concept, Creating user defined packages, Collections	
3.	<b>Exception &amp; File Handling</b>	<b>07 Lectures</b>
	<b>Exception Handling:</b> Exception types, Using try catch and multiple catch, Nested try, throw-throws and finally, Creating User defined Exceptions. <b>File Handling:</b> Byte Stream, Character Stream, File IO Basics, File Operations, Creating file, Reading file, Writing File	
4.	<b>Multithreading &amp; Applet Programming</b>	<b>07 Lectures</b>
	<b>Multithreading:</b> Thread - Synchronization - Messaging - Runnable Interface - Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads <b>Applet Programming:</b> Introduction, Types Applet, Applet Life cycle, Creating Applet, Applet tag	
5.	<b>Introduction to AWT, Swing, and Jdbc</b>	<b>12 Lectures</b>



	<p><b>AWT &amp; Swing:</b> What is AWT &amp; Swing? Difference between AWT and Swing, The MVC Architecture and Swing, Layout Manager and Layouts.</p> <p>The JComponent Classes:</p> <ul style="list-style-type: none"><li>– Components (JButton, JLabel, JText, JTextArea, JCheckBox and JRadioButton, JList, JComboBox, JMenu and JPopupMenu Class, JMenuItem and JCheckBoxMenuItem, JRadioButtonMenuItem , JScrollBar), Dialogs (Message, confirmation, input), JFileChooser, JColorChooser</li></ul> <p>Event Handling: Event sources, Listeners, Mouse and Keyboard Event Handling, Adapters, Anonymous inner class</p> <p><b>Basic Java Data Base Connectivity:</b> JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects</p>
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**Recommended Text Books:**

1. E Balagurusamy, Programming with JAVA, 4th Edition, TMH
2. Cay Horstmann, BIG Java, Wiley Publication, 3rd Edition, 2009

**Recommended References:**

1. Herbert Schildt, Java 7, The Complete Reference, 8th Edition, 2009.
2. Cay S Horstmann, Gary Cornell, Core Java Volume I- Fundamentals, Prentice Hall, 9<sup>th</sup> Edition
3. Cay S Horstmann, Gary Cornell, Core Java Volume II- Advanced Features, Prentice Hall, 9<sup>th</sup> Edition

**Course Title:** Graphics Designing  
**Course Code:** STG202  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisite Courses:** None

**Course Objective:**

- To understand the concepts of graphic designing.
- To make them understand electronic procedures of designing/producing and editing graphics using industry standard software (Adobe Creative Suite) and processes.
- To create, format, illustrate, design, and edit/revise the graphic design elements

**Learning Outcomes:**

Upon completion of this course, the student should be able to:

- Identify and use the Elements and Principles of Design in a decisive fashion
- Explain and use color to communicate ideas to others
- Explain the principles of graphic placement
- Utilize Software tools to edit images, and create artistic imagery

**Syllabus**

1.	DESIGN ELEMENTS CONCEPTS	05 Lectures
	<ul style="list-style-type: none"><li>• Elements of graphic design: Line, Shape, Forms, Space, Colour, Colour wheel, Colour Harmony, Colour meaning in various context such as culture, religion, gender and emotional factor, texture, Type</li></ul>	
2.	DESIGN PRINCIPLES CONCEPTS	05 Lectures
	<ul style="list-style-type: none"><li>• Basic principles of design: balance, proportion, rhythm, emphasis, unity etc. Laws of perception -Gestalt theory: similarity, proximity, continuity, closure etc. Scale and proportion in design</li><li>• Graphic Visualization: visual composition and layout, Grids in graphics composition</li></ul>	
3.	TYPOGRAPHY CONCEPTS	07 Lectures
	Typography - Typeface, Typeface Family, Font, Anatomy Of Type, Typographic Measurement – Point And Pica, Text Type And Display Type, Classification Of Type - Old Style, Transitional Period, Modern, Slab Serif, Sans Serif, Script, Decorative Etc. Selection Of A Type Face In Design-Clarity: Readability And Legibility, Integration With Visuals, Concept And Theme Etc	
4.	RASTER GRAPHIC CONCEPTS (DESIGNING & EDITING)	15 Lectures
	<ul style="list-style-type: none"><li>• Raster Images – Image Resolution – RGB, CMYK, Lab &amp; Other Colour Modes / Channels And Their Applications –Colour Palate And Swatches. Basic Drawing– Using Airbrush, Pencil, Paint Brush Tools. Concept Of Layers – Transparency And Blending Modes – Creative Use Of Layers And Blending Modes, Layer Mask. Selection Tools-Path Options And Selection-Alpha Channel, Type Tool And Its Properties. Concept Of GIF Animation, Image Compression: Lossy And Lossless Compression Formats</li><li>• Photo Restoration Technique- Clone Tool, Patch Tool, Sponge Tool, Burn Tool, Dodge Tool Etc. Adjusting Hue Saturation And Value, Use Of Levels And Curves, Use Of Colour Histogram, Treatment Of RAW Files, HDR Toning.</li></ul>	
5.	VECTOR GRAPHIC CONCEPTS (DESIGNING & EDITING)	13 Lectures
	<ul style="list-style-type: none"><li>• Vector Graphic-What Is Vector, Properties of Vector Graphics - Stroke and Fill Tools – Basic Shapes, Bezier Drawing with the Pen Tool – Creative Use of Shapes – Using the Pathfinder – Boolean Operations Using Shapes. Vector Drawing Techniques – Node</li></ul>	

	<p>Editing – Tracing from Raster Images – Different Styles Of Vector Illustrations. Using Colour in Vector Graphics – Different Colour Palettes – Gradients And Gradient Mesh.</p> <ul style="list-style-type: none"><li>• Using Type Tools And Type Controls – Type Along A Path –Concept Of Alignment And Text Flow Options, Filters And Effects.</li></ul>
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**Recommended References:**

1. Mark A. Thomas, Poppy Evans, Exploring the Elements of Design, Cengage Learning
2. Alexander W. White, The Elements of Graphic Design: Space, Unity, Page Architecture, and Type, Allworth Press
3. Ambrose, Harris, The Fundamentals Of Typography, Bloomsbury Publishing India Private Limited; 2nd Revised edition edition
4. Adobe Creative Team, Adobe Photoshop Classroom in a Book, Adobe Press
5. Adobe Creative Team, Adobe Illustrator Classroom In A Book, Adobe Press
6. Gary David Bouton, CorelDRAW X - Official Guide, TMH
7. Derek Lea, Beyond Photoshop, Focal Press
8. Dan Moughamian, Adobe Digital Imaging How-Tos, Adobe Press
9. Daniel James, Crafting Digital Media, Apress

**Prerequisite Courses:** None

**Course Objectives:**

This course aims to study the various background processes involved in E-Commerce website. As a part of the course the student will study the various activities associated with ecommerce, and will also be able to understand the various technologies and security mechanisms used in ecommerce websites

**Learning Outcomes:**

On Completion of this course the student will

- Explain the working of an E-Commerce website
- Be aware of the various E-Commerce Strategies.
- Evaluate and Apply appropriate Payment mechanisms to the e-commerce website

1.	INTRODUCTION TO E-COMMERCE	10 Lectures
	<ul style="list-style-type: none"> <li>• E-Commerce: In the Beginning: what Is E-Commerce? – Advantages and Limitations of E-Commerce – The Role of Strategy in E-Commerce – Value chains in E-Commerce – Integrating E-Commerce – Managerial Implications - The Internet and the WWW : The Internet today – Unique benefits of the internet - Searching online – BBS and Pay services – The Language of the Internet .</li> </ul>	
2.	E-COMMERCE SITE DESIGNING & LAUNCHING	08 Lectures
	<ul style="list-style-type: none"> <li>• Launching a Business on the Internet : The life cycle approach – The business planning and strategizing Phase – Hardware, software, Security and the setup phase – Design phase – The marketing phase – The fulfillment phase – The maintenance and enhancement phase.</li> <li>• Designing Web sites: The life cycle of site building – Building a web site – Web navigation design - Design criteria – Hiring a web designer - Website evolution and usability testing : Anatomy of a site – Cookies – What makes a website useful – Website content and Traffic management.</li> </ul>	
3.	E-MARKETING & E-PAYMENT	12 Lectures
	<ul style="list-style-type: none"> <li>• Marketing on the internet : the pros and cons of online shopping – internet marketing techniques – The E-cycle of internet marketing – Marketing your Presence – Attracting Customers – Tracking Customer – Customer service - Web based business to business Ecommerce : B2B Ecommerce – B2B Models – B2B tools –EDI.</li> <li>• Payment Systems: From barter to money – Requirements for the internet based payment – Electronic payment media – Issues and implications – E-security: Security in cyberspace – Designing for security – Kinds of threats (risk) – Virus – Security protection and recovery - Securing your system.</li> </ul>	

**Recommended Text Books:**

1. Elias M. Awad, Electronic Commerce, Prentice-Hall of India, 2008
2. Ravi Kalakota and Andrew B. Whinston, Electronic Commerce A Manager’s Guide, Pearson Education.

**Recommended References:**

1. Kamlesh K Bajaj and Debjani Nag, E-Commerce The Cutting Edge of Business, Second Edition, Tata McGraw Hill
2. Gary P. Schneider, E-Commerce Strategy, Technology and Implementation, CENGAGE Learning INDIA Private Limited, Reprint 2008



**Course Title:** Environmental Studies - II

**Type:** General Theory

**Course Code:** STG204

**Credits:** 02

**Marks:** 50

**Hours:** 30

**Prerequisite Courses:** None

**Course objectives:**

- To provide students with basic knowledge of environment and its aspects.
- To sensitize students about environmental issues.

**Learning Outcomes:**

On successful completion of the course, the students will be able to

- Explain the various aspects of Environment.
- Develop perspectives around environmental issues.
- Take practical steps to conserve the environment and ecosystem

**Syllabus:**

1.	<b>Global Environmental Issues, Human Population and Environment</b>	<b>12 Lectures</b>
	Global Environmental Issues: Climate Change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone layer; ecological and carbon footprints; Role of the individual in the prevention of environmental degradation and pollution Population Growth, World and Indian scenario, Population explosion, Population and Environmental Degradation  Urbanization: Urban population growth and Environmental problems, Food: Sources of food, Global and Indian food demand scenario, Limits of food production, Environmental effects of Agriculture. Environment and Human Health, Climate and Health, Infectious Diseases, Water-Related Diseases, Climate protection protocols	
2.	<b>Environmental Management</b>	<b>12 Lectures</b>
	Environmental Assessment – Environmental Impact Assessment (EIA), Environmental Auditing, Environmental accounting Environmental management: concept and significance; Emerging environment management strategies, Indian initiatives. Carbon Bank, carbon credits and carbon offsets Environmental Protection Movements and reputed NGOs in India. Sustainable development: meaning and significance; sustainable development goals (SDGs). Environmental Ethics: Environmental Ethics and Environmental values, Code of Ethics, Importance and limitations of ethics; Environmental Ethics in India.	
3.	<b>Environmental Legislation and Goa’s Initiatives for Environmental Protection</b>	<b>06 Lectures</b>
	<b>Environmental Acts and Regulations:</b> Brief description and major provisions of <ul style="list-style-type: none"><li>• Water (Prevention and Control of Pollution) Act 1974,</li><li>• Air (Prevention and Control of Pollution) Act 1981,</li><li>• Environment Protection Act, 1986</li><li>• Coastal Regulation Zones Rules</li><li>• E Waste (Management) Amendment Rules, 2018</li></ul> Functions and Role of Goa State Pollution Control Board	

**Recommended Text Books:**

1. Mahua Basu, S. Xavier, Fundamental of Environmental Studies, Edition 2016 Cambridge University

2. N. Balsubramanya, Gurudeep, Chatwal , Environmental Studies , Himalaya Publication.
3. Singh, Anoop Kumar, Environmental Management in mining areas, Ishwar Books

**Recommended References:**

1. Kumar Rajesh Prakash Kutir, Mining and Environmental Sustainability
2. S.C. Santra, Environmental Science, New Book Agency Pvt Ltd. Kolkata.
3. Shinde, Pendse, Donge, Environmental Education, Sheth Publication.
4. Dr. Vijay Kumar, Environmental Studies Text Book, Himalaya Publication.
5. Kumari Veena, Environmental Pollution and Health Hazard, Ishwar Book
6. Singh Chandrama Prakash and Kuter, Sustainable Development and Environment
7. [https://www.tutorialspoint.com/environmental\\_studies/environmental\\_studies\\_classification\\_of\\_ecosystem.htm](https://www.tutorialspoint.com/environmental_studies/environmental_studies_classification_of_ecosystem.htm)

**Course Title:** Software Laboratory – II  
**Course Code:** STP201  
**Marks:** 50

**Type:** General Practical  
**Credits:** 02  
**Hours:** 60

**Course objectives:**

- To understand and implement the concepts of Object Oriented Programming and Java learnt in STG201
- To implement the graphic design concepts learnt in STG202 using appropriate tools

**Learning Outcome:**

After successful completion of this course, the student will be able to

- Implement the Object Oriented Concepts in solving real world problems
- Efficiently apply the concepts of AWT, Swing, multithreading, and Jdbc.
- Implement the understanding of principles of graphic placement
- Utilize Software tools to edit images, create artistic imagery, and create publications.

**List of suggested Practical:**

*A student shall complete practical of minimum 24 Hours duration from each Section*

**Section A** - Based on STG201

Use of any SDK and IDE like eclipse, Netbeans etc...

1. Simple java programs to understand different constructs [06 Lectures]
2. Java programs to understand Object Oriented Concepts (Objects, Inheritances, Polymorphism, Abstract Class, Interfaces, Overloading, Overriding, Object copying/cloning, static and final) [12 Lectures]
3. Java programs to understand Packages, exception handling, and file handling [06 Lectures]
4. Programs to understand Applet, threading, Swing and jdbc. [06 Lectures]
5. Mini-Project (As an Assignment)

**Section B** - Based on STG202

**Software Recommended:** Adobe Suite (Illustrator, Photoshop, CorelDraw, InDesign), GIMP, INKSCAPE

1. Design Basics and Tessellation of geometric shapes [06 Lectures]
2. Raster Graphics (Design, Image Restoration & Correction) [10 Lectures]
3. Vector Graphics (Design, Logo or corporate identity design) [08 Lectures]
4. Designs based on typography [03 Lectures]
5. Symbols or Icons Designs [03 Lectures]

**Recommended Books:**

**For Section A:** *As mentioned in STG201*

**For Section B:** *As mentioned in STG202 and*

1. Ambrose Harris, The Production Manual, AVA Publishing
2. Timothy Samara, Design Elements, a Graphic Style Manual, Rockport Publishers



**Course Title:** SSC/Q0503 Web Developer  
**Course Code:** STS201  
**Marks:** 700

**Type:** Skill (Theory, Practical, & OJT)  
**Credits:** 18 (Theory-7, Practical & OJT-11)  
**Hours:** 440

**Prerequisite Courses:** None

**Course/Package objectives:**

To enable students to:

- Apply their understanding of concepts in Analysis and Design of Web based Applications
- Apply their understanding of concepts in developing media content and graphic designs for software products and Applications
- Understand importance of policies, procedures and guidelines when contributing to the design of Web based applications as well as developing media content and graphic designs for software products and Applications
- Understand and Provide data/information in standard formats
- Gain new technical and professional development skills, and give the student an opportunity to establish an interest in industrial/commercial activities.
- Develop constructive work habits
- Utilize and strengthen their communication skills and build healthy work relationships
- Determine what professional and personal competencies they need to develop and address in their transition to professional life

**Learning Outcomes:**

Students will have competencies and skills as mentioned in the Model Curriculum of Web Developer designed by NASSCOM (REFERENCE ID: SSC/Q0503, version 1.0)

**Package Syllabus** (Adopted Model Curriculum of Nasscom)

- *Lecture Hours and Marks Distribution as per Nasscom standard mentioned in Model Curriculum*
- *Unit Contents as mentioned in the courseware designed by Nasscom for Web Developer*

1.	<b>Web Design Basics (SSC/N0501)</b>
	Unit 1.1 – Introduction to the Industry and the Job Role Unit 1.2 – Introduction to the basic of Web Development Unit 1.3 – SDLC Unit 1.4 – Principles of Web Design Unit 1.5 – Phases of Web Development
2.	<b>Planning and Design (SSC/N0501)</b>
	Unit 2.1 – Planning for Web Development Unit 2.1 – The Web Designing Process Unit 2.1 – Introduction to the Web Application Development
3.	<b>Web Development Process (SSC/N0503)</b>
	Unit 3.1 – The Web Development Process Unit 3.2 – Developing Reusable Content Unit 3.3 – Designing Accessible Web Content Unit 3.4 – Evaluating the Websites
4.	<b>Web Information Security (SSC/N0503)</b>
	Unit 4.1 – Web Information and Security
5.	<b>UAT and Deployment (SSC/N0503)</b>
	Unit 5.1 – The Web Deployment Process
6.	<b>Introduction to Java &amp; JavaScript (SSC/N0501,SSC/N0503)</b>
	Unit 6.1 – Introduction to Java & JavaScript
7.	<b>Portfolios (SSC/N0501, SSC/N0503)</b>
	Unit 7.1 – Portfolio Design
8.	<b>Manage your Work to Meet Requirements (SSC/N9001)</b>

	Unit 8.1 – Understanding Scope of Work and Working within limits of Authority Unit 8.2 – Work and Work Environment Unit 8.3 – Maintaining Confidentiality
<b>9.</b>	<b>Working Effectively with Colleagues (SSC/N9002)</b>
	Unit 9.1 – Effective Communication Unit 9.2 – Working Effectively
<b>10.</b>	<b>Maintain a Healthy, Safe and Secure Working Environment (SSC/N9003)</b>
	Unit 10.1 – Need for Health and Safety at Work Unit 10.2 – Analyst Security Operations Centre’s Role Unit 10.3 – Emergency Situations Unit 10.4 – Skills for Maintaining Health and Safety at Work
<b>11.</b>	<b>Provide Data/Information in Standards Formats (SSC/N9004)</b>
	Unit 11.1 – Information and Knowledge Management Unit 11.2 – How to Manage Data/Information Effectively Unit 11.3 – Skills Required to Manage Data and Information Effectively
<b>12.</b>	<b>Develop Knowledge, Skills &amp; Competence (SSC/N9005)</b>
	Unit 12.1 – Importance of Self Development Unit 12.2 – Knowledge and Skills Required for the Job Unit 12.3 – Avenues for Self-Development Unit 12.4 – Planning for Self-Development

#### **On-Job-Training (OJT) / Project Component (Compulsory)**

It is required by a student to carry-out and complete

- **OJT** in the relevant industry or working environment and in the relevant skill area (Web Developer).

**Duration of OJT:** Minimum 45 Hours

A Student needs to submit the detailed report of the OJT along with the ‘Certificate of Completion’.

**OR**

- **Project /Mini-Project** on Web Application Development

A Student needs to submit the project report along with the finished product and other artifacts (if any).

#### **Recommended Text Books:**

1. Nasscom courseware module for Web Developer

#### **Qualification Pack Hyperlink:**

[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0503\\_Web-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0503_Web-Developer.pdf)

# B. Voc. in Software Technologies

## (Syllabus Semester – III)

**Course Title:** Data Structures

**Course Code:** STG301

**Marks:** 75

**Type:** General Theory

**Credits:** 03

**Hours:** 45

**Prerequisites Courses:** Programming Concepts

**Course Objective**

In this course, the student will learn and understand the concept of various Data structures (Array, Stack, Queue, Linked List, and Trees), sorting techniques and use them effectively in solving the problems.

**Learning Outcomes**

On successful completion of the course the students will

- Explain the concepts of Array, Stack, Queue, Linked list, Trees, Graphs and its applications in solving real life problems
- Be able to implement various data structures and sorting techniques.

**Syllabus:**

1.	<b>Arrays, Searching &amp; Sorting</b>	<b>12 Lectures</b>
	Arrays - Single and Multi Dimensional Arrays, String functions (strlen, strcpy, strcat, strcmp, strcmpi etc) using arrays. Linear Search & binary Search, Sorting Techniques- Bubble, Selection, Insertion, Merge.	
2.	<b>Data Structure and Linked List</b>	<b>08 Lectures</b>
	Data Structure - Meaning, Data type, ADT, Need of Data Structure, Types Linked List – Concept, Representation, Operations, and Applications.	
3.	<b>Stack, and Queue</b>	<b>10 Lectures</b>
	Concept, Representation, Operations, and Applications.	
4.	<b>Trees</b>	<b>10 Lectures</b>
	Concept & Terminologies, Binary Tree, Binary Tree Traversals, Binary Search Tree – construction, Operations on BST – create, Insert, delete, traversals, counting leaf, non-leaf & total nodes, non recursive in order traversal, Expression Tree. Introduction to AVL, B and B+ Trees	
5.	<b>Graphs</b>	<b>05 Lectures</b>
	Concept & terminologies, Graph Representation – Adjacency matrix, adjacency list, Traversals – BFS & DFS, Application of BFS, DFS – Shortest path, Backtracking.	

**Recommended Text Books:**

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Data Structures & Algorithms, Pearson Education India;
2. R. Venkatesan, S. Lovelyn Rose, Data Structures, Wiley; Second edition

**Recommended References:**

1. Michael T. Goodrich, Roberto Tamassia , Data Structures and algorithms in Java, John Wiley & sons inc.,5th Edition, International Student version.
2. Langsam Yedidyah, Augenstein J. Moshe, Tenenbaum M. Aaron , Data Structures using C and C++, Pearson Education, Second Edition
3. Gilbeg Richard, Forouzan Behrouz, Data Structures: A Pseudocode Approch with C++, Cengage



**Course Title:** Audio and Visual Media  
**Course Code:** STG302  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisites Courses:** None

**Course objectives:**

- To understand the broad range of basics of audio and visual media concepts.
- To develop the skill to produce and distribute digital, audio, video, animations, and presentations.
- To develop Creativity and publish a self-contained multimedia Application using multimedia authoring tools in various application areas

**Learning Outcomes:**

On successful completion of the course, the students will be able to

- Identify various properties of audio, video and animation data
- Explain compression techniques of various media types
- Familiarize with basics and latest advances in multimedia
- Develop competencies in Audio-Visual Capture and Editing using Software tools
- Create and Manipulate Animation and multimedia presentation.

**Syllabus:**

1.	AUDIO MEDIA CONCEPTS	12 Lectures
	Digitization of Sound: Fundamental Characteristics of Sound; Analog V/s Digital sound; Basics of digital sound- Sampling, Frequency, Sound Depth Sample rate and Bit-Depth; Elements of Audio System; Nyquist Theorem, SNR, SQNR  Working with Audio: Linear & Non Linear Quantization, Audio Filtering , Audio Quality VS Data Rate, Synthetic sound, MIDI to WAV conversion process , Overview of audio File Formats (WAV, VOC, AVI, MP3, MP4, Ogg, Verbose etc. )  Basic concepts of Quantization & Transmission of Audio: Coding of Audio, Pulse Code Modulation, Differential Coding of Audio, Lossless Predictive Coding , DPCM,DM,ADPCM  Concepts of Audio Editing, Mixing, Effects and Transitions	
2.	VIDEO MEDIA CONCEPTS	12 Lectures
	Analog and Digital Video, graphics accelerator cards, DirectX, AV/DV and IEEE1394 cards, Video Broadcast Standards – Frame rate (NTSC, PAL, SECAM), frame size - HDTV. Basics of video capturing and recording formats like S-VHA Video, Component (YUV), Component & Composite Digital Media & Instrument. Concepts of Frame rates, resolution, image size and color depth; Intraframe, Interframe, and Hybrid compression; Video file formats, codecs and compression options. Process of digitizing, Transferring digital footage, Editing, mixing, scrubbing, and applying transitions and effects Concepts of shooting platforms, Lighting, Chroma Key or Blue Screen, Titling and the Titler, overlays, Adding narration and soundtracks. Distribution options: Internet, CD/DVD, DCP and KDM	
3.	2D DIGITAL ANIMATION	10 Lectures
	Basics of animation, Terms used in Animation, Principle and use of animation in multimedia; Effect of resolutions, pixel depth, Images size on quality and storage.	

	Drawing, Working with Colour, Using Imported Artwork, Adding Sound, Working with Objects, Using Layers, Using Type, Using Symbols and Instances, Creating Animation, Thumbnails, sequential movement drawing, drawing for motion, Creating interactive movies, Creating Printable movies, Publishing and Exporting, features & limitations, creating simple animations for the Web. Animation file formats. Development process of Animation Character - Anatomy & Body Language, 2 D virtual drawing for animation	
<b>4.</b>	<b>ACTION SCRIPT</b>	<b>06 Lectures</b>
	Introduction, Reference Panel, Syntax, Adding an Action to Your Script, Key frame, Object, and Button; Controlling The Timeline & Movie Content, Loops, Modifying objects, Using ActionScript with Text	
<b>5.</b>	<b>3D MODELING BASICS</b>	<b>05 Lectures</b>
	Modeling Basics: Principles of 3D modeling, concepts like polygons, nurbs, and sub surface modeling etc. Primitive and compound Objects, Meshes, Polys & Splines	

#### Recommended Text Books:

1. Ranjan Parekh, Principles of Multimedia, The McGraw - Hills Company, 12<sup>th</sup> Reprint 2011.
2. Vaughan Tay, Multimedia: Making it Work, 8th edition, Tata McGraw-Hill
3. Jeffcoate Judith, Multimedia in Practice, Technology and Applications, PHI.
4. Adobe Creative Team, Adobe Flash Professional CS6 Classroom in a Book, Adobe Press, 1<sup>st</sup> Edition

#### Recommended References:

1. Peter Wells, A Beginners guide to Digital Video, AVA Publishing –Switzerland, 2004.
2. Richard Williams, The Animator's Survival Kit, Faber; Main - Revised edition
3. Steve Roberts, Character Animation Fundamentals: Developing Skills for 2D and 3D Character Animation, Routledge, 1st Edition
4. Roland Hess, Blender Foundations: The Essential Guide to Learning Blender, Focal Press
5. Using ADOBE® PREMIERE® PRO CS5 & CS5.
6. James E Shuman, Multimedia in Action, Vikas Publishing House.
7. Elson-Cook, Principles of Interactive Multimedia, McGraw Hill Higher Education.
8. Daniel Carter and Michael Courtney, Anatomy for the Artist, Parragon Inc
9. Kelly L. Murdoc, 3Ds Max 6 Bible, Wiley
10. John M. Blain, The Complete Guide to Blender Graphics: A Beginner's Guide, A K Peters/CRC Press, 1<sup>st</sup> Edition

**Course Title:** Reasoning Techniques  
**Course Code:** STG303  
**Marks:** 100

**Type:** General Theory  
**Credits:** 04  
**Hours:** 60

**Prerequisites Courses:** None

**Course Objective**

To build logical and reasoning aptitude that is essential requirement in understanding various concepts and to solve problems effectively.

**Learning Outcomes**

On successful completion of the course the students will

- Create, solve and interpret basic data and logical models.
- Make sound arguments based on reasoning and/or careful analysis of data.
- Exhibit critical thinking by developing and expressing sound arguments from given premises to related conclusions
- Effectively communicate the substance and meaning of logical problems and their solutions.

**Syllabus:**

1.	Module I	12 Lectures
	Logic, Statements, Arguments, and Assumptions, Statements and Course of Action, Logical Venn Diagrams, Statements and Conclusions, Syllogism	
2.	Module II	12 Lectures
	Seating Arrangement, Ranking & Time Sequence Test, Blood Relations, Direction Sense Test, Conditions & Grouping, Simple & Coded Inequality, Decision Making, Clocks and Calendar, Situation Reaction Test	
3.	Module III	15 Lectures
	Decision-making, Judgment, Problem-solving, Analogies, Analysis, Differences, Discrimination Arithmetic series, Similarities, Verbal & figure classification, Space visualization, Observation Simple Problems on Data interpretation and Data sufficiency	
4.	Module IV	15 Lectures
	<b>Mathematical Logic:</b> Introduction, Statements, Logical Connectives and Compound Statements: Negation, Conjunction, Disjunction, Implication, Converse and Inverse, logical Equivalence, Tautologies: Contradiction, Contingency, Algebra of Propositions, Argument, Predicate and Quantifiers. Mathematical induction, deduction, proof by contradiction, program correctness.	
5.	Module V	06 Lectures
	<b>Boolean algebra</b> - Boolean functions, truth table, DeMorgan’s theorem, logic gates, Realization of Boolean Function using logic gates, Simplification using Karnaugh map (Simple Problems).	

**Recommended Text Books:**

1. Arun Sharma, How to Prepare for Logical Reasoning for the CAT, 8<sup>th</sup> edition, McGraw Hill Education (India) Private Ltd.
2. A.K. Gupta, Logical and Analytical Reasoning, Ramesh Publishing House; 34<sup>th</sup> edition
3. Peeyush Bhardwaj, Analytical & Logical Reasoning for CAT & Other Management Entrance Tests, Arihant Publications; 4<sup>th</sup> edition
4. Rosen H. Kenneth, Discrete Mathematics and its Applications, Tata McGraw Hill, 7<sup>th</sup> edition

**Recommended References:**

1. Ananta Ashisha, Data Interpretation & Data Sufficiency, Arihant Publications; Third edition
2. MK Pandey, Magical Book Series - Analytical Reasoning, BSC Publishing Co. Pvt. Ltd., 2017
3. Daniel Kahneman, Thinking Fast and Slow, Farrar, Straus and Giroux; Reprint edition
4. Dr. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, 2018, S. Chand Publication



**Course Title:** Software Laboratory – III

**Course Code:** STP301

**Marks:** 50

**Type:** General Practical

**Credits:** 02

**Hours:** 60

**Course objectives:**

- To understand and implement the concepts of Data Structures learnt in STG301
- To implement the audio-visual design concepts learnt in STG302

**Learning Outcomes:**

After successful completion of this course, the student will be able to

- Implement various data structures and sorting techniques.
- Implement and apply Array, Stack, Queue, Linked list, Trees, Graphs in solving real life problems
- Develop competencies in Audio-Visual Capture and Editing using Software tools
- Create and Manipulate Animation and multimedia presentation.

**List of suggested Practical:**

*A student shall complete practical of minimum 24 Hours duration from each Section*

**Section A** - Based on STG301

1. Array and String Operations [04 Lectures]
2. Searching & Sorting Techniques [06 Lectures]
3. Stacks, Queues, and Linked List (Singly & Doubly) – creation, addition, deletion, and traversals [12 Lectures]
4. Binary Search Tree: create, add, delete, traversals, and display nodes. [06 Lectures]
5. Representation of Graphs & Traversal. [02 Lectures]

The lab sessions should be using appropriate IDE. The problems for lab session should be supplemented with assignments to be completed and submitted by students based on above mentioned topics.

A real time problem for software development should be evaluated as Assignments so as to enable students to acquire programming competencies.

**Section B** - Based on STG202

Practical can be done using Proprietary or Open Source Software as per industry standards. For example Adobe premiere pro, After Effects, Audition, Audacity, Sound forge, Movie maker, Openshot, Blender, 3DMax, flash, iMovie, 3D Max, Blender, etc ... tools may be used

1. Audio Editing [10 Lectures]  
Recording Sound using Sound Recorder (Capture), Sound capture through sound editing software, Sound editing, Noise correction, Effect enhancement; Voice Recognition; Importing audio and saving audio from Audio CD. Sound Quality types: CD Quality, Radio Quality, Telephone Quality.
2. Video Editing [10 Lectures]
  - a. Record video from video capture devices, webcams, screen capture or even streaming video and Video Editing. Prepare video with rough cut
  - b. Prepare Video content with title and special effects. Record Video content and learn about video compressions.
  - c. Prepare Video content for streaming.

3. 2D Animation using Action script

[06 Lectures]

4. 3D Modeling

[04 Lectures]

**An Assignment combining all the media elements /concepts learnt using various editors is recommended** like Capturing and streaming audios and videos, Designing and creating 2D animation clips and games, 3D modeling.

**Recommended Books:** *As mentioned in STG301 and STG302*

**Course Title:** SSC/Q0504 Media Developer  
**Course Code:** STS301  
**Marks:** 700

**Type:** Skill (Theory, Practical, & OJT)  
**Credits:** 18 (Theory-7, Practical & OJT-11)  
**Hours:** 440

**Prerequisite Courses:** None

**Course/Package objectives:**

To enable Students to

- Understand concepts of designing and improving the look and feel, functionality and graphic appeal of the developed application
- Understand concepts of developing media content and graphic designs for software products and Applications
- Understand and Provide data/information in standard formats
- Gain new technical and professional development skills required in the field
- Develop constructive work habits
- Utilize and strengthen their communication skills and build healthy work relationships
- Develop their professional knowledge, skills and competence
- Maintain a healthy, safe and secure working environment

**Learning Outcomes:**

Students will have competencies and skills as mentioned in the Model Curriculum of MEDIA DEVELOPER designed by NASSCOM (REFERENCE ID: SSC/Q0504)

**Package Syllabus** (Adopted Model Curriculum of Nasscom)

→ *Lecture Hours and Marks Distribution as per Nasscom standard mentioned in Model Curriculum*

1.	Contribute to the design of software products and applications (SSC/N0501)
2.	Develop media content and graphic designs for software products and applications (SSC/N0503)
3.	Manage your work to meet requirements (SSC/N9001)
4.	Work effectively with colleagues (SSC/N9002)
5.	Maintain a healthy, safe and secure working environment (SSC/N9003)
6.	Provide data/information in standard formats (SSC/N9004)
7.	Develop your knowledge, skills and competence (SSC/N9005)

**On-Job-Training (OJT) / Project Component (Compulsory)**

It is required by a student to carry-out and complete

- **OJT** in the relevant industry or working environment and in the relevant skill area (Media Developer).

**Duration of OJT:** Minimum 45 Hours

A Student needs to submit the detailed report of the OJT along with the 'Certificate of Completion'.

**OR**

- **Project /Mini-Project** on Media Development

A Student needs to submit the project report along with the finished product and other artifacts (if any).

**Recommended Text Books:**

***Qualification Pack Hyperlink:***

[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0504\\_Media-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0504_Media-Developer.pdf)

# Syllabus

## B. Voc. in Software Technologies (Semester – IV)

<b>Course Title:</b> Python Programming	<b>Type:</b> General Theory
<b>Course Code:</b> STG401	<b>Credits:</b> 03
<b>Marks:</b> 75	<b>Hours:</b> 45

**Prerequisites Courses:** None

**Course Objective**

- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them
- To use Python data structures -- lists, tuples, dictionaries.
- To do input/ output with files in Python.
- To understand application areas of Python

**Learning Outcomes**

Upon completion of the course, students will be able to

- Read, write, and execute simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python Programs.

**Syllabus**

1.	INTRODUCTION TO PYTHON	11 Lectures
	Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.	
2.	PROGRAM FLOW CONTROL	10 Lectures
	Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.	
3.	LIST, TUPLE AND DICTIONARY	08 Lectures
	Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.	
4.	FILES, MODULES, PACKAGES	08 Lectures
	Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.	
5.	APPLICATION AREAS	08 Lectures

	Google Translate, Sentiment Analysis: Analyse Facebook data, Image processing, Page rank: How Google works
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**Recommended Text Books:**

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/thinkpython/>)
2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

**Recommended References:**

1. John V Guttag, Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
5. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montoyo, Practical Programming: An Introduction to Computer Science using Python 3, Second edition, Pragmatic Programmers, LLC, 2013.

**Course Title:** Software Engineering and Testing  
**Course Code:** STG402  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisites Courses:** None

**Course Objective**

- To make students familiar with the software development principles, models and tools
- To make students understand theories, methods, and technologies applied for software development.
- To understand the Project Management Concepts
- To study basic concepts and strategies of software testing, process, strategies and matrix.
- To understand Software Quality Assurance Concepts and Standards

**Learning Outcomes**

On completion of the course students will be able to

- Acquaint with historical and modern software methodologies
- Apply the software life cycle models & appreciate the development process
- Develop project plan and control it during the software development cycle.
- Comfortably apply the testing strategies and methods.
- Explain Software Quality Assurance Concepts and Standards

**Syllabus**

1.	<b>INTRODUCTION</b>	<b>06 Lectures</b>
	Characteristics, Software Engineering goals, Software Process Models: Waterfall, Spiral, Prototyping, Agile, Fourth Generation Techniques and Software Development Life Cycle. Requirements Elicitation Techniques, Feasibility Analyses, Software Requirements Document (SRS)	
2.	<b>Software Project Management</b>	<b>05 Lectures</b>
	Software project management, Project planning and control, cost estimation, project scheduling using PERT and GANTT charts.	
3.	<b>Software Design</b>	<b>12 Lectures</b>
	Basic issues in software design, modularity, cohesion, coupling and layering, function-oriented software design: DFD and Structure chart, Object-oriented software development – Use case, Class Diagram, Activity, Sequence and State chart diagram	
4.	<b>Software Testing</b>	<b>12 Lectures</b>
	Fundamentals of testing, White-box and black-box testing, Test coverage analysis and test case design techniques, Mutation testing, Static and dynamic analysis, Software Metrics, Types of Software Metrics.	
5.	<b>Software Quality Assurance Concepts and Standards</b>	<b>10 Lectures</b>
	Quality Concepts, Quality Control, Quality Assurance, SQA Activities, Software Reviews, Formal Technical Reviews, Review Guidelines, Software Reliability, Software Safety, Quality Assurance Standards, ISO 9000, ISO 9001:2000, Quality Factors, CMM, TQM, Six Sigma, SPICE, Software Quality Assurance Metrics.	

**Recommended Text Books:**

1. Roger S. Pressman, Software Engineering – A Practitioner’s Approach, TMH, 7e, 2009.
2. Richard Fairley, Software Engineering Concepts, TMH, 2008.
3. Jalote Pankaj, An Integrated Approach to Software Engineering, Third Edition, Narosa Publishing House

4. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing- Principles and Practices, Pearson

**Recommended References:**

1. Ian Sommerville, Software Engineering, Pearson Education Asia, 2007.
2. Hans Van Vliet, Software Engineering: Principles and Practices, Wiley, 2008.
3. Mahesh Matha, Object Oriented Analysis and Design Using UML ,(1e)
4. Craig Larman, Agile and Iterative Development – A Manager’s Guide, Pearson Education
5. Jorgensen, P. (2014) Software Testing, A Craftsman’s Approach (4e), CRC Press: Boca
5. Copeland, L. (2004) A Practitioner’s Guide to Software Test Design, Artech House
6. Kathy Schwalbe, Introduction to Project Management, First Edition, Course Technology;2006
7. Myers, G. (2011) The Art of Software Testing, (3e), John Wiley & Sons
8. Martin Fowler, UML Distilled, Addison-Wesley Professional, 3rd Edition.



**Course Title:** Creative Thinking

**Course Code:** STG403

**Marks:** 100

**Type:** General Theory

**Credits:** 04

**Hours:** 60

**Prerequisites Courses:** None

**Course Objective**

This is a course on study of creative/lateral thinking and problem solving techniques those are essential to solve real world problems. Causal, deductive, and inductive arguments are described as well as the use of persuasion.

**Learning Outcome**

Upon completion of this course, students should be able to

- Identify the benefits of employing creative/lateral-thinking processes.
- Apply creative/lateral-thinking and problem-solving theories to real-world problems.
- Develop strategies to overcome the barriers that inhibit creative thinking.
- Identify strategies for creating an organizational culture that embraces and sustains creative-thinking practices
- Identify strategies to solve complex problems in a collaborative way.
- Apply creative/lateral-thinking principles to develop persuasive arguments that employ legal, moral, and aesthetic reasoning.

**Syllabus**

1.	Module I	10 Lectures
	<ul style="list-style-type: none"><li>• The way the mind works</li><li>• Difference between lateral and vertical thinking</li><li>• Attitudes towards lateral thinking</li><li>• Basic nature of lateral thinking</li></ul>	
2.	Module II	12 Lectures
	<ul style="list-style-type: none"><li>• The use of lateral thinking</li><li>• Techniques</li><li>• The generation of alternatives</li><li>• Challenging assumptions</li><li>• Innovation</li></ul>	
3.	Module III	12 Lectures
	<ul style="list-style-type: none"><li>• Suspended judgement</li><li>• Design</li><li>• Dominant ideas and crucial factors</li><li>• Fractionation</li><li>• The reversal method</li></ul>	
4.	Module IV	12 Lectures
	<ul style="list-style-type: none"><li>• Brainstorming</li><li>• Analogies</li><li>• Choice of entry point and attention area</li><li>• Random stimulation</li></ul>	
5.	Module V	14 Lectures
	<ul style="list-style-type: none"><li>• Concepts/divisions/polarization</li><li>• The new word po</li><li>• Blocked by openness</li><li>• Description/problem solving/design</li></ul>	

**Recommended Text Books:**

1. Edward De Bono, Lateral Thinking: Creativity Step by Step, Harper Perennial; Reissue edition (24 February 2015)
2. Ken Watanabe, Problem Solving 101: A simple book for smart people, Vermilion

**Recommended References:**

1. R G Chaudhari, Training Techniques of Creative Problem Solving: Trainers Manual, Notion Press, Inc.; 1<sup>st</sup> edition
2. Mahon N, Basics Advertising 03: Ideation, AVA Publishing (October 26, 2011)
3. Brian Tracy, Creativity & Problem Solving: The Brian Tracy Success Library, Manjul Publishing House
4. Michael Sloan, The Art Of Problem Solving 101: Improve Your Critical Thinking And Decision Making Skills And Learn How To Solve Problems Creatively, Make Profits Easy LLC
5. Ruggiero, V. R., The art of thinking: A guide to critical and creative thought (11th ed.), Longman (2015).
6. Proctor, T., Creative Problem Solving for Managers: Developing Skills for Decision Making and Innovation, Routledge, 4<sup>th</sup> edition

**Course Title:** Software Laboratory – IV  
**Course Code:** STP401  
**Marks:** 50

**Type:** General Practical  
**Credits:** 02  
**Hours:** 60

**Course objectives:**

- To understand and implement the concepts of Python Programming learnt in STG401
- To implement the software engineering and testing concepts learnt in STG402

**Learning Outcomes:**

After successful completion of this course, the student will be able to

- Write, test, and debug Python programs.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python
- Design SRS, Use Case, and other software modeling diagram
- Develop project plan and execute, and control it
- Design, and execute test suites effectively

**List of suggested Practical:**

*A student shall complete practical of minimum 24 Hours duration from each Section*

**Section A** - Based on STG401

- |   |               |
|---|---------------|
| 1. <b>PYTHON BASICS</b>   | [08 Lectures] |
| <ul style="list-style-type: none"><li>– Installation &amp; IDE,</li><li>– Working with variables &amp; different Data Types</li><li>– Basic Input and Output</li><li>– Types of operations</li><li>– Math, Strings, and Variables</li></ul> |               |
| 2. <b>PROGRAM FLOW CONTROL</b>  | [08 Lectures] |
| <ul style="list-style-type: none"><li>– Conditional Statements</li><li>– Control Structures</li><li>– Repetition Structures</li><li>– Working with Text</li><li>– Functions</li></ul>   |               |
| 3. <b>LIST, TUPLE AND DICTIONARY</b>  | [08 Lectures] |
| <ul style="list-style-type: none"><li>– Lists</li><li>– Tuple</li><li>– Dictionaries</li></ul>  |               |
| 4. <b>FILES, MODULES, PACKAGES</b>  | [06 Lectures] |
| <ul style="list-style-type: none"><li>– File Input and Output</li><li>– Exception Handling</li></ul>  |               |

The lab sessions should be using appropriate IDE. The problems for lab session should be supplemented with assignments to be completed and submitted by students based on above mentioned topics.

**Section B** - Based on STG402

Class may be divided into groups of 5 for the practical session. (Case Study Based)  
Use of any UML CASE Tool, Project Management Tool, and Collaboration / Versioning Tool

- |  |               |
|--|---------------|
| 1. Development of SRS, Requirement Gathering & Feasibility Study     | [04 Lectures] |
| 2. Creating WBS, Gantt and tracking Gantt chart using any IT PM Tool | [04 Lectures] |
| 3. Software Analysis and Designing                                   | [08 Lectures] |
| a. Requirement Analyses using Use Case Analysis                      |               |

- b. UML Diagrams (Class Diagram, Sequence Diagram, Activity & State Chart Diagram)

#### 4. Software Testing

[14 Lectures]

- a. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
- b. Install Selenium server and demonstrate it using a script in Java/PHP
- c. Write and test a program to login a specific web page
- d. Write and test a program to update 10 student records into table into Excel file
- e. Write and test a program to select the number of students who have scored more than 60 in any one subject ( or all subjects )
- f. Write and test a program to provide total number of objects available on the page
- g. Write and test a program to get the number of list items in a list /combo box
- h. Write and test a program to count number of check boxes on the page checked and unchecked count.

**Recommended Books:** *As mentioned in STG401 and STG402*

**Course Title:** SSC/Q0509  
Master Trainer for Junior Software Developer  
**Course Code:** STS401  
**Marks:** 700

**Type:** Skill (Theory, Practical, & OJT)  
**Credits:** 18 (Theory-7, Practical & OJT-11)  
**Hours:** 440

**Course/Package objectives:**

To enable student to

- Understand concepts to accurately describe software products/applications & their features
- Establish clearly the customization requirements and identify accurately the changes required for each customized version of software products/ applications.
- Acquire skills to implement and document changes using standard templates and tools.
- Create appropriate unit test cases for the changes, execute and document results.
- Design and Access reusable components and tools from the organization’s knowledge base.
- Update organization’s knowledge base with the code developed.
- Employ Programming Lab Oriented Pedagogical Skills as a Master Trainer in the IT Industry
- Engage Pedagogical Skills as a Master Trainer.
- Develop constructive work habits
- Utilize and strengthen their communication skills and build healthy work relationships
- Develop professional and personal knowledge, skills and competence
- Maintain a healthy, safe and secure working environment.

**Learning Outcomes:**

Students will have competencies and skills as mentioned in the Model Curriculum of MASTER TRAINER FOR JUNIOR SOFTWARE DEVELOPER designed by NASSCOM (REFERENCE ID: SSC/Q0509, version 1.0)

**Package Syllabus** (Adopted Model Curriculum of Nasscom)

→ *Lecture Hours and Marks Distribution as per Nasscom standard mentioned in Model Curriculum*

1.	Assist in performing software construction and software testing entry-level tasks in the IT Services industry (SSC/N0506)
2.	Employ Programming Lab Oriented Pedagogical Skills as a Master Trainer in the IT Industry (SSC/N0507)
3.	Engage Pedagogical Skills as a Master Trainer (SSC/N0508)
4.	Manage your work to meet requirements (SSC/N9001)
5.	Work effectively with colleagues (SSC/N9002)
6.	Maintain a healthy, safe and secure working environment (SSC/N9003)
7.	Develop your knowledge, skills and competence (SSC/N9005)

### **On-Job-Training (OJT) / Project Component (Compulsory)**

It is required by a student to carry-out and complete

- **OJT** in the relevant industry or working environment and in the relevant skill area (Master Trainer for Junior Software Developer).

**Duration of OJT:** Minimum 45 Hours

A Student needs to submit the detailed report of the OJT along with the 'Certificate of Completion'.

**OR**

- **Project /Mini-Project** : Junior Software Developer Training

A Student needs to submit the project report along with the finished product and other artifacts (if any).

**Recommended Text Books:**

***Qualification Pack Hyperlink:***

[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0509\\_Master-Trainer-for-Software-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0509_Master-Trainer-for-Software-Developer.pdf)

# Syllabus

## B. Voc. in Software Technologies (Semester – V)

**Course Title:** Mobile Application Development  
**Course Code:** STG501  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisite Courses:** Java Programming, Web Designing

**Course Objectives:**

- To understand the fundamentals of Android operating systems
- To use Android software development tools
- To develop software with reasonable complexity on mobile platform
- To deploy software to mobile devices
- To debug programs running on mobile devices

**Learning Outcomes:**

Upon successful completion of this class, the learner will be able to

- Demonstrate their understanding of the fundamentals of Android operating systems
- Efficiently develop software with reasonable complexity on mobile platform
- Use the development tools in the Android development environment
- Use the major components of Android API set to develop their own apps
- Demonstrate their ability to deploy software to mobile devices
- Debug programs running on mobile devices
- Package and prepare their apps for distribution on the Google Play Store

**Syllabus**

1.	INTRODUCTION TO ANDROID OPERATING SYSTEM	09 Lectures
	Android OS design & Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools. Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices & languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes	
2.	ANDROID USER INTERFACE	09 Lectures
	Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities	
3.	INTENTS AND BROADCASTS	09 Lectures
	Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts	
4.	PERSISTENT STORAGE	09 Lectures
	Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and	

	retrieving data using Shared Preference Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve & update)	
<b>5.</b>	<b>OTHER TOPICS</b>	<b>09 Lectures</b>
	<p>Alarms – Creating and using alarms</p> <p>Understanding Mobile Networking Fundamentals - Accessing the Internet (HTTP), Browsing the web with WebView, Calling PHP From Android: Pass Android application data to PHP.</p> <p>Using Internet Resources – Connecting to internet resource, using download manager</p> <p>Location Based Services – Finding Current Location and showing location on the Map, updating location</p> <p>Publishing Android Applications: Preparing for Publishing, Versioning, Digitally Signing Your Android Applications, Deploying APK Files, Using the adb exe Tool, Using a Web Server, Publishing on the Android Market, Creating a Developer Profile, Submitting Your Apps</p>	

**Recommended Text Books:**

1. Reto Meier, Professional Android 4 Application Development, , Wiley India, (Wrox) , 2012
2. Jonathan Simon, Head First Android Development, O'Reilly media.
3. Rick rogers, John Lombardo, Android Application Development, O'Reilly
4. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning

**Recommended References:**

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2013
2. Building Android Apps In Easy Steps, McGraw-Hill Education
3. Lauren Darcey and Shane Conder, Android Wireless Application Development, Pearson Education, 2<sup>nd</sup> ed.



**Course Title:** Human Computer Interaction  
**Course Code:** STG502  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisites Courses:** None

**Course Objective**

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

**Learning Outcome**

Upon completion of the course, the students should be able to:

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with different-abilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

**Syllabus**

1.	FOUNDATIONS OF HCI	09 Lectures
	<b>The Human:</b> I/O channels – Memory – Reasoning and problem solving; <b>The Computer:</b> Devices – Memory – processing and networks; <b>Interaction:</b> Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies	
2.	DESIGN & SOFTWARE PROCESS	09 Lectures
	<b>Interactive Design:</b> Basics – process – scenarios – navigation – screen design – Iteration and prototyping. Persona, storyboard, <b>HCI in software process:</b> Software life cycle – usability engineering – Prototyping in practice – design rationale. <b>Design rules:</b> principles, standards, guidelines, rules. <b>Evaluation Techniques</b> – Universal Design	
3.	MODELS AND THEORIES	09 Lectures
	<b>HCI Models:</b> Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.	
4.	MOBILE HCI	09 Lectures
	<b>Mobile Ecosystem:</b> Platforms, Application frameworks- <b>Types of Mobile Applications:</b> Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, <b>Mobile Design:</b> Elements of Mobile Design, Tools. - Case Studies	
5.	WEB INTERFACE DESIGN	09 Lectures
	<b>Designing Web Interfaces</b> – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies	

**Recommended Text Books:**

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3<sup>rd</sup> Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, Mobile Design and Development, 1<sup>st</sup> Edition, O’Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, Designing Web Interfaces, 1<sup>st</sup> Edition, O’Reilly, 2009. (UNIT-V)

**Prerequisites Courses:** None

**Course Objective**

- To build mathematical foundation that is essential requirement in understanding various concepts.
- To understand appropriate statistical techniques for grouping, displaying, analyzing and interpreting statistical data

**Learning Outcomes:**

On successful completion of the course, the students will be able to

- Understand the basic principles of sets and operations in sets.
- Apply counting principles to determine probabilities.
- Demonstrate an understanding of matrices and determinants
- Apply basic statistical concepts & techniques for quantification of data.
- Independently calculate basic statistical parameters (measures of central tendency and dispersion, correlation and regression coefficients, indexes)
- Interpret the meaning of the calculated statistical indicators based on the acquired knowledge

**Syllabus:**

1.	<b>Set, Relation, and Functions</b>	<b>12 Lectures</b>
	<b>SETS:</b> Sets, Subsets, Equal Sets, Universal Sets, Finite and Infinite Sets, Operation of Sets, Union, Intersection and Complement of sets, Cartesian product, Cardinality of Sets, Simple Applications. <b>RELATION:</b> Properties of Relation, Equivalence Relation <b>FUNCTIONS:</b> Domain and Range, Onto , Into and One-to One- Functions, Composite and Inverse functions, Hashing functions and Recursive Functions, growth of functions	
2.	<b>Counting Principles</b>	<b>12 Lectures</b>
	Permutations; Combinations; Counting; Probability Summation; Basics of recurrence relations	
3.	<b>Matrices and Determinants</b>	<b>12 Lectures</b>
	Definition, Minors, Cofactors, Properties of Determinants MATRICES: Definition, Types of matrices, Multiplication of matrices, Adjoint, Inverse, Cramer’s Rule, Rank of matrix, Dependence of vectors, Eigen vectors of a matrix	
4.	<b>Statistical Sampling and Central Tendency</b>	<b>12 Lectures</b>
	Collection, classification, tabulation and presentation of data; the concept and methods of sampling, sample types Measures of central tendency - mean, median, mode, quartiles, deciles and percentiles and their applications in data analyses	
5.	<b>Measures of Dispersion and Relation</b>	<b>12 Lectures</b>
	Measures of Dispersion- Range - Quartile Deviation – Mean Deviation - Standard Deviation. Coefficient of Variation Meaning and use of correlation – Types of correlation-Karl Pearson’s correlation coefficient – Spearman’s Rank correlation. Calculation of Correlation; Regression analysis, comparison between correlation and Regression – Regression Equations, Interpretation of Regression Co-efficients	

**Note:** It is recommended to use excel/spreadsheets for Unit4 and Unit5

**Recommended Text Books:**

1. Rosen H. Kenneth, Discrete Mathematics and its Applications, Tata McGraw Hill, 7<sup>th</sup> edition
2. Gupta. S. C. Fundamental of Statistics, Himalaya Publishing House, Mumbai, 6<sup>th</sup> edition
3. Kolman, Busby, Ross, Discrete Mathematical structures, Pearson

**Recommended References:**

1. Sarkar Kumar Swapan, A Textbook of Discrete Mathematics, S Chand & Company, 2005.
2. J.K. Sharma, Discrete Mathematics, Macmillan India Ltd., Second Edition – 2005
3. Spiegel. M. R. and Stephens. J. L., Shaum's Outlines Statistics, Tata McGraw-Hill, India, 2011
4. Sanchetti D.C and Kapoor V.K .Statistics - Theory, Methods and Application, Sultan Chand & Sons , New Delhi, 7<sup>th</sup> edition, 2010.

**Course Title:** Software Laboratory – V  
**Course Code:** STP501  
**Marks:** 50

**Type:** General Practical  
**Credits:** 02  
**Hours:** 60

**Course objectives:**

- To understand and implement the concepts of Mobile Application Development learnt in STG501

**Learning Outcome:**

After successful completion of this course, the student will be able to

- Demonstrate their ability to develop software with reasonable complexity on mobile platform
- Proficiently use the development tools in the Android development environment
- Use the major components of Android API set to develop their own apps
- Debug programs running on mobile devices
- Package and prepare their apps for distribution on the Google Play Store

**List of suggested Practical:**

*A student shall complete practical of minimum 50 Hours duration*

**Based on STG501**

- |   |               |
|---|---------------|
| 1. Understanding & Configuring Tools  | [04 Lectures] |
| a) Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs)  |               |
| b) Creating a New Android Project, Defining the Project Name and SDK Settings, Project Configuration Settings, Configuring the Launcher Icon, Creating an Activity, Running the Application in the AVD, Stopping a Running Application, Modifying the Example Application, Reviewing the Layout and Resource Files. |               |
| c) Familiarize with the Directory Structure of an Android Project , Common Default Resources Folders, Leveraging Android XML, Screen Sizes, Launching Your Application: The AndroidManifest.xml File  |               |
| 2. Creating First Android Application   | [02 Lectures] |
| 3. Develop an application that uses   | [06 Lectures] |
| a) GUI components, Font and Colours   |               |
| b) Layout Managers and event listeners.   |               |
| 4. Develop a native calculator application.   | [04 Lectures] |
| 5. Write an application that draws basic graphical primitives on the screen.  | [04 Lectures] |
| 6. Develop an application that makes use of RSS Feed.   | [04 Lectures] |
| 7. Implement an application that implements Multi threading   | [06 Lectures] |
| 8. Develop an application that makes use of Notification Manager  | [04 Lectures] |
| 9. Develop a native application that uses GPS location information.   | [06 Lectures] |
| 10. Develop an application that makes use of database.  | [06 Lectures] |
| 11. Implement an application that writes data to the SD card.   | [04 Lectures] |
| 12. Write a mobile application that creates alarm clock   | [06 Lectures] |
| 13. Develop a mobile application to send an email.  | [04 Lectures] |

**A mini-project combining all the technologies/concepts learnt using an IDE such as Xamarin and Eclipse is recommended as assignment or internal evaluation.**

**Recommended Books:** *As mentioned in STG501*

**Course Title:** SSC/Q0502 UI Developer  
**Course Code:** STS501  
**Marks:** 800

**Type:** Skill (Theory, Practical, & OJT)  
**Credits:** 18 (Theory-7, Practical & OJT-11)  
**Hours:** 440

**Course/Package objectives:**

To enable students to

- Acquire skills to create complex user interfaces for a variety of applications, such as software’s, databases and websites.
- Learn the UI/UX design of software products and applications
- Develop media content and graphic designs for software products and applications
- Develop software code to specification
- Provide data/information in standard formats
- Gain new technical and professional development skills
- Develop constructive work habits
- Utilize and strengthen their communication skills and build healthy work relationships
- Determine what professional and personal competencies they need to develop and address in their transition to professional life
- Maintain a healthy, safe and secure working environment
- Develop knowledge, skills and competence

**Learning Outcomes:**

Students will have competencies and skills as mentioned in the Model Curriculum of UI DEVELOPER designed by NASSCOM (REFERENCE ID: SSC/Q0502, version 1.0)

**Package Syllabus** (Adopted Model Curriculum of Nasscom)

→ *Lecture Hours and Marks Distribution as per Nasscom standard mentioned in Model Curriculum*

1.	Contribute to the design of software products and applications(SSC/N0501)
2.	Develop software code to specification(SSC/N0502)
3.	Develop media content and graphic designs for software products and applications (SSC/N0503)
4.	Manage your work to meet requirements(SSC/N9001)
5.	Work effectively with colleagues(SSC/N9002)
6.	Maintain a healthy, safe and secure working environment(SSC/N9003)
7.	Provide data/information in standard formats(SSC/N9004)
8	Develop your knowledge, skills and competence(SSC/N9005)

**On-Job-Training (OJT) / Project Component (Compulsory)**

It is required by a student to carry-out and complete

- **OJT** in the relevant industry or working environment and in the relevant skill area (User Interface Developer).

**Duration of OJT:** Minimum 45 Hours

A Student needs to submit the detailed report of the OJT along with the 'Certificate of Completion'.

**OR**

- **Project /Mini-Project** : User Interface Development

A Student needs to submit the project report along with the finished product and other artifacts (if any).

**Recommended Text Books:*****Qualification Pack Hyperlink:***

[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0502\\_UI-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0502_UI-Developer.pdf)

# Syllabus

## B. Voc. in Software Technologies (Semester – VI)

**Course Title:** Advanced Graphics Designing  
**Course Code:** STG601E1  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisite Courses:** Graphics Designing

**Course objectives:**

- To understand the concept of color theory and color psychology in graphic design
- To learn about layout design in graphic design and publication
- To learn about the process of creating and publishing books and eBooks

**Learning Outcomes:**

On successful completion of the course, the students will be able to

- Demonstrate the ability to apply effective color scheme in design
- Create artistic and effective design layout
- Prepare and publish documents and book/eBooks for various Platforms
- Explain the concepts involved in Publishing

**Syllabus:**

1.	COLOR THEORY	09 Lectures
	Color & color theory – Additive & subtractive -Terms to describe color, - color separation technique Direct & indirect method – GATF color triangles & color circle their use – modern color spaces -color matching – color original - color originals, selection and their characteristics – method of color measurement– color Gamut. Color Profiles .ico files Prepress color proofing: DDCP- inkjet-thermal wax – chromalin proofing- factors in proofing- substrate- color of ink solid ink density- trapping tone reproduction proofing methods- soft proof- digital proof photomechanical proof- press proof- other proofing methods	
2.	COLOR PSYCHOLOGY	09 Lectures
	Color Symbolism, Color Psychology, and Historical & Contemporary use of Color. Local color and subjective use of color. Emotional effects. Personal Color preferences. Color psychology in context of Indian sub-continent.	
3.	LAYOUT DESIGN	09 Lectures
	Layout Design: Directing The Eye, Backwards Movement, Application Of Design Principles In Lay Out, Free Style Lay Out, Grid Design, Formats, Margins, Columns And Gutters, Page Depth, Working With Imagery, Borders And Rules. Consistency In Design: Creating Style Guides And Printing Instructions.	
4.	LAYOUT VISUALIZATION	09 Lectures
	Visualization of various layouts- magazine, newspaper, books, screen media etc. Creating a Suitable Grid, Title and Cover Policies. Selecting and Using Type family, White Space, Colour, Headlines, The Masthead etc.	
5.	E- PUBLISHING	09 Lectures
	Paper types and sizes, GSM, etc. Creating a book –Adding documents to the book – Synchronizing Style Source – Page numbering – Creating Table of Contents – indexing – Preflight – Exporting Documents – Exporting to E-book format – Printing technologies Interactive PDF and Other E-Pub Formats, Interaction Between Movies, Sound Clips URL’s And Other E-Books, E-Publication for Various Platforms.	



**Recommended Reference Books:**

1. Adams Morioka, Color Design Workbook: A Real World Guide to Using Color in Graphic Design, Rockport Publishers
2. John T Draw, Color Management: A Comprehensive Guide for Graphic Designers, Allworth; 1 edition
3. David E. Carter, The Big Book of Layouts, Harper Design
4. Beth Tondreau, Layout Essentials -100 Design Principles for Using Grids, Rockport Publishers
5. Chris Frost, Designing for Newspapers and Magazines, Routledge
6. Jost Hochuli and Robin Kinross, Designing Books: Practice and Theory, Hyphen Press
7. Kindle Direct Publishing, Building Your Book for Kindle, Kindle Direct Publishing

**Course Title:** Relational Database Management System (RDBMS)  
**Course Code:** STG601E2  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisite Courses:** Knowledge of Data Structures and Programming skills.

**Course objectives:**  
To provide a strong formal foundation in database concepts, technology and to apply it in the field of software development

- Learning Outcomes:**  
After successful completion of this course, the students will
- Explain the need and working of Data Base and Data Base Management Systems.
  - Demonstrate competency in designing database models and design.
  - Learn the RDBMS Concepts and data manipulation using SQL.

**Syllabus:**

1.	INTRODUCTION TO DATABASE MANAGEMENT SYSTEM	05 Lectures
	Basic concepts and definitions – Data Dictionary – Database – DBMS – DBA - Disadvantages of File oriented System – Advantages and Disadvantages of DBMS – Schema, Subschema– Three-Level Architecture of DBMS - Functions and Services of DBMS - Database Languages – Data Models (Hierarchical, Network, and Relational Model)	
2	RELATIONAL DATABASE DESIGN	10 Lectures
	Relational Algebra – Relational Calculus – Codd’s Rules - Structured Query Language (SQL) – Entity – Relationship (ER) Model - Relationship sets, Attributes, Constraints, Mapping Cardinalities, Keys, ER diagrams, Weak entity sets, Strong entity sets. Database Development Life Cycle (DDLC) – Functional Dependency. <b>NORMALIZATION:</b> need for normalization, First Normal Form (1NF) – Second Normal Form (2NF) – Third Normal Form (3NF)	
3.	DATA DEFINITION AND MANIPULATION IN SQL	15 Lectures
	Data Definition: Data types, Creation, Insertion, Viewing, Updating, Deletion of tables, modifying the structure of the tables, Renaming, Dropping of tables. Data Constraints – I/O constraints, Primary key, foreign key, unique key constraints, ALTER TABLE command.  Database Manipulation: Computations done on table data Select command, Logical operators, Range searching, Pattern matching, Grouping data from tables in SQL, GROUP BY, HAVING clauses, Joins – Joining multiple tables, Joining a table to itself. Views Creation, Renaming the column of a view, destroys view, Granting & revoking privileges.	
4.	PROGRAM WITH SQL	10 Lectures
	Data types: Using set and select commands, procedural flow, if, if /else, while, goto, global variables, Security Locks, types of locks, levels of locks. Cursors Working with cursors, Error Handling, Developing stored procedures, create, alter and drop, passing and returning data to stored procedures, using stored procedures within queries, building user defined functions, creating and calling a scalar function, implementing triggers, creating triggers, multiple trigger interaction.	
5.	TRANSACTION AND SECURITY MANAGEMENT	05 Lectures
	Transaction Concepts – Concurrency Control – Database Backup – Types of Database Failures – Database Recovery Types – Database Security	

- Recommended Text Books:**
1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education.
  2. Abraham Silberschatz, Henry F Korth, S. Sudarshan, Database System Concepts, McGraw-Hill Education

**Recommended References:**

1. S. K. Singh, Database Systems Concepts, Design and Applications, 2nd Edition, Pearson Education, 2006
2. C.J. Date, Introduction to Database Systems, Addison Wesley

**Course Title:** Computer Networks  
**Course Code:** STG602  
**Marks:** 75

**Type:** General Theory  
**Credits:** 03  
**Hours:** 45

**Prerequisite Courses:** Fundamentals of Computers & Programming

**Course objectives:**

- To provide a basics of networking concepts.
- To understand the foundations covering the physical layer, data link layer, network layer and the transport layer.

**Learning Outcomes:**

After successful completion of this course, the students will

- Explain the basics of data communication and exchange
- Explain various techniques and rules for device communication

**Syllabus:**

1.	Introduction to System Security	09 Lectures
	Introduction to Computer networks, Topology, categories of networks, Internetwork, Internet, Network Models, Layered model, OSI and TCP/IP models, Transmission media, Wired and unwired media.	
2	Physical and Data link layer	09 Lectures
	Physical layer- , Analog and Digital data, Periodic and A periodic signals, Composite signals, Digital data transmission, Transmission Modes , Switching  Data link layer - Error detection and correction, Types of errors, Single bit error and Burst error, Cyclic Redundancy Check (CRC), Error correction Single bit error correction, Hamming code Data compression, Flow control, Error control, Wired LANs, Ethernet IEEE standards.	
3.	Network layer	09 Lectures
	Networking and Internetworking devices Repeater, Bridges, Routers, Gateways, Logical addressing IPv4 & IPv6 addresses, Network Address Translation (NAT), Internet protocols, internetworking, Datagram, Transition from IPv4 to IPv6, Address Mapping, Error reporting and multicasting Delivery, Forwarding and Routing algorithms	
4.	Transport and Application Layer	09 Lectures
	Transport layer - Process to process Delivery: UDP, TCP and SCTP, Congestion control and Quality of Service, Application Layer - Domain Name Systems Remote Login – Email FTP, WWW, HTTP Network management SNMP	
5.	Network Security	09 Lectures
	Network Security – Basics of Cryptography Digital Signature, Encryption, Decryption, Firewall, Data Translation Compression – Mails Services – Directory services – File Transfer and Access Management Protocol (FTAM) – Common Management Information Protocol (CMIP).	

**Recommended Text Books:**

1. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill Education (India) Pvt. Ltd., 4<sup>th</sup> Edition, 2006.

**Recommended References:**

1. Andrew S. Tanenbaum, Computer Networks, Prentice Hall of India, 4<sup>th</sup> Edition, 2002.
2. James F. Kurose & Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson India, 5th Edition, 2012

**Course Title:** Entrepreneurship Development  
**Course Code:** STG603  
**Marks:** 100

**Type:** General Theory  
**Credits:** 04  
**Hours:** 60

**Prerequisite Courses:** None

**Course objectives:**

- To familiarize the students with the concept of entrepreneurship
- To identify and develop the entrepreneurial talents of students
- To create awareness of the role of entrepreneurs in the economic development
- To help students understand the role of creativity and innovation in entrepreneurial startups
- To learn about business idea generation and preparation of Business Plan
- To identify the various sources of finance for entrepreneurial ventures
- To equip students with the latest developments in the field of entrepreneurship

**Learning Outcomes:**

On successful completion of the course, the students will be able to

- Explain the concepts involved in entrepreneurship
- Get insights into his/her own creative and innovative entrepreneurial skills and evaluate opportunities for a new venture
- Demonstrate the ability to prepare a business plan for a venture
- Evaluate various financial sources for launching entrepreneurial ventures
- Introduce business formats in tune with emerging trends

**Syllabus:**

1.	<b>Introduction: Overview of Entrepreneurship</b>	<b>12 Lectures</b>
	Concept of Entrepreneurship and Entrepreneur, Qualities and skills of an Entrepreneur, Intrapreneurs, Types of Entrepreneurs, Factors influencing Entrepreneurship; Role of entrepreneurs in economic development	
2.	<b>Entrepreneurship, Creativity and Innovation</b>	<b>12 Lectures</b>
	Creativity and entrepreneurship, Steps in Creativity, Organizational actions that enhance/hinder creativity, Innovation and inventions, Using left brain skills to harvest right brain ideas. Sources of Innovation in Business; Managing Organizations for Innovation and Positive Creativity	
3.	<b>Business Idea &amp; Business Plan</b>	<b>12 Lectures</b>
	Business Idea – Meaning & Sources, Evaluation of business idea. Business Plan – meaning & uses, Project Report – meaning, importance & contents	
4.	<b>Financing the Entrepreneurial Business</b>	<b>12 Lectures</b>
	Arrangement of funds; Traditional sources of financing, new innovative sources; Schemes of Govt. of Goa; Make in India Program	
5.	<b>Emerging trends in Entrepreneurship</b>	<b>12 Lectures</b>
	New generation entrepreneurs - Social entrepreneurs, Edupreneurs, Health entrepreneurs, Tourism entrepreneurs, Ecopreneurs, Techpreneurs, etc. New trends in entrepreneurship - <b>Startup accelerators, Student Sandbox and Business Lab, Co-working spaces, Boot camps, etc.</b> <b>Type of Class Assignments</b> <ol style="list-style-type: none"> <li>1. Presentations on Innovative Entrepreneurs from Goa.</li> <li>2. Preparation of Business Plan/ Project Report</li> </ol>	

**Recommended Text Books:**

1. Vasant Desai, Dynamics of entrepreneurial development and management, Himalaya Publishing House, 2010
2. Romeo Mascarenhas, Entrepreneurship Management, Vipul Prakashan

**Reference Books:**

1. David H. Holt, Entrepreneurship-New Venture Creation, Pearson India Education Services Pvt. Ltd., Noida-India, Fourth Impression 2018
2. Jasmer Singh Saini, Entrepreneurship Development Programmes, Deep & Deep Publications (P) Ltd., 2002.
3. Jose Paul, Ajith Kumar, Paul T. Mampilly, Entrepreneurship Development, Himalaya Publishing House, Mumbai, 2001
4. C B Gupta, N P Srinivasan, Entrepreneurial Development, Sultan Chand & Sons, New Delhi, Revised Edition 2010
5. C B Gupta Entrepreneurship and Small Business Management Seventh Revised Edition, 2017
6. Peter Drucker, Innovation and Entrepreneurship: Practice and Principles, Harper & Row, New York, 6<sup>th</sup> Edition.

**Course Title:** Software Laboratory – VI  
**Course Code:** STP601  
**Marks:** 50

**Type:** General Practical  
**Credits:** 02  
**Hours:** 60

**Course objectives:**

- To understand and implement the concepts learnt in Elective course STG601 E1/E2

**Learning Outcome:**

After successful completion of this course, the student will be able to

- Demonstrate the practical ability of the concepts learnt in elective course STG601 E1/E2

**Choose the section mapped with the elective course (STG601) chosen by you.**

**List of suggested Practical:**

*A student shall complete practical of minimum 50 Hours duration*

**Section A** - Based on STG601E1

Software Recommended: Adobe Suite

1. Colour Scheme understanding and Implementation [10 Lectures]
2. Tessellation of shapes (geometric and organic) with various colour schemes [06 Lectures]
3. Layout Design for publication [14 Lectures]
4. Designing and Publishing Booklet, Portfolio, Books, Newspaper, Magazines[20 Lectures]
5. Designing and Publishing interactive PDF and Other E-Pub Formats, Kindle etc...[10 Lectures]

**Recommended Reference Books:** *As mentioned in STG601E1 and*

1. Ambrose Harris, The Production Manual, AVA Publishing
2. Timothy Samara, Design Elements, a Graphic Style Manual, Rockport Publishers

**Section B** - Based on STG601E2

1. Familiarization of the relational database: Data definition commands CREATE, ALTER, DROP, Adding Constraints Primary key, foreign key, unique key, check, not null. [10 Lectures]
2. Basic SQL queries INSERT, SELECT, DELETE, UPDATE, Using multiple tables, ordering of rows using ORDER BY, GROUP BY option, Set operations using UNION, EXCEPT, INTERSECT, Substring Comparison using LIKE operator, IN, BETWEEN operator. [12 Lectures]
3. Complex Queries, Nested Queries, EXISTS and UNIQUE, DISTINCT functions, NULL values, Renaming of attributes and Joining of tables, Aggregate functions and grouping. [12 Lectures]
4. Programs involving views [06 Lectures]
5. Programs involving cursors [06 Lectures]
6. Programs involving triggers [06 Lectures]
7. Stored procedures, stored procedures with parameters. [06 Lectures]
8. Transaction Control Language(TCL) commands [02 Lectures]

**Recommended Books:** *As mentioned in STG601E2*



**Course Title:** SSC/Q0501, Software Developer  
**Course Code:** STS601  
**Marks:** 700

**Type:** Skill (Theory, Practical, & OJT)  
**Credits:** 18 (Theory-7, Practical & OJT-11)  
**Hours:** 440

**Course/Package objectives:**

To enable Students to:

- Contribute to the design of software products and applications
- Develop software code to specification
- Manage their work to meet requirements
- Work effectively with colleagues
- Maintain a healthy, safe and secure working environment
- Provide data/information in standard formats
- Develop their knowledge, skills and competence

**Learning Outcomes:**

Students will have competencies and skills as mentioned in the Model Curriculum of SOFTWARE DEVELOPER designed by NASSCOM (REFERENCE ID: SSC/Q0501, version 1.0)

**Package Syllabus** (Adopted Model Curriculum of Nasscom)

– *Lecture Hours and Marks Distribution as per Nasscom standard mentioned in Model Curriculum*

1.	Programming and Algorithms
2.	Analysis and Design of Software Applications
3.	Application Development
4.	Self and work Management
5.	Team Work and Communication
6.	Managing healthy and safety
7.	Data and information Management
8.	Learning and self Development

**On-Job-Training (OJT) / Project Component (Compulsory)**

It is required by a student to carry-out and complete

- **OJT** in the relevant industry or working environment and in the relevant skill area (Software Development).  
**Duration of OJT:** Minimum 45 Hours  
A Student needs to submit the detailed report of the OJT along with the ‘Certificate of Completion’.

**OR**

- **Project /Mini-Project** : Software Development  
A Student needs to submit the project report along with the finished product and other artifacts (if any).

**Recommended Text Books:**

**Qualification Pack Hyperlink:**

[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0501\\_Software\\_Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0501_Software_Developer.pdf)



**Course Title:** SSC/Q2702, Associate -DTP  
**Course Code:** STS601  
**Marks:** 700

**Type:** Skill (Theory, Practical, & OJT)  
**Credits:** 18 (Theory-7, Practical & OJT-11)  
**Hours:** 440

**Course/Package objectives:**

To enable students to

- Understand and Provide/control access to publications
- Publish Content
- Manage work to meet requirements
- Work effectively with colleagues
- Develop constructive work habits
- Maintain a healthy, safe and secure working environment
- Provide data/information in standard formats
- Develop your knowledge, skills and competence

**Learning Outcomes:**

Students will have competencies and skills as mentioned in the Model Curriculum of Associate -DTP designed by NASSCOM (REFERENCE ID: SSC/Q2702, version 1.0)

**Package Syllabus** (Adopted Model Curriculum of Nasscom)

– *Lecture Hours and Marks Distribution as per Nasscom standard mentioned in Model Curriculum*

1.	Provide/control access to publications
2.	Publish Content
3.	Manage your work to meet requirement
4.	Work effectively with colleagues
5.	Maintain a healthy, safe and secure working environment
6.	Provide data/information in standard formats
7.	Develop your knowledge, skills and competence

**On-Job-Training (OJT) / Project Component (Compulsory)**

It is required by a student to carry-out and complete

- **OJT** in the relevant industry or working environment and in the relevant skill area (Desktop Publishing).

**Duration of OJT:** Minimum 45 Hours

A Student needs to submit the detailed report of the OJT along with the ‘Certificate of Completion’.

**OR**

- **Project /Mini-Project** : Desktop Publishing

A Student needs to submit the project report along with the finished product and other artifacts (if any).

**Recommended Text Books:**

**Qualification Pack Hyperlink:**

<https://www.sscnasscom.com/qualification-pack/SSC/Q2702/>

## List of Qualification Packs Considered for B.Voc.(Software Technologies)

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1. SSC/Q0508 Junior Software Developer  
[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0508\\_Junior-Software-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0508_Junior-Software-Developer.pdf)
2. SSC/Q0503 Web Developer  
[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0503\\_Web-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0503_Web-Developer.pdf)
3. SSC/Q0504 Media Developer  
[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0504\\_Media-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0504_Media-Developer.pdf)
4. SSC/Q0509 Master Trainer for Junior Software Developer  
[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0509\\_Master-Trainer-for-Software-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0509_Master-Trainer-for-Software-Developer.pdf)
5. SSC/Q0502 UI Developer  
[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0502\\_UI-Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0502_UI-Developer.pdf)
6. SSC/Q0501, Software Developer  
[https://nsdcindia.org/sites/default/files/QP\\_SSC-Q0501\\_Software\\_Developer.pdf](https://nsdcindia.org/sites/default/files/QP_SSC-Q0501_Software_Developer.pdf)
7. SSC/Q2702, Associate –DTP  
<https://www.sscnasscom.com/qualification-pack/SSC/Q2702/>