

Annexure I

B. Voc. in Software Technologies Overview and Structure

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

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 mould 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 - **Presented in Annexure I below**

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 Designing | 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 |

Annexure – I

Updated B.Voc.(Software Technologies) Structure (Semester III to VI)

Advanced Diploma in Software Technologies (Semester III and IV)

After successfully completing the courses of Semester-III and Semester IV, the students are expected to acquire the skills to be employable as **Desktop Publishing Associate, Agent- DTP, Graphic/Web Designer**

| NSQF Level / Semester | Course Code | Course Title | Course Credits | | Hours | Marks |
|------------------------|--------------------------------------|--|----------------|----|-------|-------|
| Level 6 / Semester-III | General Education | | | | | |
| | STG 301 | Data Structures | Theory | 3 | 45 | 75 |
| | STG 302 | Audio and Visual Media | Theory | 3 | 45 | 75 |
| | STG 303 | Reasoning Techniques | Theory | 4 | 60 | 100 |
| | STP 301 | Software Laboratory - III | Practical | 2 | 60 | 50 |
| | Skill Development Qualification Pack | | | | | |
| | STS 301 | Associate-Desktop Publishing - (SSC/Q2702) | Theory | 7 | 435 | 300 |
| | | | Practical | 5 | | |
| Project/OJT/Internship | | | 6 | | | |
| Total | | | | 30 | 645 | 600 |
| NSQF Level / Semester | Course Code | Course Title | Course Credits | | Hours | Marks |
| Level 6 / Semester-IV | General Education | | | | | |
| | STG 401 | Python Programming | Theory | 3 | 45 | 75 |
| | STG 402 | Software Engineering & Testing | Theory | 3 | 45 | 75 |
| | STG 403 | Creative Thinking | Theory | 4 | 60 | 100 |
| | STP 401 | Software Laboratory - IV | Practical | 2 | 60 | 50 |
| | Skill Development Qualification Pack | | | | | |
| | STS 401 | Associate-Desktop Publishing - (SSC/Q2702) | Theory | 6 | 450 | 400 |
| | | | Practical | 6 | | |
| Project/OJT/Internship | | | 6 | | | |
| Total | | | | 30 | 660 | 700 |

B. Voc. Degree in Software Technologies (Semester V and VI)

After successfully completing the courses of Semester-V and Semester VI, the students are expected to acquire the skills to be employable as **Software/Application Developer (Also known as Software Analyst, Software Engineer, Systems Engineer, Programmer, Developer, Programmer Analyst)**

| NSQF Level / Semester | Cours e Code | Course Title | Course Credits | | Hour s | Mark s |
|-----------------------------|---|-------------------------------------|----------------------------|----|-----------|-----------|
| Level 7 / Semester- V | General Education | | | | | |
| | STG 501 | Mobile Application Development | Theory | 3 | 45 | 75 |
| | STG 502 | Human Computer Interaction | Theory | 3 | 45 | 75 |
| | STG 503 | Advanced Quantitative Techniques | Theory | 4 | 60 | 100 |
| | STP 501 | Software Laboratory - V | Practical | 2 | 60 | 50 |
| | Skill Development Qualification Pack | | | | | |
| | STS 501 | Software Developer - (SSC/Q0501) | Theory | 7 | 435 | 300 |
| | | | Practical | 5 | | |
| | | | Project/OJT/Interns hip | 6 | | |
| Total | | | | 30 | 645 | 600 |

| NSQF Level / Semester | Cours e Code | Course Title | Course Credits | Hour s | Mark s | |
|------------------------------|---|-------------------------------------|----------------------------|-----------|-----------|-----|
| Level 7 / Semester- VI | General Education | | | | | |
| | STG 601 | RDBMS | Theory | 3 | 45 | 75 |
| | STG 602 | Computer Networks | Theory | 3 | 45 | 75 |
| | STG 603 | Entrepreneurship Development | Theory | 4 | 60 | 100 |
| | STP 601 | Software Laboratory - VI | Practical | 2 | 60 | 50 |
| | Skill Development Qualification Pack | | | | | |
| | STS 601 | Software Developer - (SSC/Q0501) | Theory | 6 | 450 | 400 |
| | | | Practical | 6 | | |
| | | | Project/OJT/Interns hip | 6 | | |
| Total | | | | 3 0 | 660 | 700 |

Annexure II

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 |
| | Operating Systems: Definition & Functions, Operating system Structure, operating system operations, Relationship between Kernel, OS, and Hardware, Operating system services, System calls, Types of system calls. Storage Management: File System, Concepts, File Organization and Access Methods, Directory and Disk Structure. Secondary Storage Structure - Overview, disk structure, Disk attachment, Disk scheduling | |

Recommended Text Books:

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

Recommended Reference Books:

1. ITL Education Solutions Limited, Introduction to Information Technology, Pearson Education
2. M. Morris Mano, Computer System Architecture, Pearson Education, 3rd Edition, 2008
3. William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall, 6th 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. | Web Design Principles - Overview | 06 Lectures |
| | 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. | Structure and Style with HTML and CSS | |
| | A. HTML | 5 Lectures |
| | 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. HTML5 | 5 Lectures |
| | Introduction, New Elements, Canvas, SVG, Drag/Drop, Geolocation, Video, Audio, Input types, form elements, form attributes, semantic, web storage, app cache, web workers, SSE | |
| | C. CSS | 5 Lectures |

| | | |
|-----------|---|--------------------|
| | 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. | |
| | D. CSS3 | 5 Lectures |
| | Introduction, Borders, Backgrounds, Gradients, Text Effects, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations, Multiple Columns. | |
| | | |
| 3. | Javascript | 10 Lectures |
| | 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. | |
| | | |
| 4. | Introducing jQuery | 05 Lectures |
| | JQuery : 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. | |
| | | |
| 5. | Introducing XML | 04 Lectures |
| | 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, 8th edition, McGraw Hill Education (India) Private Ltd.
2. R S Aggarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing; Revised edition (21 February 2017)

Course Title: Environmental Studies - I

Course Code: STG104

Marks: 50

Type: General Theory

Credits: 02

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. | 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. | Introduction |
| | Unit 1.1 – Introduction to IT-ITeS Sector Unit 1.2 – Introduction to the Training Program |
| 2. | Core Skills |

| | |
|------------|---|
| | Unit 2.1 – Communication Skills Unit 2.2 – Team Work |
| 3. | Basic of IT (SSC/N0506) |
| | Unit 3.1 – Basic Computer Skills Unit 3.2 – Internet |
| 4. | Assist in Performing Software Construction and Software Testing Entry-Level Tasks in the It Services Industry (SSC/N0506) |
| | 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. | Manage Work to Meet Requirements (SSC/N9001) |
| | Unit 5.1 – Self and Work Management |
| 6. | Work Effectively with Colleagues (SSC/N9002) |
| | Unit 6.1 – Team Work and Communication 211 |
| 7. | Maintain a Healthy, Safe and Secure Working Environment (SSC/N9003) |
| | Unit 7.1 – Hazards at Workplace Unit 7.2 – Dealing with Emergencies |
| 8. | Data and Information Management (SSC/N9004) |
| | Unit 8.1 – Provide Data /information in Standard Formats |
| 9. | Develop your Knowledge, Skills and Competence (SSC/N9005) |
| | Unit 9.1 – Learning and Self Development |
| 10. | Employability & Entrepreneurship Skills |
| | 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

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. | Introduction to Java & Object-Oriented Paradigm | 07 Lectures |
| | Introduction to Java: Features of Java, JDK Environment, Java and Internet. Object Oriented Programming Concept: Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between OOP & OOC Java Programming Fundamental: Structure of java program, Data types, Constants, Variables, Operators, Keywords, Naming Convention, Decision Making (if, switch), Looping(for, while),Type Casting | |
| | | |
| 2. | Classes, Objects, and Packages in Java | 12 Lectures |
| | Classes and Objects: Creating Classes and objects, Memory allocation for objects, Constructor, Use of Inheritance, Use of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes Arrays and Strings Classes: Arrays, Creating an array, Types of Arrays, String class Methods, String Buffer methods. Abstract Class, Interface and Packages: Modifiers and Access Control, Abstract classes and methods, Interfaces, Interfaces versus Abstract Classes, Packages Concept, Creating user defined packages, Collections | |
| | | |

| | | |
|-----------|--|--------------------|
| 3. | Exception & File Handling | 07 Lectures |
| | Exception Handling: Exception types, Using try catch and multiple catch, Nested try, throw-throws and finally, Creating User defined Exceptions. File Handling: Byte Stream, Character Stream, File IO Basics, File Operations, Creating file, Reading file, Writing File | |
| | | |
| 4. | Multithreading & Applet Programming | 07 Lectures |
| | Multithreading: Thread - Synchronization - Messaging - Runnable Interface - Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads Applet Programming: Introduction, Types Applet, Applet Life cycle, Creating Applet, Applet tag | |
| | | |
| 5. | Introduction to AWT, Swing, and Jdbc | 12 Lectures |
| | AWT & Swing: What is AWT & Swing? Difference between AWT and Swing, The MVC Architecture and Swing, Layout Manager and Layouts. The JComponent Classes: <ul style="list-style-type: none"> – 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 Event Handling: Event sources, Listeners, Mouse and Keyboard Event Handling, Adapters, Anonymous inner class Basic Java Data Base Connectivity: JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects | |

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, 9th Edition
3. Cay S Horstmann, Gary Cornell, Core Java Volume II- Advanced Features, Prentice Hall, 9th 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">• 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 | |
| | | |
| 2. | DESIGN PRINCIPLES CONCEPTS | 05 Lectures |
| | <ul style="list-style-type: none">• 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• Graphic Visualization: visual composition and layout, Grids in graphics composition | |
| | | |
| 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 | |

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| 4. | RASTER GRAPHIC CONCEPTS (DESIGNING & EDITING) | 15 Lectures |
| | <ul style="list-style-type: none"> • Raster Images – Image Resolution – RGB, CMYK, Lab & 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 • 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. | |
| | | |
| 5. | VECTOR GRAPHIC CONCEPTS (DESIGNING & EDITING) | 13 Lectures |
| | <ul style="list-style-type: none"> • 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 Editing – Tracing from Raster Images – Different Styles Of Vector Illustrations. Using Colour in Vector Graphics – Different Colour Palettes – Gradients And Gradient Mesh. • Using Type Tools And Type Controls – Type Along A Path –Concept Of Alignment And Text Flow Options, Filters And Effects. | |

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

Course Title: E-Commerce

Course Code: STG203

Marks: 50

Type: General Theory

Credits: 02

Hours: 30

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

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|-----------|---|--------------------|
| 1. | INTRODUCTION TO E-COMMERCE | 10 Lectures |
| | <ul style="list-style-type: none">• 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 . | |
| | | |
| 2. | E-COMMERCE SITE DESIGNING & LAUNCHING | 08 Lectures |
| | <ul style="list-style-type: none">• 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.• 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. | |
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| 3. | E-MARKETING & E-PAYMENT | 12 Lectures |
| | <ul style="list-style-type: none">• Marketing on the internet : the pros and cons of online shopping – internet marketing | |

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| | <p>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.</p> <ul style="list-style-type: none"> • 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. |
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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

Course Code: STG204

Marks: 50

Type: General Theory

Credits: 02

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:

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| 1. | Global Environmental Issues, Human Population and Environment | 12 Lectures |
| | 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. | Environmental Management | 12 Lectures |
| | 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. | |
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| 3. | Environmental Legislation and Goa's Initiatives for Environmental Protection | 06 Lectures |
| | Environmental Acts and Regulations: Brief description and major provisions of <ul style="list-style-type: none"> • Water (Prevention and Control of Pollution) Act 1974, • Air (Prevention and Control of Pollution) Act 1981, • Environment Protection Act, 1986 • Coastal Regulation Zones Rules • E Waste (Management) Amendment Rules, 2018 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

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]

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| 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. | Web Design Basics (SSC/N0501) |
| | 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. | Planning and Design (SSC/N0501) |

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| | Unit 2.1 – Planning for Web Development Unit 2.1 – The Web Designing Process Unit 2.1 – Introduction to the Web Application Development |
| 3. | Web Development Process (SSC/N0503) |
| | 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. | Web Information Security (SSC/N0503) |
| | Unit 4.1 – Web Information and Security |
| 5. | UAT and Deployment (SSC/N0503) |
| | Unit 5.1 – The Web Deployment Process |
| 6. | Introduction to Java & JavaScript (SSC/N0501,SSC/N0503) |
| | Unit 6.1 – Introduction to Java & JavaScript |
| 7. | Portfolios (SSC/N0501, SSC/N0503) |
| | Unit 7.1 – Portfolio Design |
| 8. | Manage your Work to Meet Requirements (SSC/N9001) |
| | 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 |
| 9. | Working Effectively with Colleagues (SSC/N9002) |
| | Unit 9.1 – Effective Communication Unit 9.2 – Working Effectively |
| 10. | Maintain a Healthy, Safe and Secure Working Environment (SSC/N9003) |
| | 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 |
| 11. | Provide Data/Information in Standards Formats (SSC/N9004) |
| | 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 |
| 12. | Develop Knowledge, Skills & Competence (SSC/N9005) |
| | 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

Annexure III

B. Voc. in Software Technologies (Syllabus Semester – III)

Course Title: Data Structures

Type: General Theory

Course Code: STG301

Credits: 03

Marks: 75

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. | Arrays, Searching & Sorting | 12 Lectures |
| | 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. | |
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| 2. | Data Structure and Linked List | 08 Lectures |
| | Data Structure - Meaning, Data type, ADT, Need of Data Structure, Types Linked List – Concept, Representation, Operations, and Applications. | |
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| 3. | Stack, and Queue | 10 Lectures |
| | Concept, Representation, Operations, and Applications. | |
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| 4. | Trees | 10 Lectures |
| | 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 | |
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| 5. | Graphs | 05 Lectures |
| | 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 Approach with C++, Cengage Learning, Second Edition

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:

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|-----------|--|--------------------|
| 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), | |

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| | <p>Component & Composite Digital Media & Instrument.</p> <p>Concepts of Frame rates, resolution, image size and color depth; Intraframe, Interframe, and Hybrid compression; Video file formats, codecs and compression options.</p> <p>Process of digitizing, Transferring digital footage, Editing, mixing, scrubbing, and applying transitions and effects</p> <p>Concepts of shooting platforms, Lighting, Chroma Key or Blue Screen, Titling and the Titler, overlays, Adding narration and soundtracks.</p> <p>Distribution options: Internet, CD/DVD, DCP and KDM</p> | |
| 3. | 2D DIGITAL ANIMATION | 10 Lectures |
| | <p>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.</p> <p>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.</p> <p>Development process of Animation Character - Anatomy & Body Language, 2 D virtual drawing for animation</p> | |
| 4. | ACTION SCRIPT | 06 Lectures |
| | <p>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</p> | |
| 5. | 3D MODELING BASICS | 05 Lectures |
| | <p>Modeling Basics: Principles of 3D modeling, concepts like polygons, nurbs, and sub surface modeling etc. Primitive and compound Objects, Meshes, Polys & Splines</p> | |

Recommended Text Books:

1. Ranjan Parekh, Principles of Multimedia, The McGraw - Hills Company, 12th 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, 1st 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, 1st 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:

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|-----------|--|--------------------|
| 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 | |
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| 4. | Module IV | 15 Lectures |
| | Mathematical Logic: 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. | |

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| | Mathematical induction, deduction, proof by contradiction, program correctness. | |
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| 5. | Module V | 06 Lectures |
| | Boolean algebra - 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, 8th edition, McGraw Hill Education (India) Private Ltd.
2. A.K. Gupta, Logical and Analytical Reasoning, Ramesh Publishing House; 34th edition
3. Peeyush Bhardwaj, Analytical & Logical Reasoning for CAT & Other Management Entrance Tests, Arihant Publications; 4th edition
4. Rosen H. Kenneth, Discrete Mathematics and its Applications, Tata McGraw Hill, 7th 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*

Annexure – II

Updated B.Voc.(Software Technologies) Skill Component Syllabus (Semester III to VI)

Semester III

Course Title: SSC/Q2702, Associate -DTP

Course Code: STS301

Marks: 300

Type: Skill (Theory, Practical, & Project/OJT)

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

Hours: 435

Course/Package objectives:

This Qualification Pack is to be taught in semester III & IV.

In semester III, students will learn to

- Understand and Provide/control access to publications
- Understand the concept of Color Theory, Layout Design & Visualization
- Knowledge and understanding of Designing & Publishing software
- Maintain a healthy, safe and secure working environment
- Provide data/information in standard formats

Key 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 SSC NASSCOM and added more topics, content & duration)

- *Lecture Hours as per Nasscom standard mentioned in the Model Curriculum with additions wherever required*
- *Marks Distribution as per Nasscom standard mentioned in Model Curriculum*
- *NOSs covered in semester III: SSC/N2702, SSC/N9003, and SSC/N9004*

| | Topics /Content | Lecture (in Hours) |
|----|--|---------------------------|
| 1. | Introduction to the Job Role and Industry | |
| | <ul style="list-style-type: none">• Job Role and Responsibilities of an Associate DTP• An Introduction to the ITes Sector• DTP Industry in India | 3 Theory |
| 2. | Color Theory & Psychology | |
| | 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 | 15 Theory 15 Practical |

| | | |
|-----------|---|-----------------------------------|
| | <p>and their characteristics – method of color measurement– color Gamut. Color Profiles .ico files</p> <p>Color Psychology: 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.</p> <p>Practical (Preferably in Adobe Suite):</p> <ul style="list-style-type: none"> • Color Scheme understanding and Implementation, • Tessellation of shapes (geometric and organic) with various colour schemes <p>Introduction to Prepress color proofing: Type and factors in proofing, proofing methods- soft proof- digital proof photomechanical proof- press proof- other proofing methods</p> | |
| 3. | Layout Design & Visualization | |
| | <p>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.</p> <p>Layout Visualization- 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.</p> <p>Practical (Preferably in Adobe Suite):</p> <ul style="list-style-type: none"> • Layout Design for publication | <p>15 Theory 15 Practical</p> |
| 4. | Designing and Publishing Tools | |
| | <ul style="list-style-type: none"> • Photoshop • CorelDraw/ Illustrator • InDesign | <p>12 Theory 30 Practical</p> |
| 5. | Provide/control access to publications | |
| | <ul style="list-style-type: none"> • Check that different versions, including the most up-to-date versions, of publications are clearly indicated according to your organization's standards for version control <p>Different Types of Support People May Need to Access Publications and How to Provide This Support</p> <ul style="list-style-type: none"> • Check that publications, or specific versions of publications, are not already in the organization's knowledge base, in order to avoid duplication • Store publications in your organization's knowledge base according to your organization's policies, procedures and standards • provide support to appropriate people to access publications, where required | <p>30 Theory 30 Practical</p> |

| | | |
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| | Deal with Problems or Potential Conflicts with Access to Publications <ul style="list-style-type: none"> • Provide access to publications in your organization's knowledge base only to those who are entitled to access • Obtain advice and guidance on storing publications, version control and access issues from appropriate people, where required • Comply with your organization's policies, standards, procedures, guidelines and service level agreements (SLA) when providing and controlling access to publications | |
| 6. | Maintain a healthy, safe and secure working environment | |
| | <ul style="list-style-type: none"> • Comply with your organization's current health, safety and security policies and procedures • Report any identified breaches in health, safety, and security policies and procedures to the designated person • Identify and correct any hazards that you can deal with safely, competently and within the limits of your authority • Report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow your organization's emergency procedures promptly, calmly, and efficiently • Identify and recommend opportunities for improving health, safety, and security to the designated person • Complete any health and safety records legibly and accurately | 15 Theory 30 Practical |
| 7. | Provide data/information in standard formats | |
| | <ul style="list-style-type: none"> • Establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it • Obtain the data/information from reliable sources • Check that the data/information is accurate, complete and up-to-date • Obtain advice or guidance from appropriate people where there are problems with the data/information • Carry out rule-based analysis of the data/information, if required • Insert the data/information into the agreed formats • Check the accuracy of your work, involving colleagues where required • Report any unresolved anomalies in the data/information to appropriate people • Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time | 15 Theory 30 Practical |

Project (on/off Campus) / On-Job-Training (OJT) / Internship

Total Duration: 180 Hours

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

- **On/ Off-Campus Project** in the relevant skill area (Desktop Publishing).
 - Project can be done individually or in group of maximum 5 students.
 - There shall be an internal project guide and external, if required.
 - After completion of the project, all the artifacts along with project report in relevant format to be submitted in the college for evaluation and feedback.

OR

- **OJT** in the relevant industry and in the relevant skill area (Desktop Publishing).
 - A Student needs to submit the detailed report of the OJT along with the 'Certificate of Completion' for evaluation and feedback.

OR

- **Internship** in the relevant industry and in the relevant skill area (Desktop Publishing).
 - A Student needs to submit the detailed report and work diary along with the 'Certificate of Completion' for evaluation and feedback.

Recommended Reference Books:

1. Participants Hand Book - Associate DTP, IT- ITes Sector Skills Council NASSCOM, January 2020
2. Adams Morioka, Color Design Workbook: A Real World Guide to Using Color in Graphic Design, Rockport Publishers, 1st edition, March 2018
3. John T Draw, Color Management: A Comprehensive Guide for Graphic Designers, Allworth; 1st edition, 2012
4. Andrew Faulkner & Conrad Chavez, Adobe Photoshop CC Classroom in a Book, Paperback, Pearson Education, 1st edition, 2018
5. Brian Wood, Adobe Illustrator CC Classroom in a Book, Adobe, 1st edition, July 2013
6. Gary David Bouton, CorelDRAW X - Official Guide, TMH, 11th edition, November 2014
7. David E. Carter, The Big Book of Layouts, Harper Design, June 16th 2009
8. Beth Tondreau, Layout Essentials -100 Design Principles for Using Grids, Rockport Publishers, Jan 2019
9. Ambrose Harris, The Production Manual, AVA Publishing, 2008
10. Timothy Samara, Design Elements, a Graphic Style Manual, Rockport Publishers, 1st edition, April 2007

Qualification Pack Hyperlink:

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

Syllabus

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

Course Title: Python Programming

Type: General Theory

Course Code: STG401

Credits: 03

Marks: 75

Hours: 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. | |
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| 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 | |

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 Montojo, 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. | INTRODUCTION | 06 Lectures |
| | 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. | Software Project Management | 05 Lectures |
| | Software project management, Project planning and control, cost estimation, project scheduling using PERT and GANTT charts. | |
| | | |
| 3. | Software Design | 12 Lectures |
| | 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. | Software Testing | 12 Lectures |
| | 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. | |
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| 5. | Software Quality Assurance Concepts and Standards | 10 Lectures |
| | 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">• The way the mind works• Difference between lateral and vertical thinking• Attitudes towards lateral thinking• Basic nature of lateral thinking | |
| 2. | Module II | 12 Lectures |
| | <ul style="list-style-type: none">• The use of lateral thinking• Techniques• The generation of alternatives• Challenging assumptions• Innovation | |
| 3. | Module III | 12 Lectures |
| | <ul style="list-style-type: none">• Suspended judgement• Design• Dominant ideas and crucial factors• Fractionation• The reversal method | |

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|-----------|---|--------------------|
| 4. | Module IV | 12 Lectures |
| | <ul style="list-style-type: none"> • Brainstorming • Analogies • Choice of entry point and attention area • Random stimulation | |
| 5. | Module V | 14 Lectures |
| | <ul style="list-style-type: none"> • Concepts/divisions/polarization • The new word po • Blocked by openness • Description/problem solving/design | |

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.; 1st 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, 4th 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. PYTHON BASICS** [08 Lectures]
 - Installation & IDE,
 - Working with variables & different DataTypes
 - Basic Input and Output
 - Types of operations
 - Math, Strings, and Variables
- 2. PROGRAM FLOW CONTROL** [08 Lectures]
 - Conditional Statements
 - Control Structures
 - Repetition Structures
 - Working with Text
 - Functions
- 3. LIST, TUPLE AND DICTIONARY** [08 Lectures]
 - Lists
 - Tuple
 - Dictionaries
- 4. FILES, MODULES, PACKAGES** [06 Lectures]
 - File Input and Output
 - Exception Handling

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*

Semester IV

Course Title: SSC/Q2702, Associate -DTP

Course Code: STS401

Marks: 400

Type: Skill (Theory, Practical, & Project/OJT)

Credits: 18 (Theory-6, Practical & Project/OJT-12)

Hours: 450

Course/Package objectives:

This Qualification Pack is to be taught in semester III & IV.

In semester IV, students will learn to

- Publish Content in different format
- Knowledge and understanding of Publishing Tool/software
- Understand SEO and its importance in optimizing the design and content
- Manage work to meet requirements
- Work effectively with colleagues
- Develop constructive work habits
- Develop your knowledge, skills and competence

Key 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 SSC NASSCOM and added more topics, content & duration)

- *Lecture Hours as per Nasscom standard mentioned in Model Curriculum with additions wherever required*
- *Marks Distribution as per Nasscom standard mentioned in Model Curriculum*
- *NOSs covered in semester IV: SSC/N2703, SSC/N9001, SSC/N9002, and SSC/N9005*

| | Topics /Content | Duration (in Hours) |
|-----------|--|--------------------------------|
| 1. | Publishing Tools | |
| | <ul style="list-style-type: none">• Adobe XD - Rapid prototyping and layout design for web and mobile apps• Adobe Spark - Free desktop publishing software for web and mobile.• Formatting content into standard templates using Desktop Publishing tools such as PageMaker, MS Word, MS Publisher, Adobe Acrobat, Adobe Flash, HTM or other formats | 10 Theory 40 Practical |
| 2. | Publish Content | |
| | How and When to Use different Types of Tools, Materials and Software Available for Publishing <ul style="list-style-type: none">• Manipulate content into draft publications to meet requirements using standard templates and tools | 20 Theory 35 Practical |

| | | |
|-----------|---|---------------------------|
| | <ul style="list-style-type: none"> Obtain and verify you have the correct versions of all content for publications <p>Types of issues that may arise with specifications of content and how to deal with these</p> <ul style="list-style-type: none"> Establish clearly the requirements of the content of publications Identify any issues with the requirements and clarify these with appropriate people <p>Different Types of Content and Publications</p> <ul style="list-style-type: none"> Review draft publications with appropriate people and incorporate their inputs Content development process Create outputs of publications in formats required for production teams <p>Current Practice for Publishing Content</p> <ul style="list-style-type: none"> Provide clear instructions for production teams, where required Liaise with production teams to resolve any production issues Update organization's knowledge base with publications | |
| 3. | E – Publishing | |
| | <p>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.</p> <p>Practical (Preferably in Adobe Suite):</p> <ul style="list-style-type: none"> Designing and Publishing Booklet, Portfolio, Books, Newspaper, Magazines Designing and Publishing interactive PDF and Other E-Pub Formats, Kindle etc... | 12 Theory 21 Practical |
| 4. | SEO and Designing | |
| | <p>Basics of SEO: Basic Description, Googlebot (Google Crawler), Google Updates and Algorithm, Search Engine Basics, Major Search Engines, Ranking algorithms and Page Rank, Web Designing Basics, Browsers and Imp Add-ons, Plugins, Important SEO Tools</p> <p>On-Page SEO: Keywords Research and Analysis, Initial Site Analysis, Competition Analysis, Keywords Density Analysis and Placement, Page Mapping, Title & Meta Tags Optimization, Site Structure Analysis, URL renaming/re-writing, H1, H2, H3 Tags, Anchor Text, Creating of Favicons, Existing Web Content Optimization, HTML Validation, No follow and do follow Links, Internal/External Links, Image Optimization, Outbound/Inbound Links, Creating/uploading XML Sitemap, Creating/uploading HTML Sitemap, Creating/uploading Robots file, Canonical Tag Optimization, How to host & register Site?, How to check Keywords Ranking?, 404 Error Removal and Redirects, 301 / 302 redirection, Header and Footer Optimization, Alexa report, Creating/uploading Google webmaster code,</p> | 12 Theory 21 Practical |

| | | |
|-----------|---|------------------------------|
| | Creating/uploading Google Analytics code Practical: Design SEO Friendly Web Pages/ site | |
| 5. | Manage your work to meet requirement | |
| | <ul style="list-style-type: none"> • Establish and agree your work requirements with appropriate people • Keep your immediate work area clean and tidy • Utilize your time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with your organization's policies and procedures • Work within the limits of your job role • Obtain guidance from appropriate people, where necessary • Ensure your work meets the agreed requirements | 11 Theory 23 Practical |
| 6. | Work effectively with colleagues | |
| | <ul style="list-style-type: none"> • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate your work effectively with theirs • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • Carry out commitments you have made to colleagues • Let colleagues know in good time if you cannot carry out your commitments, explaining the reasons • Identify any problems you have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues | 10 Theory 25 Practical |
| 7. | Develop your knowledge, skills and competence | |
| | <ul style="list-style-type: none"> • Obtain advice and guidance from appropriate people to develop your knowledge, skills and competence • Identify accurately the knowledge and skills you need for your job role • Identify accurately your current level of knowledge, skills and competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address your learning needs • Undertake learning and development activities in line with your plan • Apply your new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on your knowledge and skills and how effectively you apply them • Review your knowledge, skills and competence regularly and take appropriate action | 15 Theory 15 Practical |

Project (on/off Campus) / On-Job-Training (OJT) / Internship

Total Duration: 180 Hours

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

- **On/ Off-Campus Project** in the relevant skill area (Desktop Publishing).
 - Project can be done individually or in group of maximum 5 students.
 - There shall be an internal project guide and external, if required.
 - After completion of the project, all the artifacts along with project report in relevant format to be submitted in the college for evaluation and feedback.

OR

- **OJT** in the relevant industry and in the relevant skill area (Desktop Publishing).
 - A Student needs to submit the detailed report of the OJT along with the 'Certificate of Completion' for evaluation and feedback.

OR

- **Internship** in the relevant industry and in the relevant skill area (Desktop Publishing).
 - A Student needs to submit the detailed report and work diary along with the 'Certificate of Completion' for evaluation and feedback.

Recommended Reference Books:

1. Participants Hand Book - Associate DTP, IT- ITeS Sector Skills Council NASSCOM, January 2020
2. Chris Frost, Designing for Newspapers and Magazines, Routledge, 2nd edition, 2011
3. Pariah Burke, The Business of ePubublishing 2015 (ePublishing with InDesign Book 1) Kindle Edition, Pariah S. Burke, 2nd edition, March 2015
4. Pariah Burke, Creating Fixed-Layout eBooks, ePublishing with InDesign Kindle Edition, Pariah Burke (26 February 2013)
5. Kindle Direct Publishing, Building Your Book for Kindle, Amazon Digital Services, April 2012
6. Brian Wood, Adobe XD CC Classroom in a Book, Adobe Press, 2019
7. Peter Kent, Search Engine Optimization for Dummies, Wiley & Sons, 5th Edition
8. searchenginejournal.com

Qualification Pack Hyperlink:

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Syllabus

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

Course Title: Mobile Application Development

Type: General Theory

Course Code: STG501

Credits: 03

Marks: 75

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

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|-----------|--|--------------------|
| 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 | |
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| 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, | |

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| | 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) | |
| 5. | OTHER TOPICS | 09 Lectures |
| | Alarms – Creating and using alarms Understanding Mobile Networking Fundamentals - Accessing the Internet (HTTP), Browsing the web with WebView, Calling PHP From Android: Pass Android application data to PHP. Using Internet Resources – Connecting to internet resource, using download manager Location Based Services – Finding Current Location and showing location on the Map, updating location 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 | |

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, 2nd 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

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|-----------|---|--------------------|
| 1. | FOUNDATIONS OF HCI | 09 Lectures |
| | The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies | |
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| 2. | DESIGN & SOFTWARE PROCESS | 09 Lectures |
| | Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. Persona, storyboard, HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design | |
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| 3. | MODELS AND THEORIES | 09 Lectures |
| | HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW. | |
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| 4. | MOBILE HCI | 09 Lectures |
| | Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies | |
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| 5. | WEB INTERFACE DESIGN | 09 Lectures |
| | Designing Web Interfaces – 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, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, Mobile Design and Development, 1st Edition, O'Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, Designing Web Interfaces, 1st Edition, O'Reilly, 2009. (UNIT-V)

Course Title: Advanced Quantitative Techniques

Course Code: STG503

Marks: 100

Type: General Theory

Credits: 04

Hours: 60

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:

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| 1. | Set, Relation, and Functions | 12 Lectures |
| | SETS: 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. RELATION: Properties of Relation, Equivalence Relation FUNCTIONS: Domain and Range, Onto, Into and One-to One- Functions, Composite and Inverse functions, Hashing functions and Recursive Functions, growth of functions | |
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| 2. | Counting Principles | 12 Lectures |
| | Permutations; Combinations; Counting; Probability Summation; Basics of recurrence relations | |
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| 3. | Matrices and Determinants | 12 Lectures |
| | 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 | |
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| 4. | Statistical Sampling and Central Tendency | 12 Lectures |
| | Collection, classification, tabulation and presentation of data; the concept and methods of | |

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| | sampling, sample types Measures of central tendency - mean, median, mode, quartiles, deciles and percentiles and their applications in data analyses | |
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| 5. | Measures of Dispersion and Relation | 12 Lectures |
| | 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, 7th edition
2. Gupta. S. C. Fundamental of Statistics, Himalaya Publishing House, Mumbai, 6th 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, 7th 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*

Semester V

Course Title: SSC/Q0501, Software Developer
Project/OJT)

Type: Skill (Theory, Practical, &

Course Code: STS 501

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

Marks: 300

Hours: 435

Course/Package objectives:

This Qualification Pack is to be taught in semester V & VI.

In semester V, students will learn to

- Understand the IT-ITeS sector and the job profile of Software Developer.
- Demonstrate the understanding of algorithm analysis
- Comprehend various delivery models used in the IT Software Services industry.
- Demonstrate how algorithms are used to build and develop software applications.
- Implement appropriate standards to assist in performing software analysis and designing as per specifications.
- Understand different software models, methodologies and processes
- Implement various project and risk management understanding
- Identify software development needs and changes.
- Maintain a healthy, safe and secure working environment
- Provide data/information in standard formats

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 SSC NASSCOM and added more topics, content & duration)

- *Lecture Hours as per Nasscom standard mentioned in the Model Curriculum with additions wherever required*
- *Marks Distribution as per Nasscom standard mentioned in Model Curriculum*
- *NOSs covered in semester V: SSC/N0501, SSC/N9001, and SSC/N9005*

| | Topics /Content | Duration (in Hours) |
|-----------|--|------------------------------|
| 1. | Introduction to the Job Role and Industry | |
| | <ul style="list-style-type: none"> • Explain the relevance of the IT-ITeS sector. • Collate information, evidence, and articles regarding the IT- ITeS/BPM industry. • List the various sub-sectors of the IT-ITeS industry. • Illustrate the key emerging trends in the IT- ITeS industry. • Identify key applications where software development is used. • List organizations in the IT-ITeS sector. • Identify the career path for a software developer • Identify the various categories of services and subsectors under the IT industry along with their scope. • Explain the importance of the IT Software Services sector in any organization. • Carry out research on global delivery models, which allow any organization to provide services to customers in an on-shore or off-shore basis. • List deployment issues of high capital investments, continuous business availability, turnaround time, communication costs, etc. in establishment of IT enabled services | 4 Theory 6 Practical |
| 2. | Algorithm Analysis | |
| | <ul style="list-style-type: none"> • Understand the role of algorithm in computing • Understand the framework of Analysis & Design of Algorithm <ul style="list-style-type: none"> ○ Use of pseudo code, analyzing running time (worst-average-best case), order of growth. e.g. insertion sort ○ Designing and analysis of Divide & Conquer algorithm - e.g. merge sort • Understand the growth of functions and simplifying the asymptotic analysis of algorithms <ul style="list-style-type: none"> ○ Understand Asymptotic Notations, functions, and running times ○ Understand Standard notations and common functions • Understand Divide & Conquer Approach <ul style="list-style-type: none"> ○ Understand Recurrences ○ Understand The maximum-sub array problem ○ Analyze Divide & Conquer algorithm ○ Understand Strassen's algorithm for matrix multiplication ○ Understand methods for solving recurrences: substitution, recursion-tree, master method | 15 Theory 15 Practical |
| 3. | Programming & Algorithms | |
| | <ul style="list-style-type: none"> • Illustrate various steps to construct the framework using an algorithm for a software application. • List the steps involved in solving computational problems. • Various translation problems, language translation issues • Execute simple programs, showing how input data is processed, output data is produced, and how the values of internal variables change. <ul style="list-style-type: none"> ○ Preferably use C, and C++/ Java Programming Language | 15 Theory 30 Practical |

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| | <ul style="list-style-type: none"> • Explain procedural languages • Concepts of functional and object-oriented programming languages • Major features of object-oriented programming • List the disadvantages of data flow diagrams. • Basic understanding of database management system. <ul style="list-style-type: none"> ○ Applications & uses, ER Diagram, Normalization, SQL language & various SQL commands • Deploy scripting language to automate tasks and write simple programs. • Use the error messages of the compiler to identify and correct mistakes in program syntax. • Implement testing strategies like unit, integration, regression, system, alpha, beta testing, etc. to identify and correct semantic errors in programs. • Understand concepts of Boolean Algebra: Boolean function, properties, canonical and standard form, Simplification of algebraic functions, Use of k-maps, Implement the Boolean function using k-maps, Implement SOP Boolean function using logic gates | |
| 4. | Analysis & Design of Software Applications | |
| | <ul style="list-style-type: none"> • Define the Software Development Life Cycle encompassing Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD). • List the different techniques used for Requirements Analysis. • Analyze program inputs to identify, resolve and record design defects. • Choose the correct software programming procedure like procedure oriented, object-oriented or prototyping paradigms using principles of code and design quality. • Classify elements for measuring various aspects of software process. • Review software development designs to identify any bugs - arithmetic, logical, syntax, multithreading, interface and performance issues. • Understand software estimation, project estimation, cost estimation and time estimation • Understand CASE tools, its popular features, automated diagram support, and their scope | 20 Theory 25 Practical |
| 5. | Software Models, Methodologies and Project Management Concepts | |
| | <ul style="list-style-type: none"> • Understanding the different software models & methodologies and where to use it: Waterfall, v-shaped, spiral, prototype, iterative incremental, big bang, agile, object oriented, top-down programming and bottom-up programming, various cloud based services. • Understanding various agile methodologies: Extreme Programming (XP), Rapid Application Development (RAD), Rational Unified Process (RUP), Scrum Methodology, LEAN and KANBAN • Understand Software Quality Assurance (SQA): verification and validation, software quality assurance plan, software quality framework, various standards of ISO 9000 series of quality management system, capability maturity model • Understanding Secure DevOps: proactive focus on software security, DevOps | 21 Theory 14 Practical |

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| | <p>principles, Testing tools for secure devOps, Describe veracode: leading tools for secure devOp</p> <ul style="list-style-type: none"> • Understand Design Thinking problem solving process: Describe Design Thinking, qualities of Design Thinking, Design Thinking - the only way for the software development industry, Need of the Design Thinking • Explain Cross Domain Expertise and importance of domain expertise • Explain the software security and privacy, Importance of software security • Understand Software integration, systems integration, and overview of user interface design • Understanding essentials of Project Management: <ul style="list-style-type: none"> ○ Concept of software project, project manager, project management, manage a software project successfully, principles of software project management ○ project scheduling, Resource management, Project execution and monitoring, communication management, Configuration management, project management tool ○ Risk and risk management, identify and classify risks, types of risks, categories of risk management, five types of risk, risk management plan, software risk identification and software risk analysis, software risk planning and software risk monitoring | |
| 6. | Maintain a healthy, safe and secure working environment | |
| | <ul style="list-style-type: none"> • Comply with organization's current health, safety and security policies and procedures. • Report any identified breaches in health, safety, and security policies and procedures to the designated person. • Identify and correct any hazards that can be dealt with safely, competently and within the limits of authority. • Report any hazards to the relevant person in line with organizational procedures and warn other people who may be affected. • List organization's emergency procedures. • Recommend improvement related to safety and security at the workplace | 15 Theory 30 Practical |
| 7. | Provide data/information in standard formats | |
| | <ul style="list-style-type: none"> • Establish and agree with appropriate people the data/information they need to provide, the formats in which they need to provide it, and when they need to provide it. • Check that the data/information is accurate, complete and up-to-date. • Record, control the document version and take appropriate approvals for the documents, plans or drawings according to organizational hierarchy. • Adhere to the organization's policies pertaining to accesses granted, usage, modification of any information or recording or destruction of information • Insert data/information into agreed formats. • Check accuracy of work, involving colleagues where required. • Report any unresolved anomalies in the data/information to appropriate people | 15 Theory 30 Practical |

Project (on/off Campus) / On-Job-Training (OJT) / Internship

Total Duration: 180 Hours

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

- **On/ Off-Campus Project** in the relevant skill area (Software Developer).
 - Project can be done individually or in group of maximum 5 students.
 - There shall be an internal project guide and external, if required.
 - After completion of the project, all the artifacts along with project report in relevant format to be submitted in the college for evaluation and feedback.

OR

- **OJT** in the relevant industry and in the relevant skill area (Software Developer).
 - A Student needs to submit the detailed report of the OJT along with the 'Certificate of Completion' for evaluation and feedback.

OR

- **Internship** in the relevant industry and in the relevant skill area (Software Developer).
 - A Student needs to submit the detailed report and work diary along with the 'Certificate of Completion' for evaluation and feedback.

Recommended Reference Books:

1. Participants Hand Book – Software Developer, IT- ITeS Sector Skills Council NASSCOM, August 2019
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 3rd (2009) or later edition
3. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education, 6th/7th edition.
4. Kathy Schwalbe, Introduction to Project Management, Course Technology, 6th edition
5. Craig Larman, Agile and Iterative Development: A manager's Guide, Addison Wesley, 2004
6. Hans Van Vliet, Software Engineering: Principles and Practices, Wiley, 2008 or later edition.

Qualification Pack Hyperlink:

<https://www.sscnasscom.com/qualification-pack/SSC/Q0501/>

Syllabus

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

Course Title: Relational Database Management System (RDBMS)

Course Code: STG601

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

- Understand 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:

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| 1. | INTRODUCTION TO DATABASE MANAGEMENT SYSTEM | [05 Lectures, 12% Marks] |
| | 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) | |
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| 2 | RELATIONAL DATABASE DESIGN | [10 Lectures, 20% Marks] |
| | 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. NORMALIZATION: need for normalization, First Normal Form (1NF) – Second Normal Form (2NF) – Third Normal Form (3NF) | |
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| 3. | DATA DEFINITION AND MANIPULATION IN SQL | [15 Lectures, 30% Marks] |
| | Data Definition: Data types, Creation, Insertion, Viewing, Updation, 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. | |
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| 4. | PROGRAM WITH SQL | [10 Lectures, 20% Marks] |
| | 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. | |
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| 5. | TRANSACTION AND SECURITY MANAGEMENT | [05 Lectures, 13% Marks] |
| | 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. CJ 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:

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| 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. | |
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| 2 | Physical and Data link layer | 09 Lectures |
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| | 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. | |
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| 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 | |
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| 4. | Transport and Application Layer | 09 Lectures |
| | Transport layer - Process to process Delivery: UDP, TCP and SCTP, Congestion control and Quality of Service, | |

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| | Application Layer - Domain Name Systems Remote Login – Email FTP, WWW, HTTP Network management SNMP | |
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| 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., 4th Edition, 2006.

Recommended References:

1. Andrew S. Tanenbaum, Computer Networks, Prentice Hall of India, 4th 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:

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|-----------|--|--------------------|
| 1. | Introduction: Overview of Entrepreneurship | 12 Lectures |
| | 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. | Entrepreneurship, Creativity and Innovation | 12 Lectures |
| | 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 | |
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| 3. | Business Idea & Business Plan | 12 Lectures |
| | Business Idea – Meaning & Sources, Evaluation of business idea. Business Plan – meaning & uses, Project Report – meaning, importance & contents | |
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| 4. | Financing the Entrepreneurial Business | 12 Lectures |
| | Arrangement of funds; Traditional sources of financing, new innovative sources; Schemes of Govt. of Goa; Make in India Program | |
| | | |
| 5. | Emerging trends in Entrepreneurship | 12 Lectures |
| | <p>New generation entrepreneurs - Social entrepreneurs, Edupreneurs, Health entrepreneurs, Tourism entrepreneurs, Ecopreneurs, Techpreneurs, etc.</p> <p>New trends in entrepreneurship - Startup accelerators, Student Sandbox and Business Lab, Co-working spaces, Boot camps, etc.</p> <p>Type of Class Assignments</p> <ol style="list-style-type: none"> 1. Presentations on Innovative Entrepreneurs from Goa. 2. Preparation of Business Plan/ Project Report | |

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, 6th Edition.

Course Title: Software Laboratory – VI

Course Code: STP601

Marks: 50

Type: General Practical

Credits: 02

Hours: 60

Prerequisite Courses: STG601

Course objectives:

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

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

List of suggested Practical:

A student shall complete practical of minimum 50 Hours duration

Based on STG601

[60 Hours, 100% Marks]

1. Familiarization of the relational database: Data definition commands CREATE, ALTER, DROP, Adding Constraints Primary key, foreign key, unique key, check, not null. [10 Hours]
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 Hours]
3. Complex Queries, Nested Queries, EXISTS and UNIQUE, DISTINCT functions, NULL values, Renaming of attributes and Joining of tables, Aggregate functions and grouping. [12 Hours]
4. Programs involving views [06 Hours]
5. Programs involving cursors [06 Hours]
6. Programs involving triggers [06 Hours]
7. Stored procedures, stored procedures with parameters. [06 Hours]
8. Transaction Control Language(TCL) commands [02 Hours]

Recommended Books: *As mentioned in STG601*

Semester VI

Course Title: SSC/Q0501, Software Developer
Project/OJT)

Type: Skill (Theory, Practical, &

Course Code: STS 601

Credits: 18 (Theory-6, Practical & Project/OJT-12)

Marks: 400

Hours: 450

Course/Package objectives:

This Qualification Pack is to be taught in semester V & VI.

In semester VI, students will learn to

- Implement appropriate standards to assist in performing software construction as per the specifications and designs.
- Evaluate various software testing methodologies and identify the correct one to deploy.
- Identify software development needs and changes.
- Estimate problem designs for already built products or services.
- Discuss best practices for documenting business processes and major functionalities of an application.
- Develop strategies, apply critical thinking and provide appropriate recommendations for ethical decision-making.
- Collaborate with team to improve performance by providing data/information in standard formats and achieve the desired goals through efficient resource planning, continuous monitoring and clear correspondence.
- Manage work to meet requirements
- Work effectively with colleagues
- Develop constructive work habits
- Develop self 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 SSC NASSCOM and added more topics, content & duration)

- *Lecture Hours as per Nasscom standard mentioned in the Model Curriculum with additions wherever required*
- *Marks Distribution as per Nasscom standard mentioned in Model Curriculum*
- *NOSs covered in semester VI: SSC/N0502, SSC/N9001, SSC/N9002, and SSC/N9005*

| | Topics /Content | Duration (in Hours) |
|----|---|------------------------------|
| 1. | Software Development | |
| | <ul style="list-style-type: none"> List the phases of Software Development Lifecycle. Differentiate between top down and bottom up design approaches. Capture and analyze users' needs and then design, test, and develop software to meet those needs. Categorize each piece of an application or system and plan how the pieces will work together. Create a variety of models and diagrams that show customers, the software code needed for an application. Use appropriate tools for building, debugging, testing, tuning, and maintaining programs. Prepare a document capturing every aspect of an application or system as a reference for future maintenance and upgrades. | 14 Theory 40 Practical |
| 2. | Application Development | |
| | <ul style="list-style-type: none"> List software quality attributes and characteristics of a good SRS. Differentiate between custom application development and rapid application development. Categorize the two generic approaches for software designing – top down and bottom up approach. List the tools used for structured analysis namely Data Flow Diagrams (DFD), Structure Charts, HIPO, etc. Develop a decision table based on number of conditions that may affect a decision. Differentiate between UML and Object Oriented Design. List various UML diagrams i.e. Class, Object, Use Case Sequence, Collaboration, etc. Draw a Class Diagram of an Order System of an application. | 25 Theory 37 Practical |
| 3. | Software Testing and Maintenance | |
| | <ul style="list-style-type: none"> Access reusable components, code generation tools and unit testing tools from organization's knowledge base. Convert technical specifications into code to meet the requirements, leveraging reusable components, where available. Explain validation and verification components covered under software testing. Differentiate between manual and automated testing. List the components of a test plan. Create appropriate Unit Test Cases (UTCs). Execute UTCs and document results. Rework the code and UTCs to fix identified defects. Understand debugging, role of debugging in software testing, process of the | 15 Theory 40 Practical |

| | | |
|-----------|---|------------------------------|
| | <ul style="list-style-type: none"> debugging, strategies of debugging, backtracking strategy, Debugging by testing • Explain Software maintenance, types of maintenance, Cost of maintenance, various maintenance activities • Understand and apply the concept of Software Re-engineering - Reverse engineering, Program restructuring, Forward engineering; Explain the component reusability, Describe the reuse process • Explain the customer support, Explain the customer interface and call management | |
| 4. | Self and Work Management | |
| | <ul style="list-style-type: none"> • Describe the scope of work and working within limits of authority • Establish and agree to work requirements with appropriate people, as per hierarchy. • Keep your immediate work area clean and tidy. • Maintain a time chart against activities to display effective utilization of your time. • List resources correctly as per usage requirement. • Secure all confidential information, as per organization's policies and procedures | 11 Theory 23 Practical |
| 5. | Team Work and Communication | |
| | <ul style="list-style-type: none"> • Communicate with peers clearly, concisely and accurately. • Pass on essential information to peers in line with organizational requirements. • Demonstrate activities that show respect for colleagues. • Apprise peers in good time if any assigned task cannot be completed as per time commitments, explaining the reasons. • Identify any problems working with colleagues and take the initiative to solve these problems. • Explain the importance of following the organization's policies and procedures for working with colleagues | 10 Theory 25 Practical |
| 6. | Learning and Self Development | |
| | <ul style="list-style-type: none"> • Identify accurately the knowledge and skills needed for the job role. • Agree with appropriate people a plan of learning and development activities to address learning needs. • Undertake learning and development activities in line with plan. • Apply new knowledge and skills in the workplace, under supervision. • Obtain feedback from appropriate people on their knowledge and skills and how effectively can be applied. • Review knowledge, skills and competence regularly and take appropriate action. | 15 Theory 15 Practical |

Project (on/off Campus) / On-Job-Training (OJT) / Internship

Total Duration: 180 Hours

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

- **On/ Off-Campus Project** in the relevant skill area (Software Developer).
 - Project can be done individually or in group of maximum 5 students.

- There shall be an internal project guide and external, if required.
- After completion of the project, all the artifacts along with project report in relevant format to be submitted in the college for evaluation and feedback.

OR

- **OJT** in the relevant industry and in the relevant skill area (Software Developer).
 - A Student needs to submit the detailed report of the OJT along with the 'Certificate of Completion' for evaluation and feedback.

OR

- **Internship** in the relevant industry and in the relevant skill area (Software Developer).
 - A Student needs to submit the detailed report and work diary along with the 'Certificate of Completion' for evaluation and feedback.

Recommended Reference Books:

1. Participants Hand Book – Software Developer, IT- ITeS Sector Skills Council NASSCOM, August 2019
2. Code Complete: A Practical Handbook of Software Construction, Microsoft Press, 2nd edition
3. Craig Larman, Agile and Iterative Development: A manager's Guide, Addison Wesley, 2004
4. Prentice Hall, Clean Code: A Handbook of Agile Software Craftsmanship, Prentice Hall, 1st edition
5. Hans Van Vliet, Software Engineering: Principles and Practices, Wiley, 2008 edition.
6. Ian Sommerville, Software Engineering, Pearson Education Asia, 2007 edition.
7. Jorgensen, P. Software Testing, A Craftsman's Approach, CRC Press: Boca, 4th or later edition
8. Copeland L., A Practitioner's Guide to Software Test Design, Artech House, 2004 or later edition

Qualification Pack Hyperlink:

<https://www.sscnasscom.com/qualification-pack/SSC/Q0501/>