JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA

SYLLABUS 2021-22

B. Voc. (Software Development)

B.Voc. (SD) Scheme:

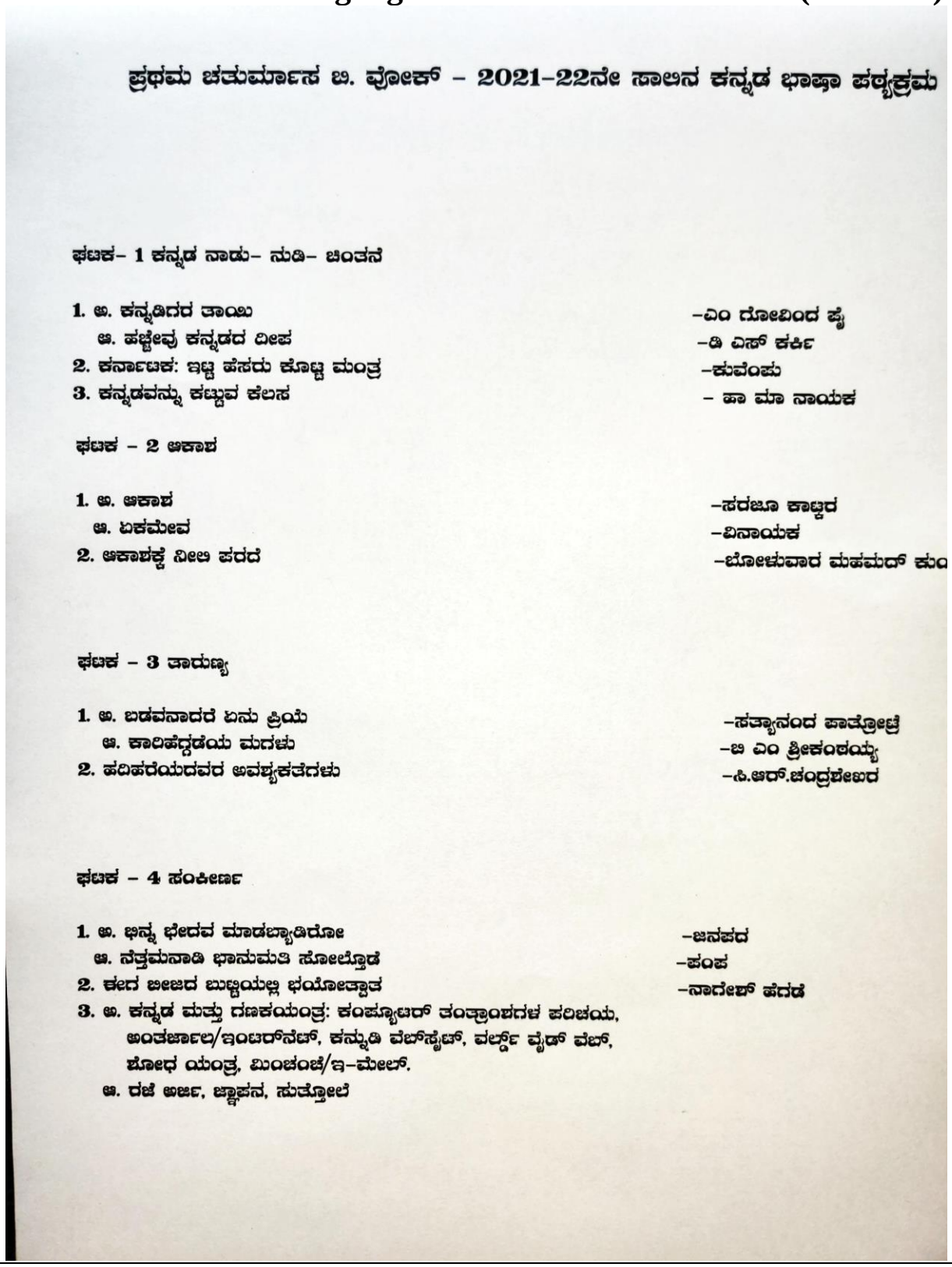
Year	Sem	Course Code	Title	L:T:P	Theory Hours	Tutorial Hours	Practical Hours	Total Hours	Total Credits
1 Year	Sem 1	SDA 020	Communication Language Kannada	3:0:0	45	0	0	45	3
		SDA 510	Basic Mathematics	3:0:0	45	0	0	45	3
		SDA 520	C Programming	2:0:1	30	0	15	45	3
		SDA 530	Digital Electronics	2:0:1	30	0	15	45	3
	Sem 2	SDB 510	Discrete Mathematics	3:0:0	45	0	0	45	3
		SDB 540	Communication Language English	3:0:0	45	0	0	45	3
		SDB 520	Algorithms & Data Structure	2:0:1	30	0	15	45	3
		SDB 550	Microcontroller & Embedded System	2:0:1	30	0	15	45	3
									24
2 Year		SDC 510	Advanced calculus	3:0:0	45	0	0	45	3
		SDC 520	Differential equation	3:0:0	45	0	0	45	3
		SDC 530	Software Architecture and SDLC & Process	2:0:1	30	0	15	45	3
		SDC 550	Indian Constitution	3:0:0	45	0	0	45	3
	Sem 4	SDD 510	Numerical Analysis & Statistics	3:0:0	45	0	0	45	3
		SDD 520	Operation Research	3:0:0	45	0	0	45	3
		SDD 530	Software Modeling & Software Quality Assurance	2:0:1	30	0	15	45	3
		SDD560	Environmental Studies	3:0:0	45	0	0	45	3
									24
3 Year	Sem 5	SDE 510	Project Management	2:0:2	30	0	30	60	4
		SDE 520	Configuration Management	3:0:1	45	0	15	60	4
		SDE 530	Human Computer Interaction	3:0:1	45	0	15	60	4
	Sem 6	SDF 510	Operating System	3:0:1	45	0	15	60	4
		SDF 550	Database Design	3:0:1	45	0	15	60	4
		SDF 520	CN & Security Fundamentals	3:0:1	45	0	15	60	4
									24
4 Year	Sem 7	G .1	Business English	2:0:1	30	0	15	45	3
		G - 2	Time Management Skills	2:0:1	30	0	15	45	3
									06
	Sem 8	G-3	Presentation Skills	2:0:1	30	0	15	45	3
		G-4	Teamwork Skills	2:0:1	30	0	15	45	3
									06

Scheme of Assessment:

SEMESTER I

General Education Content **180 hours**

1. Communication Language Kannada Credits: 3 (45 hours)



ಪ್ರಥಮ ಚತುರ್ಮಾನ ಬಿ. ವೋಕ್ – 2021–22ನೇ ಸಾಲಿನ ಕನ್ನಡ ಭಾಷಾ ಪಠ್ಯಕ್ರಮ

ಘಟಕ– 1 ಕನ್ನಡ ನಾಡು– ನುಡಿ– ಚಿಂತನೆ

1. ಅ. ಕನ್ನಡಿಗರ ತಾಯಿ –ಎಂ ಗೋವಿಂದ ಪೈ
   ಆ. ಹಚ್ಚೇವು ಕನ್ನಡದ ದೀಪ –ಡಿ ಎಸ್ ಕರ್ಕಿ
2. ಕರ್ನಾಟಕ: ಇಚ್ಚ ಹೆಸರು ಕೊಚ್ಚ ಮಂತ್ರ –ಕುವೆಂಪು
3. ಕನ್ನಡವನ್ನು ಕಟ್ಟುವ ಕೆಲಸ – ಹಾ ಮಾ ನಾಯಕ

ಘಟಕ – 2 ಆಕಾಶ

1. ಅ. ಆಕಾಶ –ಸರಜೂ ಕಾಟ್ಕರ
   ಆ. ಏಕಮೇವ –ವಿನಾಯಕ
2. ಆಕಾಶಕ್ಕೆ ನೀಲಿ ಪರದೆ –ಬೋಳುವಾರ ಮಹಮದ್ ಕು

ಘಟಕ – 3 ತಾರುಣ್ಯ

1. ಅ. ಬಡವನಾದರೆ ಏನು ಕ್ರಿಯೆ –ಸತ್ಯಾನಂದ ಪಾತ್ರೋಟ್ಟಿ
   ಆ. ಕಾಡಿಹೆದ್ದಡೆಯ ಮದಲು –ಬಿ ಎಂ ಶ್ರೀಕಂಠಯ್ಯ
2. ಹದಿಹರೆಯದವರ ಅವಶ್ಯಕತೆಗಳು –ಸಿ.ಆರ್.ಚಂದ್ರಶೇಖರ

ಘಟಕ – 4 ಸಂಕೀರ್ಣ

1. ಅ. ಭಿನ್ನ ಭೇದವ ಮಾಡಬ್ಯಾಡಿರೋ –ಜನಪದ
   ಆ. ನೆತ್ತಮನಾಡಿ ಭಾನುಮತಿ ಸೋಲ್ತೊಡೆ –ಪಂಪ
2. ಈದ ಬೀಜದ ಬುಟ್ಟಿಯಲ್ಲಿ ಭಯೋತ್ಪಾತ –ನಾದೇಶ್ ಹೆದಡೆ
3. ಅ. ಕನ್ನಡ ಮತ್ತು ಗಣಕಯಂತ್ರ: ಕಂಪ್ಯೂಟರ್ ತಂತ್ರಾಂಶಗಳ ಪರಿಚಯ,
   ಅಂತರ್ಜಾಲ/ಇಂಟರ್‌ನೆಟ್, ಕನ್ನಡ ವೆಬ್‌ಸೈಟ್, ವರ್ಲ್ಡ್ ವೈಡ್ ವೆಬ್,
   ಶೋಧ ಯಂತ್ರ, ಮಿಂಚಂಚೆ/ಇ–ಮೇಲ್.
   ಆ. ರಜೆ ಅರ್ಜಿ, ಜ್ಞಾಪನ, ಸುತ್ತೋಲೆ

ಹೊಸರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣನೀತಿ : 2021-22

ಕನ್ನಡ ಭಾಷಾ ಮಾದರಿ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ

(1,2,3 ಮತ್ತು 4ನೇ ಚತುರ್ಮಾಸಗಳು)

ಅವಧಿ : 3ಗಂಟೆಗಳು **ಗರಿಷ್ಠ ಅಂಕಗಳು : 60**

1. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ — 1x10=10

   (ಘಟಕ -೧ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

2. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ — 1x10=10

   (ಘಟಕ -೨ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

3. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ — 1x10=10

   (ಘಟಕ -೩ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ

4. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ — 1x10=10

   (ಘಟಕ -೪ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

5. ಎರಡು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ — 2x5=10

   (ಘಟಕ ೧,೨,೩ ಮತ್ತು ೪ ರಿಂದ ಪದ್ಯ ಅಥವ ಪಾಠದಿಂದ ಎರಡು ಸಂದರ್ಭ ವಾಕ್ಯಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ;

   ಪದ್ಯ ಅಥವ ಪಾಠದ ಆಶಯ, ಪಾತ್ರಚಿತ್ರಣ, ಸನ್ನಿವೇಶ ಚಿತ್ರಣ ಕುರಿತು ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

6. ಒಂದು ವಿಷಯ ಕುರಿತು ಬರೆಯಿರಿ — 1x5=5

   (ನಾಲ್ಕು ಘಟಕಗಳ ಪಠ್ಯದಲ್ಲಿನ ಒಂದು ವಿಷಯ ಕುರಿತು ವಿದ್ಯಾರ್ಥಿಗಳ ಸ್ವಂತ ಅನುಭವ, ಆಲೋಚನೆ , ಅಭಿಪ್ರಾಯ ಕುರಿತು ಪ್ರಶ್ನೆ ಕೇಳಲಾಗುತ್ತದೆ)

7. ಒಂದು ವಾಕ್ಯದಲ್ಲಿ ಉತ್ತರಿಸಿ — 1x5=5

   (ನಾಲ್ಕು ಘಟಕಗಳಲ್ಲಿ ಭಾಷಾಭ್ಯಾಸಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಪದಗಳ ಅರ್ಥ, ಪದವಿಂಗಡಣೆ , ನುಡಿಗಟ್ಟನ್ನು ಸ್ವಂತವಾಕ್ಯದಲ್ಲಿ ಬಳಸುವುದು , ಬಿಟ್ಟ ಜಾಗ ತುಂಬುವುದು ....ಇತ್ಯಾದಿ ಐದು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

2. Basic Mathematics

(45 Hrs @ 3 Hrs per week, 3 credits)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in depth Polynomials
CO2. Write down the details of Cardon's Method
CO3. Identify the details of Pair of straight lines
CO4. Deliberate in details with examples Circle
CO5. Specify in details with examples Radian Measure
CO6. Learn in depth Complex Numbers

Unit 1: Algebra 1 **15 Hours**

Theory of Equations: Polynomials – Relations between the roots and coefficients –Symmetric functions –Synthetic division-Descartes' rule of signs –Cubic equations- Cardon's method.

Unit 2: Analytical Geometry –I 15 Hours

Two dimensional coordinate geometry – straight line (Revision), Pair of straight lines –standard results and simple problems.
Circle: equations of circles, Tangent and normal, radical axis and radical centers.
Conic : Parabola – Ellipse- Hyperbola (Equations in standard form and problems)

Unit 3: Trigonometry 15 Hours

Radian measure-Trigonometric ratios –Trigonometric functions of compound angle, multiple angles and half angles-Inverse trigonometric functions-complex numbers.

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Books for Reference:

1. Algebra –Natarajan
2. Algebra – Hardy and wright
3. Algebra –Shanthi Narayan
4. Algebra -Manicavachagam Pillay.
5. Elements of Analytical Solid geometry – Shanti Narayan
6. Elements of Analytical Solid geometry –S.L.Loney
7. Differential Calculus –Shanthi Narayan
8. Triogonometry –S.L.Loney

Scheme of Teaching and Examination:

Teaching: 45 Hours of Teaching at the rate of 3 Hrs per week

Scheme of Examination:

Component	Syllabus	Weight age	Period of continuous assessment
C1	first 50 % of the syllabus	15%	First half of the semester
C2	Remaining 50%	15%	Second half of the semester
C3	Semester - end examination	70%	After completing one full semester

Question paper pattern:

Title of the paper: **Basic Mathematics**

Section A:

Q1: Six questions of 2 marks each – Five questions to be answered. $5 \times 2 = 10$

Section B: Answer any Four questions from each main. Each full question carries 20 marks.

$4 \times 15 = 60$

Q2: Five sub questions of 5 marks each from unit 1
Q3: Five sub questions of 5 marks each from unit 2
Q4: Five sub questions of 5 marks each from unit 3

3. C PROGRAMMING

Credits 3 (45 Hours)

(2 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in details with examples Problem Design
CO2. Learn in details with examples Algorithms
CO3. Deliberate the details of Data Definition Structure
CO4. Learn the details of Control Structures
CO5. Learn the details of Functions
CO6. Identify in details with examples Abstract Data Types

Unit 1 — 15 Hours

Problem Solving Technique: Problem definition, Problem analysis, Problem Design, Algorithms, Flow charts, Coding, Debugging, Program documentation, Program maintenance and Basic programming construct.

Data Definition Structure: Types, constants, variables, keywords and identifiers.

Operators and Expressions: Arithmetic, Relational, Logical, operator precedence rules; input and output statement and Assignment statement.

Unit 2 — 15 Hours

Control Structures: Sequential, Selection (one way, two way), looping (while, do while, for), combinations.

Functions: Definition and passing (function depth look), Prototypes: parameter definition and passing (scope: local and global variables).

Data Structures: One and Two dimensional arrays.

Abstract data types: Records (Structure definition statement); Strings: Use of main operations, string functions (concatenates string copy and compare etc).

Books for References:

- Programming with ANSI C by: E. Balagurusamy
- Let us C - Yashwanth kanetkar
- Computer concepts and C programming by - P. B. Kotur

Practical

(1Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

4. ELECTRONICS

Credits 3 (45 Hours)

(2 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:
After completion of the course, the students are able to:

CO1. Learn in detail with application, logic gates

CO2. Learn the classification and characteristics of combinational digital circuits

CO3. Deliberate the classification and characteristics of sequential digital circuits CO4. Learn in details with application, flip flop

Unit 1 **15 Hours**

Representation of Information: Number system, integer and floating point representation, character codes (ASCII, EBCDIC)

Number Systems: Introduction to decimal, binary and hexadecimal number systems. Inter-conversion of decimal, binary and hex numbers

Binary Arithmetic and codes: Addition, multiplication and division in binary systems. Subtraction in binary systems –one's and two's complement methods. Subtraction of binary numbers by one`s and two`s complement methods. Concept of signed and unsigned numbers

Alphanumeric codes- ASCII and EBCDIC, concept of parity, error detection and correction.

Logic Gates: Logic values and variables, positive and negative logic, AND, OR, NOT, NAND, NOR, AND, XOR gates, symbols and truth table. Definition of universal gates, NAND & NOR gates as universal gates.

Boolean Algebra: Laws of Boolean algebra. Principle of duality. DeMorgan's theorems. Simplification of Boolean expressions. Boolean expression for logic circuits and vice versa. . SOP and POS notations. Canonical Expressions. Conversion from SOP to POS form and vice versa. Reduction of Boolean expressions (three/ four variables with don't care conditions) using Karnaugh maps

Unit 2 **15 Hours**

Combinational Circuits: Half Adder, Full Adder, Half subtractor, Full subtractor, Encoders (Decimal to BCD) and decoders (BCD to Decimal), 4 X 1 Multiplexer and 1 X 4 demultiplexer - symbol and truth table

Sequential Circuits: RS flip flop, D flip flop. JK flip flop. Race around condition & T flip-flops. Shift registers –SISO, SIPO, PISO, PIPO registers. Brief explanation with Block diagrams. Counter - Synchronous and Asynchronous - Binary ripple counter and modulo counter.

Semiconductor Memories: Idea of different types of Semiconductor memories (RAM, ROM, PROM, EPROM, EEPROM), process of data storage and retrieval, organization of memory, concept of PLA and PAL.

Basic Building Blocks: ALU: arithmetic and logic unit operations, organization of control units, memory: types and organization, peripheral devices: I/O devices (video terminals and printers) and

controllers, storage devices (tapes and disks), Programmed and interrupt control mechanism, I/O controllers, and bus bandwidths

Books for References:

- Digital Electronic – Introduction to Theory & Practice by Gothmann.
- Modern Digital Electronic (3rd Ed.) by Jain.
- Digital Principles & applications (6th Ed.) by Leech, Malvino and Saha.
- Digital Electronic by Thomas Floyd.
- The 8086 / 8088 Family Design, Programming & Interfacing by John Uffenbeck.
- 8086 Microprocessors Programming & Interfacing by Duglos V Hall.
- Intel Microprocessors Architecture, Programming & Interfacing (6th Ed.) by Barry B Bery.

Practical

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SEMESTER II

General Education Content 180 hours

1. Communicative Language English

Credits: 3 (45 hours)

(3 Hours of Theory per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Voice
CO2. Specify in details with examples Articles
CO3. Learn in depth Speech
CO4. Deliberate the details of Writing Skills
CO5. Learn in depth Speaking Skills

Module – 1 Grammar

		Marks	Hrs/ Week
1.	Subject and Verb Agreement	5	6
2.	Voice	5	5
3.	Articles	5	3
4.	Speech	5	6
5.	Question tag	5	5
6.	Framing of Questions	5	3+2=05

Module – 2 Writing Skills

1.	Letter Writing Letter of Application/Letter of Grievances/Resume Preparation	10	4
2.	Comprehension	10	3
3.	Essay Writing	10	3

Module – 3 Speaking Skills

1.	Greeting		
2.	Requesting		
3.	Enquiring		
4.	Explaining	10	03+2=05
5.	Reporting		
6.	Permission		
7.	Thanking		
		70	**45**

2. DISCRETE MATHEMATICS

Credits 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Matrices and Determinants
CO2. Learn the details of Hamilton Theorem
CO3. Understand in details with examples Graph Theory
CO4. Understand the details of Calculus
CO5. Identify in details with examples Definite and Indefinite Integrals

Unit 1: Matrices and Determinants **15 Hours**

Algebra of Matrices and determinants –Elementary row operations- Rank of a matrix –Linear dependence of row and column vectors- System of Homogeneous linear equations-System of non homogeneous linear equations-Characteristic equations –Eigen values and Eigen vectors-Cayley – Hamilton theorem-Inverse of a matrix.

Unit 2: Basics of graph theory **15 Hours**

Definition-paths-matrix representation of graphs –planar graphs-non planar graphs-coloring of graphs-chromatic number of graphs-Independent number.

Unit 3: Calculus **15 Hours**

Limits–Derivatives-Rules of differentiation-problems-differentiation of implicit Parametric and inverse functions-logarithmic differentiation and derivatives of second order Indefinite and definite integrals-simple problems.

Scheme of Teaching and Examination:

Teaching: 45 Hours of Teaching at the rate of 3 Hrs per week

Scheme of Examination:

Component	Syllabus	Weight age	Period of continuous assessment
C1	First 50 % of the syllabus	15%	First half of the semester
C2	Remaining 50%	15%	Second half of the semester
C3	Semester - end examination	70%	After completing one full semester

Question paper pattern: Title of the paper: **Mathematics II**

Section A:

Q1 Six questions of 2 mark each - Five questions to be answered. $5 \times 2 = 10$

Section B: Answer any Four questions from each main. Each full question carries 15 marks.

$4 \times 15 = 60$

Q2: Five sub questions of 5 marks each from unit 1
Q3: Five sub questions of 5 marks each from unit 2
Q4: Five sub questions of 5 marks each from unit 3

3. ALGORITHMS AND DATA STRUCTURES

Credits 3 (45 Hours)

(2 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Algorithms and Data Structures
CO2. Learn in depth Arrays
CO3. Learn in details with examples Binary Search Trees
CO4. Deliberate the characteristics of Heaps
CO5. Specify the characteristics of Sorting Algorithms
CO6. Learn the details of Shortest Path

Unit 1: **15 Hours**

Algorithms and Data Structures: Asymptotic and Algorithm Analysis, Properties of data, Asymptotic Analysis, Algorithm Analysis.

Abstract Lists and Implementations: Linked lists and arrays, Stacks, Queues, De-queues.

Abstract Sorted Lists and Implementations: General trees, binary (including binary and complete trees), N-array trees and tree traversals, Abstract Sorted Lists, Binary search trees, Balanced search trees, AVL trees, B-Trees.

Unit 2: **15 Hours**

Abstract Priority Queues: Heaps.

Abstract Sets/Maps: Chained Hash Tables, Linear Probing, Double Hashing.

Sorting Algorithms: Insertion and bubble sort, Heap, merge, and quick sort, Bucket and radix sort.

Graph and Direct Acyclic Graph Algorithms: Topological sort, Minimum spanning trees and shortest path.

Reference:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2nd Ed., Prentice-Hall of India, 2006.
2. Robert L. Kruse and A.J. Ryba, Data Structures and Program Design in C++, Prentice Hall, Inc., NJ, 1998.

Practical

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

4. INTRODUCTION TO MICROCONTROLLERS AND EMBEDDED SYSTEMS

(2 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand architecture of 8051 microcontroller
CO2. Write down the the instruction set and simple programs of 8051 microcontroller
CO3. Learn the details of 8051 microcontrollers
CO4. Specify the characteristics of embedded system

Unit 1: Microcontrollers **(15 Hours)**

Microcontroller 8051 - Introduction, block diagram of microprocessor, block diagram of microcontroller, comparison between microprocessor & microcontroller, Architecture of 8051 and pin out diagram of 8051. **Addressing modes -** Data moves, Types of addressing modes - register addressing, immediate addressing, direct addressing, indirect addressing mode. **Instructions set -** Data transfer instructions, arithmetic instructions, jump and call instructions. **PIC microcontroller -** Core feature and over view of series.

Unit 2: Embedded Systems **(15 Hours)**

Introduction to Embedded Systems - Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Hardware Side - introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers. An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor

The Hardware Side: Storage Elements and Finite-State Machines - Theoretical model.

Text Books:

- Microcontroller – K J Ayala.
- Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

Books for References:

- Microcontroller – Mazadi.

Practical

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SEMESTER III

1. ADVANCED CALCULUS
Credits 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in depth Sequences

CO2. Specify the details of Series

CO3. Understand in details with examples Rolle's Theorem

CO4. Deliberate in details with examples Taylor's Theorem

CO5. Identify the details of Partial derivatives

Unit 1: Sequences and Series **15 Hours**

Sequences- Bounded and monotonic sequences-convergent, divergent and oscillatory sequences- standard results and simple problems.

Infinite series-nth partial sum- geometric series-convergence of $\sum \frac{1}{n^p}$ - comparison test and ratio test-simple problems-alternating series.

Unit 2: Calculus **15 Hours**

Mean value theorems-Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorems (Statements and Geometrical interpretations)-Taylor's theorem –Maclaurin's expansion (Statement) and problems.

Unit 3: Partial derivatives **15 Hours**

Limit and continuity of functions of two and three variables. Partial differentiation. Change of variables. Partial derivation and differentiability of real-valued functions of two and three variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two and three variables. Jacobians.

Books for Reference:

1. A First Course in Real Analysis – Asharani Singhal.
2. Real Analysis – S.C .Malik .
3. Principles of Mathematical Analysis –Shanthinarayan
4. Calculus ,Volume -1 and Volume -2

Scheme of Teaching and Examination:

Teaching: 45 Hours of Teaching at the rate of 3 Hrs per week

Scheme of Examination:

Component	**Syllabus**	**Weightage**	**Period of continuous assessment**
C1	first 50 % of the syllabus	15%	First half of the semester
C2	Remaining 50%	15%	Second half of the semester
C3	Semester - end examination	70%	After completing one full semester

Question paper pattern:

Title of the paper: Paper 1: **ADVANCED CALCULUS**

Section A:

Q1: Six questions of two marks each .Five questions to be answered $5 \times 2 = 10$

Section B: Answer any Four questions from each main. Each main carries 20 marks

3 X 20 = 60

Q2: Five sub questions of 5 marks each from unit 1
Q3: Five sub questions of 5 marks each from unit 2
Q4: Five sub questions of 5 marks each from unit 3

2: DIFFERENTIAL EQUATIONS IV

Credits 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in details with examples linear differential equations

CO2. Write down in details with examples nonlinear differential equations

CO3. Understand in details with examples Homogeneous linear differential equations

CO4. Learn the details of Non homogeneous linear differential equations CO5. Specify the details of Partial differential equations

Unit 1: Linear and nonlinear differential equations 15 Hours

Elimination of arbitrary constant-solutions of linear differential equations - separation of variables –Homogeneous equations-exact equations- equations of the form $\frac{dy}{dx} + Py = Q$-Integrating factor. Equations solvable for x, y, p. Clairaut's form and singular solutions. .

Unit 2: Homogeneous and non homogeneous linear differential equations 15 Hours

Homogeneous Linear differential equations with constant coefficients.-non homogeneous linear differential equations –inverse differential operators-Cauchy's homogeneous linear differential equations- Second order linear differential equations-variation of parameters and exact equations.

Unit 3: Partial differential equations 15 Hours

Total differential equations-simultaneous equations- partial differential equations-Lagranges form of linear partial differential equations-charpit's method.

Books for Reference :

1. A short course in differential equations –Rainville and Bedient
2. Advanced Engineering Mathematics – Kreyszig
3. Higher Engineering Mathematics – Grewal
4. Laplace Transform –Murry R Speigel
5. Applications of Differential equations –Martin Brown

Scheme of Teaching and Examination

Teaching: 45 Hours of Teaching at the rate of 3 Hrs per week

Scheme of Examination:

Component	**Syllabus**	**Weightage**	**Period of continuous assessment**
C1	First 50 % of the syllabus	15%	First half of the semester
C2	Remaining 50%	15%	Second half of the semester
C3	Semester - end examination	70%	After completing one full semester

Question paper pattern:

Title of the paper: *Paper 2:* **DIFFERENTIAL EQUATIONS**

Section A:

Q1: Six questions of two marks each .Five questions to be answered $5 \times 2 = 10$

Section B: Answer any Four questions from each main. Each main carries 20 marks

3 X 20 = 60

Q2: Five sub questions of 5 marks each from unit 1
Q3: Five sub questions of 5 marks each from unit 2
Q4: Five sub questions of 5 marks each from unit 3

3. Software Architecture and SDLC & Processes

Credits 3 (45 Hours)

(2 Hours of Theory and 1Hour of Practical's)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in depth Software Process
CO2. Deliberate in details with examples SDLC
CO3. Learn in depth Data Modeling
CO4. Understand the details of UML and ER Models
CO5. Specify the details of Loose Coupling

Unit 1: **15 Hours**

SDLC & Processes: Software Process, Software Development Life Cycle, Object-Oriented Concepts: connections between design and implementation, Software Testing, Object-Oriented Architecture and Design, Requirements analysis, Safety Critical Software.

Unit 2: **15 Hours**

Software Architecture: Introduction to enterprise software architecture, the role of middleware, Cloud computing =SaaS + Utility Computing, Data Modeling, UML and E-R models. XML, Schemas, XML Schemas, Data Processing. Strategies for data processing, Introduction to XQuery. JSON and JAXB, Domain-Driven Architecture. Domain-driven, design (DDD), Object-relational mapping (ORM), Service-oriented Architecture (SOA), Standardized service contract, Loose coupling, Service abstraction, Service-oriented Architecture (SOA).

Practical

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

4. Indian Constitution

Credits 3 (45 Hours)

(3 Hours of Theory)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn the details of Features of Indian Constitution
CO2. Understand the details of Fundamentals Rights
CO3. Identify the details of Role of Prime Minister
CO4. Learn the details of Power and Functions of Lok Sabha
CO5. Specify the details of Power and Functions of Chief Minister

UNIT I **08 hrs**

a) Preamble of the Indian Constitution
b) Salient features of Indian Constitution

UNIT II **10 hrs**

a) Fundamental Rights
b) Fundamental Duties
c) Directive principles of State Policy

UNIT III **14 hrs**

a) President – Election Method, Powers and Functions
b) The Role of the Prime Minister
c) The Parliament – Structure, Power and Functions(Lok Sabha and Rajya Sabha)
d) Supreme Court – Organization and Jurisdiction

UNIT IV **13 hrs**

a) The Role of Governor in the Administration of State
b) Powers and Functions of the Chief Minister
c) Composition , Powers and Functions of both the Houses of State Legislature
d) High Court – Organization and Jurisdiction

SEMESTER IV

General Education Content 180 hours

PAPER 1: NUMERICAL ANALYSIS

Credits 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Bisection Method

CO2. Identify in details with examples Range Kutta IV Order Method

CO3. Learn the details of Finite differences

CO4. Understand in depth Numerical Integration

CO5. Identify in details with examples Linear programming

:

Unit 1: Numerical Methods 15 Hours

Numerical solutions of algebraic equations-Bisection method -Newton Raphson method, Regula Falsi method -iteration method-Euler method, Range kutta IV order methods

Unit 2: Finite differences 15 Hours

Finite differences-Interpolation-Newton Gregory forward interpolation formula-Lagrange's interpolation formula-Finding first and second derivatives using interpolation formula.

.

Unit 3: Numerical integration 15 Hours

General quadrature formula- Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule Weddle's rule.

Books for reference:

1. Numerical methods: S.S.Sastry.
2. Probability and statistics for engineers and Scientists – Ronald E .Walpole and Raymond H Mayers .
3. Mathematical Statistics - John Freund (Prentice Hall India PVT .Ltd)

Scheme of Teaching and Examination

Teaching: 45 Hours of Teaching at the rate of 3 Hrs per week

Scheme of Examination:

Component	**syllabus**	**Weightage**	**Period of continuous assessment**
C1	first 50 % of the syllabus	15%	First half of the semester
C2	Remaining 50%	15%	Second half of the semester
C3	Semester – end examination	70%	After completing one full semester

Question paper pattern:

Title of the paper: **Numerical Techniques and Statistics**

Section A:

Q1: Six questions of two marks each .Five questions to be answered $5 \times 2 = 10$

Section B: Answer any Four questions from each main. Each main carries 20 marks

3 X 20 = 60

Q2: Five sub questions of 5 marks each from unit 1
Q3: Five sub questions of 5 marks each from unit 2
Q4: Five sub questions of 5 marks each from unit 3

PAPER 2: OPERATION RESEARCH

Credits 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Different phases of operation research

CO2. Deliberate in depth Simplex method

CO3. Identify in depth Duality theorems

CO4. Understand the details of Sequencing problems

CO5. Learn in depth Transportation model problems

CO6. Understand the details of Assignment problems

Unit 1: **15 Hours**

Definition of the term Operation Research -Different phases of operation research Advantages and limitations of O.R. Linear programming –Requirements for a linear programming problem , Examples on the Applications of linear programming problem, Formulation of a linear programming , Standardization , Solving LPP by Graphical Method ,Simplex Method (up to two variables)

Unit 2: **15 Hours**

Big M method revised simplex method, Dual simplex method, Duality theorems.

Sequencing problems: Processing 'n' jobs through two machines –Travelling salesman problems as an application of sequencing.

Unit 3: **15 Hours**

Transportation Model problems – Formulating, Solution –North West Corner Rule, Least Cost method, Row Minima method, Column minima method and Vogel's approximation.

Assignment problem: formulating, method of finding initial basic feasible solution to Assignment problem using Hungarian method.

Books for reference:

1. 'Operation Research ' by Kanthiswarup ,Guptha ,Manmohan –Sultan chand and sons Educational publishers ,New Delhi ,1996
2. ' Operation Research ' by H .A .Taha Prentice Hall of india Ltd 1998
3. 'Operation research ' ,by S .D Sharma Kedarnath Ramnath and co (publishers)1997

Scheme of Teaching and Examination

Teaching: 45 Hours of Teaching at the rate of 3 Hrs per week

Scheme of Examination:

Component	**Syllabus**	**Weightage**	**Period of continuous assessment**
C1	first 50 % of the syllabus	15%	First half of the semester
C2	Remaining 50%	15%	Second half of the semester
C3	Semester - end examination	70%	After completing one full semester

Question paper pattern:

Title of the paper: **Operation Research**

Section A:

Q1: Six questions of two marks each .Five questions to be answered $5 \times 2 = 10$

Section B: Answer any Four questions from each main. Each main carries 20 marks

3 X 20 = 60

Q2: Five sub questions of 5 marks each from unit 1
Q3: Five sub questions of 5 marks each from unit 2
Q4: Five sub questions of 5 marks each from unit 3

3. Software Modeling and Software Quality Assurance

Credits 3 (45 Hours)

(2 Hours of Theory and 2 Hour of Practical's)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Classes and Relationships
CO2. Specify the details of State diagrams
CO3. Identify in details with examples Events
CO4. Deliberate in details with examples Software quality assurance
CO5. Understand the details of Software quality assurance

Unit 1: **15 Hours**

Software Modeling: What is Modeling?, Classes, Relationships, Common Mechanisms, Diagrams, Class Diagrams, Advanced Relationships, Instances, Object Diagrams, Use Cases, Interaction/Activity Diagrams, Events, State Machines, Time, Space, State Diagrams and Events.

Unit 2: **15 Hours**

Software Quality Assurance: Software Quality, Quality Assurance, Testing Concepts and Issues, Testing Activities, Testing Techniques. Other Techniques, Defect Prevention/Process Improvement, Inspection, Refactoring; CRC, Software Reliability Engineering, Quality Models and Measurements.

Practical

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Paper 4: Environmental Studies

(One-Semester Compulsory Core Module for B.Voc Programmes)

(3 hrs Theory/Week)

3 Credits (45 Hrs)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate the details of Components of environment
CO2. Specify the details of Ecology and Ecosystems
CO3. Identify in details with examples Natural resources
CO4. Learn the details of Biodiversity
CO5. Specify in details with examples Environmental pollution
CO6. Identify the details of Environmental issues and policies

Unit i: Environment and natural systems 4 hrs

- Introduction to Environment and Environmental Studies
- Definition and Components of Environment, Relationship between the different components of Environment
- Man and Environment relationship
- Impact of technology on Environment, Environmental Degradation
- Multidisciplinary nature of the Environment studies
- its scope and importance in the present day Education System

UNIT 2: Ecology and Ecosystems: 5 hrs

- Introduction: Ecology- Objectives and Classification
- Concept of an ecosystem- structure and functions of ecosystem
- Components of ecosystem- Producers, Consumers, Decomposers
- Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Energy Flow in Ecosystem, Food Chains, Food webs ,Ecological Pyramids
- Major Ecosystems: Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine Ecosystem**.**

Unit 3: Natural Resources 6 hrs

Renewable and Non-renewable resources, exploitation and conservation,

a. Water resources: Surface and Ground water sources, Indian and Global scenario.
b. Land as a resource, land use change and land degradation
c. Forest resources: Definition and Classification of Forests
   Ecological and Economic importance and benefits of forest, Indian scenario,
   Deforestation: causes and effects, case studies remedial measures
d. Food resources: Sources of food, Global and Indian food demand scenario,

Limits of food production, Environmental effects of Agriculture

e. Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

f. Mineral resources: Definition and Classification of minerals, mining issues case studies.

e. Role of individual in conservation of natural resources.

Unit 4: Biodiversity and its Conservation 7 hrs

- Biodiversity : Definition, Levels of biological diversity : genetic, species and ecosystem diversity
- Bio geographic zones of India
- Hot spots of biodiversity
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational values
- Biodiversity patterns
- India as a mega-biodiversity nation
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT 5: Environmental pollution: 6 hrs

- Types of Environmental Pollution:
- Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution: Industrial Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants, Eutrophication.
- b) Marine pollution: Causes, effects and control.
- c) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO2, NOX, Natural & Anthropogenic Sources, Effects of common air pollutants
- d) Soil Pollution: causes, effects and control.
- e) Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects
- f) Thermal Pollution: Causes, effects and control.
- g) Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste.
- Role of individual in the prevention of pollution, Pollution case studies.

UNIT 6: Sustainable development and Environmental issues and Policies. 7 hrs

- Sustainable development: Meaning, changes in resource utilization.
- Water conservation: watershed management and Rain water harvesting.
- Environmental issues: Climate change, global warming, acid rain, ozone layer depletion.
- Disaster management: floods, drought, earthquake, cyclones and landslides.
- Wasteland reclamation.

- Environment Protection Act: Air, Water, Wildlife (Prevention and Control of Pollution)
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Environment: rights and duties**.**

Unit 7: Human Population and the Environment 5 hrs

- Population growth, Explosion, demographic variation among nations.
- Family welfare Program.
- Environment, human health and welfare; infectious and lifestyle diseases in contemporary world.
- Value Education: Environmental ethics.
- HIV/AIDS
- Women and Child welfare.
- Role of information technology in Environment and human health

Unit 8: Field visit 5 hrs

- Field work Visit to an area to document environmental assets :river/ forest/ grassland/ hill/ mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Visit to the solid waste treatment plant and water treatment plant.
- Video: The one degree • (Equal to 5 lectures)

Reference Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani , 2013 Publisher: LAP -Lambert Academic Publishing , Germany
3. Environmental Studies by Anindita Basak , 2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by: S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill.
10. Environmental Studies by N.Arumugam & V.Kumaresan, saras publication.

SEMESTER V

Paper 1: Project Management

Credits 2 (30 Hours)

(2 Hour of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand in depth Project plan

CO2. Identify the details of User controlled scheduling

CO3. Deliberate the details of Adding tasks

CO4. Understand in details with examples Adding work resources

CO5. Learn the details of Calendar

Unit 1: **15 Hours**

Creating a Project Plan.
User-Controlled Scheduling
Adding Tasks
Resolving Common Scheduling Issues

Unit 2: **15 Hours**

Adding Work Resources
Adding Material and Cost Resources
Defining a Calendar
Viewing and Tracking Project Information Gantt Charts

Practical's

Credits 2 (30 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Paper 2: Configuration Management

Credits 3 (45 Hours)

(3 Hour of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in depth Configuration management

CO2. Understand the details of Configuration management planning

CO3. Deliberate the details of Configuration control

CO4. Learn in details with examples Configuration status accounting

CO5. Identify the details of Configuration audits

Unit 1: **15 Hours**

DEFINING CONFIGURATION MANAGEMENT: CM principles and standards, the recent growth of CM

CM PLANNING: Program phasing and milestones, Creating the CM organization, Defining CM system requirements, CM job classifications

CONFIGURATION IDENTIFICATION: First tasks of CM, Configurations & Baselines, Requirements traceability, Item identification and numbering

Unit 2: **15 Hours**

ENGINEERING RELEASE: Control of technical data, the document control process, Development vs. formal release

CONFIGURATION CONTROL: Defining a closed-loop process, Change classifications, Review boards and CCBs, Processing changes and RDWs

INTRODUCTION TO SOFTWARE CONFIGURATION MANAGEMENT: Specific software CM tasks, SEI evaluation criteria

Unit 3: **15 Hours**

CONFIGURATION STATUS ACCOUNTING: Defining CSA tasks and tailoring, Status accounting elements, Understanding the impact

CM PLANS: CMP preparation techniques, Software CMPs, Assessments and Plans

General procedures and work flow

CONFIGURATION AUDITS: Internal and informal audits, developing the audit plan, The Functional and Physical Audits

Practical's

Credits 1 (15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Paper 3: Human Computer Interaction

Credits 3 (45 Hours)

(3 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn the details of Introduction of human computer interface
CO2. Understand the details of Human consideration in screen design
CO3. Identify in details with examples Windows
CO4. Deliberate in depth Multimedia and coloring
CO5. Specify in details with examples Hypermedia

Unit 1: 20 Hours

Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles. User interface design process- obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system timings - Human consideration in screen design - structures of menus - functions of menus-contents of menu-formatting -phrasing the menu - selecting menu choice-navigating menus-graphical menus.

Unit 2: 13 Hours

Windows: Characteristics-components-presentation styles-types-managements-organizations-operations-web systems-device-based controls: characteristics-Screen -based controls: operate control - text boxes-selection control-combination control-custom control-presentation control.

Unit 3: 12 Hours

Text for web pages - effective feedback-guidance & assistance-Internationalization-accesssibility-Icons-Image-Multimedia - coloring.

Windows layout-test: prototypes - kinds of tests - retest - Information search - visualization - Hypermedia - www - Software tools.

Practical's

Credits 1 (15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SEMESTER VI

Paper 1: Operating System

Credits 4 (60 Hours)

(3 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:
After completion of the course, the students are able to:

CO1. Identify the Characteristics of operating system
CO2. Deliberate in depth Scheduling algorithms
CO3. Learn in depth Semaphores
CO4. Specify the details of Message passing
CO5. Understand the details of Deadlock
CO6. Identify in details with examples File organisation

Unit 1: **15 Hours**

Overview of operating systems, functionalities and types of OS.
User Operating, System Interface, Command Interpreter and Graphical User Interface.
System Calls – Types of System Calls.
The concept of a process - operations on processes, process states, concurrent processes, process control block.
UNIX process control and management, signals and pipes.
Operating system organisation, OS kernel FLIH.
Processor scheduling, scheduling algorithms and Scheduling Criteria.

Unit 2: **15 Hours**

Mutual exclusion, process co-operation, producer and consumer processes.
Semaphores: definition, init, wait, signal operations.
Use of semaphores to implement mutex, process synchronisation etc., implementation of semaphores.
Critical regions, Conditional Critical Regions, Monitors, Ada Tasks.
Interprocess Communication (IPC), Message Passing, Direct and Indirect.

Unit 3: **15 Hours**

Deadlock – Deadlock Characterization, Methods of handling deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from deadlock. Memory organisation and management, storage allocation.
Virtual memory concepts, paging and segmentation, address mapping.
Virtual storage management, page replacement strategies.
File organisation: blocking and buffering, file descriptor, directory structure, File and Directory structures, blocks and fragments, directory tree, inodes, file descriptors, UNIX file structure.

Practical's

Credits 1 (15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Paper 2: Database Design

Credits 4 (60 Hours)

(3 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Database terminology and information types

CO2. Specify in depth Database planning and designing

CO3. Learn the details of Cloud computing

CO4. Specify the details of Sets and normalization

CO5. Specify in depth Report writing

CO6. Understand in details with examples Customer service management

Unit 1 **15 Hours**

Database Basics, Introduction to Devise Digital Storage, Database Terminology & Database Information Types, Microsoft Excel versus Microsoft Access, Database Planning, Database Objects – Creating Fields and Tables, Planning and Designing a Database

Unit 2 **15 Hours**

Introduction to Cloud Computing, Database Relationships, Designing for the Business Case, Introduction to Data Security & Data Archives, Managing the Database, Database Relationship Development, Introduction to Visual Data Analytics, Introduction to Sets & Normalization, Database Extractions

Unit 3 **15 Hours**

Database Queries and Basic SQL, Emergence of Social Media Databases, Database Distribution, Report Writing, Introduction to Customer Service Management, Computing Databases, Database Inputs, Form Development

Practical's

Credits 1 (15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Paper 3: Computer Networks & Security Fundamentals

Credits 4 (60 Hours)

(3 Hours of Theory + 2 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate the details of OSI model
CO2. Learn the details of Switches
CO3. Understand the details of Protocols and services
CO4. Identify in depth Security
CO5. Learn in depth Encryption
CO6. Specify the details of E-mail and server protection

Unit 1 **15 Hours**

COMPUTER NETWORKS: Network Infrastructure - Internet, intranet, and extranet.
Understand the OSI model. TCP/IP, Local area networks (LANs), Wide area networks (WANs). Network topologies and access methods. Network Hardware - switches. Connecting devices – Bridges, Repeaters and Hubs.

Unit 2 **15 Hours**

Internetworking device – Router, Gateway and Media types. Error detection and correction – Parity Check, CRC Checksum and Hamming Code. Protocols and Services. Understand IPv4 & IPv6. Addressing names resolution & networking services. SECURITY: Understanding Security Layers Principles, Physical, Wireless, Internet & Operating System Security.

Unit 3 **15 Hours**

Cryptography – Symmetric Key Cryptography and Public Key Cryptography. User authentication, permissions, password, audit policies, encryption, malware, Network Security & dedicated firewalls. Network Access Protection (NAP), network isolation. Protocol security, client, e-mail & server protection.

Practical's

Credits 1 (15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Model Curriculum

JUNIOR SOFTWARE DEVELOPER

JUNIOR SOFTWARE DEVELOPER

SECTOR: **IT-ITeS**
SUB-SECTOR: **IT Services**
OCCUPATION: **Application Development**
REFERENCE ID: **SSC/Q0508, version 1.0** NSQF
LEVEL: **4**

Table of Contents

Junior Software Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Junior Software Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Junior Software Developer**		
Qualification Pack Name & Reference ID.	Junior Software Developer SSC/Q0508, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	10th Standard		
Training Outcomes	**After completing this programme, participants will be able to:** • assist in performing software construction and software testing entry-level tasks in the IT Services industry • manage work to meet requirements • maintain a healthy, safe and secure working environment		

The Course encompasses all six National Occupational Standards (NOS) of **Junior Software Developer SSC/Q0508** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Basics of IT	05:00	15:00	Candidates will be able to: Demonstrate basic computer and internet literacy including operating a computer, describing its major components and how they work, using Windows and Linux OS, operating a browser, searching the internet, managing mails and using social internet media.	SSC/N0506	Refer to Unique Equipment Required section

2	Problem Solving and Program Design	30:00	60:00	Candidates will be able to: 1. Demonstrate aptitude for analysing information and making logical conclusions. 2. Demonstrate knowledge of the foundational mathematical concepts in computing.	SSC/N0506	Refer to Unique Equipment Required section
3	Basic Algorithms and Application Development	30:00	60:00	Candidates will be able to: • 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 template. Communicate effectively with appropriate people w.r.t. assigned roles in simple English – both oral and written.	SSC/N0506	Refer to Unique Equipment Required section
4	Self and work Management	30:00	70:00	Candidates will be able to: • Establish and agree work requirements with appropriate people . Keep immediate work area clean and tidy • Utilize time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of job role • Obtain guidance from appropriate people, where necessary Ensure work meets the agreed requirements	SSC/N9001	Refer to Unique Equipment Required section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
4	Self and work Management	30:00	70:00	Candidates will be able to: • Establish and agree work requirements with appropriate people • Keep immediate work area clean and tidy • Utilize time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of job role • Obtain guidance from appropriate people, where necessary • Ensure work meets the agreed requirements	SSC/N9001	Refer to Unique Equipment Required section
5	Team Work and Communication	12:00	38:00	Candidates will be able to: • Obtain guidance from appropriate people to agree the analysis to be performed on the data • Obtain advice and guidance from appropriate people on issues with data analysis outside their area of competence or • Review the results of their analysis with appropriate people • Undertake modifications to your analysis based on inputs from appropriate people • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to	SSC/N9002	Refer to Unique Equipment Required Section

				colleagues in line with organizational requirements • Work i`n ways that show respect for colleagues • Carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out your commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues		
6	Managing Health and Safety	12:00	38:00	Candidates will be able to: • 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 deal with safely, competently and within the limits of authority • Report any hazards that one is not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their 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		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
7	Data and Information Management	15:00	35:00 `	Candidates will be able to: • Establish and agree with appropriate people the data/information they need to provide, the formats in which you need to provide it, and when they 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 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	SSC/N9004	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
8	Learning and Self Development	05:00	20:00	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop your knowledge, skills and competence • Identify accurately the knowledge and skills they need for your job role • Identify accurately their 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 their learning needs • Undertake learning and development activities in line with their plan • Apply new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them • Review their knowledge, skills and competence regularly and take appropriate action	SSC/N9005	Refer to Unique Equipment Required Section
	Total Duration:	**114:00**	**286:00**	**Unique Equipment Required:** Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome.		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				For Domain NOS, For NOS SSC/N0506 – HTML, C++ / Java, IDE General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning • White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • Presentation Tools to support learning activities: • Intranet • Email • IMs • Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities • Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets For IT Lab sessions: Computer Lab with 1:1 PC : trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client and chat tools. • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition. Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This Syllabus/Curriculum has been approved by **IT-ITeS Sector Skills Council NASSCOM**.)*

Notes from IT-ITeS Sector Skills Council NASSCOM

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.
2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required to document program structure and code (in SSC/N0506) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,
    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure1: Assessment Criteria

Assessment Criteria for Junior Software Developer	
Job Role	**Junior Software Developer**
Qualification Pack	**SSC/Q0508**
Sector Skill Council	**IT-ITeS**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE DESCRIPTION)	**Assessment criteria** (PC)	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
1.SSC/N0506 (Deal remotely with customer queries - Domestic)	PC1. greet customers and verify details, following your organization's procedures	**120**	12.5	2.5	10
	PC2. read carefully, summarize, and obtain **customer** confirmation of, your understanding of queries		12.5	2.5	10
	PC3. express your concern for any difficulties caused and your commitment to resolving queries		15	0	15
	PC4. record and categorize queries accurately using your organization's query management tool		5	0	5
	PC5. refer queries outside your area of competence or authority promptly to appropriate		2.5	0	2.5

	people				
	PC6. access your organization's knowledge base for solutions to queries, where available		2.5	0	2.5
	PC7. resolve queries within your area of competence or authority in line with organizational guidelines and service level agreements (SLAs)		15	0	15
	PC8. obtain advice and guidance from appropriate people, where necessary		2.5	0	2.5
	PC9. obtain confirmation from **c**ustomers that queries have been resolved to satisfaction		10	0	10

	PC10. record the resolution of queries accurately using your organization's query management tool		35	15	20
	PC11. comply with relevant standards, policies, procedures and guidelines when dealing remotely with customer queries		7.5	0	7.5
		NOS Total	**120**	**20**	**100**
2.SSC/N9001 (Manage your work to meet requirements)	PC1. establish and agree your work requirements with appropriate people		10	5	5
	PC2. keep your immediate work area clean and tidy		5	0	5
	PC3. utilize your time effectively		5	5	0
	PC4. use resources correctly and efficiently		5	2.5	2.5
	PC5. treat confidential information correctly	**40**	5	0	5
	PC6. work in line with your organization's policies and procedures		2.5	0	2.5
	PC7. work within the limits of your job role		2.5	0	2.5
	PC8. obtain guidance from appropriate people, where necessary		2.5	0	2.5
	PC9. ensure your work meets the agreed requirements		2.5	0	2.5
		NOS Total	**40**	**12.5**	**27.5**
3.SSC/N9003 (Maintain a healthy, safe and secure workin g environment)	PC1. comply with your organization's current health, safety and security policies and procedures	**40**	10	5	5

	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		5	0	5
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		10	5	5
	PC4. 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		5	0	5
	PC5. follow your organization's emergency procedures promptly, calmly, and efficiently		5	0	5
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		2.5	0	2.5
	PC7. complete any health and safety records legibly and accurately		2.5	0	2.5
		NOS Total	**40**	**10**	**30**

Annexure2: Trainer Prerequisites for Job role: Junior Software Developer mapped to Qualification Pack: SSC/Q0508

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0508.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum 12th Standard; Preferred Master's degree in any discipline

4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0508. Additional certification in customer orientation, dealing with difficult customers, written communication etc. will be an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70% per NOS.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

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Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

IT-ITES SECTOR SKILLS COUNCIL NASSCOM

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Junior Software Developer**' QP No. '**SSC/Q0508 NSQF Level 4**'

Date of Issuance: December 31st, 2015

Valid up to*: December 31st, 2016

* Valid up to the next review date of the Qualification Pack

Authorised Signatory
Lakshmi Narayan
(Chairman, IT-ITeS Sector Skills Council NASSCOM)

Model Curriculum

WEB DEVELOPER

WEB DEVELOPER

SECTOR:	**IT-ITeS**
SUB -SECTOR:	**IT Services**
OCCUPATION:	**Application Development**
REFERENCE ID:	**SSC/Q0503, version 1.0**
NSQF LEVEL:	**5**

Format: ModCur_2015_1_0

Model Curriculum for Web Developer SSC/Q0503

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Web Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Web Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Web Developer**		
Qualification Pack Name & Reference ID.	Web Developer SSC/Q0503, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	Graduate degree/ diploma in web design/ media design or any other related field		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop media content and graphic designs for software products and Applications • Manage their work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop their knowledge, skills and competence		

The Course encompasses all seven National Occupational Standards (NOS) of **Web Developer SSC/Q0503** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Programming for the Web	20:00	30:00	Candidates will be able to: Design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD	SSC/N0501	Refer to Unique Equipment Required Section

2	Analysis and Design of Web based Applications	20:00	30:00	Candidates will be able to: Check their understanding of the Business Requirements Specification (BRS)/User	SSC/N0501	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				Requirements Specification (URS) with appropriate people • Check their understanding of the Software Requirements Specification (SRS) with appropriate people • Check their understanding of High Level Design (HLD) with appropriate people • Review their designs with appropriate people • Analyse inputs from appropriate people to identify, resolve and record design defects and inform future designs • Document their designs using standard templates and tools • Comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		

3	Media Content and Graphics Design	20:00	80:00	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • Access reusable components, media and graphical packages and tools from their organization's knowledge base	SSC/N0503	Refer to Unique Equipment Required Section

				• Convert requirements into media content and graphic designs, leveraging reusable components where available • Review media content and graphic designs with appropriate people and analyze their feedback • Record any defects and corrective actions taken to inform future work • Rework media content and graphic designs, incorporating feedback • Submit media content timely and graphic designs for approval by appropriate people • Update their organization's knowledge base with their experiences of the media content and graphic designs developed • Comply with their organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		
4	Self and work Management	12:00	38:00	Candidates will be able to: • Establish and agree their work requirements with appropriate people • Keep their immediate work area clean and tidy • utilize their time	SSC/N9001	Refer to Unique Equipment Required Section

				effectively		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of their job role • Obtain guidance from appropriate people, where necessary • Ensure their work meets the agreed requirements		

5	Team Work and Communication	12:00	38:00	Candidates will be able to: • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out their commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues	SSC/N9002	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
6	Managing and Health Safety	05:00	20:00	Candidates will be able to: • Comply with their 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 they can deal with safely, competently and within the limits of their authority • Report any hazards that they are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their 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	SSC/ N 9003	

7	Data and Information Management	15:00	35:00	Candidates will be able to: □ 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 • 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 their 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	SSC/N9004	Refer to Unique Equipment Required Section

8	Learning and Self Development	5:00	20:00	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop their knowledge, skills and competence • Identify accurately the knowledge and skills they need for their job role • Identify accurately their current level of knowledge, skills and	SSC/N9005	Refer to Unique Equipment Required Section
				competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address their learning needs • Undertake learning and development activities in line with their plan • Apply their new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their knowledge and skills and how effectively they apply them • Review their knowledge, skills and competence regularly and take appropriate action		

	Total Duration:	**109:00**	**291:00**	**Unique Equipment Required**: Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome. For Domain NOSs: • NOS SSC/N0501: HTML5, Javascript, CSS, SQL, Web Builder, Word Press, Joomla and modelling tools such as Visio, UML • NOS SSC/N0503: HTML5, CSS, Flash, Photoshop, Windows media player, Eclipse, XAMPP General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • Presentation Tools to support learning activities: ○ Intranet ○ Email ○ IMs ○ Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities □ Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets • For IT Lab sessions: Computer Lab with 1:1 PC:trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook/ other Email Clients • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition. • Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This Syllabus/Curriculum has been approved by **IT-ITeS Sector Skills Council NASSCOM**.)* **Notes from IT-ITeS Sector Skills Council**

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.

2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required write design specifications (in SSC/N0501) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,
    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration, and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure 1: Assessment Criteria

Assessment Criteria for Web Developer	
Job Role	**Web Developer**
Qualification Pack	**SSC/Q0503**
Sector Skill Council	**IT-ITeS**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	**ASSESSMENT CRITERIA** (PC)	**TOTAL MARKS**	**OUT OF**	**THEORY**	**SKILLS PRACTICAL**
1. SSC/N0501 (Contribute to the design of software products and applications)	PC1. check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check their understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check their understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review their designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	5	10

	PC7. document their designs using standard templates and tools		10	0	10
	PC8. comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	40	60
2. SSC/N0503 (Develop media content and graphic designs for software products and Applications)	PC1. check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	10	10	0
	PC2. access reusable components, media and graphical packages and tools from their organization's knowledge base		10	0	10
	PC3. convert requirements into media content and graphic designs, leveraging reusable components where available		20	0	20
	PC4. review media content and graphic designs with appropriate people and analyze their feedback		10	5	5
	PC5. record any defects and corrective actions taken to inform future work		10	0	10
	PC6. rework media content and graphic designs, incorporating feedback		10	5	5
	PC7. submit media content and graphic designs for approval by appropriate people		10	0	10
	PC8. update their organization's knowledge base with their experiences of the media content and graphic designs developed		10	0	10
	PC9. comply with their organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		10	0	10
		Total	100	20	80
3.SSC/N9001 (Manage their work to meet requirements)	PC1. establish and agree their work requirements with appropriate people	**100**	7.5	0	7.5
	PC2. keep their immediate work area clean and tidy		15	7.5	7.5
	PC3. utilize their time effectively		15	7.5	7.5
	PC4. use resources correctly and efficiently		15	7.5	7.5

	PC5. treat confidential information correctly		7.5	0	7.5
	PC6. work in line with their organization's policies and procedures		15	0	15
	PC7. work within the limits of their job role		7.5	0	7.5
	PC8. obtain guidance from appropriate people, where necessary		7.5	0	7.5
	PC9. ensure their work meets the agreed requirements		10	0	10
		Total	100	22.5	77.5
4.SSC/N9002 (Work effectively with colleagues)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate their work effectively with theirs		10	0	10
	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out their commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	100	20	80
5.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with their organization's current health, safety and security policies and procedures	**100**	20	10	10
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of their authority		20	10	10
	PC4. 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		10	0	10

	PC5. follow their organization's emergency procedures promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	100	30	70
6.SSC/N9004 (Provide data/information in standard formats)	PC1. 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	**100**	15	15	0
	PC2. obtain the data/information from reliable sources		15	0	15
	PC3. check that the data/information is accurate, complete and up-to-date		15	5	10
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		5	5	0
	PC5. carry out rule-based analysis of the data/information, if required		20	0	20
	PC6. insert the data/information into the agreed formats		10	0	10
	PC7. check the accuracy of their work, involving colleagues where required		10	0	10
	PC8. report any unresolved anomalies in the data/information to appropriate people		5	5	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		5	0	5
		Total	100	30	70
7.SSC/N9005 (Develop their knowledge, skills and competence)	PC1. obtain advice and guidance from appropriate people to develop their knowledge, skills and competence	**100**	20	7	13
	PC2. identify accurately the knowledge and skills you need for their job role		14	7	7
	PC3. identify accurately their current level of knowledge, skills and competence and any learning and development needs		14	0	14
	PC4. agree with appropriate people a plan of learning and development activities to address their learning needs		7	0	7
	PC5. undertake learning and development		12	0	12

	activities in line with their plan				
	PC6. apply their new knowledge and skills in the workplace, under supervision		12	0	12
	PC7. obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them		7	0	7
	PC8. review their knowledge, skills and competence regularly and take appropriate action		14	7	7
		Total	100	21	79

Annexure 2: Trainer Prerequisites for Job role: Web Developer mapped to Qualification Pack: SSC/Q0503

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0503.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum Graduate degree/ diploma in web design/ media design or any other related field; Preferred Master's Degree in Media Design
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0503. Certification in relevant software competencies: Software Development Certifications in C++, Embedded, C#, C, Java etc., is an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/1402". Minimum accepted score is 70%.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

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Model Curriculum

Software Developer

SECTOR: IT-ITES

OCCUPATION: SUB-SECTOR: IT SERVICES DATA SCIENTISTS

REF. ID: SSC/Q0401, VERSION 1.0
NSQF LEVEL: 7

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IT - ITeS SSC NASSCOM

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

IT-ITES SECTOR SKILLS COUNCIL NASSCOM

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Software Developer**' QP No. '**SSC/Q0501 NSQF Level 7**'

Date of Issuance: **December 31st, 2015**

Valid up to*: **December 31st, 2016**

** Valid up to the next review date of the Qualification Pack*

Authorised Signatory
Lakshmi Narayan
(Chairman, IT-ITeS Sector Skills Council NASSCOM)

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Software Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Software Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Software Developer**		
Qualification Pack Name & Reference ID.	Software Developer SSC/Q0501, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	BSc (Stat, Math, Physics, Chemistry, Geology) or BE/ BTech		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop software code to specification • Manage their work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop their knowledge, skills and competence		

The Course encompasses all seven National Occupational Standards (NOS) of Software Developer SSC/Q0501 Qualification Pack issued by IT-ITeS Sector Skills Council NASSCOM.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Programming and Algorithms** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** SSC/N0501	Candidates will be able to: • Design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD	Refer to Unique Equipment Required Section
2	**Analysis and Design of Software Applications** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** SSC/N0501	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people • Check their understanding of the Software Requirements Specification (SRS) with appropriate people • Check their understanding of High Level Design (HLD) with appropriate people • Review their designs with appropriate people • Analyse inputs from appropriate people to identify, resolve and record design defects and inform future designs • Document designs using standard templates and tools • Comply with organization's policies, procedures and guidelines when contributing to the design of software products and applications	Refer to Unique Equipment Required Section

3	**Application Development** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 80:00 **Corresponding NOS Code** SSC/N0502	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • Access reusable components, code generation tools and unit testing tools from their organization's knowledge base • Convert technical specifications into code to meet the requirements, leveraging reusable components, where available • Create appropriate unit test cases (UTCs) • Review codes and UTCs with appropriate people • Execute UTCs and document results • Rework the code and UTCs to fix identified defects	Refer to Unique Equipment Required Section

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Analyse inputs from appropriate people to inform future designs • Record corrective actions for identified defects to inform future designs • Submit tested code timely for approval by appropriate people • Update their organization's knowledge base with their experiences of the code developed • Comply with their organization's policies, procedures and guidelines when developing software code to specification	
4	**Self and work Management** **Theory Duration** (hh:mm) 12:00 **Practical Duration** (hh:mm) 38:00 **Corresponding NOS Code** SSC/N9001	Candidates will be able to: • Establish and agree their work requirements with appropriate people • Keep their immediate work area clean and tidy • utilize their time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of their job role • Obtain guidance from appropriate people, where necessary • Ensure their work meets the agreed requirements	Refer to Unique Equipment Required Section

5	**Team Work and Communication** **Theory Duration** (hh:mm) 12:00 **Practical Duration** (hh:mm) 38:00 **Corresponding NOS Code** SSC/N9002	Candidates will be able to: • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out their commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues	Refer to Unique Equipment Required Section
6	**Managing Health and Safety** **Theory Duration** (hh:mm) 05:00	Candidates will be able to: • Comply with their 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 they can deal	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 20:00 **Corresponding NOS Code** SSC/ N 9003	with safely, competently and within the limits of their authority • Report any hazards that they are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their 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	

7	**Data and Information Management** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 35:00 **Corresponding NOS Code** SSC/N9004	Candidates will be able to: • 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 • 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 their 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	Refer to Unique Equipment Required Section
8	**Learning and Self Development** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** **SSC/N9005**	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop their knowledge, skills and competence • Identify accurately the knowledge and skills they need for their job role • Identify accurately their 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 their learning needs • Undertake learning and development activities in line with their plan • Apply their new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their	Refer to Unique Equipment Required Section
Sr. No.	**Module**	**Key Learning Outcomes**	**Equipment Required**
		knowledge and skills and how effectively they apply them • Review their knowledge, skills and competence regularly and take appropriate action	

	Total Duration **Theory Duration** **109:00** **Practical Duration** **291:00**	**Unique Equipment Required:** Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome. **For Domain NOSs:** • For NOS SSC/N0501: C/C++, UML tools such as Rational suite • For NOS SSC/N0502: JDK / Eclipse General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning • White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • **Presentation Tools to support learning activities:** o Intranet o Email o IMs o Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities • Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets • For IT Lab sessions: Computer Lab with 1:1 PC: trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook/ other Email Clients • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition. • Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.

Grand Total Course Duration: 400 Hours 0 Minutes
(This Syllabus/Curriculum has been approved by IT-ITeS Sector Skills Council NASSCOM.)

Notes from IT-ITeS Sector Skills Council

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan.OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.

2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required to communicate results of testing (in SSC/N0501) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,

a. Embed such skills development in the learning pedagogy for each expected outcome
b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration, and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Trainer Prerequisites for Job role: Software Developer mapped to Qualification Pack: SSC/Q0501

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0501.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum Bachelor's Degree in Computer Science or any related field; Preferred Master's Degree in Computer Science
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0501. Certification in relevant software competencies: Software Development Certifications in C++, Embedded, C#, C, Java etc., is an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70%.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

Annexure: Assessment Criteria

Assessment Criteria for Software Developer	
Job Role	Software Developer
Qualification Pack	SSC/Q0501
Sector Skill Council	IT-ITeS

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
1.SSC/N0501 (CONTRIBUTE TO THE DESIGN OF SOFTWARE PRODUCTS AND APPLICATIONS)	PC1. check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check their understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check their understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review their designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	0	15
	PC7. document their designs using standard templates and tools		10	0	10
	PC8. comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	35	65
2.SSC/N0502 (DEVELOP SOFTWARE CODE TO SPECIFICATION)	PC1. check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	5	5	0
	PC2. access reusable components, code generation tools and unit testing tools from their organization's knowledge base		5	0	5
	PC3. convert technical specifications into code to meet the requirements, leveraging reusable components, where available		30	0	30
	PC4. create appropriate unit test cases (UTCs)		10	0	10
	PC5. review codes and UTCs with appropriate people		5	5	0
	PC6. execute UTCs and document results		5	0	5
	PC7. rework the code and UTCs to fix identified defects		10	0	10

	PC8. analyze inputs from appropriate people to inform future designs		5	5	0
	PC9. record corrective actions for identified defects to inform future designs		10	0	10
			5	5	0

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
	PC10. submit tested code for approval by appropriate people				
	PC11. update their organization's knowledge base with their experiences of the code developed		5	0	5
	PC12. comply with their organization's policies, procedures and guidelines when developing software code to specification		5	0	5
		Total	100	20	80
3.NOS/N9001 (MANAGE THEIR WORK TO MEET REQUIREMENTS)	PC1. establish and agree their work requirements with appropriate people	**100**	6.25	0	6.25
	PC2. keep their immediate work area clean and tidy		12.5	6.25	6.25
	PC3. utilize their time effectively		12.5	6.25	6.25
	PC4. use **resources** correctly and efficiently		18.75	6.25	12.5
	PC5. treat confidential information correctly		6.25	0	6.25
	PC6. work in line with their organization's policies and procedures		12.5	0	12.5
	PC7. work within the limits of their job role		6.25	0	6.25
	PC8. obtain guidance from appropriate people, where necessary		6.25	0	6.25
	PC9. ensure their work meets the agreed requirements		18.75	6.25	12.5
		Total	**100**	**25**	**75**
4.SSC/N9002 (WORK EFFECTIVELY WITH COLLEAGUES)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate their work effectively with theirs		10	0	10
	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10

	PC6. let colleagues know in good time if you cannot carry out their commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	**100**	**20**	**80**
5.SSC/N9003 (MAINTAIN A	PC1. comply with their organization's current health, safety and security policies and procedures	**100**	20	10	10

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
HEALTHY, SAFE AND SECURE WORKING ENVIRONMENT)	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of their authority		20	10	10
	PC4. 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		10	0	10
	PC5. follow their organization's emergency procedures promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	**100**	**30**	**70**
6.SSC/N9004 (PROVIDE DATA/INFORMATION IN STANDARD FORMATS)	PC1. 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	**100**	12.5	12.5	0
	PC2. obtain the data/information from reliable sources		12.5	0	12.5
	PC3. check that the data/information is accurate, complete and up-to-date		12.5	6.25	6.25
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		6.25	0	6.25

	PC5. carry out rule-based analysis of the data/information, if required		25	0	25
	PC6. insert the data/information into the agreed formats		12.5	0	12.5
	PC7. check the accuracy of their work, involving colleagues where required		6.25	0	6.25
	PC8. report any unresolved anomalies in the data/information to appropriate people		6.25	6.25	0
	PC9. provide complete, accurate and up-todate data/information to the appropriate people in the required formats on time		6.25	0	6.25
		Total	**100**	**25**	**75**
7.SSC/N9005 (DEVELOP THEIR KNOWLEDGE, SKILLS AND COMPETENCE)	PC1. obtain advice and guidance from appropriate people to develop their knowledge, skills and competence	**100**	10	0	10
	PC2. identify accurately the knowledge and skills you need for their job role		10	0	10
	PC3. identify accurately their current level of		20	10	10
				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
	knowledge, skills and competence and any learning and development needs				
	PC4. agree with appropriate people a plan of learning and development activities to address their learning needs		10	0	10
	PC5. undertake learning and development activities in line with their plan		20	10	10
	PC6. apply their new knowledge and skills in the workplace, under supervision		10	0	10
	PC7. obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them		10	0	10
	PC8. review their knowledge, skills and competence regularly and take appropriate action		10	0	10
		Total	**100**	**20**	**80**

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

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National
Skill Development
Corporation
Transforming the skill landscape

IT-ITeS Sector Skill Council
4E-Vandana Building (4th Floor) 11, Tolstoy Marg, New Delhi-110001

Model Curriculum

User Interface (UI) Developer

User Interface (UI) Developer

SECTOR: **IT-ITeS**
SUB-SECTOR: **IT Services**
OCCUPATION: **Application Development**
REFERENCE ID: **SSC/Q0502**
NSQF LEVEL: **7**

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User Interface (UI) Developer

Curriculum / Syllabus

This program is aimed at training candidates for the job of a **User Interface (UI) Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies amongst the learner.

Program Name	**User Interface (UI) Developer**		
Qualification Pack Name & Reference ID.	User Interface (UI) Developer SSC/Q0502		
Version No.	1.0	**Version Update Date**	31/01/2015
Pre-requisites to Training	Bachelor's Degree in Science/Technology/Computers or any graduate course		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop software code to specification • Develop media content and graphic designs for software products and applications • Manage your work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop your knowledge, skills and competence		

This course encompasses all Eight National Occupational Standards (NOS) of **User Interface (UI) Developer** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sl. NO	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1.	Contribute to the design of software products and applications	17:00	33:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people • check your understanding of the Software Requirements Specification (SRS) with appropriate people • check your understanding of High Level Design (HLD) with appropriate people • design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD • review your designs with appropriate people analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs document your designs using standard templates and tools • comply with your organization's policies, procedures and guidelines when contributing to the design of software products and applications.	SSC/N0501	Refer to Unique Equipment Required
2.	Develop software code to specification	20:00	80:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • access reusable components, code generation tools and unit testing tools from your organization's knowledge base • convert technical specifications into code to meet the requirements, leveraging reusable components, where available • create appropriate unit test cases (UTCs) • review codes and UTCs with appropriate		

				people • execute UTCs and document results • rework the code and UTCs to fix identified defects • analyze inputs from appropriate people to inform future designs • record corrective actions for identified defects to inform future designs • submit tested code for approval by appropriate people • update your organization's knowledge base with your experiences of the code developed comply with your organization's policies, procedures and guidelines when developing software code to specification		
3.	Develop media content and graphic designs for software products and applications	12:00	38:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • access reusable components, media and graphical packages and tools from your organization's knowledge base • convert requirements into media content and graphic designs, leveraging reusable components where available • review media content and graphic designs with appropriate people and analyze their feedback • record any defects and corrective actions taken to inform future work • rework media content and graphic designs, incorporating feedback • submit media content and graphic designs for approval by appropriate people • update your organization's knowledge base with your experiences of the media content and graphic designs developed • comply with your organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications	SSC/N0503	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
4.	Manage your work to meet requirements	12:00	38:00	Candidates will be able to: • 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	SSC/N9001	
5.	Work effectively with colleagues	10:00	40:00	Candidates will be able to: • 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	SSC/N9002	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
6.	Maintain a healthy, safe and secure working environment	7:00	18:00	Candidates will be able to: • 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	SSC/N9003	
7.	Provide data/information in standard formats	12:00	38:00	Candidates will be able to: • 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 upto-date data/information to the appropriate people in the required formats on time	SSC/N9004	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
8.	Develop your knowledge, skills and competence	5:00	20:00	Candidates will be able to: • 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	SSC/N9005	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
	Total Duration:	**95:00**	**305:00**	**Unique Equipment Required:** Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome. **Domain NOS requirements** • Visio, UML, freeminds, mockingbird • HTML 5, CSS, Java Script and SQL • IDEs such as Web Builder, Word Press, Joomla Wordpress, psdGraphics etc. • HTML, CSS, Flash, Photoshop, Windows media player, Eclipse, XAMPP **Common requirements** • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning • White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • Presentation Tools to support learning activities: ○ Intranet ○ Email ○ IMs ○ Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets • For IT Lab sessions: Computer Lab with 1:1 PC:trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client and chat tools. • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This syllabus/ curriculum has been approved **IT-ITeS Sector Skills Council NASSCOM**.)*

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				□ Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Notes from IT-ITeS Sector Skills Council NASSCOM

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.
2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. Training providers are advised to,
   a. Embed such skills development in the learning pedagogy for each expected outcome
   b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
3. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure1: Assessment Criteria

Assessment Criteria for <QP Name>	
Job Role	**User Interface (UI) Developer**
Qualification Pack	**SSC/Q0502**
Sector Skill Council	**IT-ITeS**

Sr. No.	**Guidelines for Assessment**
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

Assessable Outcomes	**Assessment criteria for the outcome**	**Total Mark**	**Out of**	**Theory**	**Skills Practical**
1. SSC/N0501 (Contribute to the design of software products and applications)	PC1. check your understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check your understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check your understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review your designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	0	15
	PC7. document your designs using standard templates and tools		10	0	10
	PC8. comply with your organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	35	65
2. SSC/N0502 (Develop software code to specification)	PC1. check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	5	5	0

	PC2. access reusable components, code generation tools and unit testing tools from your organization's knowledge base		10	0	10

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
	PC3. convert technical specifications into code to meet the requirements, leveraging reusable components, where available		10	0	10
	PC4. create appropriate unit test cases (UTCs)		10	0	10
	PC5. review codes and UTCs with appropriate people		5	5	0
	PC6. execute UTCs and document results		10	0	10
	PC7. rework the code and UTCs to fix identified defects		10	0	10
	PC8. analyze inputs from appropriate people to inform future designs		5	5	0
	PC9. record corrective actions for identified defects to inform future designs		10	0	10
	PC10. submit tested code for approval by appropriate people		5	5	0
	PC11. update your organization's knowledge base with your experiences of the code developed		10	0	10
	PC12. comply with your organization's policies, procedures and guidelines when developing software code to specification		10	0	10
		Total	100	20	80
3. SSC/N0503 m (Develop content graphic and for designs softwar products and Applications)	PC1. check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	10	10	0
	PC2. access reusable components, media and graphical packages and tools from your organization's knowledge base		10	0	10
	PC3. convert requirements into media content and graphic designs, leveraging reusable components where available		25	0	25
	PC4. review media content and graphic designs with appropriate people and analyze their feedback		10	10	0
	PC5. record any defects and corrective actions taken to inform future work		10	0	10
	PC6. rework media content and graphic designs, incorporating feedback		10	0	10
	PC7. submit media content and graphic designs for approval by appropriate people		5	5	0
	PC8. update your organization's knowledge base with your experiences of the media content and graphic designs developed		10	0	10

	PC9. comply with your organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		10	0	10
		Total	100	25	75
4.SSC/N9001 (Manage your work to meet requirements)	PC1. establish and agree your **work requirements** with **appropriate people**	**100**	6.25	0	6.25
	PC2. keep your immediate work area clean and tidy		12.5	6.25	6.25
	PC3. utilize your time effectively		12.5	6.25	6.25
	PC4. use **resources** correctly and efficiently		18.75	6.25	12.5

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
	PC5. treat confidential information correctly		6.25	0	6.25
	PC6. work in line with your organization's policies and procedures		12.5	0	12.5
	PC7. work within the limits of your job role		6.25	0	6.25
	PC8. obtain guidance from **appropriate people**, where necessary		6.25	0	6.25
	PC9. ensure your work meets the agreed requirements		18.75	6.25	12.5
		Total	**100**	**25**	**75**
5.SSC/N9002 (Work effectively with colleagues)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate your work effectively with theirs		10	0	10
	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out your commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	**100**	**20**	**80**
6.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with your organization's current health, safety and security policies and procedures	**100**	20	10	10
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10

	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		20	10	10
	PC4. 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		10	0	10
	PC5. follow your organization's **emergency procedures** promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	**100**	**30**	**70**
	PC1. establish and agree with appropriate people the data/information you need to provide, the formats	**100**	12.5	12.5	0
Assessable Outcomes	**Assessment criteria for the outcome**	**Total Mark**	**Out of**	**Theory**	**Skills Practical**
7.SSC/N9004 (Provide data/information in standard formats)	in which you need to provide it, and when you need to provide it				
	PC2. obtain the data/information from reliable sources		12.5	0	12.5
	PC3. check that the data/information is accurate, complete and up-to-date		12.5	6.25	6.25
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		6.25	0	6.25
	PC5. carry out rule-based analysis of the data/information, if required		25	0	25
	PC6. insert the data/information into the agreed formats		12.5	0	12.5
	PC7. check the accuracy of your work, involving colleagues where required		6.25	0	6.25
	PC8. report any unresolved anomalies in the data/information to appropriate people		6.25	6.25	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		6.25	0	6.25
		Total	**100**	**25**	**75**
8.SSC/N9005 (Develop your knowledge, skills and competence)	PC1. obtain advice and guidance from appropriate people to develop your knowledge, skills and competence	**100**	10	0	10
	PC2. identify accurately the knowledge and skills you need for your job role		10	0	10

	PC3. identify accurately your current level of knowledge, skills and competence and any learning and development needs		20	10	10
	PC4. agree with appropriate people a plan of learning and development activities to address your learning needs		10	0	10
	PC5. undertake learning and development activities in line with your plan		20	10	10
	PC6. apply your new knowledge and skills in the workplace, under supervision		10	0	10
	PC7. obtain feedback from appropriate people on your knowledge and skills and how effectively you apply them		10	0	10
	PC8. review your knowledge, skills and competence regularly and take appropriate action		10	0	10
		Total	**100**	**20**	**80**

Annexure2: Trainer Prerequisites for Job role: User Interface (UI) Developer mapped to Qualification Pack: SSC/Q0502

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0502.
2	**Personal Attributes**	Aptitude to conduct training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field. The individual should be result oriented. The individual should also be able to demonstrate skills for communication, creative and logical thinking.
3	**Minimum Educational Qualifications**	Bachelor's Degree in Science/Technology/Computers or any graduate course
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in SSC/Q0502. Additional certification in computers/technology/ animation/graphics
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70% per NOS.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

Model Curriculum for **User Interface (UI) Developer**

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