

QUALIFICATION FILE – A Level

Name and address of submitting body:

National Institute of Electronics and Information Technology (NIELIT)

(An ISO 9001:2008 Certified Organisation)

Electronics Niketan, 6 CGO Complex, Lodhi Road, new Delhi-110003.

Ministry of Electronics and Information Technology (MeitY)

Telephones- 011-24363330-1-2, 24366577-79-80

Name and contact details of individual dealing with the submission

Name: Rajneesh Kumar Asthana.

Position in the organisation Deputy Director (Systems)

Address if different from above NA

Tel number(s) 011-24367715

E-mail address rajneesh@nielit.gov.in

List of documents submitted in support of the Qualifications File

1. Detailed Curriculum(**Annexure -I**)
2. Recognition from different States (**Annexure -II**):
 - a) Recognition from MHRD vide notification (43) dated 01.03.1995 “A” level course equivalent to Advanced Diploma Level course.
 - b) Approval of AICTE- A level aligned with level 7 of NVEQF which is now submitted into NSQF.
 - c) Recognition by Sun Rise University-Alwar vide no: REC/SRU/2014 dated 19.08.2014 A level is equivalent to PGDCA (PG Diploma in Computer Application) for lateral entry to 3rd Semester MCA/M.Sc Programme.
 - d) Recognition by AISECT University vide no: NIELIT/Tech/(19)/13/2048 dated 17.06.2014 A level is equivalent to PGDCA(PG Diploma in Computer Application) as one bridge course.
 - e) Recognition by DR CV Raman University Bilaspur vide no: NIELIT/Tech/ (19)/13/2048 dated 17.06.2014 A level is equivalent to PGDCA (PG Diploma in Computer Application) as one bridge course.
 - f) Recognition by Government of Odisha, industry department vide no. VTTI-26/2004. Dated 29.10.2005, “A” Level as equivalent to PGDCA Course

3) Multiple entry exit channel(**Annexure -III**)

4) Evolution of course(**Annexure -IV**)

5) International Recognition(**Annexure -V**):

Agreement between India and Japan NIELIT ,,"A" Level Course equivalent to Fundamental Information Technology Engineer of Japan Information Technology Engineers Examination Center (JITEC) of Information Technology Promotion Agency (IPA), **Japan**.

6) Constitution of Governing Council/Academic Advisory Committee(**Annexure -VI**)

7) Previous Question Paper- <http://nielit.gov.in/content/old-question-papers-0> (**Annexure -VII**)

8) Year-wise students registered (**Annexure -VIII**)

QUALIFICATION FILE SUMMARY

Qualification Title	A level Course
Qualification Code	NIELIT/IT/2/44
Body/bodies which will assess candidates	Examination Cell, National Institute of Electronics and Information Technology 6-CGO Complex, Electronics Niketan Lodhi Road, New Delhi. 110003.
Body/bodies which will award the certificate for the qualification.	National Institute of Electronics and Information Technology 6-CGO Complex, Electronics Niketan Lodhi Road, New Delhi. 110003.
Body which will accredit providers to offer the qualification.	National Institute of Electronics and Information Technology 6-CGO Complex, Electronics Niketan Lodhi Road, New Delhi. 110003. Presently, Accreditation No: A
Occupation(s) to which the qualification gives access	Programmer, Web Administrator, Training faculty, Web Content Developer, Trouble Shooter
Proposed level of the qualification in the NSQF.	6
Notional Learning Hours	1550 hours.
Entry requirements / recommendations.	Level „O“/Government recognized polytechnic engineering diploma after class 10. Followed in each case, by an accredited „A“ Level course (no concurrency) Or A Government recognized polytechnic engineering diploma after 10+2/ Graduate and an accredited „A“ Level course in each case (may be concurrent). Even after clearing „A“ Level the diploma will be awarded only after successful completion of the academic stream i.e. polytechnic engineering diploma after 10+2 or degree.
Progression from the qualification.	<u>In Academic</u> After completion of this course, students can go for „B“ level (Equivalent to MCA under Ministry of Human Resource Development, Govt. of India vide their notification No. : F2/ 6/ 97-TS.IIIa (.) 54 dated 26th September 2000) then „C“ level Course. <u>Professional</u> Initially candidate can work as Programmer and to be key member of a software development team with all round capabilities to manage and guide a software project then go for System Analyst.

Planned arrangements for RPL.

- It will be incorporated once RPL strategy is finalized.
- Presently only candidates who undergo training shall be assessed

Formal structure of the qualification

Title of unit or other component (include any identification code used)	Mandatory/ Optional	Estimated size (learning hours)	Level
A1-R4 : To familiarize with various computer Hardware & Software computer processing packages & Database concepts	Mandatory	120	7
A2-R4 : Acquire knowledge of internet technology, its connectivity, communication , web designing concepts & Security	Mandatory	120	
A3-R4 : Develop Concepts of Programming and Problem Solving Through „C“ Language	Mandatory	120	
A4-R4 : To Develop concepts of Computer System Architecture	Mandatory	120	
A5-R4 : To familiarize with Design & Analysis of Structured System	Mandatory	120	
A6-R4 : Acquire knowledge of Data Structures through „C++“	Mandatory	120	
A7-R4 : Acquire basic knowledge of Database Management System	Mandatory	120	
A8-R4 : Acquire Basics of OS, Unix and Shell Programming	Mandatory	120	
A9-R4 :Acquire knowledge in Data Communication and Network Technologies	Mandatory	120	
A10-R4: Elective:(One module out of the following two modules to be chosen)	Optional	120	
A10.1-R4 : Develop Concepts of Object-Oriented Programming through Java			
A10.2-R4: Develop Concepts Software Testing and Quality Management			
PR-1 Practical -1(Based on A1, A2, A3, A4 module syllabus)	Mandatory		
PR-2 Practical -2 (based on A5,A6,A7,A8,A9,A10 modules syllabus)	Mandatory		
PJ:Project	Mandatory	350	

SECTION 1

ASSESSMENT

Name of assessment body:

Examination Cell,

National Institute of Electronics and Information Technology
6-CGO Complex, Electronics Niketan
Lodhi Road, New Delhi. 110003.

Will the assessment body be responsible for RPL assessment?

Give details of how RPL assessment for the qualification will be carried out and quality assured.

Presently only candidates undergoing training shall be assessed. Later on candidates having experience and knowledge shall be assessed. The information will be provided on finalization of such procedure.

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, consistent and fair and show that these are in line with the requirements of the NSQF:

The emphasis is on practical demonstration of skills & knowledge based on the performance criteria. Each OUTCOME is assessed & marked separately. Student is required to pass in all OUTCOMES individually and marks are allotted. Following assessment methodologies are used.

- A. Written Assessment (Multiple Choice Questions)
- B. 2 Practical Assessment
- C. 1 Project

The assessment results are backed by following evidences.

- 1 The assessor collects a copy of the attendance for the training done under the scheme. The attendance sheets are signed and stamped by the In charge / Head of the Training Centre.
- 2 The assessor verifies the authenticity of the candidate by checking the photo ID card issued by the institute as well as any one Photo ID card issued by the Central/Government. The same is mentioned in the attendance sheet.
- 3 The assessor assigns roll number.
- 4 The assessor takes photograph of all the students along with the assessor standing in the middle and with the centre name/banner at the back as evidence.

ASSESSMENT EVIDENCE

Complete the following grid for each grouping of NOS, assessment unit or other component as listed in the entry on the structure of the qualification on page 1.

Job Role

1. Programmer, Web Administrator,
2. Training faculty,
3. Web Content Developer,
4. Trouble Shooter

Title of Unit/Component:**(Detailed Curriculum attached As Annexure-I)**

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Written (Part-I)	Written(Part-II)
1) To familiarize with various computer Hardware & Software computer processing packages & Database concepts	Learn foundation level knowledge required to understand computer and its Operations.	100	60	40
	Learn and apply the hardware and software components of the computer.			
	Follow the basic concept of operating system and get knowledge about various different operating systems			
	Use the packages of word processing, spread sheet and presentation in detail.			
	Apply various data base concepts and operations.			
	Total	100	60	40
2) Acquire knowledge of internet technology, its connectivity, communication , web designing concepts & Security	Learn Web & Internet Technologies	100	60	40
	Follow Concepts for networking implementation.			
	Review the current topics in Web & Internet technologies.			
	Describe the basic concepts for network implementation.			
	Learn the basic working scheme of the Internet and World Wide Web.			
	Learn and apply fundamental tools and technologies for web design.			
	Comprehend the technologies for Hypertext Mark-up Language (HTML).			
	Specify design rules in constructing web pages and sites and implement it.			
	Effectively deal with programming issues relating to VB Script, JavaScript, Java, ASP, Front Page and Flash			
	Figure out the various security hazards on the Internet and need of security Measures.			
	Total	100	60	40

3) Develop Concepts of Programming and Problem Solving Through 'C' Language	Develop efficient Algorithm technique			
	Develop efficient algorithms for solving a problem.			
	Use the various constructs of a programming language viz. conditional, iteration and recursion.			
	Implement the algorithms in "C" language.			
	Use simple data structures like arrays, stacks and linked list in solving problems.			
	Learn file handling in "C"			
	Total	100	60	40
4) Develop concepts of Computer System Architecture	Learn basic Building blocks of the computer			
	Learn and apply different Computers Arithmetic & Algorithm			
	Identify I/O different memory organization			
	Total	100	60	40
5) Design & Analysis of Structured System	Study, Analysis and Design of a System	100	60	40
	Documenting and evaluating the system			
	Understand Data Modeling			
	Developing Information Management System for an Organization			
	Implementing, Testing and Security Aspects			
	Total	100	60	40
6) Develop knowledge of Data Structures through 'C++'	Learn the concepts of object oriented language such as c++	100	60	40
	Analyze step by step and develop algorithms to solve real world problems.			
	Implementing various data structures viz. Stacks, Queues, Linked Lists, Trees and Graphs. Understanding various searching & sorting techniques			
	Apply different Algorithm for Graph			
	Total	100	60	40
7) Implement Database Management System	Database design and normalization techniques	100	60	40
	Use Standard Query Language and its Various versions.			
	Follow Importance of backup and recovery techniques			
	Develop Database system to handle the Real world problem.			
	Total	100	60	40

8) Learn Basics of OS, Unix and Shell Programming	Learn Operating System concepts.	100	60	40
	Follow basics of Linux & its usage			
	Use Unix commands and editors.			
	Carry out Unix File management and shell programming in Unix			
	Do Network configuration and security management in Unix			
	Total	100	60	40
9) Acquire knowledge in Data Communication and Network Technologies	Evolution of data communication and networking paradigms	100	60	40
	Learn and apply Principles of data communication, channel characteristics, signaling, modulation and encoding, and multiplexing (SONET/SDH)			
	Various transmission media, their comparative study, fibre optics and wireless media			
	Different topologies of networks (LAN and WAN)			
	Layered architecture (OSI and TCP/IP) and protocol suites			
	Channel error detection and correction, MAC protocols, Ethernet and WLAN			
	Details of IP operations in the INTERNET and associated routing principles			
	Operations of TCP/UDP, FTP, HTTP, SMTP, SNMP, etc.			
	Strategies for securing network applications in enterprises			
	Emerging technologies, such as WDM mesh, mobile telephony etc			
	Total	100	60	40
Elective: (One Module out of the following two modules to be chosen)				
10- a) Develop Concepts of Object- Oriented Programming through Java	Basics of Object Oriented Programming.	100	60	40
	Apply Various Object Oriented programming concepts - Abstraction, Objects and Classes, Inheritance, Polymorphism.			
	Basic data structures in Java, Objects and Classes , Super Class, sub-class, Interfaces, Inner classes.			
	GUI programming using AWT/Swing.			

	Deploying Java Applications			
	Accessing Databases in Java.			
	What is unified Modeling Language and Why is it used.			
	Using Class, Interface, Interaction, State and Activity, Physical diagrams in modeling software.			
	Total	100	60	40
10-b) Develop Concepts Software Testing and Quality Management	Aware about the importance of Software Testing during Software Development	100	60	40
	Build Concept for Software Testing and Debugging			
PR-1 Practical - 1	(Based on A1, A2, A3, A4 module syllabus)	100	80	20
PR-2 Practical - 2	(based on A5,A6,A7,A8,A9,A10 modules syllabus)	100	80	20
PJ Project		100	80	20
	Grand	1300	840	460

Means of assessment 1

The theory examination for each module would be for duration of three hours and the total marks for each subject would be 100. Two Practical examinations of three hours duration and 100 marks each have been introduced. The Practical-1 examination will be based on the syllabi A1-R4, A2-R4, A3-R4 and A4-R4 modules and Practical -2 will be based on the syllabi A5-R4, A6-R4, A7-R4, A8-R4, A9-R4 and A10-R4 modules.

The aim of the project is to give the students an integrated experience in solving a real life problem by applying knowledge and skills gained on completion of theory papers in a course at a given Level. It provides an occasion for students to develop written and communication skills, Project also helps the students to realize the importance of resource and time management, ownership of task towards deliverables, innovation and efficiency in task management apart from presentation skills. It also provides a good opportunity for students to build, enhance and sustain high levels of professional conduct and performance and evolves a problem solver frame of mind in student. It is also felt that taking up the project by a student prepares him for a job in industry and elsewhere.

Pass percentage

To qualify for a pass in a module, a candidate must have obtained at least 50% in each theory and practical examination. The marks will be translated into grades, while communicating results to the candidates. The gradation structure is as below:-

Pass percentage Grade

Failed (<50) F
50%-54% D
55%-64% C
65%-74% B
75%-84% A
85% and over S.

SECTION 2

EVIDENCE OF NEED

What evidence is there that the qualification is needed?

Recognition has been given by the Government of India to NIELIT „A“ level examination conducted by the NIELIT as equivalent to Foundation Course in IT for the purpose of employment to the posts and services under Central Government.

What is the estimated uptake of this qualification and what is the basis of this estimate?

NIELIT is having 35 centres and 900 accredited centres spread all over India and minimum capacity of each centre is 20 so approx. 75000 candidates per year can appear in this course.

What steps were taken to ensure that the qualification(s) does/do not duplicate already existing or planned qualifications in the NSQF?

As the understanding and adoption models of QPs evolve in the industry and across its sub-sectors, we foresee consolidation of qualification packs as a natural progression. The Qualification does not exist as per information available in public domain.

What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated?

The Qualification is to be monitored and reviewed every two years.

The following data will be used

1. Results of assessments
2. Employer feedback will be sought post-placement
3. Student feedbacks
4. Workshops and seminar for reviewing the qualifications
5. Industry Requirements
6. Consultation/ Tie-up with Industries or Expert for review of the Curriculum.

SECTION 3

SUMMARY EVIDENCE OF LEVEL

Level of qualification: 6

Summary of Direct Evidence:

Justify the NSQF level allocated to the QP by building upon the five descriptors of NSQF. Explain the reasons for allocating the level to the QP.

Generic NOS is/are linked to the overall authority attached to the job role.

Title : A Level			Level : 6
NSQF Domain	Outcomes of the Qualification/Component	How the job role relates to the NSQF Level Descriptors	NSQF Level
Process required	Job that requires well developed skill, with clear choice of procedures in familiar context. Requires a common of wide ranging of specialized theoretical & Practical skill involving variable routine and non-routine context.	Demands a wide range of specialised technical skill, clarity of knowledge and practice in broad range of activity involving standard and non-standard practices. .	6
Professional knowledge	After acquiring professional knowledge on A level Course, the Programmer has factual and theoretical knowledge in broad contexts within a field of work. Full resource utilization, skill Development and skill to update Knowledge with time to time.	Factual and theoretical knowledge in broad contexts within a field of work or study.	6
Professional skill	They plan tests, prepare tests cases, generate test data and perform testing on test data to generate solutions to specific problems. They have good communication Skill and creative ideas for unique design of product.	A range of cognitive and ractical skills required to enerate solutions to pecific problems in a ield of work or study.	6
Core skill	They have well in calculation, understanding, collecting information and logical communication. They can give new ways for designing & Architecture.	Reasonable good in mathematical calculation, understanding of social, political and reasonably good in data collecting organising information, and logical communication.	6
Responsibility	They have full responsibility for output at group and self development. They can design and provide solution in a conducive & Non-Conductive environment.	Responsibility for own work and learning and full responsibility fo other"s works and learning.	6

SECTION 4

EVIDENCE OF RECOGNITION OR PROGRESSION

What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?

This qualification has comprises both technical and analytic skills and this course give link to higher qualification which is existing like B level(Equivalent to MCA under Ministry of Human Resource Development, Govt. of India vide their notification No. : F2/ 6/ 97-TS.IIIa (.) 54 dated 26th September 2000) and C level.

SECTION 5

EVIDENCE OF INTERNATIONAL COMPARABILITY

List any comparisons which have been established.

Refer Annexure-V

Detailed Curriculum

**Name of Unit of
Qualification**

:IT TOOLS AND BUSINESS SYSTEM

: 120 Hrs.

Duration

Topic	Contents	Hrs.
Acquire the foundation level knowledge required to understand computer and its operations	Characteristics of Computers, Input, Output, Storage units, CPU, Computer System, Binary number system, Binary to Decimal Conversion, Decimal to Binary Conversion, ASCII Code, Unicode	4
Understand the hardware and software components of the computer and Multimedia	Central Processing Unit - Processor Speed, Cache, Memory, RAM, ROM, Booting, Memory- Secondary Storage Devices: Floppy and Hard Disks, Optical Disks CD-ROM, DVD, Mass Storage Devices: USB thumb drive. Managing disk Partitions, File System Input Devices - Keyboard, Mouse, joystick, Scanner, web cam, Output Devices- Monitors, Printers – Dot matrix, inkjet, laser, Multimedia- What is Multimedia, Text, Graphics, Animation, Audio, Images, Video; Multimedia Application in Education, Entertainment, Marketing. Names of common multimedia file formats, Computer Software- Relationship between Hardware and Software; System Software, Application Software, Compiler, names of some high level languages, free domain software.	6
Understand the basic concept of operating system and get knowledge about various different operating systems.	Microsoft Windows- An overview of different versions of Windows, Basic Windows Elements, File management through Windows. Using essential accessories: System tools –Disk cleanup, Disk defragmenter, Entertainment, Games, Calculator, Imaging – Fax, Notepad, Paint, WordPad. Command Prompt- Directory navigation, path setting, creating and using batch files. Drives, files, directories, directory structure. Application Management: Installing, uninstalling, Running applications. Linux- An overview of Linux, Basic Linux elements: System Features, Software	13

	Features, File Structure, File handling in Linux: H/W, S/W requirements, Preliminary steps before installation, specifics on Hard drive repartitioning and booting a Linux system.	
Understand to use the package of word processing	Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout. Editing and Profiling Tools: Checking and correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards.	6
Understand to use the Package of Spreadsheet Concepts	Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts. Integrating word processor, spread sheets, web pages.	9
Understand to use the Package of Presentation Concepts.	Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations.	5
Understand various data base concepts and operations.	Data Manipulation-Concept: Database, Relational Database, Integrity. Operations: Creating, dropping, manipulating table structure. Manipulation of Data: Query, Data Entry Form, Reports	13
Understand the issues related to IT and IT applications.	Indian IT Act, Intellectual Property Rights – issues. Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies	4

Practical/Tutorials		60
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Text books:

1. P.K. Sinha and P. Sinha, “Foundations of Computing” , BPB Publication, 2008.
2. Sagman S, “MS Office for Windows XP”, Pearson Education, 2007.
3. ITL Educational Society, “Introduction to IT”, Pearson Education, 2009.
4. Miller M, “Absolute Beginners Guide to Computer Basics”, Pearson Education, 2009.

Reference Books:

1. Turban, Mclean and Wetherbe, “Information Technology and Management” John Wiley & Sons.
2. Mansfield Ron, “Working in Microsoft Office”, 2008, Tata McGraw-Hill
3. Balagurusamy E, “Fundamentals of Computers”, 2009, Tata McGraw-Hill
4. Mavis Beacon, “All-in-one MS Office” CD based views for self learning, BPB Publication, 2008
5. Perry G, “MS Office 2007”, Pearson Education, 2008.
6. D’Souza & D’Souza, “Learn Computer Step by Step”, Pearson Education, 2006.
7. Kulkarni, “IT Strategy for Business”, Oxford University Press

**Name of Unit of
Qualification**

**: A2-R4 INTERNET TECHNOLOGY AND
WEB DESIGN**

Duration

: 120 Hours

Performance Criteria(OUTCO ME) No.	Contents	Hrs.
Understand the current topics in Web & Internet technologies	Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette. Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet.	2
Understand the basic concepts for network implementation.	Packet switching technology, Internet Protocols: TCP/IP, Router, Internet Addressing Scheme: Machine Addressing (IP address), E-mail Addresses, Resources Addresses	3
Understand the basic concepts for network Communication	Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options – Shell, SLIP, PPP, Service options – E-mail, WWW, News Firewall etc.	3
Understand the basic concepts for network Communication	Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Servers, Clients, Communication Media, Types of network: Peer to Peer, Clients Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet	4

	Protocol Address. Network topologies: Bust, star and ring, Ethernet, FDDI, ATM and Intranet.	
Understand the Services on Internet (Definition and Functions)	E-mail, WWW, Telnet, FTP, IRC and Search Engine	4
Understand the basic protocol, structure and clients of Electronic Mail	Email Networks and Servers, Email protocols –SMTP, POP3, IMAp4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail. Email encryption- Address Book, Signature File.	7
Understand the Current Trends on Internet	Languages, Internet Phone, Internet Video, collaborative computing, e-commerce.	3
Understand fundamental tools and technologies for web designing and browsing	Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design. Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools.	10
Comprehend the technologies for Hypertext Mark-up Language (HTML).	HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames, HTML Images, multimedia	12
Deal with programming issues relating to VB Script, JavaScript, Java, ASP, Front Page and Flash	ASP, VB Script, JAVA Script, JAVA and Front Page, Flash	8
Figure out the various security hazards on the Internet and need of security measures	Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptosystems.	4
Practicals/Tutorials		60

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Text books:

1. Greenlaw R and Hepp E “Fundamentals of Internet and www” 2nd EL, Tata McGrawHill,2007.
2. Ivan Bayross, “HTML, DHTML, JavaScript, Perl CGI”, 3rd Edition, BPB Publications.
3. D. Comer, “The Internet Book”, Pearson Education, 2009.

Reference Books:

1. M. L. Young,”The Complete reference to Internet”, Tata McGraw Hill, 2007.
2. Godbole AS & Kahate A, “Web Technologies”, Tata McGrawHill,2008.
3. Jackson, “Web Technologies”, Pearson Education, 2008.
4. B. Patel & Lal B. Barik, ” Internet & Web Technology “, Acme Learning Publishers
5. Leon and Leon, “Internet for Everyone”, Vikas Publishing House.

Name of Unit of Qualification

: A3-R4 PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

Duration

: 60 Hours

Learning Outcome	Topics	Hours
Develop efficient algorithms	The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation.	4
Understand the Algorithms for Problem Solving	Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of 49 two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate „sin x“ as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.	10
Understand the basic of 'C' Language	Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic Operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple „C“ programs.	4
Understand Conditional Statements and Loops of 'C' Language	Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming.	7
Understand Arrays of 'C' Language	One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Standard library string functions	6
Understand Functions of 'C' Language	Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.	6
Understand	Scope and extent, Storage Classes in a single	3

Storage Classes	source file: auto, extern and static, register, Storage Classes in a multiple source files: extern and static.	
Understand Structures and Unions	Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions	6
Understand Pointers	Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.	6
Understand simple data structures like arrays, stacks and linked list in solving problems	Creation of a singly connected linked list, Traversing a linked list, Insertion into a linked list, Deletion from a linked list	4
Understand package of File Processing	Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file.	4
Practical/Tutorials		60

Text Books:

1. Byron S Gottfried “Programming with C” Second edition, Tata McGrawhill, 2007 (Paper back)
2. R.G. Dromey, “How to solve it by Computer”, Pearson Education, 2008.
3. Kanetkar Y, “Let us C”, BPB Publications, 2007.
4. Hanly J R & Koffman E.B, “Problem Solving and Programm design in C”, Pearson Education, 2009.

Reference Books:

1. E. Balagurusamy, “Programming with ANSI-C”, Fourth Edition, 2008, Tata McGraw Hill.
2. Venugopal K. R and Prasad S. R, “Mastering „C””, Third Edition, 2008, Tata McGraw Hill.
3. B.W. Kernighan & D. M. Ritchie, “The C Programming Language”, Second Edition, 2001, Pearson Education
4. ISRD Group, “Programming and Problem Solving Using C”, Tata McGraw Hill, 2008.
5. Pradip Dey , Manas Ghosh, “Programming in C”, Oxford University Press, 2007.

Name of Unit of Qualification : **A4-R4 COMPUTER SYSTEM ARCHITECTURE**

Duration : 120 Hours

Performance Criteria(OUTCOME) No.	Contents	Hrs.
Understand basic Digital Components	Overview of computer organization: Logic gates, Adders, Flip-flops (as 1 bit memory device), Encoders, Decoders, Multiplexers, Registers, Shift Registers, Counters, RAM, ROM	10
Acquire Representation of data	Number system, Hexadecimal numbers, ASCII code, Two's complement, addition, subtraction, overflow, Floating point representation	04
Know Register Transfer & Micro Operations	Bus and memory transfers, Three state Bus Buffers, Binary ADDER, Binary Incrementer, Arithmetic circuit, Logic and Shift Micro-operations, ALU	04
Understand Basic Computer Organization	Instruction codes, Direct and indirect address, Timing and Control Signal generation, Instruction Cycle, Memory Reference Instructions, Input Output instructions	04
Understand how Central Processing Unit work	General Register Organization, Memory Stack, One address and two address Instructions, Data transfer, arithmetic, logical and shift instructions, Software and hardware interrupts (only brief introduction), Arithmetic and Instruction Pipelines.	08
Know different Computer Arithmetic and Algorithm	Addition and Subtraction with signed magnitude data, Multiplication Algorithms Hardware Algorithm and Booth Algorithm, Division Algorithm	06
Understand different Input-Output of a computer	Asynchronous Data transfer - Handshaking, Asynchronous Serial Transfer, Interrupt Initiated I/O, DMA transfer, Interfacing Peripherals with CPU (Introduction), Keyboard, Mouse, Printer, Scanner, Network card, Introduction to Pipelining and Linear	08

	Pipeline processor	
Understand different Memory Organization	ROM, RAM, Hard Disk, CD-ROM, Cache Memory - Direct mapping scheme, Virtual Memory concept, Cache memory working principles	08
.Understand Assembly Language Programming	Assembly Language of Intel 8086, Simple examples based on arithmetic and character operations.	08
Practical/Tutorials		60

Text Books:

1. Carter Nicholas, "Computer Architecture", Schaun outline Sevies , Tata McGraw-Hill, 2008.
2. M. Morris Mano, "Computer System Architecture", Pearson Education, 2008.
3. Peter Abel and N. Nizamuddin, "IBM PC Assembly Language and Programming", Pearson Education, 2009.

Reference Books:

1. J.P. Hayes, "Computer Architecture & Organization", Tata McGraw Hill
2. Michael J. Flynn, "Computer Architecture: Pipelined and Parallel Processor Design", Narosa Publishing House, 2002..

**Name of Unit of
Qualification**

**:A5-R4 STRUCTURED SYSTEM ANALYSIS
AND DESIGN**

Duration

: 120 Hours

Performance Criteria(OUTCOME) No.	Contents	Hrs .
Study, Analysis and Design of a System	System Definition and concepts: General Theory systems, Manual and automated systems, Real-life Business Sub-Systems. System Environments and Boundaries, Real-time and distributed systems, Basic principles of successful systems, Approach to system Development: Structured System Analysis and Design, Prototype, Joint Application Development, Role and Need of Systems Analyst. Qualifications and responsibilities, System Analysis as a Profession.	03
Understand System Development Cycle	Introduction to Systems, Development Life Cycle (SDLC). Various phases of SDLC: Study Analysis, Design, Development, Implementation, Maintenance; Documentation: Principles of Systems Documentation, Types of documentation and their importance, Enforcing Documentation discipline in an organization.	03
Understand different System Planning	Data and fact gathering techniques: Interviews, Group Communication Questionnaires; Assessing Project Feasibility: Technical, Operational, Economic, Cost Benefits Analysis, Schedule, Legal and contractual, Political. Modern Methods for determining system requirements: Joint Application, Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal	06
Understand Modular and Structured Design	Module specifications, Top-down and bottom-up design. Module coupling and cohesion.	02

	Structure Charts.	
Understand System Design and Modeling	Process Modeling, Logical and physical design, Conceptual Data Modeling: Entity/Relationship Analysis, Entity-Relationship Modeling, ERDs and DFDs, Concepts of Normalization. Process Description: Structured English, Decision Tree, Table; Documentation: Data Dictionary, Recording Data Descriptions.	14
Understand Input/output and Interface Design	Classification of forms, Input/output forms design. User-interface design, Graphical Interfaces. Standards and guidelines for GUI design, Designing Physical Files and Databases: Designing Fields, Designing Physical Records, Designing Physical Files, Designing Databases, Introduction to CASE Tools; Features, Advantages and Limitations of CASE Tools, Awareness about some commercial CASE Tools.	07
System Implementation and Maintenance	Planning considerations, Conversion methods, procedures and controls, System acceptance criteria, System Evaluation and Performance, Testing and Validation. Preparing, User Manual, Maintenance Activities and Issues.	03
Understand Security of Computer System	Security aspects of a Computer System; Control Measures; Disaster Recovery and Contingency Planning, Prevention of Computer Virus & Malicious Applications.	02
OO Analysis / Design	OO Development Life Cycle and Modeling. Static and dynamic modeling. Comparison of OO and Module-oriented Approach. Modeling using UML ; The UML diagrams; the process of Object modeling	12
Developing Information Management System for an Organization	Meaning and role of MIS, Systems approach to MIS. Types of information systems : Transaction Processing System, Management Information System, Decision Support System, Expert System	08

	Case Studies (Illustrative) : MIS for Accounting and Finance Function, MIS for Marketing System.	
Practicals/Tutorials		60

Text Books:

1. Hoffer J. A, George J.F, Valacich J.S, and Panigrahi P.K “Modern Systems Analysis and Design”, Pearson Education, 2007.
2. A. Dennis and B. H. Wixom, “Systems Analysis and Design”, John Wiley & Sons, Inc..

Reference Books:

1. Whitten J. L, Bentley L. D, “Systems Analysis and Design Methods”, Tata McGraw-Hill, 2008.
2. Kendall & Kendall, “Systems Analysis and Design”, Seventh Edition, Pearson Education.

Name of Unit of Qualification

: A6-R4DATA STRUCTURE THROUGH 'C++'

Duration

: 120 Hours

Performance Criteria(OUTC OME) No.	Contents	Hrs.
Understand and the concepts of object oriented language such as C++	Introduction to Algorithm Design and Data Structures: Design and analysis of algorithm: Algorithm definition, comparison of algorithms. Top down and bottom up approaches to Algorithm design. Analysis of Algorithm; Frequency count, Complexity measures in terms of time and space. Structured approach to programming.	10
Understand Basics of C++, Elementary Data Structures : Arrays, linked lists	Basics of C++: Structure of a program Variables. Data Types. Constants Operators, Basic Input/output, Control Structure, Functions, Compound Data Types: Arrays, Pointers, Dynamic Memory, Object Oriented Programming: Classes, Encapsulation, Abstraction, inheritance, Polymorphism, Representation of arrays: single and multidimensional arrays. Address calculation using column and row major ordering. Various operations on Arrays, Vectors. Application of arrays: Matrix multiplication, Sparse polynomial representation and addition, Stacks and Queues : Representation of stacks and queues using arrays and linked-list. Circular queues, Priority Queue and D-Queue. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix - 95 - expression using stacks. Pointers: Definition, Pointer Arithmetic, Array of pointers, Arrays in terms of pointers. Linked list: Singly linked list; operations on list, Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, Doubly linked lists. Generalized list structure. Sparse Matrix representation using generalized list structure, stacks, queues.	18
Develop Abstract Data types Stacks and Queues	Definition of ADT, Stack ADT (array implementation), FIFO queue ADT (array implementation)	05
Implementation of tree	Binary tree traversal methods: Preorder, In-order, Post-ordered traversal. Recursive Algorithms for above mentioned Traversal	15

	methods. Representation of trees and its Applications: Binary tree representation of a general tree. Conversion of forest into tree. Threaded binary trees. Binary search tree. : Height balanced (AVL) tree, B-trees.	
Analyze different algorithm of tree	Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort , Heap sort, Radix sort and their complexity, Searching: Sequential search, Binary Search, Binary Search Tree, ASVL trees, B trees, Searching , sorting and complexity, Searching : Sequential and binary searches, Indexed search, Hashing Schemes. Sorting : Insertion, selection, bubble, Quick, merge, radix, Shell, Heap sort, comparison of time complexity.	10
Analyze different algorithm of Graph	Graph representation: Adjacency matrix, Adjacency lists, Traversal schemes: Depth first search, Breadth first search. Spanning tree: Definition, Minimal spanning tree algorithms. Shortest Path algorithms (Prime"s and Kruskal,,s).	05
Practicals/Tutorials		60

Text Books:

1. Hubbard John. R, "Schaum"s outline of Data Structures with C++", Tata McGraw-Hill, 2007.
2. Langsam Y,.Augenstein M.J and Tanenbaum A. M, "Data Structures Using C and C++", Second Edition, Pearson Education, 2007.
3. Kruse R, Tonodo C.L. and Leung B, "Data Structures and Program Design in C", Pearson Education, 2007.

Reference Books:

1. Horowitz E, Sahni S and Mehta D, "Fundamentals of Data Structures in C++," Galgotia Publiction, 2009.
2. Weiss M A, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2007.
3. Litvin G, "Programmking with C++ and Data Structures", Vikas Publishing House.

Name of Unit of Qualification

:A7-R4 INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

Duration

: 120 Hours

Performance Criteria(OUTC OME) No.	Contents	Hrs.
Understand basic of Database Management System	What is database?, Why database?, database system, database management system (DBMS), advantages of DBMS.	04
Understand Database Architecture	Three levels of architecture, mappings, role of database administrator(DBA), E-R model, three approaches of DBMS- relational, hierarchical and network.	04
Understand basics of Relational Database Management System (RDBMS)	Introduction, RDBMS terminology, relational model, base tables, keys.	08
Normalization	Normal forms, Boyce-Codd Normal form, higher normal forms.	08
Relational Algebra and Relational Calculus	Relational operators, tuple calculus, well formed formulae.	08
Understand basic of SQL Language	Introduction, Characteristics of SQL, data definition, data manipulation, SQL commands, SQL operators, Queries, aggregate functions.	12
Backup and Recovery	Transaction recovery, system recovery, SQL support	02
Security	General considerations, controls, audit trail, data encryption, SQL support.	02
Integrity	General considerations, integrity rules, SQL support.	02
Design and Development of Database Applications	Database applications using some standard RDBMS.	10
Practicals/Tutorials		60

Text Books:

1. Silberschatz A, Korth H.F and Sudarshan S, “Database System Concepts”, Fifth Edition, Tata McGraw-Hill, 2006.
2. C.J.Date, “ An introduction to Database Systems”, Pearson Education, 2007.
3. R. Elmasri, S. B Navathe, “ Fundamentals of Database System”, Pearson Education, 2007.
4. Desai C. Bipin, “An Introduction to Database Systems”, Galgotia Publication, 2009.

Reference Books.

1. Leon A and Leon M, “Fundamentals of DBMS”, Vijay Nicole & Tata McGraw-Hill, 2007.
2. Gill P.S, “DBMS”, I.K. International, 2008.
3. Singh S.K, “Database Systems: Concepts, Design & Applications”, Pearson Education, 2008.
4. Leon A and Leon M, “Database Management Systems”, Vikas Publishing House.

Name of Unit of Qualification

: A8-R4BASICS OF OS, UNIX AND SHELL PROGRAMMING

Duration

: 120 Hours

Performance Criteria(OUTC OME) No.	Contents	Hrs.
Understanding Operating System Concepts	Overview of OS. System Calls, Process Management, Memory Management, Disk and file systems, Networking, Security, Graphical User Interface, Device Drivers.	04
Learn Linux history and ideas	What is Open Source? , Linux Origins, Red Hat Distributions, Linux Principles	01
Understand Basics of Linux and its Usage	Logging in to a Linux System, Switching between virtual consoles and the graphical environment, Elements of the X Window System, Starting the X server, Changing your password, The root user, Changing identities, Editing text files.	02
Running Commands and Getting Help	Running Commands, Some Simple commands, Getting Help, The what is command, The – help Option, Reading Usage Summaries, The man command, Navigating man pages, The info command, Navigating info pages, Extended Documentation, Red Hat Documentation.	02
Understand the Browsing of File System	Linux File Hierarchy Concepts, Some Important Directories, Current Working Directory, File and Directory Names, Absolute and Relative Pathnames, Changing Directories, Listing Directory Contents, Copying Files and Directories, Copying Files and Directories: The Destination, Moving and Renaming Files and Directories, Creating and Removing Files, Creating and Removing Directories, Using Nautilus, Determining File Content.	04
Learn X-Window System	XOrg: The X11 Server, XOrg Server Design, XOrg Server Configuration, XOrg Modularity, Server and Client Relationship, XOrg in runlevel 3, XOrg in runlevel 5, Configuration Utilities, Remote X Sessions.	04
Users, Groups and Permissions	Users, Groups, Linux File Security, Permission Precedence, Permission Types, Examining Permissions, Interpreting Permissions, Changing File Ownership, Changing Permissions – Symbolic Method, Changing Permissions – Numeric Method, Changing Permissions – Nautilus	03

Advanced Topics in Users, Groups and Permissions	User and Group ID Numbers, /etc/passwd, /etc/shadow and /etc/group files, User Management tools, System Users and Groups, Monitoring Logins, Default Permissions, Special Permissions for Executables, Special Permissions for Directories.	03
The Linux File System In-depth	Partitions and Filesystems, Inodes, Directories, Inodes and Directories, cp and inodes, mv and inodes, rm and inodes, Hard Links, Symbolic (or soft) Links, The Seven Fundamental Filetypes, Checking Free Space, Removable Media, Mounting CDs and DVDs, Mounting USB Media, Mounting Floppy Disks, Archiving Files and Compressing Archives, Creating, Listing and Extracting File Archives, Creating File Archives: Other Tools.	06
vim: An Advanced Text Editor	Introducing vim, vim: A Modal Editor, vim basics, Opening a file in vim, Modifying a file, Saving a file and exiting vim, Using Command Mode, Moving around, Search and Replace, - 130 - Manipulating Text, Undoing changes, Visual Mode, Using multiple “windows”, Configuring vi and vim, Learning more.	03
Understand Standard I/O and Pipes	Standard Input and Output, Redirecting Output to a File, Redirecting STDOUT to a Program(Piping), Combining Output and Errors, Redirecting to Multiple Targets (tee), Redirecting STDIN from a file, Sending Multiple Lines to STDIN.	02
Using the Bash Shell	Bash Introduction, Bash Heritage and Features, Command Line Shortcuts, History Tricks, Command Line Expansion, Command Editing Tricks, gnome-terminal	03
Configuring the Bash Shell	Bash Variables, Environment variables, The TERM Environment variable, The PATH Environment variable, Some common variables, Aliases, How bash expands a Command Line, Preventing Expansion, Login vs non-login shells, Bash startup tasks: profile, Bash startup tasks: bashrc, Bash exit tasks	04
Text Processing Tools	Tools for Extracting Text, Viewing File Contents, Viewing File Excerpts, Extracting Text by Keyword, Extracting Text by column, Tools for analyzing text, Gathering text statistics, Sorting Text, Eliminating Duplicate Lines, Comparing Files, Duplicating File Changes, Spell Checking with aspell, Tools for manipulating Text, sed, Special Characters for Complex Searches.	03

Shell Programming	Scripting Basics, Creating Shell Scripts, Generating Output, Handling Input, Exit Status, Control Structures, Conditional Execution, File Tests, String Tests, for and sequences, continue and break, Using positional parameters, handling parameters with Spaces, Scripting at the command line, Shell Script debugging.	06
Investigating and Managing Process	What is a Process? Listing Processes, Finding Processes, Signals, Sending Signals to Processes, Scheduling Priority, Altering Scheduling Priority, Interactive Process Management tools, Job Control, Scheduling a Process to execute later, Crontab File format.	04
Finding and Processing Files	Locate, Locate Examples, find, Basic find Examples, find and Logical Operators, find and Permissions, find and Numeric Criteria, find and Access Times, Executing commands with find, find Execution Examples, The GNOME Search Tool.	02
Basic System Configuration Tools	TCP/IP Network Configuration, Managing Ethernet Connections, Graphical Network Configuration, Network Configuration Files, Printing in Linux, Setting the System's Date and Time, Managing Services.	04
Practicals/Tutorials		60

Text Books:

1. Maurice J. Bach, "Design of the Unix Operating System", Pearson Education, 2008.
2. Sumitabha Das, "Unix : Concepts and Applications", Tata McGraw-Hill , 2008.
3. ISRD Group, "Basics of OS, UNIX and SHELL Programming" , Tata McGraw-Hill, 2006.
4. Sarwar, Koretsky, and Sarwar, "Unix , The Text Book", Pearson Education, 2007

Reference Books

1. Stephen Prata "Advanced Unix -A programmer's Guide"., BPB Publication, 2008.
2. Kochan S & Wood P, "Unix Shell Programming", Pearson Education, 2008.
3. Stevens W R, Rago S.A, "Advanced Programming in Unix Environment", Pearson Education, 2008.

**Name of Unit of
Qualification**

**: A9-R4DATA COMMUNICATION AND
NETWORK TECHNOLOGIES**

Duration

: 120 Hours

Performance Criteria(OUTC OME) No.	Contents	Hrs.
Understand basic of Data Communications	Introduction, Communication Systems, Signal and data, Transmission modes, Synchronous and asynchronous transmission, Circuits, channels and multi channeling, Signaling, Encoding and decoding, Error detection and Recovery, Flow control, Sliding Window, Congestion Management, Multiplexing [FDM, TDM, CDM, WDM] and Spreading [DS. FH], Concept of Modulation, Baseband versus Broadband; Pulse Code Modulation (PCM), Shift Keying [ASK, FSK, PSK, QPSK, DPSK]; Encoding techniques and CODEC; Classification of Modems, Standards and Protocols, Protocols used by Modem to Transfer files, Establishing a Connection (Internet connectivity); Digital Subscriber Loop (DSL)	06
Understand basic of Communication Network	Introduction, Switching techniques: Circuit Switching, Packet switching, Datagram, Virtual circuit and Permanent Virtual Circuit, Connectionless and connection oriented communication, Message switching, Cell switching (ATM); Telephone network signaling Network topologies, Layering the communication process, Open Systems Interconnection (OSI) model, Data encapsulation; Protocols, services and layering, PDU/SDU; TCP/IP suite, Hour-glass model, Internet Architecture and Protocol overview.	08
Understand various Media Access Control	Introduction, Access Techniques (STDM, FDMA, TDMA, Spread Spectrum techniques and CDMA, DSSS, FHSS); Media Access Control: Aloha and Slotted Aloha, Media Access Control Address, Polling, CSMA, CSMA/CA, CSMA/CD and Reservation Aloha, Digital hierarchies [SONET/SDH]	06
Understand Categories and topologies of networks	Introduction, LAN Hardware, LAN Operating Systems, Transmission Media: Guided Media (Twisted pair, Co-axial cable, Optical fiber); Unguided Media (Radio, VHF, microwave,	06

	Satellite, Infrared); Fiber Optics Communication Components (Source, Channel Detector.	
Link Control and MAC Protocols	Framing, Error Detection and Correction; Window-based Flow Control; Logical Link Control, HDLC Protocol, Point-to-Point Protocol (PPP), X.25 CCITT standard for packet data transmission; Media access control, Random Access Techniques, Scheduling Mechanisms.	05
Local Area Network (LAN)	LAN topologies and protocols; IEEE 802 Standard; Ethernet (Standard, Fast, Gigabit), Token Ring, FDDI, Wireless LANs (802.11x); Connecting LANs: Repeaters, Bridges, Switches, Routers; Virtual LANs	05
Wide Area Network (WAN)	Network Layer Addressing and Routing concepts (Forwarding Function, Filtering Function); Routing Methods (Static and dynamic routing, Distributed routing, Hierarchical Routing); Distance Vector Protocol, Link State protocol, Open Shortest Path First (OSPF); Internet Protocol (IP): Addressing & Routing; Internet Control Message Protocol, (ICMP), Address Resolution Protocol (ARP), Dynamic Host Control Protocol (DHCP), Network Address Translation (NAT), IPv6, Mobile IP Process-to-Process delivery in Transport Layer: User Datagram Protocol (UDP), Transmission Control Protocol (TCP), congestion control	08
Application Protocols	Client/Server Model, Network File System (NFS), Remote Login: Telnet; File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP); E-mail system: Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP); World Wide Web (WWW), Domain Name System (DNS), DNS servers; Hyper Text system: Hyper Text Transfer Protocol (HTTP), Hyper Text markup Language (HTML)	08
Wireless Networks	Radio Communications, Cellular Radio, Mobile Telephony (GSM & CDMA), Satellite Networks (VSAT), Mobile Adhoc Networks (MANET).	03
Strategies for securing network applications in enterprises	Cryptography, IPsec, SSL/TLS, PGP, secure HTTP, proxy, firewall, VPN; Simple Network Management Protocol (SNMP), Network policies.	05
Practicals/Tutorials		60

Text Books:

1. Behrouz A Forouzan, “Data Communication and Networking”, Tata McGraw-Hill, 2008
2. William Stallings, “Data and Computer Communications”, Pearson Education, 2008.
3. Rajneesh Agrawal and Bharat Bhushan Tiwari, “Data Communication and Computer Networks”, Vikas Publishing house Ltd. , 2005.
4. Tomasi Wayne, “Introduction to Data Communications and Networking”, Pearson Education, 2007

Reference Books

1. A. S. Tanenbaum, “Computer Networks”, Fourth Edition, Pearson Education.
2. A. Leon-Gracia and I. Widjaja, “Communication Networks”, Tata McGraw Hill, 2004.
3. K. Pahlavan and P. Krishnamurthy, “Principles of Wireless Networks”, EEE/ Prentice Hall of India, 2003..

Name of Unit of Qualification

A10.1-R4 INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA.

Duration

: 120 Hours

Performance Criteria(OUTC OME) No.	Contents	Hrs.
Basics of Object Oriented Programming.	<p>1) Thinking Object-Oriented (1 Hr.)</p> <ul style="list-style-type: none"> • Why Is OOP Popular? A New Paradigm, A Way of Viewing the World. • Why Is OOP Popular? A New Paradigm, A Way of Viewing the World. <p>2) Abstraction (1 Hr.)</p> <ul style="list-style-type: none"> • Layers of Abstraction, Other Forms of Abstraction. <p>3) Classes and Methods (1 Hr.)</p> <ul style="list-style-type: none"> • Encapsulation, Class Definitions, Methods. <p>- 153 -</p> <p>4) Messages, Instances, and Initialization (2 Hrs.)</p> <ul style="list-style-type: none"> • Message-Passing Syntax, Statically and Dynamically Typed Languages, Accessing the Receiver from Within a Method, Object Creation, Pointers and Memory Allocation, Constructors{Constant Values}, Destructors and Finalizers. <p>5) Inheritance and Substitution (3 Hrs.)</p> <ul style="list-style-type: none"> • An Intuitive Description of Inheritance, Inheritance in Various Languages, [Subclass, Subtype, and Substitution], Overriding and Virtual Methods, Interfaces and Abstract Classes, Forms of Inheritance, The Benefits of Inheritance, The Costs of Inheritance. Examples (Language independent) <p>6) Static and Dynamic Behavior (1 Hr.)</p> <ul style="list-style-type: none"> • Static versus Dynamic Typing, Static and Dynamic Classes, Static versus Dynamic Method Binding. <p>7) Multiple Inheritance (1 Hr.)</p> <ul style="list-style-type: none"> • Inheritance as Categorization, Problems Arising from Multiple Inheritance, Inner Classes. <p>8) Polymorphism and Software Reuse (1 Hr.)</p>	14

	<ul style="list-style-type: none"> • Polymorphism in Programming Languages, Mechanisms for Software Reuse, Efficiency and Polymorphism, Will Widespread Software Reuse Become Reality? <p>9) Overloading and Overriding (3 Hrs.)</p> <ul style="list-style-type: none"> • Type Signatures and Scopes, Overloading Based on Scopes, Overloading Based on Type Signatures, Redefinition, Notating Overriding, Replacement versus Refinement, Deferred Methods, Overriding versus Shadowing, Covariance and Contra variance. 	
Introduction to Java Programming Language	<p>1) An Introduction to Java (1 Hr.)</p> <ul style="list-style-type: none"> • Java as a Programming Platform, The Java "White Paper" Buzzwords, Java and the Internet, A Short History of Java, Common Misconceptions About Java. <p>2) The Java Programming Environment (1Hr.)</p> <ul style="list-style-type: none"> • Installing the Java Development Kit, Choosing a Development Environment, Using the Command-Line Tools, Using an Integrated Development Environment, Compiling and Running Programs from a Text Editor, Running a Graphical Application, Building and Running Applets. <p>3) Fundamental Programming Structures in Java (2 Hrs.)</p> <ul style="list-style-type: none"> • A Simple Java Program, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays. <p>4) Objects and Classes (2 Hrs.)</p> <ul style="list-style-type: none"> • Introduction to Object-Oriented Programming, Using Predefined Classes, <p>- 154 -</p> <p>Defining Your Own Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages, Documentation Comments, Class Design Hints.</p> <p>5) Inheritance (2 Hrs.)</p> <ul style="list-style-type: none"> • Classes, Superclasses, and Subclasses, Object: The Cosmic Superclass, 	32

	<p>Generic ArrayLists, Object Wrappers and Autoboxing, Reflection, Enumeration Classes, Design Hints for Inheritance.</p> <p>6) Interfaces and Inner Classes (2 Hrs.) • Interfaces, Object Cloning, Interfaces and Callbacks, Inner Classes, Proxies.</p> <p>7) Introduction to GUI (2 Hrs.) • AWT Architecture, Light-Weight vs Heavy-Weight, AWT Event Model, AWT Event Hierarchy & Event Handling, Using Top-Levels, components and containers, Introduction to Layouts, Focus Architecture.</p> <p>8) Graphics Programming (4 Hrs.) • Java2D Rendering Model, Strokes & Fills, Geometries, Fonts and Text Layout, Transformations, Display and manipulation of Images and offscreen buffers, Using Color, Printing through Java, Doing More with Images using Image IO, Hardware Acceleration and Active Rendering Techniques.</p> <p>9) User Interface Components with Swing (4 Hrs.) • The Model-View-Controller Design Pattern, Introduction to Layout Management, Text Input, Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes.</p> <p>10) Deploying Applets and Applications (2 Hrs.) • Applet Basics, The Applet HTML Tags and Attributes, Multimedia, The Applet Context, JAR Files, Application Packaging, Java Web Start, Storage of Application Preferences.</p> <p>11) Exceptions and Debugging (2 Hrs.) • Dealing with Errors, Catching Exceptions, Tips for Using Exceptions, Logging, Using Assertions, Debugging Techniques, Using a Debugger.</p> <p>12) Streams and Files (3 Hrs.)</p>	
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	<ul style="list-style-type: none"> • The Complete Stream Zoo, ZIP File Streams, Use of Streams, Object Streams, File Management, New I/O, Regular Expressions. <p>13) Database Programming (5 Hrs.)</p> <ul style="list-style-type: none"> • The Design of JDBC, The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions, Advanced Connection Management, Introduction to LDAP. 	
Introduction to UML	<p>1) Introduction, An outline Development Process and Use cases (2 Hrs.)</p> <ul style="list-style-type: none"> • What Is the UML?, How We Got Here, Notations and Meta-Models, Why Do Analysis and Design?, Overview of the Process, Inception, Elaboration, Planning the Construction Phase, Construction, Transition, When to Use Iterative Development, Use Case Diagrams, Business and System Use Cases, When to Use Cases. <p>2) Class Diagrams and Advance Concepts (4 Hrs.)</p> <ul style="list-style-type: none"> • Perspectives, Associations, Attributes, Operations, Generalization, Constraint Rules, When to Use Class Diagrams, Stereotypes, Object Diagram, Class Scope Operations and Attributes, Multiple and Dynamic Classification, Aggregation and Composition, Derived Associations and Attributes, Interfaces and Abstract Classes, Reference Objects and Value Objects, Collections for Multivalued Association Ends, Frozen, Classification and Generalization, Qualified Associations, Association Class, Parameterized Class, Visibility. <p>3) Interaction Diagrams, Packages and Collaborations (1 Hr.)</p> <ul style="list-style-type: none"> • Sequence Diagrams, Collaboration Diagrams, Comparing Sequence and Collaboration Diagrams, When to Use Interaction Diagrams, Packages, Collaborations, When to Use Package Diagrams and Collaborations. 	14

	<p>4) State and Activity Diagrams (1 Hr.) • Concurrent State Diagrams, When to Use State Diagrams, Decomposing an Activity, Dynamic Concurrency, Swimlanes, When to Use Activity Diagrams.</p> <p>5) Physical Diagrams (1 Hr.) • Deployment Diagrams, Component Diagrams, Combining Component and Deployment Diagrams, When to Use Physical Diagrams.</p> <p>6) Case Studies (5 Hrs.)</p>	
Practicals/Tutorials		60

Text Books:

1. Timothy Budo, "An Introduction to Object-Oriented Programming with Java", Pearson Education, 2009.
2. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", 3rd Edition, Pearson Education, 2009

Reference Books

1. H. Schildt, "The Complete Reference -Java2", Tata McGraw-Hill, 2008.
2. P. J Dietel and H. M Dietel, "Java How to Program", 7th Edition, Pearson Education, 2008.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2009.
4. Wu C Thomas, "Introduction to Object Oriented Programming with Java", 4th Edition, Tata McGraw-Hill, 2008.
5. Balaguruswamy E, "Programming with Java", Tata McGraw-Hill, 2007.
6. Muthu C, "Essentials of Java Programming", 2008, Tata McGraw-Hill, 2007.
7. Bhavé M.P, Patekar S.A, "Programming with Java", Pearson Education , 2009.
8. Khurana Rohit , "Object Oriented Programming with C++", Vikas Publishing Hou

**Name of Unit of
Qualification**

**: A10.2-R4SOFTWARE TESTING AND
QUALITY MANAGEMENT**

Duration

: 120 Hours

Performance Criteria (OUTCOME) No.	Contents	Hrs.
Introduction	Software program and its objective, Software development techniques, top-down verses Bottom-up approach, modular and structures programming. A brief introduction about object Oriented approach.	02
Importance of Software Testing	Software testing and its importance, software development life cycle verses software testing life cycle, Deliverables, version and error control	04
Testing Techniques and Strategy	Unit testing, Integration testing, System testing, Acceptance testing White-Box testing: Flow Graph notation, Cyclomatic Complexity, Graph matrices, control structure and loop testing. Black-Box testing: Equivalence partitioning, Boundary Value Analysis, Orthogonal Array testing.	10
Verification and Validation	Requirement verification, Coding standards, Walk through, Formal Inspection, Design validation and verification, Function test, Design metrics, correctness proof and its requirement.	06
Building Test Cases and Plans	Format of test cases, Du, dc and other data paths, Test data selection, branch coverage, statement coverage, pre-condition and post-condition, Test schedule and check pointing, suitable exercises for creating test cases for each type of techniques mentioned in para 3.	20
Quality Assurance and Standards	Basic software quality parameters and its metrics, Software Configuration Change and types of errors, Quality management models: ISO, SPICE, IEEE, CMM	10

Debugging Technique and Tools	Integrated development environment, debugging, tracing, data inspection, exception errors, code and data redundancy, unreachable code.	04
External Source of Errors	Main memory, conflicting dll and unknown interface as source of error and their rectification.	04
Practicals/Tutorials		60

Text Books:

1. Desikan S, Ramesh G, "Software Testing", Pearson Education, 2008.
2. Tamres L, "Introducing Software Testing", Pearson Education, 2007.
3. Dustin E, "Effective Software Testing", Pearson Education, 2007.
4. Mathur A.P, "Fundamentals of Software Testing", Pearson Education, 2008

Reference Books.

1. Brian Marick, "The Craft of Software Testing", Pearson Education, 2008.
2. Rajani & Oak, "Software Testing : Methodology, Tools and Processes" Tata McGraw-Hill, 2007.
3. R. Pressman, "Software Engineering", 6th Edition, Tata McGraw-Hill.