

SYLLABUS
FOR
Bachelor of Science (IT) Programme



**H. N. B. GARHWAL UNIVERSITY
SRINAGAR (GARHWAL)**

H.N.B. GARHWAL UNIVERSITY

(A Central University)

Regulations, Curricula, Syllabus and Scheme of Examinations (Credit and Semester System)

B.Sc. (IT)

(With effect from session 2015-2016)

1. **Duration** of the B.Sc.(IT) program shall be 3 years, divided into 6 semesters. Each semester should have 15 – 18 weeks.
2. Eligibility for admission: Intermediate from any recognized Board.

All other ordinances related to examination and result declaration will be as per the ordinances framed by University for UG Courses.

Programme Structure

B.Sc.(IT)

Three Years Course

FIRST SEMESTER:

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT/AEC1	General English	2	-	-	10	20	30	70	100	2	
2.	SET/CSE/BIT/C101	Fundamental of Computers and Information Technology	4	1	-	10	20	30	70	100	5	
3.	SET/CSE/BIT/C102	Programming in ‘C’	4	-	-	10	20	30	70	100	4	
4.	SET/CSE/BIT/C103	Mathematical Foundation of Computer Science	4	1	-	10	20	30	70	100	5	
Practical												
1.	SET/CSE/BIT/CP11	Fundamental of Computers and Information Technology Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/ BIT /CP12	Programming in ‘C’Lab	-	-	3	30	-	30	70	100	2	
		Total	14	2	6	100	80	180	420	600	20	

SECOND SEMESTER:

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT /AEC2	Environment Science	2	-	-	10	20	30	70	100	2	
2.	SET/CSE/BIT /C201	Data Structures	4	1	-	10	20	30	70	100	5	
3.	SET/CSE/BIT /C202	Object Oriented Programming using ‘C++’	4	-	-	10	20	30	70	100	4	
4.	SET/CSE/ BIT /C203	System Analysis and Design	4	1	-	10	20	30	70	100	5	
Practical												
1.	SET/CSE/ BIT /CP21	Data Structures Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/ BIT /CP22	Object Oriented Programming using ‘C++’ lab	-	-	3	30	-	30	70	100	2	
		Total	14	2	6	100	80	180	420	600	20	

THIRD SEMESTER:

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT /C301	Computer Based Numerical Techniques	4	-	-	10	20	30	70	100	4	
2.	SET/CSE/BIT /C302	DBMS	4	1	-	10	20	30	70	100	5	
3.	SET/CSE/BIT /C303	Digital Electronics	4	1	-	10	20	30	70	100	5	
4.	SET/CSE/BIT /SEC1	SEC1A	2	-	-	10	20	30	70	100	2	
Practical												
1.	SET/CSE/ BIT /CP31	Computer Based Numerical Techniques Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/ BIT /CP32	DBMS lab	-	-	3	30	-	30	70	100	2	
		Total	14	2	6	100	80	180	420	600	20	

FOURTH SEMESTER:

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT /C401	Operating system	4	1	-	10	20	30	70	100	5	
2.	SET/CSE/BIT /C402	Data Communication & Networks	4	-	-	10	20	30	70	100	4	
3.	SET/CSE/BIT /C403	Management Information System	4	1	-	10	20	30	70	100	5	
4.	SET/CSE/BIT /SEC2	SEC2A	2	-	-	10	20	30	70	100	2	
Practical												
1.	SET/CSE/ BIT /CP41	Operating system Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/ BIT /CP42	Multimedia Technology and Application Lab	-	-	3	30	-	30	70	100	2	
		Total	14	2	6	100	80	180	420	600	20	

FIFTH SEMESTER:

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT/DSE1	DSE1A	4	-	-	10	20	30	70	100	4	
2.	SET/CSE/BIT/DSE2	DSE2A	4	1	-	10	20	30	70	100	5	
3.	SET/CSE/BIT/DSE3	DSE3A	4	1	-	10	20	30	70	100	5	
4.	SET/CSE/BIT/SEC3	SEC3A	2	-	-	10	20	30	70	100	2	
Practical / Tutorial												
1.	SET/CSE/BIT/CP53	DSE1A Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/BIT/CP54	DSE2A Lab	-	-	3	30	-	30	70	100	2	
		Total	14	2	6	100	80	180	420	600	20	

SIXTH SEMESTER:

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT/DSE4	DSE4A	4	1	-	10	20	30	70	100	5	
2.	SET/CSE/BIT/DSE5	DSE5A	4	1	-	10	20	30	70	100	5	
3.	SET/CSE/BIT/SEC4	SEC4A	2	-	-	10	20	30	70	100	2	
Practical / Tutorial												
1.	SET/CSE/BIT/CP61	DSE4A Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/BIT/CP62	Project	2	2	6	50	-	50	150	200	6	
		Total	12	4	9	110	60	170	430	600	20	
Total Credits											120	

TA : Teacher Assessment

CT : Class Test

ESE : End Semester Examination

SUB TOT. : Subject Total

TOT. : Total

Discipline Specific Elective Papers

DSE 1A -Discipline Specific Elective-1 (Choose One)

1. Programming in Visual Basic
2. Web Technologies
3. Programming in JAVA

DSE 3A: Discipline Specific Elective-3 (Choose One)

1. Network Security
2. Software Engineering
3. E-commerce

DSE 2A: Discipline Specific Elective-2(Choose One)

1. Computer Graphics
2. Programming Paradigm
3. SQL/PL-SQL

DSE 4A: Discipline Specific Elective-4 (Choose One)

1. Database Applications
2. C#
3. ASP.Net

DSE 5A: Discipline Specific Elective-5 (Choose One)

1. ERP
2. Image Processing
3. Data Mining

Skill Enhancement Courses**SEC1A (Choose One)**

- SEC1A.1** Office Automation Tools
SEC1A.2 Cyber Laws
SEC1A.3 Basic Programming Skills

SEC3A (Choose One)

- SEC3A.1** System Administration and Maintenance
SEC3A.2 Software Testing Concepts
SEC3A.3 Multimedia and Applications

SEC2A (Choose One)

- SEC2A.1** Modeling and Simulation
SEC2A.2 Graph Theory
SEC2A.3 Boolean Algebra

SEC4A (Choose One)

- SEC4A.1** Android Programming
SEC4A.2 XML Programming
SEC4A.3 PHP Programming

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub.		
Theory												
1.	SET/CSE/BIT/AEC1	General English	2	-	-	10	20	30	70	100	2	

AECC: General English

Introduction: Theory of Communication, Types and modes of Communication

Language of Communication: Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication

Speaking Skills: Monologue Dialogue Group Discussion Effective Communication/ Mis- Communication Interview Public Speech

Reading and Understanding Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation

Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts

Writing Skills Documenting Report Writing Making notes Letter writing

References :

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/BIT/C101	Fundamental of Computers and Information Technology	4	1	-	10	20	30	70	100	5	

Fundamental of Computers and Information Technology

Computer system concept, computer system characteristics, capabilities and limitations, types of computers – analog, digital, hybrid, general, special purpose, micro, mini, mainframe, super. generations of computers, personal computer (PC) - IBM PC, characteristics, PC/PCXT/PCAT - configurations, Pentium and newer PC specifications and main characteristics. Types of PC- desktop, laptop, notebook, palmtop, workstations etc, their characteristics, add on cards on PC : sound card, video card, network card etc.

Basic components of a Computer System - Control Unit, ALU, Input / Output functions and Characteristics, Memory – RAM, ROM, EPROM, PROM and other types of memory.

Input devices-Keyboard, Mouse, Trackball, Joystick, Digitizing Tablet, Scanners, Digital Camera, MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light Pen, Touch Screen – Working Principles, Areas of use & characteristics.

Output Devices – Monitors, Characteristics and Types of Monitor – Digital, Analog, Size, Resolution, Refresh Rate, Interlaced / Non Interlaced, Dot Pitch, Video Standard – VGA, SVGA, XGA etc.

Printers - Daisy Wheel, Dot Matrix, Inkjet, Laser, Line Printer, Plotter

Storage Devices –Fundamentals, Primary Vs Secondary, Data Storage and Retrieval Methods - Sequential, Direct and Index Sequential, Various storage devices - Magnetic Tape, Magnetic Disks, Cartridge Tape, Hard Disk Drives, Floppy Disks(Winchester Disk), Optical Disks, CD, VCD, CD-R, CD-RW, Zip Drive.

Need, Types of Software - System Software, Application Software, System Software - Operating System, Utility Program, Programming Languages, Assemblers, Compilers and Interpreter, Operating Systems - Functions, Types - Batch, Single, Multiprogramming, Multiprocessing, Programming Languages- Machine, Assembly, High Level, 4GLs, Their merits and demerits, Application Software – Word Processing, Spreadsheet, Presentation Graphics, Data Base Management Software, Characteristics, Uses and examples and area of applications of each of them.

Virus, Types of Viruses, Virus detection and prevention Viruses on Network. Introduction to Multimedia.

References:

1. Introduction to computers and Information Technology by Anurag Seetha, Ram Prasad & sons, Bhopal.
2. Computers today by S.K.Basandra, Galgotia Publications.
3. Fundamentals of Information Technology by Alexis Leon & Mathews Leon, Vikas publishing house, New Delhi.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
3.	SET/CSE/BIT/C102	Programming in 'C'	4	-	-	10	20	30	70	100	4	

Programming in 'C'

Programming in C: History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programms. Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor

Operators: Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, precedence and order of evaluation. Control Statements: if-else, switch, break, continue, the comma operator, go to statement.

Loops: for, while, do-while.

Functions: built-in and user-defined, function declaration, definition and function call, parameter passing: call by value, call by reference, recursive functions, multifile programs.

Arrays: Linear arrays, multidimensional arrays, Passing arrays to functions, Arrays and strings.

Structure and Union: Definition and differences, self-referential structure. And address of (&) operator, pointer to pointer, Dynamic Momory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers.

References:

1. V. Rajaraman, "Fundamentals of Computers", PHI
2. Peter Norton's "Introduction to Computer", TMH
3. Hahn, "The Internet complete reference", TMH
4. Peter Nortton's, "DOS Guide", Prentice Hall of India
5. Gottfried, "Programming in C, Schaum's Series Tata McGraw Hill

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
4.	SET/CSE/BIT/C103	Mathematical Foundation	4	1	-	10	20	30	70	100	5	

Mathematical Foundation

Relation: Type and compositions of relations, Pictorial representation of relations, Equivalence relations, Partial ordering relation.

Function: Types, Composition of function, Recursively defined function.

Mathematical Induction: Piano's axioms, Mathematical Induction, Discrete Numeric Functions and Generating functions, Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic Behaviour of functions

Algebraic Structures: Properties, Semi group, monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.

Prepositional Logic: Preposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers, Posets, Hasse Diagram.

Lattices: Introduction, Ordered set, Hasse diagram of partially ordered set, Consistent enumeration, Isomorphic ordered set, Well ordered set, Lattices, Properties of lattices, Bounded lattices, Distributive lattices, and Complemented lattices.

Classification & Presentation of Data including diagrammatic presentation. Measures of central tendency – Mean, Mode, Median, Geometric & Harmonic. Measures of dispersion - Range, Quartile Deviation, Average & Standard deviation.

Type of sampling : Probability Vs. Non Probability, Sampling, Random, Non Random, Sampling, Size of sample. Probability theory – Baye's Probability.

Simple Bivariate, Correlation & regression. Only concept of partial & multivariate correlation & regression. Index numbers – Aggregative & average of price relative methods.

References:

1. Liptschutz, Seymour, "Discrete Mathematics", TMH.
2. Trembley, J.P. & R. Manohar, "Discrete mathematical Structure with Application to Computer Science", TMH.
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", TMH.
4. C.L.Liu "Elements of Discrete Mathematics", McGraw Hill.
5. Peter Grossman, "Discrete Mathematics for Computer", Palgrave Macmillian.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/ /AEC2	BIT	Environment Science	2	-	-	10	20	30	70	100	2

Ability Enhancement Compulsory Course (AECC – Environment Studies)

Introduction to environmental studies • Multidisciplinary nature of environmental studies; • Scope and importance; Concept of sustainability and sustainable development.

Ecosystems • What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems : a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Natural Resources : Renewable and Non-renewable Resources • Land resources and landuse change; Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water : Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). • Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

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

Environmental Pollution • Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management : Control measures of urban and industrial waste. • Pollution case studies.

Environmental Policies & Practices • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture 2/2 • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Human Communities and the Environment • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management : floods, earthquake, cyclones and landslides. • Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. • Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Field work • Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. • Study of common plants, insects, birds and basic principles of identification. • Study of simple ecosystems-pond, river, Delhi Ridge, etc.

References:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/ BIT /C201	Data Structures	4	1	-	10	20	30	70	100	5	

Data Structures

Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off. Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered list, Sparse Matrices, and Vector. Stacks: Array Representation and Implementation of stack, Operations and Stacks: Push and POP, Array Representation of Stack, Linked Representation of stack, Operations Associated with Stacks, Application of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Recursive definition and processes.

Queues: Array and linked representation and implementation of queues, Operations on Queue; Create, Add, Delete, Full and Empty, Circular queue, Dequeue, and Priority Queue. Link List: Representation and implementation of Singly linked lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List of Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

Trees: Basic terminology, Binary Tree, Binary tree representation algebraic Expressions, Complete Binary Tree, Extended Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary tree, Huffman algorithm. Searching and Hashing: Sequential search, comparison and analysis, Hash Table, Hash Function, Collection Resolution Strategies, Hash Table Implementation.

Sorting: Insertion Sort, Bubble sorting, Quick Sort, Two way Merge Sort, Trees: Binary Search (BST), Insertion and Deletion in BST.

References:

1. Horowitz and Sahani, "Fundamentals of data Structures" Galgotia
2. R. Kruse etal, "Data Structures and Program Design in C" Person Education
3. A.M. Tenenbaum etal, "Data Structures and Program Design in C" Person Education
4. Lipschutz, "Data Structure", TMH
5. K Loudon, "Mastering Algorithms With C", Shroff Publishers and Distributors
6. Bruno R Preiss, "Data Structure and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons
7. Adm Frozdek, "Data Structures and Algorithms in C++" Thomson Asia
8. Pal G. Sorenson, "An Introduction to Data Structures with Application", TMH

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
3.	SET/CSE/ BIT /C202	Object Oriented Programming using ‘C++’	4	-	-	10	20	30	70	100	4	

Object Oriented Programming using ‘C++’

Introduction: Introduction to OOP, Basic Concepts of OOP, Applications of OOP. Introduction to C++, Introduction to C++ stream I/O, declarations in C++, Creating New data types in C++, function Prototypes, Inline functions, Reference Parameters, Const Qualifier, Dynamic memory allocation, default arguments, Unary Scope resolution operator, Linkage specifications.

Class, Constructors, Friend Class : Introduction, Comparing class with Structure, Class Scope, Accessing Members of a class, Constructor, Destructor, Const objects, Const member functions, Friend class, Friend function, This pointer, Data abstraction and Information hiding, container classes and Iterators

Overloading & Inheritance: Operator Overloading, Fundamentals, Restrictions, Overloading stream, Insertion and stream extraction operators, Overloading unary & binary operators, Converting between types, Overloading ++ and --. Inheritance, Introduction, Protected members, Casting base _class pointers to derived _class pointers Overloading Base class members in a Derived class, Public, Protocols and Private inheritance, Direct base classes and Indirect Base Classes, Using Constructors and Destructors in Derived classes, Implicit Derived class object to base class object conversion.

Virtual Functions: Introduction, Type fields and switch statements, Virtual functions, Abstract base classes and concrete classes, Polymorphism, Dynamic binding, Virtual destructors.

C++ Stream I/O: Streams, Stream Input, Stream Output, Unformatted I/O, Stream manipulators, Stream format states, Stream error, States.

Files : File Operations –File pointers – error Handling during file Operations

References:

1. Deitel H.M. & Deitel P.J. – “How to Program C++” – PHI – 2003
2. Al stevenes – “C++ Programming” – Wiley dreamtech – 2003.
3. Herbert Scheldt, “Complete Reference”.
4. E. Balagurusamy “Object Oriented Programming with C++”.
5. Yashwant Kanetkar, “Let Us C++”.
6. C++ Programming by Herbert Scheldt – 2004.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
4.	SET/CSE/ BIT /C203	System Analysis and Design	4	1	-	10	20	30	70	100	5	

System Analysis and Design

System Concepts and Information System Environment: The System Concept, Definition, Characteristics of Systems, Elements of a System, Open and Closed and closed system, Formal & Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

The System Development Life Cycle: Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation & Maintenance.

The Role of the Systems Analyst: Historical Perspective, Academic & Personal Qualifications, the multifaceted role of the Analyst, The Analyst/User Interface, Behavioral issues.

Systems Planning & Initial Investigation: Strategies for Determining Information Requirement, Problem Definition & Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews & Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

Information Gathering: Kind of Information needed. Information about the firms, Information gathering tools, the art of Interviewing, Arranging the Interview, Guides to Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

The Tools of Structured Analysis: The Dataflow Diagram (DFD), Data Dictionary, Decision Trees and Structured English.

Feasibility Study: System performance, Economic Feasibility, Technical Feasibility, Behavioral Feasibility, Steps in Feasibility Analysis.

Input/Output and Forms Design: Input Design, CRT Screen Design, Output Design, Requirements form Design.

References:

1. Elias M.Awad, "Systems Analysis & Design" Galgotia Publication
2. Hoffer, "Modern Systems Analysis & Design" Addison Wesley
3. Kendall, "Introduction to System Analysis & Desogm", McGraw Hill

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/ BIT /C301	Computer Based Numerical Techniques	4	-	-	10	20	30	70	100	4	

Computer Based Numerical Techniques

Floating point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation.

Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.

Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, III conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence. Interpolation and approximation: Finite Differences, Difference tables. Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, stirling's Bassel's Everett's formula. Interpolation with unequal intervals: Language's Interpolation, Newton Divided difference formula, Hermite's interpolation Approximation of function by Taylor's series and Chebyshev polynomial.

Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapazoidal rule, Simpon's rules, Boole's Rule Euler-Maclaurin Formula Solution of Differential Equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.

References:

1. Rajaraman V., :Computer Oriented Numerical Methods". PHI
2. Gerald and Wheatley, "Applied Numerical Analyses", AW
3. Jain, Lyengar and Jain, "Numerical Methods for Scientific and Engineering Computations"; New Ager Int.
4. Grewal B.S., "Numerical methods in Engineering and Science. Khanna Publishers, Delhi.
5. T.Veerarajan, T Ramchandran, "Theory and Problems of Numerical Methods", TMH

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/ BIT /C302	DBMS	4	1	-	10	20	30	70	100	5	

DBMS

Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database structure. Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

Relational Data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and clusters.

Database Design & Normalization: Functional dependencies, normal forms, first, second third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict and view serializable schedule, recoverability, Recovery from transaction failures, deadlock handling .

References:

1. Date C.J. "An Introduction to Database System". Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts" McGraw Hill
3. Elmasri, Navathe, "Fundamentals of Database Systems" Addison Wesley
4. Paul Beynon Davis, "Database Systems" Palgrave Macmillan
5. Bipin C. Desai, "An introduction to Database Systems", Galgotia Pub.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
3.	SET/CSE/ BIT /C303	Digital Electronics	4	1	-	10	20	30	70	100	5	

Digital Electronics

Representation of information & Basic Building Blocks: Introduction to Computer, Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD), ASCII, EBCDIC and their conversion. Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry look ahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (Synchronous and asynchronous), ALU, Micro-operation. ALU-chip, Faster Algorithm and Implementation (multiplication & Division).

Basic Organization: Operational flow chart (Fetch, Execute, Instruction Cycle), Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers.

Memory Organization: Memory hierarchy, Main memory (RAM/ROM) chips, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

I/O Organization: Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication. I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.

References:

1. Willam Stallings, "Computer Organization & Architecture" Pearson Education Asia
2. Mano Morris, "Computer System Architecture" PHI
3. Zaky & Hamacher, "Computer Organization: McGraw Hill
4. B. Ram, "Computer Fundamental Architecture & Organization" New Age
5. Tannenbaum, "Structured Computer Organization" PHI.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
4.	SET/CSE/ /SEC1	BIT	SEC1A	2	-	-	10	20	30	70	100	2

SEC1A.1 Office Automation Tools

Introduction to MS office, Word Processing: Formatting Text, Pages, Lists, Tables, Spreadsheets: Worksheets, Formatting data, creating charts and graphs, using formulas and functions, macros, Pivot Table

Presentation Tools: Adding and formatting text, pictures, graphic objects, including charts, objects, formatting slides, notes, hand-outs, slide shows, using transitions, animations

References:

1. Sushila Madan , Introduction to Essential tools,JBA,2009.
2. Anita Goel, Computer Fundamentals, Pearson, 2012

SEC1A.2 HTML Programming

Introduction, The Basics: The Head, the Body, Colors, Attributes, Lists, ordered and unordered

Links : Introduction, Relative Links, Absolute Links, Link Attributes, Using the ID Attribute to Link Within a Document, Images: Putting an Image on a Page, Using Images as Links, Putting an Image in the Background

Tables: Creating a Table, Table Headers, Captions, Spanning Multiple Columns, Styling Table

Forms: Basic Input and Attributes, Other Kinds of Inputs, Styling forms with CSS,Where To Go From Here

References:

1. Introduction to **HTML** and CSS -- O'Reilly , 2010
2. Jon Duckett, HTML and CSS, John Wiely, 2012

SEC1A.3 Cyber Laws

Definitions, Digital Signature And Electronic Signature, Penalty and Compensation for damage to computer, computer system, etc.

Tampering with Computer Source Documents, Punishment for sending offensive messages through communication service, etc.

Punishments for dishonestly receiving stolen computer resource or communication device, Punishment for identity theft. Punishment for cheating by personation by using computer resource, Punishment for violation of privacy, Punishment for cyber terrorism, Punishment for publishing or transmitting obscene material in electronic form, Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form, Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form, Breach of confidentiality and privacy

References:

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.2005
2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/ BIT /C401	Operating system	4	1	-	10	20	30	70	100	5	

Operating system

Introduction: Definition, Design Goals, Evolution; Concept of User, job and Resources; Batch processing, Multi-programming, Time sharing; Structure and Functions of Operating System.

Process Management: Process states, State Transitions, Process Control Structure, Context Switching, Process Scheduling, Threads.

Memory Management: Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Combined Systems, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing, Working Set Model, Paging.

Concurrent Processes: Process Interaction, Shared Data and Critical Section, Mutual Exclusion, Busy form of waiting, Lock and unlock primitives, Synchronization, Classical Problems of Synchronization, Semaphores, Monitors, Conditional Critical Regions, System Deadlock, Wait for Graph, Deadlock Handling Techniques: Prevention, Avoidance, Detection and Recovery.

File and Secondary Storage Management: File Attributes, File Types, File Access Methods, Directory Structure, File System Organization and Mounting, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management. Protection & Security.

References:

1. Silberschatz and Galvin, Operating System Concepts 6/ed, Addison Wesley.
2. William Stalling, Operating Systems: Internals and Design Principles 5/ed, PHI.
3. Tanenbaum, Modern operating Systems, PHI.
4. J Bach, The Design of UNIX Operating System, Pearson Education.
5. Vijay Mukhi, The C Odessy, BPB.
6. Peterson and Silberschatz, Operating System Concepts, Addison Wesley.
7. P. B. Hansen, Operating System Principles, PHI.
8. K. Christian, The UNIX Operating System, John Wiley.
9. A. N. Haberman, Introduction to Operating System Design, Galgotia.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/ BIT /C402	Data Communication & Networks	4	-	-	10	20	30	70	100	4	

Data Communication & Networks

Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer transmission, switching methods, Integrated services digital networks, terminal handling.

Medium Access sub Layer: Channel allocations, LAN protocols, ALOHA Protocols-Pure Aloha, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI, Data Linked Layer elementary data link protocols, sliding windows protocols, error handling, High Level Data Link Control.

Network Layer: Point-to Point networks, routing algorithms, congestion control algorithms, internetworking, TCP/IP packet, IP addresses, Ipv6.

Transport Layer: Design issues, connection management, TCP window Management, User Datagram Protocol, Transmission Control Protocol.

Application Layer: Network Security, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and compression Techniques.

References:

1. A.S. Tanenbaum, "Computer Networks, 3rd Edition," PHI
2. W.Stallings, "Data and Computer Communication" Macmillan Press
3. Comer, "Internetworking with TCP/IP" PHI
4. Comer, "Computer networks & Inter" PHI
5. Forouzan, "Data Communication and Networking": TMH

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
3.	SET/CSE/ BIT /C403	Management Information System	4	1	-	10	20	30	70	100	5	

Management Information System

Fundamentals of Information Systems, Systems approach to problem solving, Developing information system solutions, Levels of MIS (Top, Middle, Lower).

Corporate Databases & Database Management, Data Organization, Data models, Data Security & Information quality.

Transaction Processing Systems, Executive Information Systems, Decision Support Systems, Expert Systems, Information Systems in Marketing, Manufacturing, HRM, Accounting and Finance.

Information Resource Management, Planning Implementing & Controlling Information Systems, Computer Crime, Ethics & Society.

References:

1. Brein James O. – Management Information Systems
2. Murdick & Ross – Information Systems for Modern Management
3. Parker C.S. – Management Information Systems – Strategy and Action.
4. Aktas A.Ziya – Structured Analysis and Design of Information Systems.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
4.	SET/CSE/ BIT /SEC2	SEC2A	2	-	-	10	20	30	70	100	2	

SEC 2A.1: Modeling and Simulation

Systems and environment: Concept of model and model building, model classification and representation, Use of simulation as a tool, steps in simulation study.

Continuous-time and Discrete-time systems: Laplace transform, transfer functions, state space models, order of systems, z-transform, feedback systems, stability, observability, controllability. Statistical Models in Simulation: Common discrete and continuous distributions, Poisson process, empirical distributions.

Random Numbers: Properties of random numbers, generation of pseudo random numbers, techniques of random number generation, tests for randomness, random variate generation using inverse transformation, direct transformation, convolution method, acceptance-rejection.

References:

1. Narsingh Deo, *System Simulation with Digital Computer*, Prentice Hall of India, 1999.
2. Averill Law, *Simulation Modeling and Analysis*, 3rd Ed., Tata McGraw-Hill, 2007.
3. G. Gordan, *System Simulation*, 2nd Ed., Pearson Education, 2007.
4. A.F. Seila, V. Ceric and P. Tadikamalla, *Applied Simulation Modeling* (International Student Edition), Thomson Learning, 2004.

SEC 2A.2: Graph Theory

Definition, examples and basic properties of graphs, pseudo graphs, complete graphs, bi-partite graphs, isomorphism of graphs, paths and circuits, Eulerian circuits, Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd-Warshall algorithm..

References:

1. Edgar G. Goodaire and Michael M. Parmenter, *Discrete Mathematics with Graph Theory*, 2nd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint 2003.
2. Rudolf Lidl and Günter Pilz, *Applied Abstract Algebra*, 2nd Ed., Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

SEC 2A.3: Boolean Algebra

Definition, examples and basic properties of ordered sets, maps between ordered sets, duality principle, maximal and minimal elements, lattices as ordered sets, complete lattices, lattices as algebraic structures, sublattices, products and homomorphisms. Definition, examples and properties of modular and distributive lattices, Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials, Quinn- McCluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits.

References:

1. B A. Davey and H.A. Priestley, *Introduction to Lattices and Order*, Cambridge University Press, Cambridge, 1990.
2. Rudolf Lidl and Günter Pilz, *Applied Abstract Algebra*, 2nd Ed., Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT/DSE1	DSE1A	4	-	-	10	20	30	70	100	4	

DSE1A.1 Programming in Visual Basic

Introduction : What is Visual basic; Features of Visual Basic; Visual basic Editions; The Visual Basic Philosophy; The Controls; The Properties; Events; Methods; Developing an Application; Design the User Interface; Write Code to Respond to User Input/Events

Creating an Application : The Tool Box; Project Explorer; The Properties Window; The Form Window; Saving the Project; Understanding Projects; What does Visual Basic 6 have for you to create applications; Customizing this Toolbar; Text Box Control; The Picture Box; Label Box; Option Button; Frame; List Box; Combo Box; Data; Command Button; Check Box; The Drive, Directory and File List Controls; The Line and Shape Controls; The Image Control; OLE(Object Linking and Embedding); Other Tools for Software Development; Menu Bar; Context Menus; Tool Bars; Tool Box; Project Explorer Window; Properties Window; Object Browser; Form Designer; Code Editor Window; Form Layout Window; Immediate, Locals, and Watch Windows

IDE, Forms and Controls : The Form; The Anatomy of a Form; Setting Form Properties; Working with the Properties Window; Name; Caption; Picture; Background Color; The Control Box; Min Button and Max Button; Movable; Border Style; Font Properties; Form Methods; Move; Graphic Methods; Show Methods; Initialize; Load; Activate; Deactivate; Unload Event; Terminate; Show Method; Show Style; Hide Method; How Do You Put or Create the Control on the Form; Working with a Control; More work on a Control; The Code Window; Opening the Code Window; Anatomy of the Code Window; Now Entering the Code.

Variables: What is a Variable; Declaring variables; Data Types; The Null Value; The error Value; The Empty Value; The Scope of a Variable; Module Level Variable; Declaring Variable; Constants; Circular References; Converting Data Types; Arrays, How do you Define them; Declaring Fixed-Size Arrays; Multi-dimensional arrays; Dynamic arrays; The Preserve Keyword.

Writing Code in Visual Basic : The Code Window; Opening the Code Window; Parts of the Code Window; Object Box; Procedures/Events Box; Split Bar; Margin Indicator Bar; Procedure View Icon; Full Module View Icon; The Procedure Separator; The Anatomy of a Procedure; Subroutine or Function; Editor Features; Automatic Word Completion; Auto List Members; Color Cueing; Line Continuation Character; Commenting and Uncomment Statements; The For. Next Statement; The Decision Maker. If; The Loop; The While Loop; Select Case...End Select

Menus : Building the User Interface. The First Step; Overcrowding; Important Information Must be Given Prominence; Consistency; The Fonts; Consistency Across Forms and the Application; Affordances; Simplicity; Usability; Images; Colors; Interacting With the user; All about Menus; The Menu system; Menu Conventions; The Menu Editor; Using the Menu Editor; Making the Menu Better; Coding the Menu Items; Adding the Toolbar; Toolbar Conventions; Pasting Icons on Buttons

Multiple Document Interface Applications : Why MDI Forms; Features of an MDI Form; Loading MDI Forms and Child Forms; The Active Form Property; Changing the Caption of the New Forms; Listing Open Forms; Saving your work; Specifying the Active Child Form or Control; Maintaining State Information for a Child Form; Unloading MDI Forms with Query Unload

Additional Controls Available in Visual Basic 6.0 : Objectives; The Image List control; Working with the Image List Control; Adding Images to the Image List; Tab strip Control; Creating Tabs at Design Time or Run Time; Associating the Image List Control with the Tab Strip Control; MSFlexGrid Control; The Status Bar Control; The Panel Object and the Panels Collection; Tree View Control; Creating a Tree View control; Working with the Tree View control; Displaying Data from a Database; Populating the Tree View control; Slider Control;

ActiveX Data Objects : Objectives; Why ADO; OLE DB; ADO; Establishing a Reference; The Data Source; The ODBC Data Source Administrator; Using the Data Source name in Our Control; Table or Stored Procedure; Using Bound Controls; Updating the data in the Data Source; What is a Cursor

Crystal and Data Reports : Crystal Reports; Prerequisites for working with Crystal reports; Creating a Report through a Wizard; Creating a Report without a Wizard; The Design/Preview

DSE 1A.2 Web technology

History of the web, Growth of the Web, Protocols governing the web, Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics.

Communication Issues, the client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML. Java Script: Introduction, Documents, Documents, forms, statements, functions, objects in Java Script, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

XML: Introduction, Display and XML Documents, Data Interchange with an XML document, Document types definitions, Parsers using XML, Client-side usage, Server Side usage.

Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, VBScript, Active Server Pages (ASP).

References:

1. Burdman, "Collaborative Web Development", Addison Wesley
2. Sharma & Sharma, "Developing E-Commerce Sites" Addison Wesley
3. Iva Bayross, "Web Technologies Part-II" BPB Publications
4. Shishir Gundavarma, CGI Programming on the World Wide Web" O'Reilly & Associate
5. DON Box, "Essential COM" Addison Wesley
6. Greg Buczek, " ASP Developer's Guide" TMH

DSE 1A.3 Programming in JAVA

Java Programming: Introduction, Operator, Data types, Variables, Methods and Classes, Multi threaded programming, I/O Java applet.

Java Library: String handling, I/O exploring JAVA, Networking, Applet Classes, Event Handling, Introduction to AWT, Working with windows, Graphics, AWT Controls, Layout manager and menu, Images, Additional Packages.

Software Development Using Java: Java Bean, Java Swing, Java Servlets, Migrating from C++ to Java, Application of JAVA, Dynamic Billboard Applet.

Image Menu: An image based menu, Lavatron Applets, Scrabblets JDBC, Brief functioning of Upper Layer E-mail and their applications.

References:

1. Naughton, Schidt, "The Complete Reference JAVA2", TMH
2. Balagurusamy E, "Programming in JAVA, TMH
3. Dustin R. Calway, "Inside Serviets" Addison Wesley
4. Mark Wutica, "Java Enterprise Edition" QUE
5. Steven Hoizner, "Java2 Black book" Dreamtech

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/BIT/DS E2	DSE2A	4	1	-	10	20	30	70	100	5	

DSE 2A.1 Computer Graphics

Graphics Primitives: Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display Plotters, Printers. Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera.

Input Techniques: Positioning techniques, Potentiometers, Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging Dimensioning techniques and Graphical Potentiometers, Pointing and Selection: the use of selection points defining a boundary rectangle, multiple selections, Menu selection.

Mathematics for Computer Graphics: Point representation, Vector representation, Matrices and operations related to matrices, Vector addition and vector multiplication, Scalar product of two vectors, Vector product of two vectors.

Line Drawing Algorithms: DDA Algorithms, Bresenham's Line algorithm.

Segment & Display files: Segments, Functions for segmenting the display file, Posting and posting a segment, segment naming schemes, Default error conditions, Appending to segments, Refresh concurrent with reconstruction, Free storage allocation, Display file structure.

Graphics Operations: Clipping, Point Clipping, Line Clipping, Polygon Clipping. Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm.

Conics, Curves and Surfaces: Quadric surfaces: Sphere, Ellipsoid, and Torus. Superquadrics: Superellipse, superellipsoid, Spline & Bezier Representations: Interpolation and approximation splines, parametric continuity conditions, Geometric Continuity Conditions, Spline specifications. Bezier curves and surfaces.

Transformation: 2D transformation, Basic Transformations, Composite transformations: Reflection, Shearing, Transformation between coordinate systems. 3D Graphics: 3D Display Methods, 3D transformations, Parallel projection, Perspective projection, Visible lines and surfaces identification, Hidden surface removal.

Animation: Introduction to Animation to Animation, Principles of Animation, Types of Animation, Types of Animation Systems: Scripting, Procedural, Representational, Stochastic, etc. Animation Tools: Hardware-SGI, PC's Amiga etc.

References:

1. Donald Hearn and M Pauline Baker, "Computer Graphics" PHI
2. Steven Harrington, "Computer Graphics: A Programming Approach" TMH
3. Prajapati A.K. "Computer Graphics" PPM Ed2
4. Foley James D, "Computer Graphics" AW Ed2
5. Newman and Sprould, "Principle of Interactive Computer Graphics" McGraw Hill
6. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
7. Rogers and Adams, "Mathematical Elements of Computer Graphics" McGraw Hill

DSE 2A.2 Programming Paradigm

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Elementary and Structured Data Types: Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types.

Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, coroutines, Scheduled sub programmes, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism.

Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management. Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics.

References:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley
4. Fundamentals of Programming Languages, Galgotia.

DSE 2A.3 SQL/PL-SQL

SQL Vs. SQL * Plus:

SQL Commands and Data types, Operators and Expressions, Introduction to SQL * Plus. Managing Tables and Data:

- Creating and Altering Tables (Including constraints)
- Data Manipulation Command like Insert, update, delete
- SELECT statement with WHERE, GROUP BY and HAVING, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE
- Join, Built in functions

Other Database Objects

- View

- Synonyms, Index

Transaction Control Statements

- Commit, Rollback, Savepoint

Introduction to PL/SQL

- SQL v/s PL/SQL
- PL/SQL Block Structure
- Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.)
- % TYPE and % ROWTYPE
- Using Cursor (Implicit, Explicit)

References:

1. Baron Schwartz , High Performance MySQL, O'Reilly, 2012.
2. Vikram Vaswani , The Complete Reference MySQL , McGraw Hill Educations, 2004.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
3.	SET/CSE/BIT/DSE3	DSE3A	4	1	-	10	20	30	70	100	5	

DSE 3A.1 Network Security

Introduction To security: Attacks, Services & Mechanisms, Security, Attacks, Security Services, Conventional Encryption: Classical Techniques, Conventional Encryption Model, and steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operations.

Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, CR2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement of Encryption Function.

Hash Functions: Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Function Birthday Attacks, Security of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signature, Authentication Protocol, Digital Signature Standard (DDS) Proof of Digital Signature Algorithm.

Network & System Security: Authentication Applications: Kerberos X-509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S/MIME Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management.

References:

1. William Stallings, "Cryptography and Network Security: Principles and Practice" Prentice hall, New Jersey
2. Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag
3. Atul Kahate, "Cryptography and Network Security" TMH

DSE 3A.2: Software Engineering

Introduction: Introduction to software engineering, Importance of software, evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.

Software Requirement Specification: Analysis, Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control.

Software-Design: Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Forth generation techniques, Functional independence, Software Architecture, Transaction and Transaction and Transform Mapping, Component level Design, Forth Generation Techniques.

Coding: Top-Down and Bottom-Up programming, structured programming, information hiding, programming style and internal documentation.

Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification and validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.

Software Project Management: The Management spectrum (The people, the product, the process, the project) Cost estimation, project scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, project monitoring, risk management.

Software Reliability & Quality Assurance: Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 Certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM. CASE (Computer Aided Software Engineering): CASE and its scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.

References:

1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed. Boston: McGraw Hill, 2001
2. Jalote, Pankaj, "Software Engineering Ed.2" New Delhi: Narosa 2002
3. Schaum's Series, "Software Engineering" TMH
4. Ghezzi Carlo and Others "Fundamentals of Software Engineering" PHI
5. Alexis, Leon and Mathews Leon, "Fundamental of Software Engg."
6. Sommerville, Ian, "Software Engineering" AWL

DSE 3A.3 : E-Commerce

Introduction: Electronic Commerce - Technology and Prospects, Definition of E-Commerce, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-Commerce on business.

Network Infrastructure of E-Commerce: Internet and Intranet based E-Commerce Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Mobile Commerce: Introduction, Wireless Application Protocol, WAP Technology, Mobile Information device, Mobile Computing Applications.

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Encryption: Encryption techniques, Symmetric Encryption-Keys and data encryption standard, Triple encryption.

Asymmetric encryption-Secret key encryption, public and private pair key encryption, Digital Signature, Virtual Private Network.

Electronic Payments: Overview, The SET protocol, payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking EDI Application in business, E-Commerce Law, Forms of Agreement, Govt. policies and Agenda.

References:

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce" Addison Wesley.
2. Bajaj and Nag. "E-Commerce the cutting edge of Business". TMH.
3. P. Loshin, John Vacca, "Electronic Commerce" Firewall Media, N.Delhi.
4. E Business & Commerce: Brahm Cazner, Wiley dreamtech.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
4.	SET/CSE/BIT/SEC3	SEC3A	2	-	-	10	20	30	70	100	2	

SEC3A.1 System Administration and Maintenance

Part I (Linux/Unix) (8L)

- ✓ Basics of operating system, services,
- ✓ Installation and configuration, maintenance
- ✓ What is linux/unix Operating systems, Kernel, API, cli, gui,
- ✓ Difference between linux/unix and other operating systems
- ✓ Features and Architecture
- ✓ Linux features, advantages, disadvantages

Part II(Windows) (8L)

- ✓ Windows as operating system, history, versions.
- ✓ PC hardware, BIOS, Devices and drivers,
- ✓ Kernal Configuration and building
- ✓ Application installation, configuration and maintenance
- ✓ Server services and Client services
- ✓ Difference between WindowsXP/windows7 and windows server 2003/2008

SEC3A.2 Software Testing

Introduction

Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System Testing, Basic Terminologies, V Shaped Software Lifecycle Model

Functional Testing\ Black-box Testing

Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing

Structural Testing\ White-box Testing

Basis Path Testing: Program Graph, DD Path graph, Cyclomatic Complexity, Graph Matrices, Control Flow Testing: Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage

References:

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, Seventh Edition, Mc Graw Hill Education.2009.
2. Yogesh Singh, Software Testing, Cambridge University Press,2011.

SEC3A.3 Multimedia Applications

Multimedia: Introduction to multimedia, Components, Uses of multimedia.

Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia software and Authoring tools.

Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia &Hypertext.

Images: Still Images – Bitmaps, Vector Drawing, 3D Drawing & rendering, Natural Light & Colors, Computerized Colors, Color Palletes, Image File Formats.

Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.

Video: How Video Works, Analog Video, Digital Video, Video File Formats, Video Shooting and Editing.

Animation: Principle of Animations. Animation Techniques, Animation File Formats.

References:

1. Tay Vaughan, “Multimedia: Making it work”, TMH, Eighth edition. 2006
2. Ralf Steinmetz and Klara Naharstedt, “Multimedia: Computing, Communications Applications”, Pearson,1995.
3. Keyes, “Multimedia Handbook”, TMH. 2000.
4. K. Andleigh and K. Thakkar, “Multimedia System Design”, PHI,2000

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
1.	SET/CSE/BIT/DSE4	DSE4A	4	1	-	10	20	30	70	100	5	

DSE 4A.1 Database Applications

Application Design and Development: User interfaces and tools, web interfaces to Databases Web Fundamentals: HTML, static vs. dynamic web pages, client (Java script/VB) and server side scripting (JSP/ASP/PHP/VB), web servers and sessions, two level & three level architecture, Real Life Application Development using Popular DBMS: SQL, procedures & functions, exception handling, triggers, large objects, user defined data types, collection types, bulk loading of data. Query Optimization: Query Processing, query tree, query plans, measures of query cost, estimates of basic operations, equivalent relational algebra expressions, evaluation of expressions. Authorizations in SQL: System and user privileges, granting and revoking privileges, roles, authorization on views, functions and procedures, limitations of SQL authorizations, audit trails Application Security: Encryption techniques, digital signatures and digital certificates.

References:

1. A. Silberschatz, H. Korth and S. Sudarshan, *Database System Concepts*, 5th Ed., Tata McGraw Hill, 2006.
2. J. Morrison, M. Morrison and R. Conrad, *Guide to Oracle 10g*, Thomson Learning, 2005.
3. Loney and Koch, *Oracle 10g: The Complete Reference*, Tata McGraw Hill, 2006.
4. David Flanagan, Java Script, *The Definitive Guide*, O'Reilly Media, 2006.
5. Marty Hall, Larry Brown, and Yaakov Chaikin, *Core Servlets and Java Server Pages: Core Technologies* (Vol. II), 2nd Ed., Sun Microsystems Press, 2006.
6. S.K. Singh, *Database Systems Concepts, Design and Applications*, Pearson Education 2006.

DSE 4A.2 C#

Language Basics: Datatypes & Variables Declaration , Implicit and Explicit Casting , Checked and Unchecked Blocks – Overflow Checks , Casting between other datatypes, Boxing and Unboxing , Enum and Constant , Operators , Control Statements , Working with Arrays, Working with Methods , Pass by value and by reference and out parameters

Features of Object Oriented programming

Exception Handling: What is Exception , Rules for Handling Exception , Exception classes and its important properties, Understanding & using try, catch keywords , Throwing exceptions, Importance of finally block , "using" Statement , Writing Custom Exception Classes.

Working With Collections and Generics: Importance of IList and IDictionary., Using ArrayList and Hashtable. , Understanding IEnumerable and IEnumerator. Sorting Items in the collection using IComparable. Typesafety issue with ArrayList and Hashtable classes. Writing custom generic classes. Working with Generic Collection Classes. Operator Overloading, Partial Class, Attributes, Reflection, Configuration

WinForms: Introduction, Controls, Menus and Context Menus, MenuStrip, ToolStrip. Graphics and GDI , SDI and MDI Applications , Dialogbox (Modal and Modeless)

Form Inheritance, Developing Custom, Composite and Extended Controls Other Misc topics., Working with Resource Files , Working with Settings

DSE 4A.3 ASP.Net

Introduction to .NET framework : Managed Code and the CLR- Intermediate Language, Metadata and JIT Compilation
- Automatic Memory Management.

Language Concepts and the CLR: Visual Studio .NET - Using the .NET Framework.

The Framework Class Library: NET objects - ASP .NET - .NET web services – Windows Forms

ASP.NET Features: Change the Home Directory in IIS - Add a Virtual Directory in IIS- Set a Default Document for IIS - Change Log File Properties for IIS - Stop, Start, or Pause a Web Site.

Creating Web Controls: Web Controls - HTML Controls, Using Intrinsic Controls, Using Input Validation Controls, Selecting Controls for Applications - Adding web controls to a Page.

Creating Web Forms: Server Controls - Types of Server Controls - Adding ASP.NET Code to a Page.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/BIT/DSE5	DSE5A	4	1	-	10	20	30	70	100	5	

DSE 5A.1 ERP

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Mining and OLAP, ERP Drivers, Decision support system.

ERP Domain, ERP Benefits classification, Present global and Indian Market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use and Maintenance, Evolution and Retirement phases, ERP Modules.

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating DRP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP Customization.

Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation. Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

References:

1. A. Lexis Leon, "Enterprise Resource Planning" TMH
2. Brady, Manu, Wegner, "Enterprise Resource Planning", TMH

DSE 5A.2 Image Processing

Introduction: Digital Image Processing, The origins of Digital Image Processing, Examples of Digital Image Processing application, Fundamental steps in Digital Image processing, Components of Image Processing system Fundamentals: Elements of Visual Perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels, Linear and Nonlinear Operations.

Image Enhancement in the spatial domain: Background, Some basic gray level transformation, Introduction of Histogram processing, Enhancement using Arithmetic/Logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Image Enhancement in the Frequency Domain : Introduction.

Image Restoration: Model of the Image Degradation/Restoration process, Noise Models, Restoration in the presence of noise only spatial filtering, Inverse filtering, Minimum Mean Square Error (Wiener) filtering, Geometric mean filter, Geometric Transformations, Image Compression: Fundamentals, Lossy Compression, Lossless Compression, Image Compression models, Error-free Compression : Variable length coding, LZW coding, Bit plane coding, Run length coding, Introduction to JPEG.

Morphology: Dilation, Erosion, Opening and Closing, Hit-and Miss transform, Morphological Algorithms : Boundary Extraction, Region filling, Extraction of connected components, Convex Hull, Image Segmentation: Definition, characteristics of segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region based segmentation. Introduction to Representation & Description, Introduction to Object Recognition.

References:

1. Digital Image Processing: Rafael C. Gonzalez and Richard E.Woods. Addison Wesley.
2. Fundamentals of Digital Image Processing. Anil K. Jain, PHI.
3. Digital Image Processing and Analysis : B. Chanda & D. Dutta Majumber, PHI.
4. Image Processing in C : Dwayne Phillips, BPB.

DSE 5A.3 Data Mining

Overview: The process of knowledge discovery in databases, predictive and descriptive data mining techniques, supervised and unsupervised learning techniques. Techniques of Data Mining: Link analysis, predictive modeling, database segmentation, score functions for data mining algorithms, Bayesian techniques in data mining. Issues in Data Mining: Scalability and data management issues in data mining algorithms, parallel and distributed data mining, privacy, social, ethical issues in KDD and data mining, pitfalls of KDD and data mining.

References:

1. Margaret H. Dunham, *Data Mining: Introductory and Advanced Topics*, Pearson, 2002.
2. Jiawei Han and Micheline Kamber, *Data Mining: Concepts and Techniques*, 2nd Ed., Morgan Kaufmann, 2006.
3. Arun Pujari, *Data Mining Techniques*, University Press, 2001.
4. D. Hand, H. Mannila and P. Smyth, *Principles of Data Mining*, Prentice-Hall of India, 2006.
5. G.K. Gupta, *Introduction to Data Mining with Case Studies*, Prentice-Hall of India, 2006.

S. No	Course No.	Subject	Evaluation – Scheme								Credit	
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
3.	SET/CSE/BIT/SEC4	SEC4A	2	-	-	10	20	30	70	100	2	

SEC 4A.1 Android Programming

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project

– Hello Word, run on emulator, Deploy it on USB-connected Android device.

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.

Database: Understanding of SQLite database, connecting with the database.

References:

1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

SEC 4A.2 XML Programming

Introduction: Understanding Mark-up Languages, Introduction to XML and its Goals.

XML Basics: XML Structure and Syntax, Document classes and Rules.

Other XML Concepts: Scripting XML, XML as Data, Linking with XML.

XML with Style: XSL –Style Sheet Basics, XSL basics, XSL style sheets.

References:

1. William J. Pardi , XML in action web technology, Microsoft Press, 1999
2. Michael J. Young ,Step by Step XML , Microsoft Press, 2002

SEC 4A.3 PHP Programming

Introduction to PHP: PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.), PHP with other technologies, scope of PHP, Basic Syntax, PHP variables and constants, Types of data in PHP , Expressions, scopes of a variable (local, global), PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator. PHP operator Precedence and associatively

Handling HTML form with PHP: Capturing Form Data, GET and POST form methods, Dealing with multi value fields, Redirecting a form after submission.

PHP conditional events and Loops: PHP IF Else conditional statements (Nested IF and Else), Switch case, while ,For and Do While Loop, Goto , Break ,Continue and exit

PHP Functions: Function, Need of Function , declaration and calling of a function, PHP Function with arguments, Default Arguments in Function, Function argument with call by value, call by reference, Scope of Function Global and Local

String Manipulation and Regular Expression: Creating and accessing String , Searching & Replacing String, Formatting, joining and splitting String , String Related Library functions, Use and advantage of regular expression over inbuilt function, Use of preg_match(), preg_replace(), preg_split() functions in regular expression

Array: Anatomy of an Array ,Creating index based and Associative array ,Accessing array, Looping with Index based array, with associative array using each() and foreach(), Some useful Library function

References:

1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007.
2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback, O'reilly, 2014.
4. Luke Welling, Laura Thompson, PHP and MySQL Web Development", 4th Edition, Addison Paperback, Addison-Wesley Professional,2008.
5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014.