

SYLLABUS

FOR

Bachelor of Computer Application (BCA) 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)

Bachelor of Computer Applications (BCA)

(With effect from session 2015-2016)

1. **Duration** of the BCA program shall be 3 years, divided into 6 semesters. Each semester should have 15 – 18 weeks.
2. Eligibility for admission: Intermediate with Mathematics from any recognized Board.
3. **Course Structure**

Two kinds of courses/subjects/papers are offered - core courses and elective courses. Core courses are offered by the department conducting the programme. Elective courses are offered either by the department conducting the programme or by any other department.

Elective courses should be relevant to the programme for which the student is admitted and are identified by the department.

Each course shall have a unique alphanumerical code.

No regular student shall register for more than 22 credits and less than 10 credits per semester.

The minimum total credits required for the successful completion of a four semester BCA programme is 120.
4. **Evaluation** of all semester papers will be in two parts viz. Continuous Assessment (CA) and End Semester Assessment (ESA). *Thirty percent marks will be set apart for CA and seventy percent marks will be set apart for ESA, for theory, practical and project parts.* Weightage for theory, practical and project components will be according to the credit distribution.
5. **End Semester Assessment:**
 - (a) Question pattern (Theory part): There shall be *eight questions carrying equal marks*. Each question may contain sub divisions also. Student has to answer any *five* full questions.
 - (b) Question pattern (Practical part): One compulsory question that may contain sub divisions is to be attempted by the student.
6. **Grading:**

As per University/UGC norms.
7. **Grade Card**
 - 7.1 The university under its seal shall issue to the students a grade card on completion of each semester and a consolidated grade statement at the end of the BCA.
 - 7.2 Grade card shall contain the following.
 - a. Title of the courses.
 - b. The credits associated with and grades awarded for each course.
 - c. The number of credits earned by the student and the grade point average.
 - d. The total credits earned by the student till that semester.
 - 7.3 The grade card issued on completion of the programme shall contain the name of the programme, the department / school offered the programme, the titles of the courses taken, the credits associated with each course, grades awarded, the total credits earned by the student, the CGPA and the class in which the student is placed.
8. **Ranking**

Only those candidates who have passed all the papers in the first appearance within the minimum period will be considered for ranking on the basis of CGPA for the entire course.
9. **Attendance:** Will be applied as per university norms.
10. **Scrutiny shall be allowed as per the rules of the University.** Revaluation is not permitted.

Programme Structure

Bachelor of Computer Application (BCA)

FIRST SEMESTER:

S. No	Course No.	Subject	Evaluation – Scheme								Credit
			Period			Sessional			Examination		
			L	T	P	TA	CT	TOT	ES	Sub. Total	
Theory											
1.	SET/CSE/BCA/AEC1	General English	2	-	-	10	20	30	70	100	2
2.	SET/CSE/BCA/C101	Computer Fundamental	4	1	-	10	20	30	70	100	5
3.	SET/CSE/BCA/C102	Programming in ‘C’	4	-	-	10	20	30	70	100	4
4.	SET/CSE/BCA/C103	Mathematical Foundation of Computer Science	4	1	-	10	20	30	70	100	5
Practical											
1.	SET/CSE/BCA/CP11	Computer Fundamental Lab	-	-	3	30	-	30	70	100	2
2.	SET/CSE/BCA/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/BCA/AEC2	Environment science	2	-	-	10	20	30	70	100	2
2.	SET/CSE/BCA/C201	Data Structure & File Organization	4	1	-	10	20	30	70	100	5
3.	SET/CSE/BCA/C202	Programming in C++	4	-	-	10	20	30	70	100	4
4.	SET/CSE/BCA/C203	Database Management Systems	4	1	-	10	20	30	70	100	5
Practical											
1.	SET/CSE/BCA/CP21	Data Structure & File Organization lab	-	-	3	30	-	30	70	100	2
2.	SET/CSE/BCA/CP22	Programming in C++ Lab	-	-	3	30	-	30	70	100	2
Total			14	2	6	100	80	180	420	600	20

TA : Teacher Assessment

CT : Class Test

ESE : End Semester Examination

SUB TOT. : Subject Total

TOT. : Total

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/BCA/C301	Computer Networks	4	1	-	10	20	30	70	100	5
2.	SET/CSE/BCA/C302	Computer Based Numerical Techniques	4	-	-	10	20	30	70	100	4
3.	SET/CSE/BCA/C303	System Analysis and Design	4	1	-	10	20	30	70	100	5
4.	SET/CSE/BCA/SEC1	SEC1A	2	-	-	10	20	30	70	100	2
Practical											
1.	SET/CSE/BCA/CP31	Computer Networks and Internet Technologies Lab	-	-	3	30	-	30	70	100	2
2.	SET/CSE/BCA/CP32	Computer Based Numerical Techniques 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/BCA/C401	Multimedia Systems and Applications	4	1	-	10	20	30	70	100	5
2.	SET/CSE/BCA/C402	Operating System Organization & UNIX	4	-	-	10	20	30	70	100	4
3.	SET/CSE/BCA/C403	Software Engineering	4	1	-	10	20	30	70	100	5
4.	SET/CSE/BCA/SEC2	SEC2A	2	-	-	10	20	30	70	100	2
Practical											
1.	SET/CSE/BCA/CP41	Multimedia Systems and Applications Lab	-	-	3	30	-	30	70	100	2
2.	SET/CSE/BCA/CP42	Operating System Organization & UNIX Lab	-	-	3	30	-	30	70	100	2
Total			14	2	6	100	80	180	420	600	20

TA : Teacher Assessment

CT : Class Test

ESE : End Semester Examination

SUB TOT. : Subject Total

TOT. : Total

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/BCA/DSE1	DSE1A	4	-	-	10	20	30	70	100	4	
2.	SET/CSE/BCA/DSE2	DSE2A	4	-	-	10	20	30	70	100	4	
4.	SET/CSE/BCA/DSE3	DSE3A	5	1	-	10	20	30	70	100	6	
3.	SET/CSE/BCA/SEC3	SEC3A	2	-	-	10	20	30	70	100	2	
Practical												
1.	SET/CSE/BCA/EP51	DSE1A Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/BCA/EP52	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/BCA/DSE4	DSE4A	4	1	-	10	20	30	70	100	5	
2.	SET/CSE/BCA/DSE4	DSE5A	4	1	-	10	20	30	70	100	5	
3.	SET/CSE/BCA/SEC4	SEC 4A	2	-	-	10	20	30	70	100	2	
Practical												
1.	SET/CSE/BCA/EP51	DSE4A Lab	-	-	3	30	-	30	70	100	2	
2.	SET/CSE/BCA/EP52	Project	2	2	6	50	-	50	150	200	6	
Total			12	4	9	110	60	170	430	600	20	

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)

- DSE 1A.1 Advance RDBMS
- DSE 1A.2 Web Technologies
- DSE 1A.3 Computer Graphics

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

- DSE 2A.1 ASP.NET
- DSE 2A.2 C#
- DSE 2A.3 SQL/PL-SQL

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

- DSE 5A.1 Compiler Designing
- DSE 5A.2 Human Computer Interaction
- DSE 5A.3 Unified Modeling Language

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

- DSE 3A.1 Fuzzy Logic & Neural Network
- DSE 3A.2 Distributed and Parallel Computing
- DSE 3A.3 Artificial Intelligence

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

- DSE 4A.1 Software Project Management
- DSE 4A.2 Natural Language Processing
- DSE 4A.3 Unix & Shell Programming

Skill Enhancement Courses

SEC1A (Choose One)

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

SEC2A (Choose One)

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

SEC3A (Choose One)

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

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	ES	Sub. Total	
Theory											
1.	SET/CSE/BCA/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	ES	Sub.	
Theory											
2.	SET/CSE/BCA/C101	Computer Fundamental	4	1	-	10	20	30	70	100	5

Computer Fundamental

Introduction to Computers: Computer hardware Components, Disk Storage, memory, keyboard, mouse, printers, monitors, CD etc., and their functions, Comparison Based analysis of various hardware components.

Basic Operating System Concepts: MS-DOS, WINDOWS, Functional knowledge of these operating systems. Introduction to Basic Commands of DOS, Managing File and Directories in various operating Systems, Introduction to internet, Basic terms related with Internet, TCP/IP.

Algorithm development, techniques of problem solving, flowcharting, stepwise refinement algorithms for searching, sorting (exchange and insertion), merging of ordered lists.

Programming : Representation of integer, character, real, data types, constraints and variables, arithmetic expressions, assignment statement, logical expression; sequencing, alteration and interaction, arrays, string processing sub programs, recursion, files and pointers.

Structured programming concepts : Top down design, development of efficient programs; Program correctness; Debugging and testing of programs.

Element of a computer processing system : Hardware CPU, storage devices and media, VDU, input-output devices, data communication equipment software-system software, application software.

Programming languages : Classification, machine code, assembly language, higher level languages, fourth generation languages.

References :

1. Raja Raman V : Fundamentals of Computers
2. Sanders D.H. : Computers Today

S. No	Course No.	Subject	Evaluation – Scheme								Credit
			Period			Sessional			Examination		
			L	T	P	TA	CT	TOT	ES	Sub. Total	
Theory											
3.	SET/CSE/BCA/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 programmes. 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 Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers.

File: File Handling in C

References:

1. V. Rajaraman, "Fundamentals of Computers", PHI
2. Pater 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

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			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ES	Sub.	Total	
Theory												
4.	SET/CSE/BCA/C103	Mathematical Foundation of Computer Science	4	1	-	10	20	30	70	100	5	

Mathematical foundation of Computer Science

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.

Propositional 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.

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. Doerr Alan and Levasseur Kenneth, "Applied Discrete Structure for Computer Science, Galgotia Pub. Pvt. Ltd.
5. Gersting "Mathematical Structure for Computer Science", WH freeman and Macmillan
6. Kumar Rajendra, "Theory of Automata: Languages and Computation", PPM
7. Hopcroft J.E. Uliman J.D., "Introduction to Automata Theory, Language and Computation" Narosa Pub. House, New Delhi.
8. C.L.Liu "Elements of Discrete Maehmatics", McGraw Hill.
9. 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/BCA/AEC2	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 land use 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/BCA/C201	Data Structure & File Organization	4	1	-	10	20	30	70	100	5	

Data Structure & File Organization

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, Inc.

S. No	Course No.	Subject	Evaluation – Scheme								Credit
			Period			Sessional			Examination		
			L	T	P	TA	CT	TOT	ESE	Sub. Total	
Theory											
3.	SET/CSE/BCA/C202	Programming in C++	4	-	-	10	20	30	70	100	4

Programming in 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.

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/BCA/C203	Database Management Systems	4	1	-	10	20	30	70	100	5

Data Base Management System

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, DMI, 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

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											
1.	SET/CSE/BCA/C301	Computer Networks	4	1	-	10	20	30	70	100	5

Computer Networks

Introduction to Computer Networking: Use, advantage, structure of the communications network topologies the telephone network, analog to digital communication. Communication Between Analog Computers & Terminals Layered Protocols, Network & The OSI Models, Traffic control and accountability wide area and local area networks, connection oriented and connectionless networks, classification of communication protocols polling/selection systems, non-priority system priority system, rotation for layered protocols foals of layered protocols, network design problems, communication between layers, A parametric illustration, introduction to standards organizations and the ISO standard.

Polling/Selection, Satellite and Local area Networks: Binary synchronous control, other BSC system, conversion using satellite communication SPUS, and the Tele-port primary attribute of a LAN, IEEE LAN standards, LAN topology and protocols.

Switching and routing in Network: Telephone switching system, message switching, packet switching, packet switching support to circuit switching networks. The X.25 & Digital Networks: Layers of x.25, features of x.25 flow control principles, other packet type, x.25 logical channel states time out and time limits, packet formats, flow control and windows x.25 facilities, other standards layer the pad, communication networks communication between layers, advantage of digital networks, Digital's switching, voice transmission by packet.

Personal Computer Network: Personal computer communications, characteristics, using the personal computers as server linking the personal computer to mainframe computers, semaphores of vendor offerings. File transfer on personal computers, personal computer and local area networks. Personal computer networks and the OSI models.

TCP/IP: TCP/IP and internetworking, example of TCP/IP operations, related protocols ports and sockets. The IP address structure, major features of IP, IP datagram, Major IP services. IP source routing, value of the transport layer, TCP, Major features of TCP, passive and active operation, the transmission control block (TCB), route discovery protocols, examples of route discovery protocols, application layer protocols.

References:

1. Tannanbaum, A.S. : Computer Network, PHI – 1995.
2. Martin J.: Computer Network and Distributed processing, 1985.
3. Black : Computer Network; Protocols, Standards and Interface PHI – 1995.

S. No	Course No.	Subject	Evaluation – Scheme									Credit
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/BCA/C302	Computer Based Numerical & Statistical 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. Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule Euler-Maclaurin Formula Solution of Differential Equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods.

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											
3.	SET/CSE/BCA/C303	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 and 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 and Maintenance.

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

Systems Planning and Initial Investigation: Strategies for Determining Information Requirement, Problem Definition and Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews and 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 and Design" Galgotia Publication
2. Hoffer, "Modern Systems Analysis and Design" Addison Wesley
3. Kendall, "Introduction to System Analysis and Design", McGraw Hill
4. System Analysis and Design Handbook: V. K. Jain, 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/BCA/SEC1	SEC 1A	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/BCA/C401	Multimedia Systems and Applications	4	1	-	10	20	30	70	100	5	

Multimedia System and Applications

Evolution of Multimedia and its objects, Scope of multimedia in business and work, production and planning of Multimedia applications. Multimedia hardware, Memory of Storage Devices, Communication Devices, Multimedia Software, Presentation and object generation tools, Video, sound, Image capturing Authoring Tools, Card and Page Based Authoring Tools.

Production and Planning of Multimedia building blocks, Text, sound (MIDI), Digital Audio, Audio File Formats, MIDI under Windows environment, Audio and Video Capture.

Macromedia products, Basic drawing techniques, Advance animation techniques, Creating Multi layer combining interactivity and multiple scenes, Creating transparency effects using text in Flash, Flash animation.

Digital Audio Concepts, Sampling variables, Loss Less compression, of sound, Lossy compression and Silence compression.

Multimedia monitor bitmaps, Vector drawing , Lossy graphic compression, Image file formatic animations, Image standards, JPEG compression, Zig Zag coding. Video representation, colors, video compression, MPEG standards, MHEG standard, recent development in multimedia. Multimedia Application Planning, Costing, Proposal preparation, and Financing-Case study of a typical industry.

References:

1. Andreas Halzinger, "Multimedia Basics" Vol-I to VOL-III Firewall Media
2. Tay Vaughan, "Multimedia Making It work" Tata McGraw Hill
3. Buford, "Multimedia Systems" Addison Wesley
4. Agarwal and Tiwari, "Multimedia Systems" Excel
5. Rosch, "Multimedia Bible" Sams Publishing
6. Digital Multimedia "Nigel Chapman" Wiley dreamtech India Pvt. Ltd.
7. Sleinreitz, "Multimedia Bible" Sams Publishing
8. Ken Milburn, John Ckroteau, "Flash 4 Web special Effects, Animation and Design Handbook" Dreamtech Press
9. John. Villamil-Casanova and Louis Molina, "Multimedia-Production, Planning and Delivery" PHI
10. Flash MX 2004 Bible: Robert , Wiley dreamtech India Pvt. Ltd.

S. No	Course No.	Subject	Evaluation – Scheme									Credit
			Period			Sessional			Examination			
			L	T	P	TA	CT	TOT	ESE	Sub. Total		
Theory												
2.	SET/CSE/BCA/C402	Operating System Organization & UNIX	4	-	-	10	20	30	70	100	4	

Operating system Organization & UNIX

Operating system- definition, simple batch system, Time sharing system, Real time system, storage hierarchy, operating system service.

Process concept, process Scheduling, operating on process, co-operating process.

CPU Scheduling concepts, Scheduling algorithms, process synchronization, critical section problem, synchronization hardware, semaphores.

Deadlocks, deadlock characterization, deadlock prevention, avoidance detection and recovery.

Storage management Resident monitor, Logical versus physical address space, swapping, and segmentation, SCM.

Virtual memory, Demand paging, page replacement and page replacement algorithms, allocation of frames, thrashing.

File System: File supports, access methods, allocation methods-contiguous, linked and index allocation, directory system – single level, tree structured, acyclic graph and general graph directory, file protection.

Secondary storage structure: Disk structures, disk scheduling disk management, allocation methods, free space management.

Case study of the UNIX system: design principles, programmer and user interface, process, memory and file management.

References:

1. Peterson Abraham & Silbesschatz, Peter Galvin: Operating system concepts. .
2. Mandnick and Donovan : Operating system (Mc–Graw Hill) 1996.
3. Tanenbaum A.S. : Modern Operating system, (PHI) 1998.
4. Growley, : Operating system a design Approach .

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

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 BottomUp 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

S. No	Course No.	Subject	Evaluation – Scheme								Credit
			Period			Sessional			Examination		
			L	T	P	TA	CT	TOT	ESE	Sub. Total	
Theory											
4.	SET/CSE/BCA/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.
5. Jerry Banks, *Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice*, Wiley Inter Science, 1998.
6. J. Banks, J.S. Carson, B.L. Nelson, *Discrete Event System Simulation*, 4th Ed., Prentice Hall of India, 2004.
7. N.A. Kheir, *Systems Modeling and Computer Simulation*, Marcel Dekker, 1988.
8. B.P. Zeigler, T.G. Kim, and H. Praehofer, *Theory of Modeling and Simulation*, 2nd Ed., Academic Press, 2000.

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/BCA/DSE1	DSE1A	4	-	-	10	20	30	70	100	4

DSE 1A.1 Advance RDBMS

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

File processing system. File Management system. Components of RDBMS. Database Architecture. Object Oriented Databases. Distributed Databases. Client/server database. Data Dictionary. Database models. Normalization. The Database Administration. Database Manager responsibilities. Monitoring Database performance. Database Machine overview.

Designing RDBMS for organization. Object modeling. Perspectives of Data Modelling.

Evolving the logical model. Transformation from Logical to Physical model.

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control. CODD's 12 rules for a fully relational DBMS.

Data Integrity. Redundancy. Primary and Foreign keys.

Object database management. Database design and choosing the database server.

SQL and MySQL. Database access and ODBC.

Middleware: Kinds of middleware. Sockets-talking to database, virtual database engine defined, web based middleware, Microsoft JET engine,

Database security and Recovery. Data Mining and Warehouse.

References:

1. Adv. DBMS by V.K. Jain, Cyber Tech Publication, 5A/13 Ansari Road, Daryaganj, N.Delhi.- 110002
2. Date C.J. "An Introduction to Database System". Addison Wesley
3. Korth, Silbertz, Sudarshan, "Database Concepts" McGraw Hill
4. Elmasri, Navathe, "Fundamentals of Database Systems" Addison Wesley
5. Paul Beynon Davis, "Database Systems" Palgrave Macmillan
6. Bipin C. Desai, "An introduction to Database Systems", Galgotia Pub.

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 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 Sproul, "Principle of to 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

S. No	Course No.	Subject	Evaluation – Scheme								Credit
			Period			Sessional			Examination		
			L	T	P	TA	CT	TOT	ESE	Sub. Total	
Theory											
2.	SET/CSE/BCA/DSE2	DSE2A	4	-	-	10	20	30	70	100	4

DSE 2A.1 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.

DSE 2A.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 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											
4.	SET/CSE/BCA/DSE3	DSE3A	5	1	-	10	20	30	70	100	6

DSE 3A.1 Fuzzy Logic & Neural Network

Statistical concepts and Reasoning theories. Probability and Bayes' Theorem. Certainty factors and Rule-Based systems. Bayesian networks.

Working of Human Mind. Discourse and Pragmatic processing. Semantic Nets and Frames. Fundamentals of Neural networks and Building techniques. Discovery and Analogy. Neural net learning and Genetic learning. Formal learning theory.

A.I. techniques, pattern recognition, Level of, speech recognition representation in A.I. properties of internal representation. Introduction to Predicate Calculus: Predicates and Arguments, connectives, Simplifications of strategies, extracting answers from Resolution Refutation. Control strategies.

Dempster-Shafer Theory. Parallelism in Reasoning system. Distributed reasoning systems. Default reasoning, default logic. Logics for non monotonic reasoning. Symbolic techniques for representing and using uncertain knowledge. Definition, Concept, and framework of Fuzzy Logic. Fundamental changes to the idea about Set membership and corresponding changes to the definition of Logic Operations. Defining fuzzy sets, used in representing a list of Propositions.

Commonsense ontologies. Memory organization. Case based reasoning. Perception. Robot Architectures. Graphical representation of networks. Matching. Forward and backward production system. Using deduction systems to generate Robot Plans. Heuristic graph search process .

Real Life Applications of Fuzzy Logic and Neural Networks.

References:

1. Principles of Artificial Intelligence. By Nils J. Nilsson, Narosa Publishing House, N.Delhi.
2. Artificial Intelligence Elaine Rich, Tata MC Graw, N.Delhi.
3. 3.Principal of Artificial Intelligence, Nelson, Springer-Verlag.
4. P. Hajek, Metamathematics of Fuzzy Logic, Kluwer Academic Publishers.
5. Harris, J., An Introduction to Fuzzy Logic Applications, Kluwer Academic Publishers, Dordrecht, 2000, ISBN 0-7923-6325-6.
6. Investment in Mutual Funds using Fuzzy Logic By Kurt E. Peray, Foreword by Chemical Publishing Co., Inc., New York.

DSE 3A.2 Distributed and Parallel Computing

Parallel and high-performance computers, Models and parallel computers, Basic communication operations, Performance and scalability, MPT and open MP programming.

Distributed processing potential, Forms of Distributed processing strategies, Hexagon Distributed computing, client server model.

References:

1. Kumar, Grama, Gupta and Karypis : Introduction to Parallel Computing, Benjamin Benjamin Cummings Publishing Co.
2. Tannanbaum, A.S. : Computer Networks, prentice-Hall.
3. Martin, J : Design and Strategy for Distributed Data Processing, Prentice Hall.
4. Martin, J. : Computer Networks and Distributed Processing, Prentice-Hall.
5. Stallings, William : Local Networks; An Introduction Macmillan publishing Co.

DSE 3A.3 Artificial Intelligence

Introduction: Definition and meaning of artificial intelligence, A.I. techniques, pattern recognition, Level of, speech recognition representation in A.I. properties of internal representation.

Production System: Different types of tracing, strategies, graph search strategies, Heuristic graph, search procedure, AND/OR graph, relationship between decompositional and compatible systems, searching Gate Tree, min-max search game playing, actual game playing.

Introduction to Predicate Calculus: Predicates and Arguments, connectives, Simplifications of strategies, extracting answers from Resolution Refutation. Control strategies.

Rule Based Deduction Systems: Forward and backward deduction system, resolving with AND/OR graph, computation, deduction and program synthesis, central knowledge for rules based deduct systems.

Managing Plans of Action: Plan interpreter, planning decisions, execution monitoring and re-planning domain of application robot motion planning and game playing.

Structural Object Representation: Semantic networks semantic market matching deductive operations on structured objects.

Architectural for A.I. Systems: Knowledge, acquisitions representation IMAGES PROCESSING, Natural language processing.

References:

1. Introduction to artificial Intelligence Eugene Charnik Drew MC mott
2. Artificial Intelligence Elaine Rice.
3. Principal of Artificial Intelligence, Nelson, Springer-Verlag.
4. Artificial Intelligence Application Programming: Tim Jones, Wiley dreamtech

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

DES4A.1 Software Project Management

Introduction and Software Project Planning Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

Project Organization and Scheduling Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts. Project Monitoring and Control Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

Software Quality Assurance and Testing Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

Project Management and Project Management Tools Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. Software Project Management by M. Cotterell
2. Information Technology Project Management

DES4A.2 NATURAL LANGUAGE PROCESSING

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, 2/e, Pearson Education, 2003
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education, 2002
4. L.M. Ivasca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

DES4A.3 Unix & Shell Programming

Basic Unix Commands: The Unix editors and vi; Redirection, Piping, Tees and filters; The Unix Utilities grep, sed, etc.

Overview of Unix Architecture: The kernel and the Shell; Processes and Time Sharing files and Directories; Peripheral Device as files.

Introduction the Shell Scripts: The Bourne and C-shells; Shell variables, scripts meta-characters and environment; the if and case statements; for, while and until loops.

System calls and the 'C' library: Discussion of the Unix system calls and 'C' library functions, the standard I/O Package; file handling; math library; command line parameters etc. The Unix 'C' interface; 'C' files and Graphics.

Introduction of systems Administration under Unix: The system Manger OLE and functions.

Different Tools: Debugging language development, System development different print formatting UNIX Tools.

Bourne Shell: Shell meta characteristics, shell variable, scripts, facilities, commands and environments, shell archive, idea about restricted shell, ROLC program.

Korn Shell: Shell variables and scripts, built in EDITOR, built in integer arithmetic, string manipulation capabilities, Command Aliasing, Array Job control.

C-Shell: Shell variables and scripts, shell facilities, history Integer Arithmetic Decision making and job control.

References:

1. Stephan Prata : Advanced Unix – A Programmers Guide – BPB PUB.
2. Kernighlan & Pike : The Unix Programming Environment – PHI.
3. The Unix System Manuals.

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

DES5A.1 Compiler Designing

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler.

Programming Language: High level languages, lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission. Lexical Analysis: The role of Lexical Analyzer, A Simple approach to the design of Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer.

The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of EFG.

Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive descent Parsers, Predictive Parser, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC

Intermediate Code Generation: Different Intermediate forms: Three address code, Quadruples & Triples, Syntax Directed Translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management.

Error Detection and Recovery: Lexical phase errors. Syntactic phase errors, semantic errors.

Code Optimization and Code Generation: Local optimization, Peephole optimization, Basic blocks and flow Graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.

References:

1. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa
2. A.V. Aho, R. Sethi and J.D.Ullman, "Compiler Principle, Tech & tools" AW
3. H.C. Holub "Compiler Design in C", Printice Hall Inc.
4. Apple, "Modern Computer Implementation in C: Basic Design" Cambridge Press
5. Modern Compiler Design: Dick Grune, Wiley dreamtech India Pvt. Ltd.
6. Starting Out with Modern Compiler “ David Gaddis Wiley dreamtech India Pvt. Ltd.

DES5A.2 Human- Computer Interaction

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design,

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Software tools – Specification methods, interface – Building Tools.

Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

References:

1. Human – Computer Interaction. Alan Dix, Janet Finckay, Greg Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech,
3. User Interface Design, Soren Lauesen , Pearson Education.

DES5A.3 Unified Modeling Language

Introduction: The Evolution of Technology, Structured Analysis and Design, Object-Oriented Technologies, Comparison between the main technologies.

The Unified Process and Features: Unified Process, Static Structure: Process Representation, Dynamic Structure: iterative development, an architecture-centric process, A use-case-driven process, Use case models, Notations and Terminology.

Process Components (Workflows): Business Modeling Workflow, Requirement Workflow, Analysis and Design Workflow, Deployment workflow.

Understanding Object –Oriented Technologies, Current status of Object Technologies, The static object model- Class, Collaborations and Object Diagrams, Generalization, Composition, Aggregation, Multiplicity & Association with concept and examples.

Use Case Analysis: Discussion on use cases, terminology, notations and analysis, what they are and aren't, Use case- an example, Use case- formal Scenario template.

Static chart Diagram: Composite states, nested states, Events, Simple transitions.

UML Activity and sequence diagrams: Usage and Syntax, Guarded Transitions, Synchronization Bars, Swim lanes Purpose, Proper Usage of Activity diagram. Transition time sequence diagram: Objective and Modeling guidelines, Objective Interaction, Sequence diagram- UML notation, Object and Stereotypes.

References:

1. UML distilled by Martin Fowler- Pearson Education.
2. Object –Oriented Modeling by James Raumbaugh, PHI.
3. UML a nutshell by Dan Pillone, O'Reilly Publication.
4. The elements of UML by Scott Amber, Cambridge University Press.
5. Designing Object-Oriented Software by Rebecca Wirf Brock, PHI.

S. No	Course No.	Subject	Evaluation – Scheme								Credit
			Period			Sessional			Examination		
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3.	SET/CSE/BCA/SEC4	SEC 4A	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 associativity

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, Addition Paperback, Addison-Wesley Professional,2008.
5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014.