Integrated BCA-MCA

SYLLABUS

Department of Computer Science & Informatics

UNIVERSITY OF KOTA, KOTA

Important information about the course

Course Name	Duration of Course	Course Fee	Number of Seats	Remark
Integrated BCA-MCA (As per UGC Norms)	4 year (8 Semester)	Rs 17000/- Per annum (Rs. 8500/- Per semester)	60 seats	1. Reservation in admission as per University norms and State Govt norms. 2. Course passing scheme and other conditions are the as per University rules.

NEWCOURSE STRUCTURE

To be effective from academic session 2020- 21

Based on CBCS & OBE model Recommended scheme of study for

Integrated BCA-MCA Programme (Course Structure)

Semester - I

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Fundamental Science (FS)	BMCA-101	Basic Mathematics	3	1	0	3
2		BMCA-102	Environmental Science	3	1	0	3
3	Humanities & Social Sciences (HSS)	BMCA-103	Business Communication/ Communication Skills/ Technical Communications	3	1	0	3
4		BMCA-104	Essentials of Web Designing	3	1	0	3
5	Core Computer Science (CCS)	BMCA-105	Programming with C	3	1	0	3
6		BMCA-106	Fundamentals of IT	3	1	0	3
7	Programming Core (PC)	BMCA-107	Programming Lab in C	0	0	4	2
8		BMCA-108	Programming Lab in IT	0	0	4	2
9	(HSS)	BMCA-103	Communication Skills Lab	0	0	4	2
					Total Credits		**24**

Semester - II

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Fundamental Science (FS)	BMCA-201	Discrete Mathematical Structures	3	1	0	3
2		BMCA-202	Computer Oriented Numerical and Statistical Methods	3	1	0	3
3	Humanities & Social Sciences (HSS)	BMCA-203	Managerial Economics	3	1	0	3
4	Core Computer Science (CCS)	BMCA-204	System Programming	3	1	0	3
5	MOOC	BMCA-205	Data Structures	3	1	0	3
6	Core Computer Science (CCS)	BMCA-206	Digital circuit &Logic Design	3	1	0	3
7	Programming Core (PC)	BMCA-207	Programming Lab in CONM	0	0	4	2
8		BMCA-208	Programming Lab in Data Structure	0	0	4	2
9		BMCA-203	Programming Lab inSystem Programming	0	0	4	2
					Total Credits		**24**

Semester - III

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Humanities & Social Sciences (HSS)	BMCA-301	Organization Behaviour	3	1	0	3
2	Core Computer Programming (CCS)	BMCA-302	Object oriented Programming	3	1	0	3
3		BMCA-303	Computer System and Architecture	3	1	0	3
4	Core Computer Science (CCS)	BMCA-304	Python Programming	3	1	0	3
5		BMCA-305	Electronic Commerce & Applications	3	1	0	3
6		BMCA-306	Database Management System	3	1	0	3
7	Programming Core (PC)	BMCA-307	Programming Lab in C ++	0	0	4	2
8		BMCA-308	Programming Lab in Python Programming	0	0	4	2
9		BMCA-303	Lab on DBMS with PHP	0	0	4	2
Total Credits							**24**

Semester - IV

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Humanities & Social Sciences (HSS)	BMCA-401	Probability & Stastics	3	1	0	3
2		BMCA-402	Automata Theory	3	1	0	3
3	Core Prog.	BMCA-403	JAVA Programming	3	1	0	3
4	Core Computer Science (CCS)	BMCA-404	Computer Graphics	3	1	0	3
5		BMCA-405	Computer Networks	3	1	0	3
6		BMCA-406	Cloud Computing	3	1	0	3
7	Programming Core (PC)	BMCA-407	Programming Lab in JAVA	0	0	4	2
8		BMCA-408	Programming Lab in CG	0	0	4	2
9		BMCA-403	Seminar I	0	0	4	2
Total Credits							**24**

Semester - V

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Humanities & Social Sciences (HSS)	BMCA-501	Legal Privacy and Security in E-Commerce	3	1	0	3
2	Core Prog. Core Computer Science (CCS)	BMCA-502	Design and Analysis of Algorithms (DAA)	3	1	0	3
3		BMCA-503	Operating System	3	1	0	3
4		BMCA-504	Software System analysis & Project Management	3	1	0	3
5		BMCA-505	System Simulation and Modeling	3	1	0	3
6	MOOC	BMCA-506	Artificial Intelligence	3	1	0	3
7	Programming Core (PC)	BMCA-507	Lab on OS (Windows/Linux/Unix)	0	0	4	2
8		BMCA-508	Lab on SSAPM	0	0	4	2
9		BMCA-503	Technical Report Writing & Presentation based on summer project I	0	0	4	2
						Total Credits	**24**

Semester - VI

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Humanities & Social Sciences (HSS)	BMCA-601	Quantitative methods for Business Decision/ Analytics	3	1	0	3
2	Core Prog.	BMCA-602	Internet and Web Technology	3	1	0	3
3	Core Computer Science (CCS)	BMCA-603	Distributed Databases	3	1	0	3
4		BMCA-604	Introduction to Data Science	3	1	0	3
5		BMCA-605	Network Security and Cryptography	3	1	0	3
6	Elective	BMCA-606	Data Mining and Warehousing	3	1	0	3
7	Programming Core (PC)	BMCA-607	Lab on Distributed Data Base	0	0	4	2
8		BMCA-608	Lab on Internet and Web Technology	0	0	4	2
9		BMCA-603	Seminar II	0	0	4	2
						Total Credits	**24**

Semester - VII

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Humanities & Social Sciences (HSS)	BMCA-701	Decision Support Systems	3	1	0	3
2	Core Prog. Core Computer Science (CCS)	BMCA-702	Soft Computing	3	1	0	3
3		BMCA-703	Software Engineering	3	1	0	3
4		BMCA-704	Internet of Things(IoT)	3	1	0	3
5	Elective	BMCA-705	**Elective- I** Decesion Theory Natural Language Processing	3	1	0	3
6		BMCA-706	**Elective-II** Wireless Technologies Network Programming	3	1	0	3
7	Programming Core (PC)	BMCA-707	Lab on Soft Computing	0	0	4	2
8		BMCA-708	Lab on (Minor Project)	0	0	4	2
9		BMCA-703	Technical Report Writing & Presentation based on summer project II	0	0	4	2
						Total Credits	**24**

Semester - VIII

S no	Category of Course	Course Code	Courses	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits
				L (Periods/week)	T (Periods/week)	P (Periods/week)	C
1	Core Computer Science (CCS)	BMCA-801	Big Data Analytics	3	1	0	3
2	Elective	BMCA-802	**Elective-3** Digital Image Processing Machine Learning	3	1	0	3
3		BMCA-803	**Elective-4** Software Testing Parallel Computing	3	1	0	3
4		BMCA-804	**Elective-5** Distributed Computing Advanced Operating Systems	3	1	0	3
5	Project	BMCA-805	Major Project	0	0	12	6
6		BMCA-806	Elective Lab	0	0	4	2
7		BMCA-807	Big Data Lab (DOOP)	0	0	4	2
						Total Credits	**22**

Category of Course	Courses Name
Humanities & Social Sciences (HSS) **(CBCS)**	Business Communication/ Communication Skills/ Technical Communications
	Essentials of Web Designing
	Communication Skills Lab
	Managerial Economics
	Organization Behaviour
	Probability & Stastics
	Automata Theory
	Legal Privacy and Security in E-Commerce
	Quantitative methods for Business Decision/ Analytics
	Decision Support Systems

Fundamental Science (FS) **(CBCS)**	Basic Mathematics
	Environmental Science
	Discrete Mathematical Structures
	Computer Oriented Numerical and Statistical Methods

Core Computer Science (CCS)	Programming with C
	Fundamentals of IT
	System Programming
	Digital circuit &Logic Design
	Object oriented Programming
	Computer System and Architecture
	Python Programming
	Electronic Commerce & Applications
	Database Management System
	Computer Graphics
	Computer Networks
	Cloud Computing
	Design and Analysis of Algorithms (DAA)
	Operating System
	Software System analysis & Project Management
	System Simulation and Modeling
	Distributed Databases
	Introduction to Data Science
	Network Security and Cryptography
	Soft Computing
	Software Engineering
	Internet of Things(IoT)
	Big Data Analytics

Programming Core (PC)	Programming Lab in C
	Programming Lab in IT
	Programming Lab in CONM
	Programming Lab in Data Structure
	Programming Lab in System Programming
	Programming Lab in C ++
	Programming Lab in Python Programming
	Lab on DBMS with PHP
	Programming Lab in JAVA
	Programming Lab in CG
	Seminar I
	Lab on OS (Windows/Linux/Unix)
	Lab on SSAPM
	Technical Report Writing
	Lab on Distributed Data Base
	Lab on Internet and Web Technology
	Seminar II
	Lab on Soft Computing
	Lab on (Minor Project)
	Technical Report Writing II
Core Prog.	JAVA Programming
	Internet and Web Technology

CCS & MOOC	Data Structures
	Artificial Intelligence

Elective	Data Mining and Warehousing
	Elective- I Decesion Theory Natural Language Processing
	Elective-II Wireless Technologies Network Programming
	Elective-3 Digital Image Processing Machine Learning
	Elective-4 Software Testing Parallel Computing
	Elective-5 Distributed Computing Advanced Operating Systems

Project	Major Project
	Elective Lab
	Big Data Lab (DOOP)

*** (For details, please visit MHRD-SWAYAM Portal).**

Program Educational Objectives (PEOs)

PEO1: To excel in software development skills coveted in the IT industry.

PEO2: To be well prepared for pursuing higher studies in related fields of teaching and research.

PEO 3: To be aware of the requirements of being an ethical and professional leader and inculcating team spirit.

PEO4: To inculcate the ability to innovate and contribute towards the growth of the nation.

Programme Outcomes(POs)

PO1: Attain problem solving attitude in systematic and timely manner.

PO2: Apply knowledge of mathematics, algorithm and computing principles appropriately to solve real-world problems.

PO3: Identify modern tools and techniques through critical thinking for solving complex problems.

PO4: Use the computational resources efficiently to develop software for the industry need.

PO5: Understand and assess societal, environmental, safety, legal and ethical norms for professional computing practices.

PO6: Function as an individual or as a member in team in the software domain.

PO7: Recognize the need for self-motivation, learning and unlearning to engage in life-long learning for continual development.

PO8: Excel in descriptive oral, written communication and presentation skills required for documenting and delivering project artefacts effectively.

Course code: BMCA-101

Course title: BASICMATHEMATICS

UNIT I

Sets and Relations: Sets and their representations, The empty set, Finite and Infinite set, Equal and equivalent set, Subset; powerset; Universalset; Venndiagrams; Operations on sets; Complement of a set; Cartesian product, Relation, Inverse Relation, Composition of relation, Equivalence of relations and Classes.

UNIT II

Functions and Binary Operations: Functions as a set, Representation of function, Types of Functions, Functions applicable in Computer Science: Integer function, Factorial function, Absolute, Characteristic, Floor, Ceiling, Remainder, Boolean, Exponential, Logarithmic, Hashing functions and Binary operation on a set.

UNIT III

Abstract Algebra: Group, Subgroup, Order of group, cyclic group and Simple theorems, Ring, Integral domain, Field and Simple theorem related to Integral domain and field.

UNIT IV

Matrices Algebra: Definition of matrix, Operations on matrices, Square matrix and its inverse, Inverse of a matrix by Row operation, Rank of matrix by Echelon form, Solution of a System of Linear Simultaneous equation by matrix method, Eigen value and Eigen vector, Caley Hamilton theorem (without proof), to find the inverse of a non-singular matrix using Caley-Hamilton theorem.

UNIT V

Differential Calculus: Successive differentiation, Leibnitz Theorem, Partial derivative, Partial derivative of Higher orders, Homogeneous function, Euler's Theorem on Homogeneous functions.

Differential equation: Definition of Differential equation, Order and degree of a differential equation, Linear differential equation and Equation of Higher Order Linear differential equation with constant coefficients, Partial differential equations, Order and degree of partial differential equation, Lagrange's Linear Equations, Linear Homogeneous partial differential equation.

Books Recommended:

TEXT BOOK

1. Vasishtha A.R., "Modern Algebra", Krishna Prakashan Media (P) Ltd, Meerut, 2006.**(T1)**
2. Vasishtha A.R, "Matrices", Krishna Prakashan Media (P) Ltd, Meerut, 2006.**(T2)**
3. DasH.K., "Advanced Engineering Mathematics", S. Chand,2009.**(T3)**

REFERENCE BOOK

1. KolmanB., BusbyR. C., and RossS. C., "Discrete Mathematical Structures", 6th Edition, Prentice Hall of India,2008.**(R1)**
2. ShethH., "Abstract Algebra", PHI,2009.**(R2)**
3. GrewalB. S., "Higher Engineering Mathematics", Khanna Publishers,2000.**(R3)**

Course code: BMCA-102

Course title: ENVIRONMENTAL SCIENCE

UNIT I

Ecosystem and Environment

Concepts of Ecology and Environmental science, ecosystem: structure, function and services, Biogeochemical cycles, energy and nutrient flow, ecosystem management, fate of environmental pollutants, environmental status and reports on climate change.

UNIT II

Air Pollution

Structure and composition of unpolluted atmosphere, classification of air pollution sources, types of air pollutants, effects of air pollution, monitoring of air pollution, control methods and equipment for air pollution control, vehicular emissions and control, indoor air pollution, air pollution episodes and case studies.

UNIT III

Water Pollution

Water Resource; Water Pollution: types and Sources of Pollutants; effects of water pollution; Water quality monitoring, various water quality indices, water and waste water treatment: primary, secondary and tertiary treatment, advanced treatments (nitrate and phosphate removal); Sludge treatment and disposal.

UNIT IV

Soil Pollution and Solid Waste Management

Lithosphere – composition, soil properties, soil pollution, ecological & health effects, Municipal solid waste management – classification of solid wastes, MSW characteristics, collection, storage, transport and disposal methods, sanitary landfills, technologies for processing of MSW: incineration, composing, pyrolysis.

UNIT V

Noise pollution & Radioactive pollution

Noise pollution: introduction, sources: Point, line and area sources; outdoor and indoor noise propagation, Effects of noise on health, criteria noise standards and limit values, Noise measurement techniques and analysis, prevention of noise pollution; Radioactive pollution: introduction, sources, classification, health and safety aspects, Hazards associated with nuclear reactors and disposal of spent fuel rods-safe guards from exposure to radiations, international regulation, Management of radioactive wastes.

Books recommended

TEXT BOOK

1. A, K. De., "Environmental Chemistry", New Age Publications India Ltd., 3rd Edition, 2008.**(T1)**
2. R. Rajagopalan,"Environmental Studies: From Crisis to Future", 3rd Edition, Oxford University Press,2016.**(T2)**
3. Eugene P. Odum., "Fundamentals of Ecology", 3rd Edition, WB Sunders Company, Philadelphia,1971.**(T3)**
4. C. N. Sawyer, P. L. McCarty and G. F. Parkin, "Chemistry for Environmental Engineering and Science", John Henry Press,2002.**(T4)**
5. S.C. Santra,"Environmental Science", New Central Book Agency, 2011.**(T5)**

REFERENCE BOOK

1. D.W. Conell,"Basic Concepts of Environmental Chemistry", CRCPress.**(R1)**
2. Peavy,H.S,Rowe,D.R,Tchobanoglous,G.,"EnvironmentalEngineering",Mc-Graw - Hill International. **(R2)**
3. G.M. Masters & Wendell Ela,"Introduction to Environmental Engineering and Science", PHI Publishers,1991.**(R3)**

Course code: BMCA-103
Course title: BUSINESS COMMUNICATION

Unit - I:

Introduction to Business Communication:

Importance and Objectives of Business communication, Process of communication, Barriers to effective communication, Techniques of effective communication. Forms of communication (Written, Oral, audio-visual communication).

Unit - II:

Managing Business Communication:

Formal and Informal communication, Non- verbal communication (Body language, Gestures, Postures, Facial expressions). The cross-cultural dimensions of business communication. Techniques to effective listening, methods and styles of reading.

Unit - III:

Other aspects of communication:
Vocabulary:

Single word substitution, Idioms and phrases, Precis writing, Comprehension.
Group Discussions, Extempore, Principles of effective speech and presentations, Role-playing.

Unit - IV:

Introduction to managerial writing:

Business letters: Inquiries, Circulars, Quotations, Orders, Acknowledgement, Claims & adjustments, Collection letters, Sales letters, Drafting of different resumes, Covering letters Applying for a job, Social correspondence, Invitation to speak.
Official Correspondence: Memorandum, Notice, Agenda, Minutes, Circular letters.

Unit - V:

Report writing and Technical Proposals:

Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, checklists for reports.
Technical proposals, Definitions, types and format.

Books recommended:

TEXT BOOK

1. "Communication Skills", Sanjay Kumar &PushpLata, Oxford University Press. **(T1)**
2. "Business Correspondence and Report Writing", R.C.Sharma, Krishna Mohan, McGraw Hill. **(T2)**
3. "Communication for Business", Shirley Taylor, V. Chandra, Pearson. **(T3)**

REFERENCE BOOK

1. "Business Communication", HorySankar Mukherjee, Oxford University Press. **(R1)**
2. "Basic Business Communication", Lesikar I Flatley, McGraw Hill. **(R2)**
3. "Business Communication Today", Bovee, Thill and Chaterjee, Pearson. **(R3)**

Course code: BMCA-104
Course title: Essential of web designing

Unit-I

Web Design Principles: Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing, Designing navigation bar, Page design, Home Page Layout, Design Concept, Basics in Web Design, Brief History of Internet, What is World Wide Web, Why create a web site, Web Standards, Audience requirement.

Unit-II

Introduction to HTML, What is HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags, Elements of HTML

Unit-III

Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

Unit-IV

Introduction to Cascading Style Sheets, Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align,Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs.

Unit-V

Introduction to Web Publishing or Hosting, Creating the Web Site, Saving the site, Working on the web site, Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

Text Books

1. HTML 5 in simple steps, Kogent Learning Solutions Inc., Dreamtech Press
2. A beginner's guide to HTML, NCSA,14th May,2003
3. Creating a Web Page and Web Site, Murray,Tom/Lynchburg, College,2002
4. Beginning CSS: Cascading Style Sheets for Web Design, Ian Pouncey, Richard York, Wiley India

Course code: BMCA-105

Course title: PROGRAMMING WITH C

Unit – I:

Problem Solving and Programming Concepts: Problem Solving in Everyday Life, Types of Problem, Problem Solving with Computers- Algorithms & Flow-Charts, Data Storage and Communication with Computer, Organizing the Problem, Computer Software and Software Development Method.

Unit – II:

Overview of C: C Language Elements, Variable Declaration, Data Types, Expressions, DataFiles.

Top-Down Design with Functions: Top-Down Design and Structure Charts, Functions withoutArguments, Functions with Input Arguments.

Selection Structures: Problem Solving with Decisions, Control Structures, Conditions, All kindsof if statements, Switch statement.

Repetition and Loop Statements: Problem Solving with Loops, Repetition in Programs, whileStatement, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement and Flag Controlled Loops.

Unit – III:

Modular Programming: Functions with Simple Output Parameters, Multiple Calls to a Functionwith Input/Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments. **Arrays:** Declaring and Referencing Arrays, Array Subscripts, Using for Loops for SequentialAccess, Using Array Elements as Function Arguments, Array Arguments, Multidimensional Arrays.

Unit – IV:

Strings: String Basics, String Comparison, Arrays and Pointers, Arrays of Pointers, CharacterOperations, String-to-Number and Number-to-String Conversions.

Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive MathematicalFunctions, Recursive Functions with Array and String Parameters, Problem Solving with Recursion.

Unit – V:

Structure and Union Types: User-Defined Structure types, Structure Type Data as Input andOutput Parameters, Functions Whose Result Values are Structured, Problem Solving with Structure Types, Union types.

File Processing and Programming in the Large: Input and Output Files, Binary Files, UsingAbstraction to Manage Complexity, Header Files, Implementation Files, Storage Classes, Macros, Command Line Arguments.

Books recommended:

TEXT BOOK

1. Sprankle M., "Problem Solving and Programming Concepts", 7th Edition, Pearson Education, New Delhi, 2006.**(T1)**
2. Hanly J.R.,&Koffman E.B., "Problem Solving and Program Design in C", 4thEdition, Pearson Education, New Delhi, 2004.**(T2)**

REFERENCE BOOK

1. Venugopal K R, Prasad S R "Mastering C", Tata McGraw Hill, New Delhi,2007.**(R1)**
2. Balagurusamy E. "Programs in ANSI C", 3rd Edition, TMH, New Delhi-2004.**(R2)**
3. Frozen B.A. &Gilberg R.F. "Computer Science: A structured Programming Approach
4. Using C", 2nd Edition, Brooks/Cole- Thomson Learning, Indian Reprint, 2003. **(R3)**

Course code: BMCA-106

Course title: FUNDAMENTALS OF IT

Unit-I

Introduction to Computers: Basics of computer , Characteristics of computers, Limitations of computers, System Components, Input devices, Output devices, Computer Memory, Central Processing Unit, Mother Board, Computer Generations & Classifications: Evolution of computers, Classification of Computers, Types of Microcomputers Distributed Computer

Unit-II

Number Systems and Boolean algebra: Decimal, Binary, Octal, Hexadecimal, Converting Techniques in Number systems, 1's Complements, 2's Complements, Computer Codes, Rules and Laws of Boolean algebra, Basic Gates (NOT, AND & OR), Logical Circuits: Combinational Circuits, Sequential Circuits, Flip Flops, Shift registers, Types of shift registers, Counters

Unit-III

Computer Memory: Memory System, Memory Cells, Memory Arrays, Random Access Memory (RAM) Read Only Memory (ROM), Physical Devices Used to construct Memories, Bus, Bus Interface, Industry standard architecture (ISA), Micro Channel Architecture (MCA), VESA (Video Electronics Standards Association, Peripheral component Interconnect, Accelerated graphics Port, FSB, USB, Dual Independent Bus, Troubleshooting

Unit-IV

Introduction to Computer Software: Computer Software, Overview of different operating systems, Overview of different application software, Overview of proprietary software, Overview of open source technology. Operating System Concepts: Operating System Concepts, Functions of Operating System, Development of Operating System, Operating system virtual memory, Operating System Components, Operating System Services, Operating System Security

Unit-V

Internet and Its Working: History of Internet , Web browsers, Web servers, Hypertext Transfer Protocol , Internet Protocols Addressing, Internet Connection Types, How Internet Works. Internet and Its Uses: Internet Security, Uses of Internet, Virus, Antivirus, Cloud System, Cloud Technologies, Cloud Architecture, Cloud Infrastructure, Cloud Deployment Models

Text Books:

1. Fundamentals of Computers, V. Rajaraman, PHI
2. Computer Fundamentals, P K Sinha, BPB Publications

Course code: BMCA-107
Course title: PROGRAMMING LAB IN C

Syllabus as per BMCA 105

Books recommended:

TEXT BOOK

1. Jery R Hanly, "Problem solving and Program design in C", Paerson Education, 7th Edition.
2. **(T1)**
3. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw-Hill. **(T2)**
4. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill. **(T3)**
5. R.G.Dromey, How to Solve it by Computer, Pearson Education. **(T4)**

REFERENCE BOOK

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", PrenticeHall India Learning Private Limited.**(R1)**

Semester II

Course code: BMCA-201
Course title: DISCRETE STRUCTURES

UNIT I

Sets and Propositions: Sets, Operations of sets, Finite and Infinite sets, Principle of inclusion and exclusion, Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, Mathematical Induction.

UNIT II

Relations and Functions: Relations, Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence relations. Functions, Types of functions, Composition of functions, Invertible functions.Permutations and Combinations, Pigeonhole Principle, Recurrence Relation.

UNIT III

Partially Ordered Sets: Introduction, Elements of Partially Ordered Sets, Lattices.

UNIT IV

Graph Theory and Trees: Basic terminology, representation of a graph in computer memory, Relations and Digraphs, Paths in Relations and Digraphs, Shortest path in weighted graphs (Dijkstra's algorithm). Basic terminology and characterization of trees, Tree traversal, Spanning trees, Minimal Spanningtrees(Introduction).

UNIT V

Groups, Rings and Fields: Groups, Semi Groups, Monoids, Subgroups, Isomorphism and Homomorphism and Normal Subgroups, Rings, Integral Domain, Rings Homomorphism, Polynomial Rings, Fields.

TEXT BOOKS

1. KolmanB., BusbyR. and RossS., "Discrete Mathematical Structures", 6th Edition, PearsonEducation, 2002, ISBN81-7808-556-9.
2. DeoN., "Graph Theory with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 – 87692 – 145 –4.
3. JohnsonbaughR., "Discrete Mathematics", 5th Edition, Pearson Education, 2001 ISBN 81 –7808 – 279 – 9.

REFERENCE BOOKS

1. BiggsN., "Discrete Mathematics", 3rd Edition, Oxford University Press, ISBN 0 – 19 – 850717 – 8.
2. RosenKenneth H., "Discrete Mathematics and its Applications", 6th edition, McGraw-Hill, 2007, ISBN978-0-07-288008-3.
3. LipschutzSemyour & Lipson Marc, "Discrete Mathematics", McGraw-Hill, 3rd Special Indian Edition, ISBN-13:978-0-07-060174-1.
4. LiuC. L. and MohapatraD. P., "Elements of Discrete Mathematics", SiE Edition, Tata McGraw- Hill, 2008, ISBN10:0-07-066913-9.
5. LipschutzS. and LipsonM., Schaum's Outline of Discrete Mathematics,

Course code: BMCA-201
Course title: DISCRETE MATHEMATICAL STRUCTURE

Unit - I:
Introduction: Sets - Finite and Infinite sets, Functions, Relations, Properties of Binary Relations, Representation of relation, Closure operations, Equivalence and Partial order relations; Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

Unit - II:
Functions and its properties, Asymptotic notations and Growth of functions. Recurrences: Recurrence Relations, Solving the recurrence relation with constant coefficients, Solving the recurrence relation by using Generating functions.

Unit - III:
Group:Semi group, Group, Finite and infinite groups, Sub-groups, Cosets, Lagranges Theorem, Ring and Field, Vector, Vector space and subspace, Linear combination of vectors, Basis.
Coding: Codewords and code, Encoding and decoding function, Hamming distance, Error detection and correction of codes

Unit - IV
Graph Theory: Basic Terminology, Types of graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian graphs, Planar Graphs, Graph Colouring, Chromatic number and chromatic polynomial

Unit - V
Trees: Basic Terminologies and properties of Trees, Introduction to Spanning Trees, Minimum spanningtrees. Propositional Logic: Proposition, Logical operation and its properties, Tautologies, Equivalences

Books recommended:

TEXT BOOK

1. KolmanBusby and Ross Rehmann, Discrete Matheamatical Structures., 5/e, Pearson Education, 2006.
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Chakraborty S.K.and Sarkar B.K.,Discrete Mathematics, Oxford University Press, New Delhi, India, 2010(ISBN No.- 0-19-806543-4).

REFERENCE BOOK

1. BikashKanti Sarkar and Swapan Kumar Chakraborty, "Combinatorics and Graph Theory",PHI, 2016. **(R1)**
2. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics", Shaum's outlines, 2003.**(R2)**
3. C. L. LIU, "Elements of Discrete Maths", McGraw Hill, 2nd Edition, 2001. **(R3)**
4. Johnsonbaugh, R., "Discrete Mathematics", 6th Edition, Maxwell, Macmillan International.**(R4)**

Course code: BMCA-202
Course title: NUMERICAL AND STATISTICAL METHODS

Unit - I:
Errors and their computation: absolute, relative and percentage. Solution of algebraic & transcendental equations: Bisection method, False position method, Secant method, Newton's Raphson method, Iterative method, Error analysis and convergence study.

Unit - II:
Interpolation with equal & unequal intervals: Introduction, finite differences-forward, backward & central difference tables, Newton's formula for interpolation, Gauss's central difference interpolation formula, divided difference and their properties- Newton's divided differences formula, Lagrange's interpolation formula, Inverse interpolation. Numerical solution of linear system of equations: Direct Method-Gauss elimination, Gauss-Jordan, LU decomposition methods. Iterative Methods-Gauss-Jacobi and Gauss Seidel methods.

Unit - III:
Numerical differential & integration: Introduction, derivatives using forward and backward difference formula, Numerical Integration-Trapezoidal rule, Simpson's 1/3 & 3/8 rules, Weddle's rule. Numerical solution of ordinary differential equations: Taylor Series method, Euler's method, Modified Euler's method, Runge-Kutta methods of 2nd and 4th order.

Unit - IV:
Concepts of Probability:Experiment and Sample Space, Events and Operations with Events, Probability of an Event, Basic Probability Rules, Applications of Probability Rules, Conditional Probability, random variable:continuous and discrete**,** Mean, Variance and Standard Deviation of a Random Variable. Binomial Experiments:Structure of a Binomial Experiment, Binomial Probability Distribution, Use of Binomial Probability Table. Properties of a Normal Curve, Normal Probability Distribution, Areas Under a Normal Curve. Approximating a Binomial Probability, The Normal Theorem and the Central Limit Theorem.

Unit - V:
Estimation of Population Parameters:Parameter and Statistic, Point and Interval Estimation, Interval Estimation of Three Common Parameters. Hypothesis Testing for a Single Population:Concept of a Hypothesis, Tests Involving a Population Mean, Tests Involving a Population Proportion, Tests Involving a Population Standard Deviation. Concepts of a Bivariate Data Set, Correlation Coefficient, The Regression line.

Books recommended:

TEXT BOOK

1. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI, Private Ltd., New Delhi.**(T1)**
2. N.Pal& S. Sarkar, "Statistics: Concepts and Applications", PHI, New Delhi, 2005.**(T2)**

REFERENCE BOOK

1. R.V.Hogg et.al, "Probability and Statistical Inpane", 7th Edition, Pearson Education, New Delhi, 2006. **(R1)**
2. R.L.Burden&J.D.Faires, "Numerical Analysis", Thomson Learning-Brooks/Cole, IndianReprint, 2005. **(R2)**

Course code: BMCA-204
Course title: OPERATING SYSTEM

Unit – I

Overview of Operating Systems: OS and the Computer System, Efficiency, SystemPerformance and User Convenience, Classes of Operating Systems, Batch Processing Systems, Multiprogramming Systems, Time Sharing Systems, Real Time Operating Systems, Distributed Operating Systems, Modern Operating Systems.

Unit – II

Processes and Threads: Processes and Programs, Programmer view of Processes, OS view ofProcesses, Threads, Case studies of Processes and Threads.

Scheduling: Preliminaries, Non-preemptive Scheduling Policies, Preemptive Scheduling Policies,Scheduling in Practice, Real Time Scheduling, Scheduling in Unix, Scheduling in Linux, Scheduling in Windows, Performance Analysis of Scheduling Policies.

Unit – III

Memory Management: Managing the Memory Hierarchy, Static and Dynamic MemoryAllocation, Memory Allocation to a Process, Reuse of Memory, Contiguous Memory Allocation, Noncontiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Kernel Memory Allocation, A Review of Relocation, Linking and Program Forms.

Virtual Memory: Virtual Memory Basics, Demand Paging, Page Replacement Policies, MemoryAllocation to a Process, Shared Pages, Memory Mapped Files, Unix Virtual Memory, Linux Virtual Memory, Virtual Memory using Segmentation.

Unit – IV

File Systems: File System and IOCS, Files and File Operations, Fundamental File Organizations,Directory Structures, File Protection, Interface between File System and IOCS, Allocation of Disk Space, Implementing File Access, File Sharing Semantics, File System Reliability, Virtual File System, Unix File System, Linux File System, Windows File System, Performance of File Systems.

Unit – V

Security and Protection: Overview of Security and Protection, Goals of Security and Protection,Security Attacks, Formal and Practical aspects of Security, Encryption, Authentication and Password Security, Access Descriptors and the Access Control Matrix, Protection Structures, Capabilities, Unix Security, Linux Security, Windows Security.

Text Book:

1. Dhamdhere D.M., "Operating Systems: A Concept-Based Approach", 2nd Edition, TMH, New Delhi, 2006.

Reference Books:

1. SilberschatzA.,Galvin Peter B.,Greg Gagne, "Operating System Concepts", 6th Edition, John Wiley, Indian Reprint, 2003.
2. Crowley C., "Operating Systems: A Design-Oriented Approach", TMH, New Delhi, 2002.
3. Deitel H.M., "Operating Systems", 2nd Edition, Pearson Education, 2003.
4. Tanenbaum A.S., "Operating System: Design and Implementation", PHI, New Delhi,2002.

Course code: BMCA-205
Course title: DATA STRUCTURES

UNIT I

Algorithms and Analysis of Algorithms: Definition, Structure and Properties of Algorithms, Development of an Algorithm, Data Structures and Algorithms, Data Structure – Definition and Classification, Efficiency of Algorithms, Asymptotic Notations, Polynomial Vs Exponential Algorithms, Average, Best and Worst case Complexities, Open source software development process.

UNIT II

Arrays, Stacks and Queues: Array Operations, Number of Elements in an Array, Representation of Arrays in Memory, Applications of Array, Stack-Introduction, Stack Operations, Applications of Stack, Queues-Introduction, Operations on Queues, Circular Queues, Other Types of Queues, Applications of Queues.

UNIT III

Linked List, Linked Stacks and Linked Queues: Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, Applications of Linked Lists, Introduction to Linked Stack and Linked Queues, Operations on Linked Stacks and Linked Queues, Implementations of Linked Representations, Applications of Linked Stacks and Linked Queues.

UNIT IV

Trees, Binary Trees, BST, AVL Trees and B Trees: Trees: Definition and Basic Terminologies, Representation of Trees, Binary Trees: Basic Terminologies and Types, Representation of Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Applications. Introduction, BST: Definition and Operations, AVL Trees: AVL Definition and Operations, B Trees: Introduction, m-way search trees: Definition and Operations.

UNIT V

Sorting and searching: Introduction, Radix sort, Shell Sort, Quick Sort, Heap Sort. Searching: Introduction, Binary Search, Transpose Sequential Search, Interpolation Search.

TEXT BOOKS

1. BalujaG S, "Data Structure through C", Ganpat Rai Publication, New Delhi,2015.
2. PaiG A V, "Data Structures and Algorithms: Concepts, Techniques and Applications", 2nd Edn, Tata McGraw-Hill,2008.
3. Horowitz E., Sahni S., Susan A., "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2010.

REFERENCE BOOKS

1. TremblayJ. P.**,** SorensonP. G, "An Introduction to Data Structures with Applications", 2nd Edn, McGraw-Hill, Inc. New York, NY,USA.
2. Lipschutz Seymour, "Data Structures", 6th Edn, 9th Reprint 2008, TataMcGraw-Hill.
3. Drozdek Adam, "Data Structures and Algorithms in C++", Thomson Learning, New Delhi – 2007.
4. FellerJ., FitzgeraldB., "Understanding Open Source Software Development", Pearson Education Ltd. NewDelhi

Course code: BMCA-205
Course title: FUNDAMENTALS OF DATA STRUCTURES

Unit – I
Fundamental Data Structures: Using Arrays, Singly Linked Lists, Circularly Linked Lists, DoublyLinked Lists, Asymptotic Analysis.

Unit – II
Stacks, Queues, Dequeues: The Stack, Queue, Dequeue ADTs, Simple Array Based Stack, Queue, Dequeue Implementation, Implementing Stack, Queue with Singly Linked List, Reversing an Array using Stack, Matching Parenthesis and HTML tags, A Circular Queue.

Unit – III
Trees: General Trees, Binary Trees, Implementing Trees, Tree Traversal Algorithms, BinarySearch Trees, AVL Trees, B Trees.

Unit – IV
Sorting: Merge sort, Quick sort, Studying sorting through algorithmic lens, Comparing SortingAlgorithms.
Heap: Priority Queues, Array Implementation of Heaps, Construction of Heaps, Heap Sort.

MODULE V
Graphs: Data Structures for graphs, Graph Traversals, Transitive Closure, Directed Acyclic Graphs, Shortest Paths, Minimum Spanning Trees.

Text book:

1 Goodrich Michael T., Tamassia Roberto, Goldwasser Michael H. "Data Structures andAlgorithms in Java", Wiley, 6th Edition, 2014.
2. Klein Shmuel Tomi, Basic Concepts in Data Structures, Cambridge University Press, 1stEdition, 2016.

Reference books:

1. YedidyahLangsam, Moshe Augenstein J., Tenenbaum Aaron M. "Data Structures using JAVA",Pearson Education, 2009.
2. Brass Peter "Advanced Data Structures", Cambridge University Press, 1st Edition.

Course code: BMCA-206
Course title: DIGITAL CIRCUIT & LOGIC DESIGN

Unit – I

Number Systems and codes: Binary to Decimal Conversions, Decimal to Binary Conversions, Octal Number System, Hexadecimal Number System, BCD Code,

Unit – II

Alphanumeric Codes, Parity Method for Error Detection. Logic Gates and Boolean Algebra: Boolean Constants and Variables, Truth Tables, OR, AND, and NOT Operations, Description, Evaluation and Implementation of Logic Circuits, NOR and NAND gates and their universality, Boolean and DeMorgan's Theorem, Logic Gate Representations.

Unit – III

Combinational logic circuits: Sum of Products From, Simplifying and Designing Logic Circuits, Karnaugh map Method Executive – OR and Excluxre NOR Circuits , Parity Generators and Checker Enable/Disable Circuits , Basic Characteristics of Digital ICS, Programmable Logic Devices

Unit – IV

Sequential Logic Circuits: Latches and Flip-flops , Asynchronous Inputs, Flip-flops Timing Considerations , Potential Timing Problem in FF Circuits, Flip-flop Applications and Synchronization, Data Storage and Transfer, Shift Registers,

Unit – V

Digital Arithmetic: Binary Addition, Subtraction, Multiplication and Division, BCD Addition, Hexadecimal Arithmetic, Arithmetic Circuits, Full Adder, Parallel Adder, ALU Integrated Circuits. Counter and Registers: Different Asynchronous and Synchronous Counters, Pre settable Counters, Decoding a Counter, Decoding Glitches, Cascading BCD Counters, Shift – Registers, Counters, Counter Applications, Integrated Circuit Registers, Decoders, Encoders, Multiplexes and Demultiplexers, Magnitude Comparator. Memory Devices : Memory Terminology and General Operation, ROM and its Architecture, Timing, Types and Applications of ROM, Semiconductor RAM and RAM Architecture, Static and Dynamic RAM.

Text Book:

1. Ronald J. Tocci and Neal S. Widmer - Digital Systems : Principles and Applications Pearson Education, 8th Edn. New Delhi, 2002

Reference Books:

1. M. Morris Mano- Digital Logic and Computer Design, PHI (Reprint). New Delhi 2004.
2. A.B. Marcovitz- Introduction to Logic Design, TMH, New Delhi - 2002.
3. S.P. Dondamudi- Fundamentals of Computer Organization and Design Springer (India) Pvt. Ltd. New Delhi – 2004

Course code: BMCA-208
Course title: DATA STRUCTURES LAB

Semester III

Course code: BMCA-302
Course title: OBJECT ORIENTED DESIGN AND PROGRAMMING
Unit – I
Computing and the Object-Oriented Design Methodology: Basic Computing Terminology,Software, Engineering Software, Object-Oriented Design.
C++ -The Fundamentals: Program Organization, A First Program, A Second Program,Comments, Assigning a Value, Fundamental C++ Objects, Constants, Names, Definitions, Expressions, Output Statements, Computing Average Velocity.
Unit – II
Modifying Objects: Assignment, Const Definitions, Input Statements, Computing the Number ofMolecules in a Hydrocarbon, Compound Assignment, Increment and Decrement, Estimating Yearly Savings of Change, The String Class, EzWindows, Moving Lawns.
Control Constructs: Boolean Algebra, A Boolean Type, Conditional Execution Using the ifStatement, Conditional Execution Using the switch Statement, Computing a Requested Expression, Validating a Date, Iteration Using the while Statement, Simple String and Character Processing, Iteration Using the for Statement, Simple Data Visualization, Solving the Lazy Hobo Riddle, Iteration Using the do Construct.
Unit – III
Functions Usage Basics and Libraries: Function Basics, The Preprocessor, Using SoftwareLibraries, The iostream Library, The iomanip Library, The fstream Library, The math Library, Library ctype, The assert macros.
Programmer-Defined Functions: Basics, A Tasty Problem, Some Useful Functions, Integratinga Quadratic Polynomial, The Logic Scope, Displaying a Price-Interval Chart, Recursive Functions.
Advanced Parameter Passing: Reference Parameters, Passing Objects by Reference, ValidatingTelephone Access Codes, Constant Parameters, Default Parameters, Casting of Function Parameters, Function Overloading, Random Numbers, A Factory Automation Trainer.
Unit – IV
The Class Construct and Object-Oriented Design: Introducing a Parameter-Defined DataType, The Rectangle Shape Class, Using the Rectangle Shape Class, Constructors, Building a Kaleidoscope, Object-Oriented Analysis and Design.
Pointers and Dynamic Memory: Lvalues and Rvalues, Pointer Basics, Constant Pointers andPointers to Constants, Arrays and Pointers, Character String Processing, Program Command-line Parameters, Pointers to Functions, Dynamic Objects, A Simple ADT for Representing Lists of Integer Values.
Unit – V
Inheritance: Object-Oriented Design Using Inheritance, Reuse via Inheritance, A Hierarchy ofShapes, Protected Members and Inheritance, Controlling Inheritance, Multiple Inheritance, A Prettier Kaleidoscope.
Templates and Polymorphism: Generic actions and Types, Function Templates, ClassTemplates, A Simple List Class Using a Class Template, Sequential Lists, Polymorphism, Virtual Function Nuances, Abstract Base Classes, Virtual Multiple Inheritance.
Text Book:
1. Cohoon J.P. & Davidson J.W., "C++ Program Design: An Introduction to Programming andObject-Oriented Design", 2nd Edition, TMH Education, New Delhi, 2000.
Reference Book:
2. Friedman F.L. &Koffman E.B., "Problem Solving, Abstraction, and Design Using C++", 4th Edition, Pearson Education, Inc. 2004.

Course code: BMCA-303
Course title: COMPUTER ORGANIZATION AND ARCHITECTURE

Unit – I:
INTRODUCTION
Digital Logic Design: Axioms and laws of Boolean algebra, Reduction of Boolean expressions,conversion between canonical forms, Karnaugh map (4 variable), Half Adder, full adder, 4-bit parallel parity bit generator, checker circuit, Decoder, Encoder, Multiplexer, IC RAM, ROM, Memory Organization, Sequential Circuits, State transistors, Flip-flop, RS, JK, D-Latch, Master-slave.
Unit – II:
INSTRUCTION SET ARCHITECTURE
Memory Locations and Addresses: Byte Addressability, Big-Endian and Little-EndianAssignments, Word Alignment, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Subroutines, Additional Instructions, dealing with 32-Bit Immediate Values.
Unit – III:
BASIC PROCESSING UNIT & PIPELINING
Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, HardwareComponents, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control, CISC-Style Processors.
Pipelining: Basic Concept, Pipeline Organization, Pipelining Issues, Data Dependencies,Memory Delays, Branch Delays, Pipeline Performance Evaluation.
Unit – IV:
MEMORY ORGANIZATION
Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Memory Hierarchy, Cache Memories, Performance Considerations, Virtual Memory, Memory Management Requirements, Secondary Storage
Unit –V:
INPUT OUTPUT & PARALLEL PROCESSING
Basic Input Output: Accessing I/O Devices, Interrupts, Input Output Organization: BusStructure, Bus Operation, Arbitration, Interface, Interconnection Standards.
Parallel Processing: Hardware Multithreading, Vector (SIMD) Processing, Shared-MemoryMultiprocessors, Cache Coherence, Message-Passing Multicomputers, Parallel Programming for Multiprocessors, Performance Modeling.
Books recommended:
TEXT BOOK

1. Hamacher Carl, et. al, "Computer Organization and Embedded Systems", 6th Edition, Tata McGraw Hill,New Delhi, 2011.**(T1)**
2. Patterson David A., "Computer Organization and Design: The Hardware Software / Interface", 5thEdition, 1994.**(T2)**
3. Mano M. Morris, "Computer System Architecture", Revised 3rdEdition, Pearson Education.**(T3)**

Course code: BMCA-305
Course title: AUTOMATA THEORY
Unit - I
Basic Mathematical Objects and Mathematical Induction: Sets, logic, Functions, Relations,Alphabets, Strings, Languages, Principle of mathematical induction, Recursive definition.
Unit - II
Regular Expressions and Finite Automata: Regular languages and Regular Expressions,Memory required to recognize a language, Finite Automata, capability & limitations of FSM, Deterministic Finite Automata , Non-Deterministic Finite Automata, NFA with e-moves, regular sets & regular expressions, Equivalence of DFA and NDFA, NFA from regular expressions, regular expressions from DFA, Moore versus Mealy m/c, two way finite automata equivalence with one way , Kleen's Theorem, applications of finite automata.
Unit - III
Regular and Non-regular languages: Criterion for Regularity, Minimal Finite Automata,Pumping Lemma for Regular Languages, Decision problems, Regular Languages and Computers.
Context Free Grammars: Introduction, definition, Regular Grammar, Derivation trees,Ambiguity, Simplified forms and Normal Forms, Applications.
Unit - IV
Pushdown Automata: Definition, Moves, Instantaneous Descriptions, Language recognised byPDA, Deterministic PDA, Acceptance by final state & empty stack, Equivalence of PDA , Pumping lemma for CFL, Interaction and Complements of CFL,Decision algorithms.
Turing Machines: Definition and examples, Computing Partial Functions with TuringMachine(TM), Combining TMs, Variations of TMs, Multi-tape TMs, Non-deterministic TM,Universal TM, Church Thesis.
Unit - V
Recursively Enumerable Languages: Recursively Enumerable and Recursive, EnumeratingLanguage, Context Sensitive and Chomosky Hierarchy.
Unsolvable Problems and Computable Functions: Nonrecursive Language and unsolvableProblems, Halting Problem, Rice Theorem, Post Correspondence Problem.
Computational Complexity: Discussion on P, NP, NPC and NP-Hard Problems.

Text Books:
1. Martin John "Introduction to Languages and the Theory of Computation", 3rd Edition, TMH.
Reference Books:
1. Mishra K.L.P &Chandrasekharan N., "Theory of Computer Science", PHI.
2. Hopcroft John E. And Ullman Jeffrey D., "Introduction to Automata Theory, Languages & Computation", 3rd Edition, Narosa, 2008.
3. Lewis H. R. and Papadimitrou C. H, "Elements of the theory of Computation", PHI.

Course code: BMCA-306
Course title: DATABASE MANAGEMENT SYSTEM

Unit – I

Introduction and Conceptual Modelling: Purpose of Database Systems, Data Models, Schemasand Instances, Three-Schema Architecture and Data Independence, Database languages, Database Architecture, Classification of DBMS, relational database, Database users and Administrators, Advantages of DBMS. Entities and Entity Sets, Relationships and Relationship Sets, Keys, Mapping, Constraints, ER Diagram, Reducing ER Diagram to tables, Generalization and Specialization, Aggregation.

Unit –II

Relational Model: Concepts, Constraints, Languages, Design and Programming: Relationaldatabase Schemas, Relational Algebra, Relational Calculus (Tuple Relational calculus and Domain Relational calculus), Update operations, Transactions, Dealing with constraint violations. Binary Relational operation: JOIN and DIVISION, SQL, More complex SQL Queries, Security & Integrity violations, authorization and views, integrity constants, encryption, Statistical databases

Unit – III

Database Design Theory and Methodology: Pitfalls in relational database design, FunctionalDependencies, Decomposition Using Functional Dependencies. Normalization using functional Dependencies, General Definition of First, Second, Third and Forth Normal Form. Boyce-Codd Normal Form(BCNF), Multivalued and join dependencies, DKNF, Atomic values, Data-base Design Process. Modeling Temporal Data, Alternative approaches to database design.

Unit – IV

Transaction Processing Concepts and Concurrency Control Techniques: TransactionProcessing, Desirable Properties of Transactions, Transaction State, Characterizing Schedules based on Recoverability and Serializability. Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Deadlock Handling, Recovery and Atomicity, Log-Based Recovery.

Unit – V

Distributed Databases and Client-Server Architectures: Concepts and Types of Distributeddatabases, data fragmentation, Replication and Allocation Techniques for Distributed Database Design, Query Processing in Distributed Databases, Overview of Concurrency Control and Recovery in Distributed Databases, An Overview of 3-Tier Client-Server Architecture.

Text Book:

1. ElmasriRamez, &Navathe S.B., "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2006.

Reference Book:

1. Silberschatz A., &Korth H., "Database Systems Concepts", 5th Edition, McGraw Hill Higher Education, 2005.

Course code: BMCA-307
Course title: C++ PROGRAMMING LAB

Semester IV

Course code: BMCA-403
Course title: JAVA PROGRAMMING

Unit - I

Fundamentals of Java Programming: Data in Java Programs, Arithmetic Operators andExpressions, Simple Program Input and Output.

Making Decisions with Java: Comparing Numbers in Java, Comparing Strings in Java, Logical(Boolean) Operators and Order of Precedence, Selection Structures in Java.

Unit - II

Repeating Program Statements: The **while** Statement, The**for** Statement, The **do…while** Statement, Nested Loops, **break**, and **continue**.

Methods and Classes: Predefined Java Methods, Programmer-Defined Methods.

Arrays: The One-Dimensional Array, Multidimensional Arrays, Other Array Topics.

Unit -III

Characters, Strings, and Formatting: Working with Characters, Working with Strings,Formatting Data for Output.

Exceptions and Assertions: Exception Handling, Assertions

Unit - IV

File Input and Output: Inputting Data from a Text File, Outputting Data to a Text file,Performing Input and Output with Binary Files.

Unit - V

Graphical User Interfaces: Creating User Interfaces, Overview of a Java GUI, Developing aJava GUI, Adding Functionality to a GUI, Improving GUI Layout.

Text Book:

1. Johnson Richard A., "An Introduction to Java Programming and Object-Oriented Application Development", 1st Edition, Thomson Learning, New Delhi, 2007.

Reference Books:

1. Dietel&Dietel, "Java How to Program", 5th Edition, Pearson Education, New Delhi, 2006.
2. Balagurusamy E. "JAVA Programming", 3rd Edition, TMH, New Delhi, 2005
3. Sleek James M. Sleek "Programming and Problem Solving with JAVA", Thomson Learning,Indian Edition, 2007.

Course code: BMCA - 404
Course title: COMPUTER GRAPHICS

Unit -I

Introduction: Image Processing as Picture Analysis, The Advantages of Interactive Graphics,Representative Uses of Computer Graphics, Classification of Applications, Development of Hardware and Software for Computer Graphics, Conceptual Framework for Interactive Graphics.

Basic Raster Graphics Algorithms for Drawing 2D Primitives: Overview, Scan ConvertingLines, Scan Converting Circles, Scan Converting Ellipses, Filling Rectangles, Filling Polygons,Filling Ellipse Arcs, Pattern Filling, Thick Primitives, Line Style and Pen Style, Clipping in aRaster World, Clipping Lines, Clipping Circles and Ellipses, Clipping Polygons, GeneratingCharacters, SRGP_copyPixel, Antialising.

Unit - II

Graphics Hardware: Hardcopy Technologies, Display Technologies, Raster-Scan DisplaySystems, The Video Controller, Random-Scan Display Processor, Input Devices for Operator Interaction, Image Scanners.

Geometrical Transformations: 2D Transformations, Homogeneous Coordinates and MatrixRepresentation of 2D Transformations, Composition of 2D Transformations, The Window-to-View port Transformation, Efficiency, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Transformations as a Change in Coordinate System.

Unit - III

Viewing in 3D: Projections, Specifying an Arbitrary 3D View, Examples of 3D Viewing, TheMathematics of Planar geometric Projections, Implementing Planar Geometric Projections,Coordinate Systems.

Unit -IV

Input Devices, Interaction Techniques, and Interaction Tasks: Interaction Hardware, BasicInteraction Tasks, Composite Interaction Tasks.

Representation Curves and Surfaces : Polygon Meshes, Parametric Cubic Curves, ParametricBicubic Surfaces, Quadric Surfaces.

Achromatic and Colored Light: Achromatic Light, Chromatic Color, Color Models for RasterGraphics, Reproducing Color, Using Color in Computer Graphics.

Unit -V

The Quest for Visual Realism: Why Realism?, Fundamental Difficulties, Rendering Techniquesfor Line Drawings, Rendering Techniques for Shaded Images, Improved Object Models, Dynamics, Stereosis, Improved Displays, Interacting with Our Other Senses, Aliasing and Antialiasing.

Visible-Surface Determination: Functions of Two Variables, Techniques for Efficient Visible-Surface Algorithms, Algorithms for Visible-Line Determination, The z-Buffer Algorithms, List-Priority Algorithms, Area-Subdivision Algorithms, Algorithms for Octress, Algorithms for Curved Surfaces, Visible-Surface Ray Tracing.

Illumination and Shading: Illumination Models, Shading Models for Polygons, Surface Detail,Shadows, Transparency, Inter object Reflections, Physically Based Illumination Models, Extended Light Sources, Spectral Sampling.

Text Book:

1. Foley, Dam Van, Feiner, Hughes "Computer Graphics Principles & Practice", 11th Edition., Pearson Education, New Delhi, 2004.

Reference Book:

1. Hearn D. & Baker M.P. "Computer Graphics", PHI, New Delhi, 2006.

Course code: BMCA – 405
Course title: Computer Networks

Unit - I

Introduction to computer networks, advantage of networking, network architecture & strategies. Data transmission: concept and terminology (data and signal), Analog and digital data transmission, transmission impairments.

Unit - II

Transmission media : guided v/s unguided transmission media, multiplexing ; TDM, FDM, SDM & WDM types of network : LAN (Star Ethernet, BUS), VLAN, MAN ,WAN: Configuration, topology ,network hardware (hub, bridge, switch and router).

Unit - III

Principles and purpose of layered approach, ISO-OSI model, protocols and their standards, protocol architecture, different layers and their functions of OSI model, Introduction to TCP/IP models.

Network switching: circuit switching, packet switching; routing and congestion control.

Unit - IV

Network technologies: ATM, Frame relay network, DSL, cable modem system, ISDN, SONET/SDH: architecture and functions.

Unit - V

Network management: – functions SNMPV1: architecture and models, Internetworking, Concept of DNS, URL and models RMON. Issues related to network reliability and security, SSL, firewalls, encryption / decryption and data compression, concept of cyber laws and cybercrimes.

Text books/ Reference Books

1. Data and Computer communications, Stallings William Prentice Hall of India, 5th edition.
2. Computer Networks, Andrew S., Tanenbaum, Prentice Hall, 4th Edition.
3. Data Communications & Networking, Forouzon, A. Behrouz, McGraw Hill, 5th edition.
4. Computer Network, "A system approach", Peterson & Dovie, Harcoert, 3rd edition,2005.
5. Computer Networks and Internets, Douglas E. Comer, Pearson/PHI, 4th edition,2004.

Course code: BMCA - 406
Course title: CLOUD COMPUTING

Unit - I

Introduction: Online Social Networks and Applications, Cloud introduction and overview,Different clouds, Risks, Novel applications of cloud computing

Unit - II

Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise

Unit - III

Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security Identity and Access Management Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management.

Unit - IV

Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS, Privacy Issues: Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations.

Unit - V

Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud, Recent developments in hybrid cloud and cloud security

Text Books:

1. Rhoton John, "Cloud Computing Explained: Implementation Handbook for Enterprises",2009.
2. Tim Mather, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)", ISBN-10: 0596802765, O'Reilly Media, 2009.

Course code: BMCA - 407
Course title:

Semester V

Course code: BMCA – 502

Course title: DESIGN AND ANALYSIS OF ALGORITHMS (DAA)

Unit-I

Algorithms and structured programming, analysing algorithms, asymptotic behaviour of an algorithm, Order notations, time and space complexities (polynomial, logrithmic and exponential), average and worst case analysis, lower and upper bounds.

Unit-II

Advanced data structures: Threaded trees, B-trees, Heaps and heap sort, sets and relations, Graphs, Hashing. Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs).

Unit-III

Algorithm design strategies: Divide and conquer, Merge sort, Quick sort, matrix multiplication. Greedy method:

General method, knapsack problem, job sequencing with deadlines, minimum cost spanning trees). Dynamic programming (0/1 knapsack, travelling salesman problem).

Unit-IV

Backtracking: 8 - Queens problem, Sum of Subsets, Graph coloring, 0/1 Knapsack. Branch & Bound 0/1 knapsack, Travelling salesman.

Unit-V

Approximation algorithms: Polynomial Time Approximation Schemes. Complexity: - NP-Hard and NP- complete Problems - Cook's theorem, NP completeness reductions.

Text/Reference Books

1. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications, 1985.
2. Design & Analysis of Computer Algorithms, Aho, J.E. Hopcroft, & J.D. Ullman, Addition Wesley, 1974.
3. Algorithms - The Construction, Proof & Analysis of Programs, P.Berlions & P. Bizard, John Wiley & Sons, 1986.
4. Data Strucures and Algorithms, K. Melhorn, Vol. I & II, Springer Verlag, 1984.
5. Introduction to Algorithms by Charles E. Leiserson, Clifford Stein, Ronald Rivest and Thomas H. Cormen,3rd Edition, PHI Learning pvt. Ltd. (Pdf available).

Course code: BMCA - 503
Course title: PYTHON PROGRAMMING

Unit I

Introduction to Python What is Python and history of Python? Unique features of Python Python-2 and Python-3 differences Install Python and Environment Setup First Python Program Python Identifiers, Keywords and Indentation Comments and document interlude in Python Command line arguments Getting User Input Python Data Types What are variables? Python Core objects and Functions Number and Maths.

List, Ranges & Tuples in Python Introduction Lists in Python More About Lists Understanding Iterators Generators , Comprehensions and Lambda Expressions Introduction Generators and Yield Next and Ranges Understanding and using Ranges More About Ranges Ordered Sets with tuples

Unit II

Python Dictionaries and Sets Introduction to the section Python Dictionaries More on Dictionaries Sets Python Sets Examples

Input and Output in Python Reading and writing text files writing Text Files Appending to Files and Challenge Writing Binary Files Manually Using Pickle to Write Binary Files

Python built in function Python user defined functions Python packages functions Defining and calling Function The anonymous Functions Loops and statement in Python Python Modules & Packages

Python Object Oriented Overview of OOP Creating Classes and Objects Accessing attributes Built-In Class Attributes Destroying Objects

Unit III

Python Exceptions Handling What is Exception? Handling an exception try….except…else try-finally clause Argument of an Exception Python Standard Exceptions Raising an exceptions User-Defined Exceptions

Python Regular Expressions What are regular expressions? The match Function The search Function Matching vs searching Search and Replace Extended Regular Expressions Wildcard

Unit IV

Python Multithreaded Programming What is multithreading? Starting a New Thread The Threading Module Synchronizing Threads Multithreaded Priority Queue Python Spreadsheet Interfaces Python XML interfaces

Using Databases in Python Python MySQL Database Access Install the MySQLdb and other Packages Create Database Connection CREATE, INSERT, READ, UPDATE and DELETE Operation DML and DDL Oepration with Databases Performing Transactions Handling Database Errors Web Scraping in Python

Unit V

Python For Data Analysis Numpy: Introduction to numpy Creating arrays Using arrays and Scalars Indexing Arrays Array Transposition Universal Array Function Array Processing Arrar Input and Output Pandas: What is pandas? Where it is used? Series in pandas Index objects Reindex Drop Entry Selecting Entries Data Alignment Rank and Sort Summary Statics Missing Data Index Heirarchy Matplotlib: Python For Data Visualization Welcome to the Data Visualiztion Section Introduction to Matplotlib,

Django Web Framework in Python Introduction to Django and Full Stack Web Development.

Books:

1`. Python Programming: An Introduction to Computer Science by John M Zelle

Course code: BMCA - 504

Course title: SOFTWARE PROJECT MANAGEMENT

Unit-1

Introduction to Software Project Management: The Nature of Software Production, Key Objectives of Effective Management, Quality, Productivity, Risk Reduction, The Role of the Software Project Manager.

Unit-2

Planning the Project: Business Planning, Types of Plans, Plan documentation methods, Determining Objectives,Forecasting demand for the Product, Proposal Writing, Requirements analysis. Technical Planning: Work breakdown structures, PERT and CPM, Gantt Charts, Standards.

Unit-3

Planning for Risk Management and Control, Entry and Exit criteria, Intermediate checkpoints, Performance prediction and analysis People, Capacity Planning, Estimating - what it takes to do the job, Cost (direct and indirect), Resources, Time, Size and complexity of the product, Managing the Project, Feedback and Reporting Mechanisms.

Unit-4

Financial planning - budgeting, Resource Allocation, Managing Product Support and adaptive maintenance,restructuring code, flexibility, reusability, reliability, efficiency, quality assurance, Managing Change, Readjusting Goals and Milestones.

Unit-5

Introduction to Software Architectures, Origin and design process of software architectures, Quality attributes, scope of software architecture, architectural styles, and software architectural design.

Text/Reference Books

1. Tom Gilb, Finzi Susannah, "Principles of Software Engineering Management', Addision-Wisley, England, 1988.
2. Paul Clements, et al., 'Documenting Software architectures: Views and beyond', Addision-Wisley, 2002. 3. Mark Norris, Peter Rigby, Malcolm Payne, 'The healthy Software Project-A Guide to Successful Development & Management', John Wiley & Sons, 1993.
3. 'Software Architecture : System Design, Development and maintenance', Edited by Jan Bosch, Morven Gentleman, Christine Hofmeister, Juha Kusela, Kluwer academic Publishers, 1992.
4. Barbee Mynatt, 'Software Engineering with Student Project Guidance', Prentice Hall, New Jersey, 1990.
5. Mary Shaw and David Garlan, 'Software Architecture: Perspectives on an Emerging Discipline', Prentice-Hall, 1996.
6. Neal Whitten, 'Managing Software Development projects', John Wiley, 1995.

Course code: BMCA - 505
Course title: SYSTEM SIMULATION AND MODELLING

Unit –I

The concepts of a system, System Environment, Stochastic Activities, continuous and discrete systems, System Modeling, Types of models.

System Studies: Subsystem, A Corporate Model, Environment segment, Production Segment, Management Segment, full Corporate Model, Types of System study, System Analysis, SystemDesign, System Postulation.

Unit –II

The technique of simulation, the Monte Carlo method, comparison of simulation and analytical methods, experimental nature of simulation, types of system simulation, numerical computation technique for continuous & discrete models, distributed lag models, cobweb models.

Continuous system models, differential equations, analog computers & methods, hybrid computers, CSSLs, CSMP-III, Feedback Systems, Simulation of an Autopilot.

Unit –III

Exponential Growth & decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamics diagrams, Simple system dynamics diagrams, multi–segment models, representation of time delays.

Unit –IV

Evaluation of continuous probability functions, continuous uniformly distributed random numbers, a uniform random number numbers, generating discrete distributions, non-uniform continuously distributed random numbers, the rejection method.

Random numbers Generators: Techniques for generating random numbers. Test for randomnumbers.

Random vitiate Generation: Inverse transform technique, exponential distribution, uniformdistribution.

Unit –V

Queuing disciplines, measures of queues. Discrete events, representation of time, generation of arrival patterns, simulation of a telephone system, delayed calls, Simulation programming tasks,measuring utilization and occupancy.

Text books:

1. Gordon Geoffrey, “System Simulation”, 2nd Edition, Pearson Education, 2007.
2. Banks J., Carson J. S., Nelson B.L., Nicol D.M. Nicol, “Discrete-Event System Simulation”, 4th Edition, Pearson Education, 2007.

Course code: BMCA - 506
Course title: ARTIFICIAL INTELLIGENCE

Unit-I

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem.

Intelligent Agents: Agents & Environment, Nature Of Environment, Structure Of Agents, GoalBased Agents, Utility Based Agents, Learning Agents.

Problem Solving: Problems, Problem Space & Search: Defining The Problem As State SpaceSearch, Production System, Problem Characteristics, Issues In The Design Of Search Programs.

Unit -II

Search Techniques: Solving Problems By Searching, Problem Solving Agents, Searching ForSolutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies.

Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded HeuristicSearch: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems.

Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Mini Max SearchProcedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening.

Unit -III

Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping,Approaches to Knowledge Representation, Issues in Knowledge Representation.

Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISARelationship, Computable Functions & Predicates, Resolution, and Natural Deduction.

Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, LogicProgramming, Forward Verses Backward Reasoning, Matching, Control Knowledge

Unit -IV

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks,Dempster-Shafer Theory.

Planning: Overview, Components of A Planning System, Goal Stack Planning, HierarchicalPlanning.

Learning: Forms Of Learning, Inductive Learning, Explanation Based Learning, Neural NetLearning & Genetic Learning.

Unit -V

Natural Language Processing: Brief introduction to Syntactic Processing, Semantic Analysis, Discourse& Pragmatic Processing.

Robotics: Introduction, Robot hardware, robotic perception, planning to move, planning uncertainmovements, robotic software architecture, application domains.

Text books:

1. Russel S. and Norvig P. "Artificial Intelligence a Modern Approach", 3rd Edition, Pearson Education.
2. Rich E. & Knight K. "Artificial Intelligence", 2nd Edition, TMH, New Delhi.

Semester VI

Course code: BMCA - 601
Course title: Quantitative Methods for Business Decisions

Unit-I

Statistics: Meaning and Applications of Statistics in business decision making and research.Collection, Tabulation andpresentation of data.Measures of central tendency: Mean, Median andMode. Measures of dispersion: Range, Mean Deviation, Standard Deviation. Relative measure ofDispersion

Unit -II

Correlation: Karl Pearson's coefficient of correlation, Rank, Probable error and coefficient ofdetermination.Regression Analysis: Regression Lines, Equations and Coefficients. Analysis ofTime Series and Business Forecasting: Components, Moving Averages, Exponential smoothingand Least Squares Method.

Unit -III

Probability Theory: Concepts, Conditional Distribution, Bayes' Theorem and application. RandomVariable. Distribution Theory: Discrete and Continuous: Binomial and Poisson Distribution and Normal Distribution. Application of Distribution theory to Engineering and Management Scienceproblems

Unit -IV

Sampling Theory and Distribution. EstimationTheory: Unbiasedness and Minimum Variance Unbiased Estimator.

Unit - V

Testing of Hypotheses: Null and Alternative Hypothesis, Type-I and II error. p test, t test, ChiSquare test, F Test and their applications. ANOVA - One way test.

Text Books:

1. Levin Richard I. & Rubin, David S, Statistics for Management, Prentice Hall Of India, New Delhi.
2. Gupta S.P Gupta M P, Business Statistics, Sultan Chand.
3. Terry, Sineich, Business Statistics by Examples, Collier McMillan Publisher.

Course code: BMCA - 602

Course title: INTERNET AND WEB TECHNOLOGIES

UNIT I

Internet Basics: Introduction to Internet, Client Server model, Internet IP Address, Domain Name, Domain Registration, Internet Services, A Brief Overview of TCP/IP and its Services, Hyper Text Transfer Protocol: Introduction, Web Servers and Clients, IP Address, Cyber Laws, URL and its Anatomy, Message format, Testing HTTP Using Telnet, Persistent and Non persistent Connections, Internet Security, Web Caching, Proxy.

UNIT II

History of HTML and W3C, HTML and its Flavours, HTML Basics, Elements, Attributes and Tags, Basic Tags, Advanced Tags, Frames, Images, Meta Tag, Planning of Web Page, Model and Structure for a Website, Designing Web Pages, Multimedia Content Frames, Cascading Style Sheet:Introduction,Advantages, Adding CSS, Browser Compatibility, CSS and Page Layout, Selectors.

UNIT III

XML Technologies: Common Usage, Role of XML,Prolog,Body, Elements, Attributes, Validation, Displaying XML, Namespace. XML DTD: XML Schema Languages, validation, Introduction to DTD, Purpose of DTD, Using a DTD in an XML Document, Element Type Declaration, Attribute Declaration, Entity Declaration.

Parsing XML: XML DOM, DOM Nodes, The Node Interface, Document Node, Element Node, Text Node, Attr Node, Java and DOM

UNIT IV

Server Side Programming: Servlet : Server –Side JAVA, Advantages Over Applets , Servlet Alternatives , Servlets Strengths , Servlet Architecture, Servlet life Cycle , Generic Servlet and Http Servlet, First Servlet , Passing Parameters to Servlets , Retrieving Parameters , Server side Include , Cookies, Filters, Problems with Servlet, Security Issues , Java Server Pages : Introduction and Marketplace , JSP and HTTP, JSP Engines, How JSP Works , JSP and Servlet, Anatomy of JSP page , JSP Syntax , JSPComponents.

UNIT V

Session Tracking: User Passing Control and Data between Pages, Sharing Session and Application Data, Data Base Connectivity, JDBC Drivers, Basic Steps, Loading a Driver, Making a connection, Execute an SQLStatement, SQl Statements, Retrieving Result, GettingDatabase Information, Scrollable and Updatable Result Set, Result SetMetadata.

TEXT BOOK

1. RoyUttam K., “Web Technology”, Oxford University Press.

REFERENCE BOOKS

1. EtalXue Bai, “The Web Warrior Guide to Web Programming”, Thomson Learning,2003.
2. XavierC., “Web Technology & Design”, New Age International Publishers, 1st Edn, New Delhi,2004.

Course code: BMCA - 603
Course title: DISTRIBUTED DATABASES

Unit - I
Introduction: Distributed Data Processing, What is a Distributed Database System? Promises ofDDBSs, Problem Areas.

Unit - II
Distributed DBMS Architecture: DBMS Standardization, Architectural Models for DistributedDBMSs, Distributed DBMS Architecture.

Distributed Database Design: Alternative Design Strategies, Distribution Design Issues,Fragmentation, Allocation.

Unit - III

Overview of Query Processing: Query Processing Problem, Objectives of Query Processing,Complexity of Relational Algebra Operations, Layers of Query Processing.

Query Decomposition and Optimization: Query Decomposition, Query Optimization,Centralized Query Optimization, Distributed Query Optimization Algorithms.

Unit - IV

Transaction Management and Concurrency Control: Definition of a Transaction, properties ofTransactions, Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Locking-based Concurrency Control Algorithms, Timestamp-based Concurrency Control Algorithms,

Deadlock Management.

Unit - V

Distributed DBMS Reliability: Reliability Concepts and Measures, Failures and Fault Tolerancein Distributed Systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed

Reliability Protocols.

Text Books:

1. M. Tamer Ozsu, Patrick Valduriez, "Distributed Database Systems", 2nd Edition, Pearson,
2. 2011.

Reference Books:

1. ElmasriNavathe, "Fundamental of Database Systems", 5th Edition, Pearson Education, 2008.
2. Thomas Connolly, Carolyn Begg, "Database Systems – A Practical Approach to Design,
3. implementation and Management", 4th Edition, Pearson Education, 2008.
4. Silberschatz, Korth, Sudarshan, "Database System Concepts", 4th Edition, McGraw Hill, 2002.

Course code: BMCA - 604
Course title: INTRODUCTION TO DATA SCIENCE

Unit I

Introduction: What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed

Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: RealDirect (online real estate firm)

Unit II

Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means 5. One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam - Data Wrangling: APIs and other tools for scrapping the Web

Unit III

Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests

Unit IV

Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system

Mining Social-Network Graphs - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs

Unit V

Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset

Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science

Books

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

References and books related to the course:

1 Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)

2 Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.

3 Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.

4 Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)

5 Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science for a modern theoretical course in computer science.)

6 Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.

7 Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

Course code: BMCA - 605
Course title: NETWORK SECURITY AND CRYPTOGRAPHY

Unit - I
Foundations – Protocol Building Blocks - Basic Protocols - Intermediate Protocols - Advanced
Protocols - Zero-Knowledge Proofs - Zero-Knowledge Proofs of Identity -Blind Signatures -
Identity-Based Public-Key Cryptography.

Unit - II
Key Length - Key Management – Public Key Cryptography versus Symmetric Cryptography - Encrypting Communications Channels - Encrypting Data for Storage - Hardware Encryption versus Software Encryption - Compression, Encoding, and Encryption - Detecting Encryption –

Hiding and Destroying Information.

Information Theory - Complexity Theory - Number Theory - Factoring - Prime Number Generation - Discrete Logarithms in a Finite Field - Data Encryption Standard (DES) – Lucifer - Madryga - NewDES - GOST – 3 Way – Crab – RC5 - Double Encryption - Triple Encryption -

CDMF Key Shortening - Whitening.

Unit - IV
Pseudo-Random-Sequence Generators and Stream Ciphers – RC4 - SEAL - Feedback with Carry Shift Registers - Stream Ciphers Using FCSRs - Nonlinear-Feedback Shift Registers - System-Theoretic Approach to Stream-Cipher Design - Complexity-Theoretic Approach to Stream-Cipher Design - N- Hash - MD4 - MD5 - MD2 - Secure Hash Algorithm (SHA) - OneWay Hash Functions Using Symmetric Block Algorithms - Using Public-Key Algorithms - Message

Authentication Codes

RSA - Pohlig-Hellman - McEliece - Elliptic Curve Cryptosystems -Digital Signature Algorithm (DSA) - Gost Digital Signature Algorithm - Discrete Logarithm Signature Schemes - Ongchnorr-Shamir -Cellular Automata - Feige-Fiat-Shamir -Guillou-Quisquater - Diffie-Hellman - Station-to-Station Protocol -Shamir's Three-Pass Protocol - IBM Secret-Key Management Protocol -

MITRENET - Kerberos - IBM Common Cryptographic Architecture.

Text Books:

1. Schneier Bruce, "Applied Cryptography: Protocols, Algorithms, and Source Code in C",
   2nd Edition, John Wiley & Sons, Inc, 1996.

2. Mao Wenbo, "Modern Cryptography Theory and Practice", Pearson Education, 2004.
3. KahateAtul, "Cryptography and Network Security", Tata McGrew Hill, 2003.

Reference Book:

4. Stallings William, "Cryptography & Network Security Principles and Practice", Pearson
   Education.

Course code: BMCA - 606
Course title: Data Mining and Warehousing

Unit – I

Data Mining: Introduction, Relational Databases, Data Warehouses, Transactional databases,Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.
Data Processing: Data Cleaning, Data Integration and Transformation, Data Reduction.

Unit –II

Data Warehouse: Introduction, A Multidimensional data Model, Data Warehouse Architecture,Data Warehouse Implementation, Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization

Unit – III

Mining Association Rules in Large Databases: Association Rule Mining, Single–DimensionalBoolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to

Correlation Analysis.

Unit – IV

Classification and Prediction: Classification & Prediction, Issues Regarding Classification &Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule Analysis, Other

Classification Methods, Prediction, Classification Accuracy.

Unit – V

Cluster Analysis: Introduction, Types of Data in Cluster Analysis, A Categorization of MajorClustering Methods, Partitioning Method - k- Medoids Algorithm, CLARANS, Hierarchical

Methods - BIRCH, ROCK Density-Based Methods - DBSCAN, Outlier Analysis.

Text books:

1. Jiawei Han & Micheline Kamber "Data Mining Concepts & Techniques", Publisher
   Harcourt India. Private Limited, 2nd Edition.

Reference books:

1. Gupta G.K. "Introduction to Data Mining with case Studies", PHI, New Delhi, 2006.
2. Berson A. & Smith S.J. "Data Warehousing Data Mining", COLAP, TMH,
3. Dunham H.M. & Sridhar S. "Data Mining", Pearson Education, New Delhi, 2006.

Semester VII

Course code: BMCA - 701
Course title: DECISION SUPPORT SYSTEMS

Unit – I
Decision Making Process: An Over view, Introduction, Managerial decision making andInformation System, Need for computerized decision support and the supporting technologies, Framework of DSS, Group Support System, Executive information system, Knowledge

management Systems.

Unit – II
Decision Making, System, Models: Decision Making–Introduction and Definition, System,Models, previews of modeling process, Decision making – The intelligence phase, the design phase and the choice phase.

Evaluation – Multiple Goals, sensitivity analysis, What–if and goal seeking.
Decision Making - The implementation phase, Alternative decision making models.

Unit –III
DSS – Configurations, Definitions, Characteristics & Capabilities, Components, The Datamanagement Subsystem, Model Management Subsystem, Knowledge – based management, Subsystem, User interface Subsystem, DSS Classification, DSS H/W, Difference between Management Science and MIS.
Modeling & Analysis - Modeling for MSS, Static & Dynamic Models, Treating Certainty,Uncertainty and Risk, Interface diags, MSS modeling in spreadsheets, Decision analysis (Decision tables and Decision trees), Optimization via mathematied programming, Meusistic Programming,
Multidimensional Modeling – OLAP.

Unit – IV
DSS Development – Introduction, The Traditional System Development life cycle, AlternateDevelopment Methodologies, Prototyping, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team Developed DSS, End – User Developed DSS,

DSS System Integration.

Unit – V
Collaboration Communication, Enterprise DSS Group Decision Making – Communication &Collaboration, Communication Support, Collaboration Support – Computer Supported Co-

operative work, Group Support System, GSS Technologies.

Text Book:
1. Turloan E. & Aronson E. "Decision Support System & Intelligent System", 6th Edition, Pearson Education.

Reference Book:
1. Marakas G.M. "Decision Support Systems", 2nd Edition, Pearson /Prentice Hall of India.

Course code: BMCA - 702
Course title: SOFT COMPUTING

Unit – I
Introduction to Artificial Intelligence System, Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crip Relation, Fuzzy Relations.

Unit – II
Fuzzy System: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System,Defuzzification Methods, and Applications.

Unit – III
Genetic Algorithms, Basic Concepts, Creation Of Offspring, Working Principle, Encoding, Fitness Function, Reproduction.

Genetic Modeling, Inheritance Operations, Cross Over, Inversion And Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods, Advanced In GA.

Unit – IV
Fundamentals Of Neural Networks, Basic Concepts Of Neural Network, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristic Of Neural Networks, Learning Method, Taxonomy Of Neural Network Architectures, History Of Neural Network Research, Early Neural Network Architectures, Some Application Domains.

Unit – V
Back Propagation Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm.

Associative Memory And Adaptive Resonance Theory, Autocorrelations, Hetrocorrelators , Multiple Training Encoding Strategy, Exponential BAM, Associative Memory For Real Coded Pattern Pairs, Applications, Introduction To Adaptive Resonance Theory, ARTI, Character Recognition Using ARI1

Text Book:

1. Rajasekharan S. &Vijayalakshmi G. A. “Neural Network Fuzzy Logic and GenticAlgorithm Synthesis and Applications”, Prentice Hall of India PLT, Pai, 2004.

Reference Book:

1. Jang JyhShing R, Sun C. T., Mizutani E. “Neuro Fuzzy and Soft Computing –A Computational Approach to Learning and Machine Intelligence”, Prentice Hall of India,

1997.

Course code: BMCA - 703
Course title: SOFTWARE ENGINEERING

Unit - I
Introduction to Software Engineering: Evolving Role of Software, Changing Nature ofSoftware, Legacy Software, Process Frame work, Process Patterns, Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models,

Unified Process Model, Agile Process Model.

Unit - II
Requirement Engineering: A bridge to design and construction, Requirement Engineering Task,Initiating the Requirement Engineering Process, Eliciting Requirements, Developing Use case, Building the Analysis Model, Negotiating Requirements, Validating Requirements.

Unit - III
Design Engineering: Design Process and Design Quality, Design Concepts, Design Models,
Pattern Based Software Design.

Unit - IV
Testing Strategies and Testing Tactics: Strategic Approach to software Testing, Test Strategiesfor conventional and Object Oriented Software, Validation Testing System Testing, White Box Testing, Basic Path Testing Control Structure Testing, Black Box Testing, Object Oriented

Testing Methods.

Unit - V
Metric for process and Estimation Techniques: Process metrics, Software Measurement,Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Estimation for Object Oriented Projects Specialized Estimation Techniques.
Software Quality and Configuration Management: Quality Concepts, Software QualityAssurance, Software Reliability, Software Configuration Management, SCM Repository, SCM

Process.

Text Book:

2. Pressman Roger S., "Software Engineering – A Practitioner's Approach", 6th Edition., Tata
3. McGraw Hill.

Reference Books:

a. Vliet Haus Van, "Software Engineering – Principles and Practice", Wiley John and Sons,
2nd Edition.
4. Sommerville Ian, "Software Engineering", 7th Edition., Pearson Education.

Course code: BMCA - 704
Course title: INTERNET OF THINGS(IoT)

Unit - I
IoT - An Architectural Overview

Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT,

Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

Unit - II
Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture; Introduction, Functional View, Information View, Deployment and

Operational View

Unit - III
IoT Data Link Layer & Network Layer Protocols

PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Bluetooth Low Energy, Zigbee Smart EnergyNetwork Layer-IPv4, IPv6, 6LoWPAN

Unit - IV
Transport & Session Layer Protocols
Transport Layer (TCP, MPTCP, UDP,) Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.

Unit - V
Layer Protocols & Security
Service Layer -oneM2M, ETSI M2MSecurity in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, Application Layer protocols.

Text Books:

5. Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

6. Waher Peter, "Learning Internet of Things", PACKT publishing, BIRMINGHAM-

7. Reiter Bernd Scholz, Michahelles Florian, "Architecting the Internet of Things", Springer,

   ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2.

8. Minoli Daniel, "Building the Internet of Things with IPv6 and MIPv6:".

Course code: BMCA – 705 (Elective-I)
Course title: DECESION THEORY

Unit –I
Introduction: Mobility of bits and bytes, wireless the beginning, mobile computing, dialogue control, Networks, middleware and gateways, application and services, developing mobile computing applications, security in mobile computing, standard bodies. Mobile Computing Architecture: architecture for mobile computing, three tier architecture,

Unit –II
Mobile Computing through Telephony: evolution of telephony, multiple access procedures, mobile computing through telephone. Emerging Technologies: introduction, Bluetooth, radio frequency identification, wireless broadband, mobile IP, IPV6,

Unit –III
Global System for Mobile Communications GSM: introduction, GSM architecture , call routing in GSM, PLMN interface, GSM address and identifiers, network aspect in GSM, GSM frequency allocation, authenticity and security. Short Message Service SMS : Mobile computing over SMS,

Short message services(SMS)

Unit –IV
General Packet Radio Service GPRS:GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, applications for GPRS, limitations for GPRS, billing and charging in GPRS. Wireless Application Protocol WAP: introduction , WAP, MMS, GPRS applications. CDMA and 3G
Client Programming: introduction, moving beyond the desktop, a peak under the hood: hardware

overview, mobile phone, PDA, design constraints in application for handheld devices.

Unit –V
Voice Over Internet Protocol and Convergence: VoIP, H 323 framework for VoIP 564, SIP, comparision between H.323 and SIP 570, Real time protocol, convergence technologies, call

routing, voice over IP applications, IP multimedia subsystem, Mobile VoIP.

Text Book:

9. Talukedar Ashok, Ahmed Hasan, YavagalRoopa R "Mobile Computing Technology, Applications and Service Creation",Tata McGraw -Hill Education ,2010.

Reference Books:

10. Schiller Jochen H. "Mobile Communications", 2nd Edition, Addison wesley.
11. Kamal Raj "MobileComputing", 2nd Edition, Oxford University Press.

12. Behravanfar Reza “Mobile Computing Principles: Designing and Developing Mobile
Applications with UML and XML”, ISBN: 0521817331, Cambridge University Press,
October 2004.

13. Adelstein Frank, Gupta Sandeep K.S., Richard III Golden G., Schwiebert, Loren,

“Fundamentals of Mobile and Pervasive Computing”, ISBN: 0071412379, McGraw-Hill Professional, 2005.

14. Hansmann Uwe, MerkLothar, Nicklous Martin S., Stober Thomas “Principles of Mobile Computing”, 2nd Edition., Springer, 2003.

Course code: BMCA – 705 (Elective-I)
Course title: NATURAL LANGUAGE PROCESSING

Unit-I
Introduction to NLP

NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of
English.

Unit -II
Language Modelling: N-gram and Neural Language Models

Language Modelling with N-gram, Simple N-gram models, Smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development.

Unit -III
Parts-of-speech Tagging
Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, POS Tagging using Maximum Entropy Model.

Unit -IV
Parsing
Basic concepts: top down and bottom up parsing, treebank; Syntactic parsing: CKY parsing; Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

Unit -V
Semantics
Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet.

Text books:

15. Jurafsky Dan and Martin James H. "Speech and Language Processing" ,3rd Edition, 2018.

Reference books:

16. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to
Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.

17. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".

Course code: BMCA – 706 (Elective-II)
Course title: NETWORK PROGRAMMING
NETWORK SECURITY AND CRYPTOGRAPHY

Unit- I

Foundations – Protocol Building Blocks - Basic Protocols - Intermediate Protocols - Advanced Protocols - Zero-Knowledge Proofs - Zero-Knowledge Proofs of Identity - Blind Signatures - Identity-Based Public-Key Cryptography.

(8L)

Unit- II

Key Length - Key Management – Public Key Cryptography versus Symmetric Cryptography - Encrypting Communications Channels - Encrypting Data for Storage - Hardware Encryption versus Software Encryption - Compression, Encoding, and Encryption - Detecting Encryption – Hiding and Destroying Information.

(8L)

Unit- III

Information Theory - Complexity Theory - Number Theory - Factoring - Prime Number Generation - Discrete Logarithms in a Finite Field - Data Encryption Standard (DES) – Lucifer - Madryga - NewDES - GOST – 3 Way – Crab – RC5 - Double Encryption - Triple Encryption - CDMF Key Shortening - Whitening.

(8L)

Unit- IV

Pseudo-Random-Sequence Generators and Stream Ciphers – RC4 - SEAL - Feedback with Carry Shift Registers - Stream Ciphers Using FCSRs - Nonlinear-Feedback Shift Registers - SystemTheoretic Approach to Stream-Cipher Design - Complexity-Theoretic Approach to Stream-Cipher Design - N- Hash - MD4 - MD5 - MD2 - Secure Hash Algorithm (SHA) - OneWay Hash Functions Using Symmetric Block Algorithms - Using Public-Key Algorithms - Message Authentication Codes

(8L)

Unit- V

RSA - Pohlig-Hellman - McEliece - Elliptic Curve Cryptosystems -Digital Signature Algorithm (DSA) - Gost Digital Signature Algorithm - Discrete Logarithm Signature Schemes - OngchnorrShamir -Cellular Automata - Feige-Fiat-Shamir -Guillou-Quisquater - Diffie-Hellman - Station-toStation Protocol -Shamir's Three-Pass Protocol - IBM Secret-Key Management Protocol - MITRENET - Kerberos - IBM Common Cryptographic Architecture. (8L)

Text Books:

1. Schneier Bruce, "Applied Cryptography: Protocols, Algorithms, and Source Code in C", 2 nd Edition, John Wiley & Sons, Inc, 1996.
2. Mao Wenbo, "Modern Cryptography Theory and Practice", Pearson Education, 2004.
3. KahateAtul, "Cryptography and Network Security", Tata McGrew Hill, 2003.

Reference Book:

1. Stallings William, "Cryptography & Network Security Principles and Practice", Pearson Education.

Semester VIII

Course code: BMCA – 802 (Elective-4)
Course title: SOFTWARE TESTING

Unit - I
Introduction to Software testing, Error fault, Failure, Incident, Test cases, Test Plan, Software testing processes overview, Incremental testing approach, Test outlines, Limitation of Testing.

Unit – II
Functional Testing: Boundary value analysis, Equivalence Class Testing, Decision Table Based Testing and cause effect – graphing Technique.

Unit – III
Structural Testing: Path Testing, Cyclomatic Complexity, Graph metrics, Data Flow testing, Mutation Testing. Object Oriented Testing: Issues, Class Testing, GUI Testing, Object Oriented Integration and System testing, Testing Web Based Systems

Unit – IV
Reducing the number of test cases: Prioritization guidelines, Priority category scheme, Risk analysis, Regression Testing, slice based Testing,
Testing activities: Unit Testing, Levels of Testing, and Integration Testing, System Testing, Debugging, Domain Testing.

Unit – V
Testing Tools: Static Testing Tools, Dynamic testing Tools, and characteristics of Modern Tools.
Building and applying standards to test Documentation: Configuration management, Reviews, Industry Standards – ISO 9001, CMM for Software, IEEE standards.

Text/ References Books:

1. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2. Cem Kaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993
3. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990
4. Louise Tamres, "Software Testing", Pearson Education Asia, 2002
5. Roger S. Pressman, "Software Engineering – A Practitioner‟s Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
6. Boris Beizer, "Software System Testing and Quality Assurance," Van Nostrand Reinhold, New York, 1984.

Course code: BMCA – 804 (Elective-3)
Course title: MACHINE LEARNING

Unit - I
Introduction to Machine Learning

Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression.

Unit - II
Supervised Learning

Basics of Feature Selection and Evaluation, Decision Tree, Overfitting and Pruning, Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts.

Unit - III
Neural Networks

Perceptrons: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

Unit - IV
Unsupervised and Semi Supervised Learning

Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-meanspartitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labeled and unlabled data.

Unit - V
Ensemble
Committees of multiple hypotheses, bagging, boosting, active learning with ensembles.

Text Books:

18. Mitchell Tom, "Machine Learning", Latest Edition, Mc-Graw Hill.

Reference Books:

19. Shwartz Shai Shalev, and David Shai Ben, "Understanding Machine Learning", Cambridge
University Press, 2017.
20. Bishop Christopher "Pattern Recognition and Machine Learning", Springer, 2006.

Course code:
Course title:

DISCRETE MATHEMATICAL STRUCTURES

Unit- I

Logic and Mathematical Reasoning: Logic, Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Mathematical Induction, Recursive Definition and Algorithms, Program Correctness.

Unit - II

Functions and Relations: Functions, Sequences and Summations, The Growth Functions, Relations and Their Properties, Non- array Relations & Their Applications, Representing Relations, Closures of Relations, Equivalence Reloans, Partial Orderings.

Unit - III

Graphs: Introduction to Graphs, Graph Terminology and Representation, Connectivity, Euler and Hamiltonian Paths, Shortest Path Programs.

Unit - IV

Trees: Introduction and applications of trees, Tree Traversal, Spanning Trees, Minimum Spanning trees.

Unit - V

Semgroups, Groups and Coding: Binary Operations, Semigroups, Products and Quotients of Semigroups, Groups, Product and Quotients of Groups, Coding of Binary Information and Error Correction, Decoding and Error Correction.

Text Books:

1. B.Kolman et.al- Discrete mathematical Structures, 5th Edn , Pearson Education, New Delhi - 2004. 2. K.H. Rosen – Discrete Mathematics and Its Applications – 4th Edn , Tata McGraw Hill, New Delhi - 2001

Reference Books:

1. J.P. Tremblay et.al – Discrete Mathematical Structures with Applications to Computer Science, TMH, New Delhi – 2004.

Course code:
Course title:

CORPORATE SOCIAL RESPONSIBILITY

Unit-I

Introduction to CSR:Meaning& Definition of CSR, History& evolution of CSR. Corporate Citizenship,. Concept of sustainability & Stakeholder, Management.CSR through triple bottom line and Sustainable Business; environmental aspect of CSR; ;theories of CSR , Carroll's model.

Unit-II

SUSTAINABLE DEVELOPMENTSustainable development goals, United Nations (UN) Global Compact 2011.UN guiding principles on business and human rights.

Unit-III

CSR-Legislation In India & the world. Section 135 of Companies Act 2013 .

Unit- IV

The Drivers of CSR in India, Relation between CSR and Corporate governance; Identifying key stakeholders of CSR & their roles. (Stakeholders: Organization, Government, Society and Regulatory Environments)

Unit-V

Review current trends and opportunities in CSR.CSR as a Strategic Business tool for Sustainable development. Review of successful corporate initiatives & challenges of CSR.

Books:

1. Corporate Social Responsibility : Kotler and Lee
2. Theory and practices of CSR : Idowu, Samuel O., Louche, Celine 3. CSR in India : Sanjay Aggarwal

Course code:
Course title:

DECISION SUPPORT SYSTEMS

Unit – I

Decision Making Process: An Over view, Introduction, Managerial decision making and Information System, Need for computerized decision support and the supporting technologies, Framework of DSS, Group Support System, Executive information system, Knowledge management Systems.

Unit – II

Decision Making, System, Models: Decision Making – Introduction and Definition, System, Models, previews of modeling process, Decision making – The intelligence phase, the design phase and the choice phase. Evaluation – Multiple Goals, sensitivity analysis, What – if and goal seeking. Decision Making - The implementation phase, Alternative decision making models.

Unit – III

DSS – Configurations, Definitions, Characteristics & Capabilities, Components, The Data management Subsystem, Model Management Subsystem, Knowledge – based management, Subsystem, User interface Subsystem, DSS Classification, DSS H/W, Difference between Management Science and MIS. Modeling & Analysis - Modeling for MSS, Static & Dynamic Models, Treating Certainty, Uncertainty and Risk, Interface diags, MSS modeling in spreadsheets, Decision analysis (Decision tables and Decision trees), Optimization via mathematied programming, Meusistic Programming, Multidimensional Modeling – OLAP.

Unit – IV

DSS Development – Introduction, The Traditional System Development life cycle, Alternate Development Methodologies, Prototyping, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team Developed DSS, End – User Developed DSS, DSS System Integration.

Unit – V

Collaboration Communication, Enterprise DSS Group Decision Making – Communication & Collaboration, Communication Support, Collaboration Support – Computer Supported Cooperative work, Group Support System, GSS Technologies.

Text Book:

1. Turloan E. & Aronson E. “Decision Support System & Intelligent System”, 6th Edition, Pearson Education. Master of Computer Applications111

Reference Book:

1. Marakas G.M. “Decision Support Systems”, 2nd Edition, Pearson /Prentice Hall of India

Course code:
Course title:

SYSTEMS PROGRAMMING

Unit –I

Introduction: System Softwares& its Components, Evolution of System Softwares-Operating System, Loaders, Interpreters, Compilers, Linkers, Assemblers.Assemblers: Elements of Assembly Language Programming, Assembly Process, Single Pass Assembler, Design of a 2-Pass assembler for In 8088.

Unit -II

Macros & Macro processors: Macros, Different forms of Macros, Macros using AIF, AGO, REPT. Etc, Design of a Macro Processor, Macro Assembler.

Unit –III

Loaders: Basic Loader Functions, Absolute Loader, Compile & go Loader, Relocating Loader, Direct Linking Loader.

Unit -IV

Linkage Editors: Linking and Relocation, Program Relocability, Linkage Editor and its Application in IBP-PC, Linking for Program Overlays.

Unit -V

Software Tools: Spectrum of Software Tools, Text Editors, Interpreter and Program Generators, Debug Monitors, Programming Environments.

Text Book:

1. Dhamdhere D.M. "System Programming and Operating Systems", 2nd Edition, TMH, New Delhi.

Reference Book:

1. Donovon J.J. "System Programming", TMH, New Delhi.

Course code:
Course title:

PROGRAMMING LANGUAGE DESIGN AND CONCEPTS

Unit-I

Introduction: The Role of Programming Languages: Toward Higher-Level Languages, Programming Paradigms, Languages Implementation: Bridging the Gap. Language Description: Syntactic Structure: Expression Notations, Abstract Syntax Trees, Lexical Syntax, Context- Free Grammars, Grammars for Expressions.

Unit–II

Imperative Programming: Statements: Structured Programming: The Need for Structured Programming, Syntax-Directed Control Flow, Design Considerations: Syntax, Handling Special Cases in Loops, Programming with Invariants, Proof Rules for Partial Correctness, Control Flow in C.

Unit-III

Types: Data Representation: The Role of Types, Basic Types, Arrays: Sequences of Elements, Records: Named Fields, Unions and Variant Records, Sets, Pointers: Efficiency and Dynamic Allocation, Two String Tables, Types and Error Checking. Procedure Activations: Introduction to Procedures, Parameter- Passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope: Procedures as in C.

Unit -IV

Object-Oriented Programming: Grouping of Data and Operations: Constructs for Program Structuring, Information Hiding, Program Design with Modules, Modules and Defined Types, Class Declarations in C++, Dynamic Allocation in C++, Templates: Parameterized Types, Implementation of Objects in C++. Object-Oriented Programming: What is an Object?, Object-Oriented Thinking, Inheritance, Object-Oriented Programming in C++, Derived Classes and Information Hiding, Objects in Smalltalk, Smalltalk Objects have a Self.

Unit -V

Functional Programming: Elements of Functional Programming: A Little Language of Expressions, Types: Values and Operations, Approaches to Expression Evaluation, Lexical Scope, Type Checking. Functional Programming in a Typed Language: Exploring a List, Function Declaration by Cases, Functions as First-Class Values, ML: Implicit Types, Data Types, Exception handling in ML. Functional Programming with Lists: Scheme, Dialect of Lisp, The Structure of Lists, List Manipulation, A Motivating Example: Differentiation, Simplification of Expressions.

Text Book:

1. Sethi R. & Viswanathan K.V. "Programming Languages Concepts & Constructs", 2nd Edition, Pearson Education, 2007.

Course code:

Course title:

QUANTITATIVE METHODS FOR BUSINESS DECISIONS

Unit-I

Statistics: Meaning and Applications of Statistics in business decision making and research. Collection, Tabulation andpresentation of data.Measures of central tendency: Mean, Median and Mode. Measures of dispersion: Range, Mean Deviation, Standard Deviation. Relative measure of Dispersion

Unit -II

Correlation: Karl Pearson's coefficient of correlation, Rank, Probable error and coefficient of determination. Regression Analysis: Regression Lines, Equations and Coefficients. Analysis of Time Series and Business Forecasting: Components, Moving Averages, Exponential smoothing and Least Squares Method.

Unit -III

Probability Theory: Concepts, Conditional Distribution, Bayes' Theorem and application. Random Variable. Distribution Theory: Discrete and Continuous: Binomial and Poisson Distribution and Normal Distribution. Application of Distribution theory to Engineering and Management Science problems

Unit -IV

Sampling Theory and Distribution. Estimation Theory: Unbiasedness and Minimum Variance Unbiased Estimator.

Unit - V

Testing of Hypotheses: Null and Alternative Hypothesis, Type-I and II error. p test, t test, Chi Square test, F Test and their applications. ANOVA - One way test.

Text Books:

1. Levin Richard I. & Rubin, David S, Statistics for Management, Prentice Hall Of India, New Delhi.
2. Gupta S.P Gupta M P, Business Statistics, Sultan Chand.
3. Terry, Sineich, Business Statistics by Examples, Collier McMillan Publisher.

Course code:

Course title: SOFT COMPUTING

Unit – I

Introduction to Artificial Intelligence System, Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crip Relation, Fuzzy Relations.

Unit – II

Fuzzy System: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, and Applications.

Unit – III

Genetic Algorithms, Basic Concepts, Creation Of Offspring, Working Principle, Encoding, Fitness Function, Reproduction. Genetic Modeling, Inheritance Operations, Cross Over, Inversion And Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods, Advanced In GA.

Unit – IV

Fundamentals Of Neural Networks, Basic Concepts Of Neural Network, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristic Of Neural Networks, Learning Method, Taxonomy Of Neural Network Architectures, History Of Neural Network Research, Early Neural Network Architectures, Some Application Domains.

Unit – V

Back Propagation Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm. Associative Memory And Adaptive Resonance Theory, Autocorrelations, Hetrocorrelators , Multiple Training Encoding Strategy, Exponential BAM, Associative Memory For Real Coded Pattern Pairs, Applications, Introduction To Adaptive Resonance Theory, ARTI, Character Recognition Using ARI1

Text Book:

1. Rajasekharan S. &Vijayalakshmi G. A. “Neural Network Fuzzy Logic and GenticAlgorithm Synthesis and Applications”, Prentice Hall of India PLT, Pai, 2004.

Reference Book:

2. 1. Jang JyhShing R, Sun C. T., Mizutani E. “Neuro Fuzzy and Soft Computing –A Computational Approach to Learning and Machine Intelligence”, Prentice Hall of India, 1997.

Course code:
Course title:PROGRAMMING FOR PROBLEM SOLVING

Unit- I

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Problem Solving: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Unit- II

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals, Iterations, Loops.

Unit-III

Array, Character array, strings. Case studies to discuss the various Problems related to Basic science (Matrix addition, Matrix-matrix multiplication, Roots of an equation etc.), Sorting, Searching.

Unit- IV

Functions (including using built in libraries), Parameter passing in functions, call by value, call by reference. Passing arrays to functions, Recursion (Finding Factorial, Fibonacci series, Ackerman function etc.).

Unit- V

Structures, Defining structures and Array of Structures Pointers: Defining pointers, Use of Pointers in self-referential structures, File Handling.

Text Books:

1. Jery R Hanly, Problem solving and Program design in C, 7thEdition, Pearson Education.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. ReemaThareja, Introduction to C Programming, 2nd Edition, Oxford University Press, 2015.
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice.
5. Byron Gottfried, Schaum's Outline of Programming with C, Tata McGraw-Hill.

Course code:
Course title: FUNDAMENTALS OF MANAGEMENT & ORGANIZATION BEHAVIOUR

Unit - I:
Introduction: Concepts, Function or Process, Management Discipline, as an Arts or Science,Understanding Management and Administration, Managerial Skills, Roles of a Manager, Levels of Management.

Development of Management Thought: Classical Approaches- Scientific Management,
Administrative Management: Bureaucracy, Behavioural Approach.

Unit - II:
Planning: Nature and significance of Planning, Types of plans, Process of Planning,
Organizing:
Process of Organizing, Forms of Organizational Structure, Formal and informal organization

Unit - III:

Staffing: Concept, Manpower Planning, Process of Manpower planning, Recruitment & Selection,Training & Development, Performance Appraisal.

Motivating: Significance of Motivation**,** Motivation process, Theories of Motivation and theirapplication

Unit - IV:
Leading: Concept of Leadership, Leadership Style, Theories of Leadership

Communication: Process, Importance of Communication, Communication Channels, Barriers toCommunication.

Unit - V:

Controlling: Definition, Importance of controlling, Characteristics of control, Control process,Types of Control System, Introduction to CSR and Sustainable Development.

Books recommended:
TEXT BOOK

"Management", Stoner and Freeman, Prentice Hall of India. **(T1)**
"Essentials of Management", Koontz and Heinz Weihrich, McGraw Hill. **(T2)**
"Management", Robbins &Coulter, Prentice Hall of India. **(T3)**

REFERENCE BOOK

"Principles of Management", Gilbert, Mc Graw Hill. **(R1)**

"Principles and Practices", T. N. Chhabra, Dhanpat Rai and Sons Pvt. Ltd. **(R2)**
"Management: A Global and Entrepreneurial Perspective", Weihrich Heinz &Koontz
Harold, Mc Graw Hill. **(R3)**
"Principles of Management", P.C.Tripathi and P.N.Reddy, Mc Graw Hill. **(R4)**

Course code:
Course title: NUMERICAL AND STATISTICAL METHODS LAB

Course code:
Course title: Bioinformatics

Unit – 1:

Major Information Resources & Databases in Bioinformatics: Information Resources: NCBI,EBI, ExPasy, Entrez, Derived (Secondary) Databases of Sequences, Different Bio-sequence File

Formats.

Unit – 2:

Sequence Analysis: Homology, Gap Penalty, Scoring matrices (PAM, BLOSUM), Dot matrixmethod, Dynamic programming using Needleman-Wunschalgorithm,Scoring methods of MSA (Sum of Pair), BLAST and FASTA.

Unit – 3:

Phylogenetic Analysis: Molecular Phylogenetics: Basics, molecular clock, Substitution Models ofevolution, Tree reconstruction methods (Distance based).

Unit – 4:

Molecular Modeling and Molecular Docking: Structure alignment: superimposition and RMSDcalculations, DALI, Classification of 3-D structures of proteins, SCOP, CATH, Structure Prediction of Protein Structure (Chou-Fasman), Homology modelling.

Unit – 5:

Applications of Bioinformatics: Cheminformatics, Bigdata analysis, Microarray - Dataanalysis, Theory and Algorithms, motif analysis and presentation.

Textbook

21. **Bioinformatics: Sequence and Genome Analysis,** David W Mount, Cold SpringHarbor Laboratory Press, New York (September 2004)

22. ***Guidebook on Molecular Modeling In Drug Design (Illustrated),*** J. G. Vinter,Mark Gardner (Editor), J. G. Vinter (Editor), CRC Press (May 1994) ISBN: 0849377722

23. **Binformatics: a practical guide to the analysis of genes and proteins,** Baxevanis A.,Ouellette F.B.F., John Wiley and Sons, New York.

Reference books:

24. Fundamental Concepts of Bioinformatics, Dan E Krane, Michael L Raymer, Benjamin-Cummings Pub Co (Sept 2002, ISBN 0805346333)

Course code:
Course title: Basics of Financial Accounting andManagement

Unit – I
Introduction to Financial Management, Accounting Concept Concept, Finance Functions, Roleof Finance Manager, Decision Making. Principles and conventions, Double Entry System, Accounting Statements, Analysis of Financial Statement: Ratio Analysis.

Unit – II
Sources of Finance: -Short term &Long term, Stock Market: Primary Market & Secondary
Market, Shares: Equity Shares & Preference Shares, Debenture: Definition & Types, Venture
Capital, Mutual Fund, Bank Loan: Working Capital Loan & Term Loan.

Unit – III
Capital Budgeting: -Definition, Concept, Objective, Methods of appraisal; Payback Period, ARR,NPV, IRR, Benefit Cost Ratio.

Unit – IV
Working Capital Management: -Working Capital:Definition, Gross Working Capital, NetWorking Capital, Importance, influencing factors, Working Capital Cycle, Working CapitalPolicies, Working Capital Financing Policies.

Unit – V
Cost Management- Cost:Definition, Concept, Classification, Cost Centre: Concept and Types,Cost Sheet. Marginal Costing: Definition, Importance, CVP Analysis: Break Even Analysis, Margin of Safety, Angle of incidence, Graphical Representation, Limitations.

Reference Books:-

25. Financial Management by I.M. PandeyVikas Publication.
26. An Introduction to Financial Accounting by S.N. Maheshwari, Vikas Publication.
27. Cost & Management Accounting by M.N.Arora, Vikas Publication
28. Financial Management: Theory & Practices by Chandra Prasanna, TMH Publication

Course code:
Course title: OPERATING SYSTEM LAB

Course code:
Course title: COMPUTER ALGORITHM DESIGN

Unit - I
Elementary Algorithmic: Introduction, Problems and instances, The efficiency of algorithms,Average and worst-case analyses, What is an elementary operation, why look for efficiency. **Asymptotic Notation**: Introduction, A notation for "the order of", Other asymptotic notation,Conditional asymptotic notation, Conditional asymptotic notation, Asymptotic notation with

several parameters, Operations on asymptotic notation.

Unit - II
Analysis of Algorithm: Introduction, Analyzing control structures, Using a barometer,Supplementary examples, Average-case analysis, Amortized analysis, Solving recurrences.
Greedy Algorithms: General characteristics of greedy algorithms, Graphs: Minimum spanning
trees, Shortest paths, The knapsack problem, scheduling.

Unit - III
Divide-and-conquer: Introduction: Multiplying large integers, The general template, Binary
search, Sorting, Finding the median, Matrix Multiplication, Exponentiation.

Unit - IV
Dynamic Programming: Calculation the binomial coefficient, The World Series, Makingchange, The principle of optimality, The knapsack problem, Shortest paths, Chained matrixmultiplication.

Unit - V
Exploring Graphs: Graphs and games: An introduction, Traversing trees, Depth-first search:Undirected graphs, Depth-first search: directed graphs, Breadth-first search, Backtracking, Branch-and-bound, the minimax principle.
Probabilistic Algorithms: Introduction, Probabilistic does not imply uncertain, Expected versusaverage time, Pseudorandom generation, Numerical probabilistic algorithms, Monte Carloalgorithms, Las Vegas algorithms.

Text Book:
1. Brassard G. & Bratley P., "Fundamentals of Algorithms", New Delhi, 2005.

Reference Books:

29. E.Horowitz. et.al., "Fundamentals of Computer Algorithms", Galgotia Publication Pvt.
Ltd.,New Delhi, 2004.
30. Kleinberg J. &Tardos E., "Algorithm Design", Pearson Education, New Delhi, 2006.

31. Cormen T.H., Leiserson Charles E.,Rivest Ronald, Stein Clifford "Introduction to Algorithms" 3rd Edition, PHI, New Delhi, 2005.

32. Dasgupta S., Papadimitriou C.H., Vaziran U.V, " Algorithm" 3rd Edition , TMH, New Delhi, 2007.

33. Sahani S., "Data Structures Algorithms and Applications in C++" 2nd Edition, Universities Press (India) Pvt. Ltd., 2005.

Course code:

Course title: Corporate Social Responsibility

Unit - I

Introduction to CSR:Meaning& Definition of CSR, History& evolution of CSR. Corporate Citizenship,. Concept of sustainability & Stakeholder, Management.CSR through triple bottom line and Sustainable Business; environmental aspect of CSR; ; theories of CSR , Carroll's model.

Unit - II
SUSTAINABLE DEVELOPMENT Sustainable development goals, United Nations (UN) Global
Compact 2011.UN guiding principles on business and human rights.

Unit - III
CSR-Legislation In India & the world. Section 135 of Companies Act 2013.

Unit - IV

The Drivers of CSR in India, Relation between CSR and Corporate governance; Identifying key stakeholders of CSR & their roles. (Stakeholders: Organization, Government, Society andRegulatory Environments)

Unit - V

Review current trends and opportunities in CSR.CSR as a Strategic Business tool for Sustainable development. Review of successful corporate initiatives & challenges of CSR.

Reference Books:

34. Corporate Social Responsibility : Kotler and Lee

35. Theory and practices of CSR : **Idowu**, Samuel O.,**Louche**, Celine
36. CSR in India : Sanjay Aggarwal

Course code:
Course title: MULTIMEDIA DATABASES

Unit -I
Introduction, Multimedia Information Applications, Issues and Challenges, Semantic Models for
Multimedia Information Systems, Multimedia Semantic Models.

Unit -II
Multimedia database Searching, Image Segmentation,Video Parsing and SegmentationApproaches ,Iconic-Based Grouping and Browsing Approaches , Knowledge-Based Event Modeling Approaches , Characteristics of Video Data Modeling , Motion Detection and Tracking Approaches ,Object Recognition Approaches ,Content-Based Retrieval.

Unit -III

Multimedia Browsing, Video Browsing, Key Frame Selections.

Unit -IV
Augmented Transition Network Model (ATN), Spatial and Temporal Relations of SemanticObjects, Multimedia Presentations, Multimedia Database Searching, Multimedia Browsing, User

Interactions and Loops.

Unit -V
Object Composition Petri Net Model, Interval Based Conceptual Models.

Text Book:

37. Chen S. C., Kashyap R. L., Ghafoor A. “Semantic Models for Multimedia Database Searching and Browsing”, Kluwer Academic Publishers.

Reference Book:

38. Muneesawang P. “Guan L-Multimedia Database Retrieval A Human-Centered
Approach”, Springer Publication, 2006.

Course code:
Course title: SOFTWARE ENGINEERING LAB

Course code:
Course title: FRONT END DESIGN
Unit- I
Introduction: Importance of user interface–definition, importance of good design, brief history
– Graphical User Interface – Web User Interface – Theories, Principles and Guidelines of User
interface design

Unit- II

Design Process: Obstacles in development path deigning for people-Understanding HumanInteraction with computers, Importance of Human Characteristics, Human consideration, Human Interaction speeds – Understanding Business function

Unit- III

Screen Designing: Design goals - screen meaning and purpose, organizing screen elementsordering of screen data and content – screen navigation and flow – visually pleasing composition– amount of information – focus and emphasis – presenting information simply and meaningfully– information retrieval on web – Statistical graphics – Technological considerations in Interface Design.

Unit- IV

Menus and navigation schemes: structures of menus-functions of menus- contents of menus -formatting of menus – phrasing the menu- selecting menu choices-navigating menus-kinds of graphical menus- Selection of windows-Window characteristics-components of windows-window presentation styles-types of windows-window management-organising window functions-window operations-Selection of device based and screen based controls - text and messages – icons andimages – Multimedia – colours- uses, problems, choosing colours.

Module V

Distributed and Collaborative Interaction: Device consistency-distribution of the userinterface-event distribution-graphical package layer-programmable API-Model semantics distribution-data layer distribution-asynchronous Collaboration-Software tools-specification methods- interface building tools –evaluation and critiquing tools-Interaction devices keyboard and function keys - pointing devices- speech recognition, digitization and generation – image andvideo displays – printers.

Text books:

39. Galitz Wilbert O. "The Essential Guide to User Interface Design" 3rdEdition., Wiley Dreamtech, Delhi, 2007.
2. Shneiderman Ben "Designing the User Interface", 5thEdition., Pearson Education Asia, Delhi, 2014.

Reference books:

40. Dan R. Olsen, Human Computer Interaction, Cengage, New Delhi, 2009.

41. John M. Carroll, Human Computer Interaction, Pearson Education Asia, Delhi, 2002.
42. Alan Cooper, The Essentials of User Interface Design, Wiley Dreamtech, Delhi, 2002.

Course code:

Course title: DATA COMMUNICATION AND COMPUTER NETWORK

Unit - I

Data Communications and Networking Overview: A Communications Model, Data

Communications, Data Communication Networking.

Protocol Architecture: The Need for a Protocol Architecture, A Simple Protocol Architecture,OSI, The TCP/IP Protocol Architecture**(8L)**

Unit - - II

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission,Transmission Impairments, Channel Capacity.

Guided and Wireless Transmission: Guided Transmission Media, Wireless Transmission,Wireless Propagation, Line-of-Sight Transmission.**(8L)**

Unit - - III

Signal Encoding Techniques: Digital Data Digital Signals, Digital Data Analog Signals, AnalogData Digital Signals, Analog Data Analog Signals.

Digital Data Communication Techniques: Asynchronous and Synchronous Transmission,Types of Errors, Error Detection, Error Correction, Line Configurations, Interfacing.**(8L)**

Unit – IV

Data Link Control: Flow Control, Error Control, High-Level Data Link Control (HDLC).
Multiplexing: Frequency Division Multiplexing, Synchronous Time Division Multiplexing,Statistical Time Division Multiplexing.

Circuit Switching and Packet Switching: Switching Networks, Circuit-Switching Networks,Circuit-Switching Concepts, Control Signaling, Softswitch Architecture, Packet-Switching Principles, X.25, Frame Relay.**(8L)**

Unit -V

Asynchronous Transfer Model: Protocol Architecture, ATM Logical Connections, ATM Cells,Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.

Routing in Switched Networks: Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms**(8L)**

Text Book:

43. Stallings W. "Data and Computer Communications", 7th Edition., Pearson Education./ PHI, New Delhi, 2006.

Reference Books:

44. Forouzan B. A., "Data Communications and Networking", 4th Edition. TMH, New Delhi, 2006.

45. Gupta P.C. "Data Communications and Computer Networks", PHI, New Delhi 2006.

Course code:
Course title: ADVANCED JAVA PROGRAMMING

Unit -I

Components and Facilities or Rich Graphical User Interfaces: Programming with the JFC,Swing API Components, Jcomponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, and Check Boxes, Menus, Toolbars, and Actions, Sliders, Spinners, Progress Bars, and Scrollbars, Lists and Combo Boxes, Text-Entry Components, Color and File Choosers, Tables and Trees, Printing with the 2D API, Java Print Service API.

Unit -II

Using Relational Database: Introduction, Best Practices for Programming for Databases, JDBCDrivers for RDBM Systems, SQL to Java Type Mappings, Understanding the Database used in this chapter, Using the **java.sql** API, Coding Transactions, Using the **javax.sql** API, Connection

Pooling.

Unit -III

XML: Introduction, XML Structure, XML Example Document with SAX, Parsing an XMLDocument with DOM, Generating an XML Document with DOM, Validating XML Documents using DTD and XML Schema, Transforming XML using XSLT.**Network Programming:** Introduction, Working with URLs, Working with Sockets, Remote Method Invocation.

Unit -IV

Building Web Applications: Introduction, The Technology of the Web, J2EE Web ApplicationPackaging, Servlets, The Servlet API, The User Experience, Building a Web App with Continuity, Java Server Pages, JSP Tags and API, How the Server Processes JSPs, Java Coding in JSPs, Frameworks for Building Web Applications, Building Robust WebApps.

Unit -V

Enterprise JavaBeans: Introduction, Enterprise Programming, What are EJBs? Session EJBs,EJB Clients, Entity EJBs, Message-Driven Beans, EJB Transactional Characteristics, EJB Security, Best Practices for Designing EJB-Based Applications.

Text Book:

46. Wigglesworth & McMillan "JavaTM Programming Advanced Topics", 3rd Edition, India Edition, Thomson Education, New Delhi, 2007.

Course code:
Course title: SYSTEMS PROGRAMMING

Unit -I
Introduction: System Softwares & its Components, Evolution of System Softwares-OperatingSystem, Loaders, Interpreters, Compilers, Linkers, Assemblers. **Assemblers:** Elements of Assembly Language Programming, Assembly Process, Single Pass Assembler, Design of a 2-Pass assembler for In 8088.

Unit -II
Macros & Macro processors: Macros, Different forms of Macros, Macros using AIF, AGO,REPT. Etc, Design of a Macro Processor, Macro Assembler.

Unit -III
Loaders: Basic Loader Functions, Absolute Loader, Compile & go Loader, Relocating Loader,Direct Linking Loader.

Unit -IV
Linkage Editors: Linking and Relocation, Program Relocability, Linkage Editor and itsApplication in IBP-PC, Linking for Program Overlays.

Unit -V

Software Tools: Spectrum of Software Tools, Text Editors, Interpreter and Program Generators,Debug Monitors, Programming Environments.

Text Book:
47. Dhamdhere D.M. "System Programming and Operating Systems", 2nd Edition, TMH, New Delhi.

Reference Book:
48. Donovon J.J. "System Programming", TMH, New Delhi.

Course code:
Course title: COMPILER DESIGN

Unit -I

Introduction to Compiling: Translators, Interpreters, Compiler, other language processors,Phases of a compiler, Passes of compiler, Back-end and Front-end of compiler, Basic idea on Symbol Table, Issues in Compiler construction, Concept on *l*-value and r-value, Programming Language basics, Compiler construction tools.

Lexical and Syntax Analysis:*Lexical analysis*: Role of a Lexical analyser, Input buffering,Specification and recognition of tokens, State-machine driven lexical analysers and their implementations, Lexical analyser generator tool: LEX/FLEX.

Unit -II

Syntax analysis: Need and Role of Parser, Importance of Context Free Grammars in designingParser, Parse trees, derivations and sentential forms, Ambiguity.

Top down parsing: Backtracking, Recursive descent and Predictive parsers (LL), Error-detection
in LL parser

Bottom-up parsing: Simple Shift-Reduce parsing, LR Parsers: SLR, CLR and LALR parsers, Error detection in S-R parsing, Handling ambiguous grammar, Parser generator tool: YACC/BISON

Unit -III

Syntax Directed Translation: Syntax directed definitions, Construction of syntax tree, Attributegrammars, Inherited and synthesized attributes, Dependency graphs, Evaluation orders of attributes, S-Attributed definitions, L-attributed definitions.

Intermediate code generation: Variants of Syntax Trees, Three-address codes of different
constructs, Translation of expressions, Type checking: Rules for type checking, Type conversion;

Unit -IV

Machine independent code optimization: Sources of optimization, DAG, Peephole optimizationand Basic Blocks, Loops in Flow Graphs, Data flow analysis and equations

Unit -V
Runtime Environment and Code Generation:

Runtime environment: Storage organization: Static and Dynamic, Stack allocation and Heapallocation of memory;

Code generation: Issues in designing of a code generator, Register allocation and Assignment,
Target machine (assembly code for 80- series)

Text Book:

49. Aho A.V., Sheth R. I. and Ullman J.D. “Compilers Principles Techniques and Tools”, Pearson Education.

Reference Books:

50. Levine John R., Mason Tony, Brown Doug "Lex &Yacc", O'reilly.
51. Appel Andrew N., "Modern Compiler Implementation in C", Cambridge University Press.
52. Cooper & Linda "Engineering a Compiler", Elsevier theory.

Course code:
Course title: PROGRAMMING LANGUAGE DESIGN AND CONCEPTS

Unit -I
Introduction:
The Role of Programming Languages: Toward Higher-Level Languages, Programming
Paradigms, Languages Implementation: Bridging the Gap.
Language Description: Syntactic Structure: Expression Notations, Abstract Syntax Trees,Lexical Syntax, Context- Free Grammars, Grammars for Expressions.

Unit -II
Imperative Programming:

Statements: Structured Programming: The Need for Structured Programming, Syntax-DirectedControl Flow, Design Considerations: Syntax, Handling Special Cases in Loops, Programming with Invariants, Proof Rules for Partial Correctness, Control Flow in C.

Unit -III
Types: Data Representation: The Role of Types, Basic Types, Arrays: Sequences of Elements,Records: Named Fields, Unions and Variant Records, Sets, Pointers: Efficiency and Dynamic Allocation, Two String Tables, Types and Error Checking.

Procedure Activations: Introduction to Procedures, Parameter- Passing Methods, Scope Rules for
Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope: Procedures as in C.

Unit -IV
Object-Oriented Programming:

Grouping of Data and Operations: Constructs for Program Structuring, Information Hiding,Program Design with Modules, Modules and Defined Types, Class Declarations in C++, Dynamic Allocation in C++, Templates: Parameterized Types, Implementation of Objects in C++.

Object-Oriented Programming: What is an Object?, Object-Oriented Thinking, Inheritance,Object-Oriented Programming in C++, Derived Classes and Information Hiding, Objects in

Smalltalk, Smalltalk Objects have a Self.

Unit -V

Functional Programming:

Elements of Functional Programming: A Little Language of Expressions, Types: Values andOperations, Approaches to Expression Evaluation, Lexical Scope, Type Checking.

Functional Programming in a Typed Language: Exploring a List, Function Declaration byCases, Functions as First-Class Values, ML: Implicit Types, Data Types, Exception handling in ML.

Functional Programming with Lists: Scheme, Dialect of Lisp, The Structure of Lists, List Manipulation, A Motivating Example: Differentiation, Simplification of Expressions.

Text Book:

1. Sethi R. & Viswanathan K.V. "Programming Languages Concepts & Constructs", 2nd Edition, Pearson Education, 2007.

Course code:
Course title: WEB PROGRAMMING

Unit -I

MVC, Asp.NET MVC, ORMs, Entity Framework, Models, Database Contexts, Adding Controllers, Views, Filtering, Searching related entitites.

Unit -II

ViewBag, View Model, Complex Filtering, Data Validation, Annotations, Sorting, Paging, Routing Configurations, Many to many relationships with the Entity Framework, Partial Views.

Unit -III

Authentication, Authorization, ASP.NET Identity, Role Management, User management,
Password management.

Unit -IV

CSS Fundamentals, Selectors, Inheritance, Cascading, Box Model, Advanced CSS, Animations.

Unit -V

Designing Responsive web sites, Media Queries, Developing for mobiles and Tablets.

Text books:

53. Naylor L., "ASP.NET MVC with Entity Framework and CSS", 1st Edition, Apress, 2017.

Course code:

Course title: OPTIMIZATION TECHNIQUES

Unit- I

Operation Research –An overview, Organ and Development of OR, Nature and Features of OR,Modeling in OR, General Solution Methods for OR models, Scientific method in OR, Methodology of OR, Application, Opportunities and Shortcomings of OR.

Unit- II

Linear Programming Problem: Introduction, Mathematical Formulation of the Problem,Graphical Solution Method, Some Exceptional Cases, General LPP, Canonical and Standard forms of LPP, Simplex Method: Introduction, Fundamental properties of solutions, the Computational Procedure, Use of Artificial variables, Solution to simulation Linear Equations, Investing a Matrix

using Simplex Method.

Unit - III

Duality in LPP: Introduction, General Primal–Dual pair, Formulating a Dual Problem, PrimalDual pair in Matrix form, Halting theorems, Dual simplex method, Post optical Analysis, Introduction: Variation in cost vector, Requirement Vector, Coefficient Matrix, Structural

Variation.

Unit- IV

Integer Programming and Advance LPP techniques: Introduction, Gomory's Method, Courtruction of Gomorra's constraints, Fractional Cut Method: All Integer & Mixed Integer, Revised Simplex Method, Bounded Variable, Parametric LPP, KarmakarAlgorith.

Unit- V

Dynamic Programming & Introduction: Characteristic of Dynamic Programming, DynamicProgramming Algorithm, Solution of LPP by Dynamic Programming. **NLPP:** Introduction, Formulality

Text Book:

1. Hiller S. & Lieberman G.J. "Operations Research", 9th Edition, TMH, New Delhi, 2012.

Reference Books:

54. Taha H.A. "Operations Research", 9th Edition, Pearson Education, New Delhi, 2013.
55. Pai Pradeep Prabhakar "Operations Research", 1st Edition, Oxford University Press 2012.

Course code:
Course title: IMAGE PROCESSING

Unit -I

What Is Digital Image Processing, Fundamental Steps in Digital Image Processing , Components of an Image Processing System, Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic

Relationships Between Pixels, Linear and Nonlinear Operations.

Unit -II

Enhancements in Spatial Domain: Some Basic Gray Level Transformations, HistogramProcessing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Enhancements in Frequency Domain: Introduction to the Fourier Transform and the FrequencyDomain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters,

Homomorphism Filtering

Unit -III

Image Restoration: A Model of the Image Degradation/Restoration Process, Noise Models.Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations.

Unit -IV

Image Compression: Fundamentals, Image Compression Models, Elements of InformationTheory, Error-Free Compression, Lossy Compression.

Unit -V
Morphological Image Processing and Segmentation: Preliminaries, Dilation and Erosion, Opening and Closing,The Hit-or-Miss Transformation. Some Basic Morphological Algorithms, Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based

Segmentation.

Text books:

56. Rafael. C. & Woods Richard E. “Digital Image Processing”, 3rd Edition, Pearson Education, New Delhi, 2009.

Reference books:

57. Pratt W.K. “Digital Image Processing”, 4th Edition, John Wiley & sons Inc., 2006.
58. Sonka M., Hlavac Vaclav,Boyle Roger “Image Processing, Analysis and Machine Vision”, 2nd Edition, Thomson Learning, India Edition, 2007.
59. Jayaraman “Digital Image Processing”, Tata McGraw. Hill Education, 2011.

Course code:
Course title: IN-MEMORY COMPUTING

Unit -I

An introduction to Apache Spark, Basic Architecture, Spark APIs, Spark Session, Dataframes, Transformations, Actions, Datasets, Structured Streaming

Unit -II
Structured APIs, Overview, Basic Structured Operations, Different types of Data, Aggregations, Joins, Data Sources, SparkSQL, Datasets

Unit -III

Low Level API, Resilient Distributed Datasets, Advanced Resilient Distributed Datasets, Distributed shared variables.

Unit -IV
Streaming, Fundamentals, Structured Streaming basics, Event time and stateful processing

Unit -V
Machine Learning, Preprocessing and feature engineering, Classification, Unsupervised learning

Text books:

60. Chambers B., Zaharaia M., "Spark The Definitive Guide – Big Data Processing made Simple", 1st Edition, O'Reilly Media, 2018.

Course code:
Course title: Multimedia and Animation

Unit -I
Introduction, Multimedia Information Applications, Issues and Challenges, Semantic Models for

Multimedia Information Systems, Multimedia Semantic Models

Unit -II
Multimedia database Searching, Image Segmentation, Video Parsing and Segmentation Approaches, Iconic-Based Grouping and Browsing Approaches, Knowledge-Based Event Modeling Approaches, Characteristics of Video Data Modeling, Motion Detection and Tracking

Approaches, Object Recognition Approaches, Content-Based Retrieval.

Unit -III

Multimedia Browsing, Video Browsing, Key Frame Selections

Unit -IV

Augmented Transition Network Model (ATN), Spatial and Temporal Relations of Semantic Objects, Multimedia Presentations, Multimedia Database Searching, Multimedia Browsing, User

Interactions and Loops

Unit -V

Object Composition Petri Net Model, Interval Based Conceptual Models

Text Book:

61. Chen S C, Kashyap R L, Ghafoor A. "Semantic Models for Multimedia Database Searching and Browsing", Kluwer Academic Publishers.

Reference Book:

62. Muneesawang P., Guan L. "Multimedia Database Retrieval a Human-Centered Approach", Springer Publication, 2006.

List of Elective

Course code:

Course title:INTRODUCTION TO SYSTEM THEORY

Unit-I

Introduction to signals and systems: Definition, Basis of classification, Representation of common signals and their properties, Systemmodeling

Unit-II

Analogous System: Introduction, D Alembert's Principle, Force-voltage and force-current analogies, Electrical analogue of mechanical, Hydraulic and thermal systems.

Unit-III

Fourier Transform Method: Introduction, Fourier transform pair, Amplitude spectrum and phase spectrum of signals, Sinusoidal transfer function.

Unit-IV

Laplace Transform Method: Introduction, Laplace transform pair, Laplace transformation of common functions, Gate function, Step function and impulse function, Laplace theorems

shifting, initial value, final value and convolution theorems.
Inverse Laplace transform by partial fraction expansion and convolution integral method.

Unit-V

System Analysis: System Analysis by Laplace Transform method, System response. Natural, forced, transient and steady state responses. Transfer function and characteristic equation, Superposition integral, Concept of poles and zeros, Nature of system response from poles and zeros.

Unit-VI

System Stability: Concept of stability, Types, Necessary and sufficient conditions, Routh Hurwitz stability criterion, Limitations and its applications to closed loop systems.

Unit-VII

State-Space Concept: Introduction, Definition: State, State variable, State vector and state space, State space representation, Derivation of State model from transfer function, Bush form and diagonal canonical form of state model, Non-uniqueness of state model, Derivation of transfer function from state model, Transition matrix and its properties, Solution of time invariant state equation.

Text Books:

1. Analysis of Linear Systems –D.K.Cheng.
2. Control System Engineering – Nagrath &Gopal
3. Control System – A. AnandKumar

Reference Books:

1. Networks and Systems – D. RoyChoudhury
2. Signals and Systems - Basu &Natarajan

Course code:

Course title:SCIENTIFIC COMPUTING

A – NUMERICAL COMPUTING

Unit-I

High Speed Computation: Introduction, Computer Arithmetic, Errors, Machine Computation.

Transcendental and Polynomial Equations: Introduction, Bisection Method, Iterative Methods, Rate of Convergence, Methods for Complex Roots, Polynomial Equations.

Unit-II

System of Linear Algebraic Equations and Eigenvalue Problems: Introduction, Direct Methods, Error analysis, Iteration Methods, Eigenvalues and Eigen Vectors.

Interpolation and Approximation: Introduction to Lagrange and Newton Interpolations, Finite difference operators, Interpolating polynomial using finite differences, Hermite interpolations, Piecewise and spline interpolation.

Unit-III

Differentiation and Integration: Introduction, Numerical differentiation, Numerical integration, Methods based on interpolation.

Ordinary Differential Equations: Introduction, Euler methods, Single and Multistep methods, Predictor-corrector methods.

B – STATISTICAL COMPUTING

Unit-IV

Empirical and Probability Distributions: Basic Concepts, The Mean Variance, and Standard Deviation, Continuous-Type Data, Exploratory Data Analysis, Graphical Comparisons of Data Sets, Probability Density and Mass Functions.

Probability: Properties of Probability, Methods of Enumeration, Conditional Probability, Independent Events, Bayes Theorem.

Unit-V

Discrete, Continuos & Multivariable Distributions: Random Variables of the Discrete Type, Mathematical Expectation, Bernoulli Trials and the Binomial Distribution, The Moment-Generating Function, The Poisson Distribution, Random Variables of the Continuous Type, The Uniform and Exponential Distributions, The Gamma and Chi-Square Distributions, The Normal Distribution, Distributions of Functions of a Random Variable, Distributions of Two RandomVariables.

Sampling Distribution Theory: Independent Random Variables, Distributions of Sums of Independent Random Variables, Random Functions Associated with Normal Distributions, The Central Limit Theorem, Approximations for Discrete Distributions, The t and F Distributions.

Unit-VI

Estimation & Tests of Statistical Hypotheses: Point Estimation, Confidence Intervals for Means, Confidence Intervals for Difference of Two Means, Sample Size, Tests About Proportions, Tests of the Equality of Two Normal Distributions, Chi-Square Goodness of Fit Tests, Contingency Tables, Tests of the Equality of Several Means.

Text Books:

1. Jain,M.K., etal : Numerical Methods for Scientific and Engineering Computation, 3rd Edn. New Age Publication, New Delhi,1999
2. Hogg, R.V. & Tanis E. A. : Probability and Statistical Inference, 6th Edn., Pearson Education, New Delhi ,2004.

Reference Books:

1. Sastrty, S.S. – Introductory Methods of Numerical Analysis, 4th Edn., PHI, New Delhi,2005
2. Hines, W.W. et_al – Probability and Statististics in Engineering, 4th edn., John Witey, Singapore (Indian Reprint),2003.

3. Veerarajan, T. – Probability, Statististics and Random Processes, 2nd Edn., TMH, New Delhi,2003.

Course code:

Course title: INFORMATION AND CODING THEORY

Unit-I

Source Coding: Definitions and Examples, Uniquely Decodable Codes, Instantaneous Codes, Costructing Instantaneous Codes, Kraft's Inequality, McMillan's Inequality, Comments on Kraft's and McMillan's Inequalities.

Unit-II

Optimal Codes: Optimality, Binary Huffman Codes, Average Word-length of Huffman Codes, Optimality of Binary Huffman Codes, r-ary Huffman Codes, Extensions of Sources.

Unit-III

Entropy: Information and Entropy, Properties of the Entropy Function, Entropy and Average Word-length, Shannon-Fano Coding, Entropy of Extensions and Products, Shannon's First Theorem, An Examples of Shannnon's FirstTheorem.

Unit-IV

Information Channels: Notation and Definitions, The Binary Symmetric Channel, System Entropies, System Entropies for the Binary Symmetric Channel, Extension of Shannon's first Theorem to Information Channels, Mutual Information, Mutual Information for the Symmetric Channel, ChannelCapacity.

Unit-V

Using an Unreliable Channel: Decision Rules, An Examples of Improved Reliability, Hamming Distance, Statement and Outline Proof of Shannon's Theorem, The Converse of Shannon's Theorem, Comments on Shannon's Theorem

Unit-VI

Error- correcting Codes: Introductory Concepts, Examples of Codes, Minimum Distance, Hamming's Sphere-packing Bound, The Gilbert – Varshamov Bound, Hadamard Matrices andCodes.

Unit-VII

Linear Codes: Matrix Description of Linear Codes, Equivalence of Linear Codes, Minimum Distance of Linear Codes, The Hamming Codes, The Golay Codes, The Standard Array, Syndrome Decoding.

Text Book:

1. G.A.Jones & J.M.Jones-Information and Coding Theory, 3rd Edition, Springer Publication, New Delhi, 2000.

Reference Books:

1. R.Bose- Information Theory, Coding and Cryptography, TMH, New Delhi,2002.
2. R.W. Hamming- Coding and Information Theory, Prentice-Hall, New Jersy,1980.

Course code:

Course title: Real Time Systems

Unit-I

Basic Real-Time Concepts: Terminology, Real-Time System Design Issues, Example Real-Time Systems, Common Misconceptions, Brief History.

Unit-II

Hardware Considerations: Basic Architecture, Hardware Interfacing, Central Processing Unit, Memory, Input/Output, Enhancing Performance, Other Special Devices, Non-von- Neumann Architectures.

Unit-III

Real-Time Operating Systems: Real-Time Kernels, Theoretical Foundations of Real-Time Operating Systems, Intertask Communication and Synchronization, Memory Management, Case Study: POSIX.

Unit-IV

Software Requirements Engineering: Requirements-Engineering Process, Types of Requirements, Requirements Specification for Real-Time Systems, Formal Methods in Software Specification, Structured Analysis and Design, Object-Oriented Analysis and the Unified Modeling Language, Organizing the Requirements Document, Organizing and Writing Requirements, Requirements Validation andReview.

Unit-V

Software System Design: Properties of Software, Basic Software Engineering Principles, The Design Activity, Procedural-Oriented Design, Object-Oriented Design, Appendix: Case Study in

Software Requirements Specification for Four-Way Traffic Intersection Traffic Light Controller System.

Unit-VI

Programming Languages and the Software Production Process: Introduction, Assembly Language, Procedural Languages, Object-Oriented Languages.

Unit-VII

Performance Analysis and Optimization: Theoretical Preliminaries, Performance Analysis, Application of Queuing Theory, I/O Performance, Performance Optimization.

Text Book:

1. Phillip A. Laplante- Real-Time Systems: Design and Analysis, John Wiley- India Edition, 2006.

Reference Books:

1. Rajib Mall- Real Time Systems; Theory and Practice, Pearson Edition, New 2. Delhi-2007.
3. J.W.S.Liu – Real Time Systems, Pearson Education, New Delhi –2004.
4. C.M.Krishna & K.G. Shiv – Real Time Systems, Mc Graw Hill –1997.

Course code:

Course title: Parallel & Distributed Computing

Unit-I

Introduction: A brief history, Computer organization for parallel and distributed computing, Communications and computer networks, Operating systems for distributed and parallel computing, The client-server model, Distributed database systems, Parallel programming languages andalgorithms.

Computer organization for parallel and distributed computing: Pipeline and vector processors, Multicomputers and computer networks, Multiprocessors, Massively parallel architecture, Non-von Neumann-type computers, Cache architectures in multiprocessors.

Unit-II

Communications and computer networks: Communications, Computer network architecture Network topology, Network interconnection, Integrated Services Digital Network (ISDN), Asynchronous Transfer Mode, Wirelesscomputing.

Unit-III

Operating systems for distributed and parallel computing: Network operating systems, Distributed operating systems, Operating systems for parallel computing, Distributed and Parallel system modeling, Example systems.

Unit-IV

Distributed Computing: Introduction – Distributed Systems, Theory of Distributed Computing, Formal models for Message – passing systems, Broadcast and Converge Cast on a Spanning Tree, Flooring and Building a Spanning Tree, Constructing DFS Spanning Tree for a Specified Root and without a Specified Root, The Leader Election Problems, Anonymous Rings, Asynchronous and SynchronousRings.

Unit-V

Mutual Exclusion in Shared Memory: Formal model for shared memory systems, The Mutual Exlusion Problem, Mutual Exclusion Problem, Mutual Exclusion using powerful Primitives and R/W registers.

Unit-VI

Fault to Lerant Concensus: Synchronous systems with Crash and Byzantine Failures, Impossibility in a synchronous systems.

Unit-VII

Causality and Time: Capturing Causality, Examples of using causality, Clock synchronization.

Text Books:

1. J.M. Crichlow – An Introduction to Distributed and parallel computing, 2/e PHI, New Delhi –2002.

2. H.Attiya & J. Welch – Distributed Computing, 2/e John Wiley, India Edition,2006.

Course code:

Course title: Software Reliability & Testing

Unit-I

Introduction: Software Reliability & Hardware Reliability, Basic Concepts, Availability, Modeling.

Unit-II

Selected Models: Execution Time Component, Calendar Time Component, Model Choice.

Unit-III

Applications: System Engineering, Project Management, Management of Operational Phase, Evaluation of S/W Engg. Technologies.

Unit-IV

System Definition: Failure definition, System Configuration, Text Run Selection.

Unit-V

Parameter Determination: Execution Time Component, Calendar Time Component.

Unit-VI+VII

Project Specific Techniques: Unobserved Failures, Failure Time Measurement, Evolving Programs, Changes in Environment, Other Consideration.

Text Book:

1. J. D. Musa, et.al - Software Reliability: Measurement, Prediction & Application, Mc-Graw Hill, NewYork.

Course code:

Course title: Distributed Database Systems

Unit-I

Introduction: Distributed Data Processing, Promises of DDBSs, Complicating Factors, Problem Areas.

Unit-II

Distributed DBMS Architecture: DBMS standardization, Architectural Models for Distributed DBMSs, Distributed DBMS Architecture, Global Directory Issues.

Unit-III

Distributed Database Design: Alternative Design Strategies, Distributed Design Issjues, Fragmentation, Allocation.

Semantic data Control: View Management, Data Security, Semantic Integrity Control.

Unit-IV

Optimization of Distributed Queries: Query Optimization, Centralized Query Optimization, Join Ordering in Fragment Queries, Distributed Query Optimization Algorithms.

Unit-V

Introduction to Transaction Management: Definition of a Transaction, Properties of Transactions, Types of Transactions.

Unit-VI

Distributed Concurrency Control: Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Locking – based Concurrency Control Algorithms, Timestamp-based Concurrency Control algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management, Relaxed concurrency control.

Unit-VII

Distributed DBMS Reliability: Reliability Concepts and Measures, Failures and Fault Tolerance in distributed Systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols, Dealing with Site Failuros, Network Partitioning, Architectural Considerations.

Text Book:

1. M.TamerOzsu&PatrickValduries:DistributedDatabaseSystems,2/e, Pearson Education,2001.

Course code:

Course title: E-Commerce

Unit-I

Introduction to Electronic Commerce: Electronic Commerce, Scope of Electronic Commerce, Definition of Electronic commerce, Electronic Commerce and Tmade cycle, Electronic Market, Electronic Data Interchange, Internet Commerce.

Unit-II

Business Strategy in an Electronic Age: Value Chain, Supply Chains, Porter's Value Chain Model Inter organizational Value chains Competitive advantage, Competitive strategy, Porter's Model, First Mover advantage, Competitive advantage usinge-commerce.

Unit-III

Business strategy: Introduction to Business Strategy, Strategic implications of IT, Technology, Business Environment, Business Capability, Existing Business strategy, Strategy Formulation and Complementation Planning, e-commerce implementation, e- commerce &evaluation.

Unit-IV

Case Study: Case Study, e-commerce in passenger Air Transport.
Business to Business Electronic Commerce: Inter-orgranisational Transactions.

Unit-V

Electronic Market: Markets, Electronic Markets, Usage of electronic markets, Advantages and Disadvantages of electronic market.

Unit-VI

Future of electronic markets: Electronic Data Interchange (EDI), Introduction, Definition, Benefits, Examples, EDI Technology, EDI Communications, EDI implementation, EDI Security, EDIBusiness.
InterOrganizational:e- commerce, Transaction, Purchasing online.

Business to Consumer Electronic Commerce: Consumer Trade Organizations, Internet e-commerce, e-shop, e-commerce Technology, Advantages & Disadvantages.

Electronic Data Interchange (EDI) : Introduction, Definition, Benefits, Examples, EDI Technology, EDI Communications, EDI implementations, EDI Security, EDI and Business.

Unit-VII

Inter Organizational e-commerce: Transactions, Purchasing on line.

Internet: Internet, TCP/IP, Internet Components.

Page on the Web : TAIL Basic, introduction.

Elements of E-Commerce: Elements, e-shop, Online Payments, Internet e-commerce security.

E-Business: Introduction, Grocery Supplies, Internet Banking, Online share sealing, Gambling on the Net,e-diversity.

Text Book:

1. David Whiteley - E-COMMERCE: Strategy, Technologies and Applications, TMH, New Delhi,2000.

Reference Book:

1. Ravi Kalakota & Andre B. Whinston - Electronic Commerce A Manager's Guide Pearson Education,2005.

Course code:

Course title: Digital Image Processing

Unit-I

Introduction: Background, Digital Image Representation, Fundamental Steps in Image Processing, Elements of a Digital Image Processing System.
Digital Image Fundamentals: Elements of Visual Perception, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels, Imagining Geometry.

Unit-II

Image Transforms: Introduction to the Fourier Transform, The Discrete Fourier Transform, Some Properties of the Two-Dimensional Fourier Transform, Other Separable ImageTransforms.

Unit-III

Image Enhancement : Spatial Domain Methods, Frequency Domain Methods, Some Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Background, Smoothing Filters, Sharpening Filters, Lowpass Filtering, Highpass Filtering, Generation of Spatial Masks from Frequency DomainSpecifications.

Unit-IV+V

Image Restoring : Degradations Model - Definitions, Degradation Model for Continuous Functions, Diagonalization of Circulant and Block-Circulant Matrices, Circulant Matrices, Block Circulant Matrices, Effects of Diagonalization on the Degradation Model, Algebraic Approach to Restoration, Unconstrained Restoration, Constrained Restoration, Inverse Filtering – Formulation, Removal of Blur Caused by Uniform Linear Motion, Restoration in the Spatial Domain, GeometricTransformation.

Unit-VI

Image Compression: Fundamentals – Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria. Image Compression Models – The Source Encoder and Decoder, The Channel Encoder and Decoder. Elements of Information Theory – Measuring Information, The Information Channel, Fundamental Coding Theorems, Using Information Theory. Error-Free Compression–Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.

Text Book :

1. Rafael. C. Gonzalez & Richard E.Woods.- Digital Image Processing, 2/e Pearson Education, New Delhi - 2006

Reference Books :

1. W.K.Pratt.-Digital Image Processing, 3/e Edn., John Wiley & sons, Inc.2006
2. A.K.Jain.- Fundamentals of Digital Image Processing, PHI, New Delhi,2006
3. M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition,2007.

Course code:

Course title: Neural Networks & Applications

Unit-I

Recurrent Networks And Temporal Feedforward Networks: Introduction , Overview of Recurrent Neural Networks, Hopfield Associative Memory , Simulated Annealing, Boltzmann Machine , Overview of Temporal Feedforward Networks, Simple Recurrent Network, Time-Delay Neural Networks, Distributed Time-Lagged FeedforwardNeural

Unit-II

Neural Networks For Optimization Problems: Introduction, Neural Networks for Linear Programming Problems, Neural Networks for Quadratic Programming Problems, Neural Networks for Nonlinear Continuous Constrained Optimization Problems.

Unit-III

Solving Matrix Algebra Problems With Neural Networks: Introduction, Inverse and Pseudoinverse of a Matrix, LU Decomposition, QR Factorization, Schur Decomposition, Spectral Factorization- Eigenvalue Decomposition (EVD) (Symmetric Eigenvalue Problem), Neural Network Approach for the Symmetric Eigenvalue Problem.

Unit-IV+V

Solution Of Linear Algebraic Equations Using Neural Networks: Introduction, Systems of Simultaneous Linear Algebraic Equations, Least-Squares Neurocomputing Approach for Solving Systems of Linear Equations, Conjugate Gradient Learning Rule for Solving Systems of Linear Equations, A Generalized Robust Approach for Solving Systems of Linear Equations Corrupted with Noise, Regularization Methods for Ill-Posed Problems with Ill-Determined Numerical Rank, Matrix Splittings for Iterative Discrete-Time Methods for Solving LinearEquations.

Unit-VI

Statistical Methods Using Neural Networks: Introduction, Principal-Component Analysis, Learning Algorithms for Neural Network Adaptive Estimation of Principal Components, Principal- Component Regression, Partial Least-Squares Regression, A Neural Network Approach for Partial Least-SquaresRegression.

Unit-VII

Identification, Control, And Estimation Using Neural Networks: Introduction, Linear System Representation, Autoregressive Moving Average Models , Identification of Linear Systems with ARMA Models, Parametric System Identification of Linear Systems Using PLSNET, Nonlinear System Representation, Identification and Control of Nonlinear Dynamical.

Text Book:

1. M. Ham & I. Kostanic – Principles of Neurocomputing for Science & Engineering, TMH, New

Delhi,2002.

Course code:

Course title: Optimization Techniques

Unit-I

Introduction to Linear Programming: Prototype Example, The Linear Programming Model, Assumptions of Linear Programming, Additional Examples, Some Classic Case Studies.

Solving Linear Programming Problems- The Simplex Method: The Essence of the Simplex Method, Setting Up the Simplex Method, The Algebra of the Simplex Method, The Simplex Method in Tabular Form, Tie Breaking in the Simplex Method, Adapting to Other Model Forms, Postoptimality Analysis.

Unit-II

The Theory Of The Simplex Method: Foundations of the Simplex Method, The revised Simplex Method, A Fundamental Insight.

Duality Theory And Sensitivity Analysis: The Essence of Duality Theory, Economic Interpretation of Duality, Primal-Dual relationships, Adapting to Other Primal Forms, The Role of Duality Theory in Sensitivity Analysis.

Unit-III

Other Algorithms for Linear Programming: The Dual Simplex Method, Parametric Linear Programming, The Upper Bound Techniques, An Interior-PointAlgorithm.

Network Optimization Models: Prototype Example, The Terminology of Networks, The Shortest-Path Problem, The Minimum Spanning Tree Problem, The Maximum Flow Problem, The Minimum Cost flow Problem, The Network Simplex Method.

Unit-IV

Dynamic Programming: A Prototype Example for Dynamic Programming, Characteristics of Dynamic Programming Problems, Deterministic Dynamic Programming, Probabilistic Dynamic Programming.

Unit-V

Integer Programming : Prototype Example, Some BIP Applications, Innovative Uses of Binary Variables in Model Formulation, Some Formulation examples, Some Perspectives on Solving Integer Programming Problems, The Branch-and-Bound Technique and Its Application to Binary Integer Programming, A Branch-and-Bound Algorithm for Mixed Integer.

Unit-VI

Nonlinear Programming : Sample Applications, Graphical Illustration of Nonlinear Programming Problems, Types of Nonlinear Programming Problems, One-Variable Unconstrained Optimization, Multivariable Unconstrained Optimization, The Karush-Kuhn-

Tucker (KKT) Conditions for Constrained Optimization, Quadratic Programming, Separable Programming , Convex Programming.

Unit-VII

Queueing Theory : Prototype Example, Basic Structure of queueing Models, Examples of Real Queueing Systems, The role of the Exponential Distribution, The Birth-and-Death Process, Queueing Models Based on the Birth-and Death Process ,Queueing Models Involving NonexponentialDistributions.

Text Book:

1. S. Hiller & G.J. Lieberman – Operations Research, 8th Edn, TMH, New Delhi – 2006.

Reference Books:

1. H.A.Taha – Operations Research, 8/e, Pearson Education, NewDelhi-2007.
2. J.K. Sharma – Operations Research, 3/e, McMillan, India Ltd,2007.

Course code:

Course title: Bio-informatics

Unit-I

Molecular Biology and Biological Chemistry: The Generic Material: Nucleotides, Orientation, Base Pairing, The Central Dogma of Molecular Biology, Gene Structure and Information Content: Promoter Sequences, The Genetic Code, Open Reading Frames, Introns and Exons, Protein Structure and Function: Primary Structure, Secondary, Tertiary, and Quaternary Structure, The Nature of Chemical Bonds: Anatomy of an Atom, Valence, Electronegativity, Hydrophilicity and Hydrophobicity, Molecular Biology Tools: Restriction Enzyme Digests, Gel Electrophoresis, Blotting and Hybridization, Cloning, Polymerase Chain Reaction, DNA Sequencing, Genomic Information Content: C-Value Paradox, Reassociation Kinetics.

Unit-II

Data Searches and Pairwise Alignments : Dot Plots, Simple Alignments, Gaps: Simple Gap Penalties, Origination and Length Penalties, Scoring Matrices, Dynamic Programming: The Needleman and Wunsch Algorithm, Global and Local Alignments: Semiglobal Alignments, The Smith-Waterman algorithm, Database Searches: BLAST and Its Relatives, FASTA and Related Algorithms, Alignment Scores and Statistical Significance of Database Searches, Multiple Sequence Alignments.

Unit-III

Substitution Patterns: Estimating Substitution Numbers: Jukes-Cantor Model, Transitions and Transversions, Kimura's Two-Parameter Model, Models With Even More Parameters, Substitutions Between Protein Sequences, Variations in Evolutionary Rates Between Genes.

Unit-IV

History of Molecular Phylogenetics: Advantages to Molecular Phylogenies, Phylogenetic Trees: Terminology of Tree Reconstruction, Rooted and Unrooted Trees, Gene vs. Species Trees, Character and Distance Data, Distance Matrix Methods: UPGMA, Estimation of Branch Lengths, Transformed Distance Method, Neighbor's Relation Method, Neighbor- Joining Methods, Maximum Likelihood Approaches, Multiple SequenceAlignments.

Unit-V

Character–Based Methods of Phylogenetics: Parsimony: Informative and Uninformative Sites, Unweighted Parsimony, Weighted Parsimony, Inferred Ancestral Sequences, Strategies for Faster Searches: Branch and Bound, Heuristic Searches, Consensus Trees, Tree Confidence: Bootstrapping, Parametric Tests, Comparison of Phylogenetic Methods, Molecular Phylogenies: The Tree of life, HumanOrigins.

Unit-VI

Genomics and Gene Recognition : Prokaryotic Genomes, Prokaryotic Gene Structure: Promoter Elements, Open Reading Frames, Conceptual Translation, Termination Sequences, GC Content in Prokaryotic Genomes, Prokaryotic Gene Density, Eukaryotic Genomes, Eukaryotic Gene Structure: Promoter Elements, Regulatory Protein Binding Sites, Open Reading Frames: Introns and Exons, Alternative Spicing, GC Content in Eukaryotic Genomes: CpG Islands, Isochores, Codon Usage Bias, Gene Expression: cDNAs and ESTs, Serial Analysis of Gene Expression, Microarrays.

Unit-VII

Protein and RNA Structure Prediction : Amino Acids, Polypeptide Composition, Secondary Structure: Backbone Flexibility, Accuracy of Predictions, The Chou-Fasman and GOR Methods, Tertiary and Quaternary Structure: Hydrophobicity, Disulfide Bonds, Active Structures vs. Most Stable Structures, Algorithms for Modeling Protein Folding: Lattice Models, Off-Lattice Models, Energy Functions and Optimization, Structure Prediction: Comparative Modeling, Threading : Reverse Protein Folding, Predicting RNA Secondary Structures.

Text Book:

1. D.E. Krane & M.L. Raymer - Fundamental Concepts of Bioinformatics, Pearson Education, New Delhi-2003.

Reference Books:

1. S.C.Rastogiet.al.-Bioinformatics:MethodsandApplications,PHI,NewDelhi-2005.
2. V.R. Srinivas - Bioinformatics: A Modern Approach, PHI, NewDelhi-2005.
3. A.M. Lesk – Introduction to Bioinformatics, Oxford (Indian Edn), NewDelhi-2004.

Course code:

Course title: System Programming

Unit-I

Background: Introduction, System Software and Machine Architecture, The Simplified Instructional Computer (SIC), Traditional (CISC) machines, RISC Machines.

Unit-II & III

Assemblers: Basic Assembler Functions, Machine – Dependent Assembler Features, Machine – Independent Assembler Features, Assembler Design Options, Implementation Examples.

Unit-IV & V

Loaders and Linkers: Basic Loader Functions, Machine - Dependent Loader Features, Machine – Independent Loader Features, Loader Design Options, Implementation Examples.

Unit-VI
Macro Processors: Basic Macro Processor Functions, Machine – Independent Macro Processor Features, Macro Processor Design Options, Implementation Examples.

Unit-VII
Software Engineering Issues: Introduction to Software Engineering Concepts, System Specifications, Procedural System Design, Object – Oriented Design, System Testing Strategies.

Text Book:

1. L. L. Beck – System Software – An Introduction to Systems Programming, 3/e, Pearson Education, New Delhi, 2004

Reference Book:

1. J.J. Donovan – System Programming, McGraw Hill , New Delhi,1993.
2. D.M. Dhamdhere – System Programming and Operating Systems, 2/e., Tata McGraw Hill , New Delhi,2000

Course code:

Course title: Compiler Design

Unit-I

Introduction to Compiling: Compilers, Analysis of the source program, The phase of a compiler, Cousins of the compiler, The grouping of phases, Compiler-constructions tools.

Unit-II

A Simple One-Pass Compiler: Syntax definition, Syntax-directed translation, Parsing, A translator for simple expressions, Lexical analysis, Incorporating a symbol table, Abstract stack machines.
Lexical Analysis: The role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, A language of specifying lexical analyzers, Design of a lexical analyzergenerator.

Unit-III & IV

Syntax Analysis : The role of the parser, Writing a grammar, Top-down parsing, Bottom- up parsing, Operator-precedence parsing, LR parsars, Using ambiguous grammars, Parsar generators.

Unit-V & VI

Syntax-Directed Translation: Syntax-direct definitions, Constraction of syntax trees, Bottom-up evaluation of S-**,** attributed definitions, L-attributed definitions, Top-down translation.
Type Checking: Type systems, Specification of a simple type checker.

Run-Time Environments: Source language issues, Storage organization, Storage- allocation strategies, Access to nonlocal names, Parameter passing, Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation techniques.

Unit-VII

Intermediate Code Generation: Intermediate languages, Declarations, Assignment statements, Boolean expressions.

Code Generation: Issues in the design of a code generator, Target machine, Run-time storage management, Basic blocks and flow graphs.
Code Optimization: Introduction, The Principle sources of optimization.

Text Book:

1. A.V.Aho, R. Sethi et.al.- Compilers Principles, Techniques, and Tools, 2nd Edition, Pearson Education, New Delhi, 2006

Reference Books:

1. A.I.Holub -Compiler Design in C, Prentice Hall of India, New Delhi,1995
2. J.P. Tremblay - The Theory and Practical of Compiler Writing, McGraw Hill, Singapore,1993.

3. K.C. Louden- Compiler Construction: Principles and Practice, Thomson, Learning, New Delhi,2005.

Course code:

Course title: Data Mining & Warehousing

Unit-I

Data Mining : Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

Unit-II

Data Warehouse : Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data warehousing to Data Mining.

Unit-III

Data Processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept Hierarchy Generation.
Data Mining Primitives, Languages and System Architecture: Data Mining Primities, DMQL, Architectures of Data Mining Systems.

Unit-IV

Concept Description: Data Generalization & Summarization – Based Characterization, Analytical Characterization, Mining class Comparisons, Mining Descriptive Statistical Measures in Large Databases.

Unit-V

Mining Association Rules in Large Databases : Association Rule Mining, Single – Dimensional Booloan Association Rules, Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based AssociationMining.

Unit-VI

Classification and Prediction : Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule, Other Classification, Prediction, Classification Accuracy.

Unit-VII

Cluster Analysis: Types of Data in Cluster Analysis, Partitioning methods, Hierarchical methods, Density – Based Methods, Grid – Based Methods, Model – Based Clustering Methods, Outlier Analysis.

Mining Complex Types of Data.

Text Books:

1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcout India. Private Linited.

Reference Books:

1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi –2006.
2. A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi,2006.

Course code:

Course title: Principle of Management

Unit-I

Concepts of Managements: Definition, nature and scopes, overall view of Management, Relation with other social sciences andindustry.

Unit-II & III

Evolution Of Management Thought: Classical theory of management, Bureaucracy - Introduced by Max Weber, Scientific Management-F.W. Taylor and his followers, Process Management-Introduced B.H. Fayol and others, NCO-classical theory of management, aluman Relations-B.E. May and Roethlisberger, Behavioral Science approach-By Mc Gregor Maslow and others, Modern Management theories peter Drucker.

Management Functions: Planning, Organisation, staffing, Directing and controlling.

Unit-IV

Executive Functions: Production, Marketing, Finance,Personnel.

Planning: Concept, Nature, Importance, Objectives, Policies, Procedure, strategies, and Method of Decision-Making.

Unit-V

Organisations: Definition, Theories of Organisation, Forms of Organisation, Formal and Informal Organisation, Type of formal organisations, Departmentation, Line and Staff Relationship, Span of Decentralisation, Committees.

Unit-VI & VII

Staffing: Selection, Recruitment, raining, Development and Welfare. **Directing:** Leadership and

Supervision, Motivation and communication. **Controlling:** The elements, process and style of

Control, techniques of control. **Social Responsibility of Business:**

Reference Books:

1. Koontz et.al - Principle ofManagementEssentialsofmanagement.
2. Theo Haiman - Management theory andPractice.
3. Drucker P.F - Management-Task andResponsibility.
4. Drucker P.F- The Practice ofManagement.
5. Newman et.al - Process ofManagements.
6. Beach E.F.L. - The Principle and Practical Management Chapter1.
7. Merril H.F - Classics in ManagementPreface.

Course code:

Course title: Enterprise Resource Planning

Unit-I

Introduction to ERP: Evolution of ERP, What is ERP, Reasons for the growth of the ERP market, Advantages of ERP, Reasons of Failure.

Unit-II

Enterprise- An overview: Integrated Management information, Business Modeling, Integrated Data Model.

Unit-III

ERP and Related Technologies: BRP (Business Process Reengineering), MIS (Management Information System), DSS (Decision Support System), EIS (Executive Information system), OLAP, Supply Chain Management.

Unit-IV

A Manufacturing Perspective: ERP, CAD/CAM, MRP (Material Requirement Planning), Bill of Material, Closed loop MRP, MRP-II, DRP (Distributed Requirement Planning), Product Data Management, Data Management,

Unit-V

Benefits of PDM: ERP Modules, Finance, Plant Maintenance, Quality Management, Material Management.

Unit-VI

Benefits of ERP:

ERP Market: SAP, BAAN, Oracle Corporation, People Soft.

ERP Implementation Life Cycle:

Unit-VII

Vendors, Consultants & User's: In – house Implementation – pros & cons, Vendors, Consultants, End-users.

Future Directions in ERP. ERP Case Studies.

Text Book :

1. Alexis Leon - Enterprise Resource Planning, TMH, New Delhi 2001.

Reference Books:

1. E. Monk & B. Wagner – Concepts in Enterprise source planning, 2/e, Thomson Learning, India Edition 2007.

Course code:

Course title: Information System Project Management

Unit-I& II

Information Systems: Concepts and Management: Information Systems: Concepts and Definitions, Types of Information Systems, Examples of Information Systems, Managing InformationResources.

The Modern Organization in the Digital Economy: Doing Business in the Digital Economy, Business Pressures, Organizational Responses, and IT Support, Competitive Advantage and Strategic Information Systems, Why Should You Learn About Information Technology.

Unit-III & IV

Ethics, Privacy, and Informationsecurity: Ethical Issues, Threats to Information Security, Protecting Information Resources.

Data and Knowledge Management: Managing Data, The Database Approach, Database Management Systems, Data Warehousing, Data Visualization Technologies, Knowledge Management.

Wireless, Mobile Computing, and Mobile Commerce: Wireless Technologies, Wireless Computer Networks and Internet Access, Mobile Computing and Mobile Commerce, Pervasive Computing, Wireless Security.

Unit-V

Organizational Information Systems: Transaction Processing Systems, Functional Information Systems, Enterprise Resource Planning Systems, Customer Relationship Management, Supply Chain Management Systems, Electronic Data Interchange and Extranets.

Unit-VI & VII

Managerial Support Systems: Managers and Decision Making, Decision Support Systems, Enterprise and Executive Decision Support Systems, IntelligentSystems.

Acquiring IT Application: Planning for and Justifying IT Applications, Strategies for Acquiring IT Applications, The Traditional Systems Development Life Cycle, Alternative Methods and Tools for Systems Development, Outsourcing and Application Service Providers.

Text Book:

1. R.K. Rainer Jr, E Turban & R.E.Potter- Introduction to Information Systems, John Wiley, India Edition, 2006.

Reference:

1. L.Jessup – Information Systems Today, 2/e, Pearson Education, New Delhi-2006.

Course code:

Course title: Decision Support Systems & Intelligent Systems

Unit-I

Decision Support Systems: An Overview: Opening Vignette: Southwest Airlines Flies in the Face of Competition through DSS, DSS Configurations, What Is a DSS, Characteristics and Capabilities of DSS, Components of DSS, The Data Management Subsystem, The User Interface (Dialog) Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classifications.

Unit-II

Modeling and Analysis: Opening Vignette: DuPont Simulates Rail Transportation System and Avoids Costly Capital Expense, MSS Modeling, Static and Dynamic Models, Certainty, Uncertainty, and Risk, Influence Diagrams, MSS Modeling with Spreadsheets, Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees), The Structure of MSS Mathematical Models, Mathematical Programming Optimization, Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking, Problem-Solving Search Methods, Heuristic Programming, Simulation, Visual Interactive Modeling and Visual Interactive Simulation, Quantitative Sofware Packages, Model Base Management.

Unit-III

Business Intelligence: Data Warehousing, Data Acquisition, Data Mining, Business Analytics, and Visualization: Opening Vignette: Information Sharing a Principal Component of the National Strategy for Homeland Security, The Nature and Sources of Data, Data Collection, Problems, and Quality, The Web/Internet and Commercial Database Services, Database Management Systems in Decision Support Systems/Business Intelligence, Database Organization and Structures, Data Warehousing, Data Marts, Business Intelligence/Business Analytics, Online Analytical Processing (OLAP), Data Mining, Data Visualization, Multidimensionality, and Real-Time Analytics.

Unit-IV

Decision Support System Development: Opening Vignette: Osram Sylvania Thinks Small, Strategizes Big-Develops the InfoNet HR Portal System, Introduction to DSS Development, The Traditional System Development Life Cycle, Alternative Development Methodologies, Prototyping: The DSS Development Methodology, Change Management, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS, End User Developed DSS, Putting The DSSTogether.

Unit-V

Artificial Intelligence and Expert Systems: Knowledge-Based Systems: Opening Vignette: Intelligent Systems in KPN Telecom and Logitech, Concepts and Definitions of Artificial Intelligence, Evolution of Artificial Intelligence, The Artificial Intelligence Field, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, How Expert Systems Work, Problem Areas Suitable for Expert Systems, Benefits and Capabilities of Expert Systems, Problems and Limitations of Expert Systems, Expert System Success Factors, Types of Expert Systems, Expert Systems on theWeb.

Unit-VI

Knowledge Acquisition, Representation, and Reasoning: Opening Vignette: Development of a Real-Time Knowledge-Based System at Eli Lilly, Concepts of Knowledge Engineering, Scope and Types of Knowledge, Methods of Knowledge Acquisition from Experts, Knowledge Acquisition from Multiple Experts, Automated Knowledge Acquisition from Data and Documents, Knowledge Verification and Validation, Representation of Knowledge, Reasoning in Rule-Based Systems, Explanation and Metaknowledge, Inferencing with Uncertainty, Expert Systems Development, Knowledge Acquisition and the Internet.

Unit-VII

Intelligent Systems over the Internet: Opening Vignette: Spartan Uses Intelligent Systems to Find the Right Person and Reduce Turnover, Web-Based Intelligent Systems, Intelligent Agents: An Overview, Characteristics of Agents, Why Intelligent Agents, Classification and Types of Agents, Internet-Based Software Agents, DSS Agents and Multi- Agents.

Text Book:

1. E. Turban, J.E. Aronson & T.P.Liang- Decision Support Systems and Intelligent Systems, 7/e, Pearson Education, New Delhi- 2006.

Course code:

Course title: Embedded System Design

Unit-I

Embedded Computing: Introduction, Complex systems and Microprocessors, The embedded system design process, Formalization for systemdesign.

Unit-I & II

Instruction Sets CPUs: Instruction and preliminaries ARM and SHARC Processors, Programming I/O CPU performance and Power consumption.

Unit-III& IV

The embedded Computing Platform and program design: Introduction, the CPU bus, Component interfacing, designing with microprocessors, development and debugging.

Unit-V& VI

Program DesignandAnalysis:

Introduction program design, Assembly, Linking, Basic compilation techniques, Analysis optimisation of executivetime.

Text Book:

1. Wayner Wolf., "Computers as components – Principle of EmbeddedComputing
2. System Design", Morgan Kaufmann/ Hercourt India Pvt.Ltd.

Reference Books :

1. Raj Kamal - Embedded Systems, TMH, New Delhi2004.
2. F. Vahid & T. givargis- Embedded system Design, John wiley, India Edition,2005.

Course code:
Course title: Pattern Recognition

Unit-I

Pattern Recognition Overview: Overview, Pattern Recognition, Classification and Description, Patterns and Feature Extraction, Training and Learning in PR Systems, Pattern Recognition Approaches.

Unit-II

Statistical Pattern Recognition: Introduction, The Gaussian case and Class Dependence Discriminate Functions, Extensions, Classifier Performance, RISK and Errors.

Unit-III

Supervised Learning: Parametric Estimation and Supervised Learning, Maximum Likelihood Estimation Approach, Bayesian Parameter Estimation Approach, Non – Parametric Approaches, Parzen Windows, K-nn Non-Parametric Estimation. Nearest NeighbourRule.

Unit-IV

Linear Discriminate Functions and the Discrete and Binary Feature Cases: Introduction, Discrete and Binary Classification Problems, Techniques to Directly Obtain Linear Classifiers.

Unit-V & VI

Syntactic Pattern Recognition: Overview Quantifying Structure in Pattern Description and Recognitions, Grammar Based Approach and Application, String Generation as Pattern Description.

Recognition by String Matching and Parsing. The Cocke-Younger Kasami ((ck) parsing algorithm.

Unit-VII

Neural Pattern Recognition: Introduction to Neural Networks, Neural Network Structure from Pattern Recognition Applications. Physical Neural Network. The Artificial Neural Network Model, Neural Network Based Pattern Associators.

Text Book :

1. Robort Schalkoff - Pattern Recognition, Statistical, Structural and Neural Approach, John Wiley, Indian Edition, 200.

Reference Books :

1. R. U. Duda – Pattern Classification, John Wiley, Indian Edition, 2006.