SYLLABUS
(Effective from academic session 2016-17)

FOR THE DEGREE

OF

Bachelor of Computer Applications
Six-Semester Full Time Programme

SCHOOL OF BASIC SCIENCES

MANIPAL UNIVERSITY JAIPUR
INSPIRED BY LIFE

ELIGIBILITY OF THE CANDIDATES:

The candidate must have passed in 10+2 with 50% marks in Science, Arts, Commerce streams or A Level or IB or American 12th grade with Mathematics as one the subjects up to 10th.

Programme Specific Outcomes (PSOs)-Bachelor of Computer Application

[PSO.1.] At the end of the Programme, the graduates will have clarity on both conceptual and application-oriented skills of IT Applications in Business context.

[PSO.2.] To develop and manage policies related to organizations' IT systems.

[PSO.3.] In-depth knowledge &sustained learning leading to innovation& research to fulfil global interest.

BACHELOR OF COMPUTER APPLICATION COURSE STRUCTURE- 2016-17

First Semester

Course Code	Course Name	L	T	P	C	Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
MA1122	Mathematics-I	3	1	0	4	3	-	10	-	40	50	-
CA1101	Fundamentals of Computer	3	1	0	4	3	-	10	-	40	50	-
CA1102	Fundamentals of Digital Electronics	3	1	0	4	3	-	10	-	40	50	-
CA1103	C Programming	3	1	0	4	3	-	10	-	40	50	-
EN1113	Technical Communication	2	0	0	2	-	-	-	-	-	-	-
CA1130	C-Programming Lab	0	1	2	2	-	1.5		60			40
CA1131	Digital Electronics Lab	0	1	2	2	-	1.5		60			40
	Total	**14**	**6**	**4**	**22**							

Second Semester

Course Code	Course Name	L	T	P	C	Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
MA1222	Mathematics-II	3	1	0	4	3	-	10	-	40	50	-
CM1221	Financial and Accounting Management	3	1	0	4	3	-	10	-	40	50	-
CA1202	Linear Data Structures	3	1	0	4	3	-	10	-	40	50	-
CA1203	Internet and HTML	3	1	0	4	3	-	10	-	40	50	-
CA1204	Principles of Programming Languages	3	1	0	4	3	-	10	-	40	50	-
CA1230	Data Structure Lab	0	1	2	2	-	1.5		60			40
CA1231	Internet and HTML Lab	0	1	2	2	-	1.5		60			40
	Total	**15**	**7**	**4**	**24**							

Third Semester

Course Code	Course Name	L	T	P	C	Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
MA1322	Basic Statistics and Probability	3	1	0	4	3	-	10	-	40	50	-

CA1301	Computer Organization and Architecture	3	1	0	4	3	-	10	-	40	50	-
CA1302	Web Technology	3	1	0	4	3	-	10	-	40	50	-
CA1303	Object Oriented Programming using C++	3	1	0	4	3	-	10	-	40	50	-
CA1304	Multimedia Technologies	3	1	0	4	3	-	10	-	40	50	-
CA1303	Web Technology Lab	0	1	2	2	-	1.5		60			40
CA1331	OOPS in C++ Programming Lab	0	1	2	2	-	1.5		60			40
	Total	**15**	**7**	**4**	**24**							

Fourth Semester

Course Code	Course Name	L	T	P	C	Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
MA1422	Numerical Methods	3	1	0	4	3	-	10	-	40	50	-
CA1401	Database Management Systems	3	1	0	4	3	-	10	-	40	50	-
CA1402	Visual Programming using .NET	3	1	0	4	3	-	10	-	40	50	-
CA1403	E-Commerce	3	1	0	4	3	-	10	-	40	50	-
CA1404	Data Communication	3	1	0	4	3	-	10	-	40	50	-
CA1430	DBMS lab	0	1	2	2	-	1.5		60			40
CA1431	Visual Programming using C#.NET lab	0	1	2	2	-	1.5		60			40
	Total	**15**	**7**	**4**	**24**							

Fifth Semester

Course Code	Course Name	L	T	P	C	Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
CA1501	Software Engineering	3	1	0	4	3	-	10	-	40	50	-
CA 1502	Computer Graphics	3	1	0	4	3	-	10	-	40	50	-
CA1503	Java Programming	3	1	0	4	3	-	10	-	40	50	-
CA1504	Introduction to Unix Programming	3	1	0	4	3	-	10	-	40	50	-
CA1505	Non Linear Data Structures & Algorithms	3	1	0	4	3	-	10	-	40	50	-
CA 1530	Java Programming Lab	0	1	2	2	-	1.5		60			40
CA1531	Software Engineering Lab	0	1	2	2	-	1.5		60			40
	Total	**15**	**7**	**4**	**24**							

Sixth Semester

Course Code	Course Name	L	T	P	C	Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
CA1601	Operating Systems	3	1	0	4	3	-	10	-	40	50	-
CA 1602	Computer Networks & Protocols	3	1	0	4	3	-	10	-	40	50	-
CA1603	Data Warehousing using OLAP	3	1	0	4	3	-	10	-	40	50	-
CA1604	Python Programming	3	1	0	4	3	-	10	-	40	50	-
CA1605	Soft Computing Techniques	3	1	0	4	3	-	10	-	40	50	-
CA1682	Project	-	-	-	2	-	-	-	-	100	-	-
	Total	**15**	**5**	**0**	**22**							

SEMESTER-I

MA1122   **MATHEMATICS-I**   **[3 1 0 4]**

Introduction to mathematics – I: Function: Definition, Domain and Range of Function, Types of Functions (into, onto, one to one), composite function. Limit: Definition, First principle, properties, and simple problems related to limit. Some standard limits. **Continuity**: Definition, continuity of sum, product, difference and quotient of two continuous functions, simple problems. **Special functions:** Trigonometric functions and their properties, exponential functions, logarithmic functions, hyperbolic functions, inverse circular functions and related properties, simple problems. Rational functions, Partial fraction and simple problems. **Differentiation**: Definition, Differentiation of simple functions using first principle, differentiation of trigonometric functions and inverse circular functions, method of substitution, Differentiation of product and quotient of functions, maxima and minima of a function of single variable. **Integration:** Definition, integration of simple functions using substitution, Integration of trigonometric and inverse circular functions and related problems, integration by parts, integration of rational functions, Definite integral and their properties, simple problems, Reduction formula and simple problems.

Text Books
1. Shanti Narayan, Differential calculus, S. Chand & Co, 2012.
2. Shanti Narayan, Integral calculus, S. Chand & Co, 2012.
3. M.D. Raisinghania, H.C. Saxena & H.K. Dass, Differential calculus, S. Chand, 2010
Reference Books:
1. Das Mukherjee, Integral Calculus, U.N. Dhur, 1977
2. N. Piskunov, Differential and integral calculus, Vol I & Vol II, CBS, 2000

CA1101   FUNDAMENTALS OF COMPUTER AND OPERATING SYSTEMS   [3 1 0 4]

Introduction: Basic Definitions, Data, information, bits, byte, software, hardware, memory, Characteristics of a computer. Block diagram of a computer. Generation of Computers, Types of Computers, Memory and its types, Input Devices; **Output Devices:** Monitors Characteristics, Digital and Analog. Video Standard-VGA, SVGA; **Printers:** Types of printer; **Storage Devices:** Storage Fundamentals, Primary Vs Secondary; **Data Storage and Retrieval Method:** Various Storage Devices. Computer Software: **Types of software:** System Software and Application Software. **Programming Languages:** Machine Language, Assembly language, High-level language, Assembler, Compilers and Interpreter; **Operating Systems:** Operating system? What is DOS?

Text Book

1. S.K. Basanadra, *"Computers Today"*, Galgotia Publications, 2011
2. A. Leo & M. Leon, *"Fundamentals of Computer Science & Communication Engineering"*, Vikas Publishing House, 2000

Reference Book

1. W. S. Davis , *"Fundamental Computer Concepts"*, Addison-Wesley, 1986

CA1102　　　　**FUNDAMENTALS OF DIGITAL ELECTRONICS**　　　　**[3 1 0 4]**

Introduction: Number system, Boolean Algebra, De-Morgan's law, simplification of Boolean algebra, **Logic Gates:** basic and universal gates, simplification method: K-map and tabulation method. **Combination circuit**: introduction to combinational circuit, half adder circuit, full adder circuit, half subtracted, full subtracted, binary parallel adder, carry propagation, magnitude comparator, decoder, encoder, multiplexer, de-multiplexer circuit, design of code converter, parity bit generator and checker. **Sequential circuit:** Introduction to flip flop. Types of flip flop: S-R, D, J-K, T, Clocked flip flop. S-R latch, Master-Slave flip flop, realization of one flip flop using other flip flop. **Counter and shift registers:** Synchronous counters, asynchronous counter, ring counter, serial-in-parallel out, parallel-in-serial out, parallel-in-parallel out, bidirectional shift registers.

Text Book

1. M. Mano, *"Digital Logic and Computer Design"*, PHI Publications, 2002
2. R. P. Jain, *"Modern Digital Electronics"*, TMH, 3rd Edition, 2003.

Reference Book

1. R.L.Tokheim, *"Digital Electronics, Principles and Applications"*, Tata McGraw Hill, 1999.
2. W.Gothman, *"Digital electronics"*, PHI,2009.
3. S. Salivahanan& S. Arivyhgan. *"Digital circuits and design"* Vikas Publication, 2001
4. M.Leach, *"Digital Principles and Application"*, TMH, 1999.
5. Floyd, Floyd Thomas L., *"Digital Fundamentals"*, Pearson Education India, 2005

CA1103   **C PROGRAMMING**   **[3 1 0 4]**

Introduction to Computers: Block diagram of a computer, Introduction to operating system; Number System; **Algorithms and Flowcharts**: Algorithmic notations; Space and Time complexity; **C Fundamentals:** C program structure, Simple I/O operations; **Operators and Expressions:** Operator precedence and associativity, bitwise operators, arithmetic expressions, evaluation of expressions; **Flow of Control:** Statements and blocks, switch–case statement, looping constructs; **Arrays:** arrays-Declaration and Initialization, sorting; **Strings:** String - operations on strings, built-in string handling functions, programs on strings; **Functions:** Modular programming, function declaration, definition and function call, Types of functions, function returning more values, function with operators, function and Decision Statements, function and loop operators, function with Arrays.

Text Book

1. E.Balaguruswamy, "*Computing Fundamentals & C Programming",* TataMcGraw Hill, 2008.
2. E.Balaguruswamy, "*Programming in ANSI"* Tata McGraw Hill, 2011.

Reference Book

1. R. Thareja, " *Computer Fundamentals and Programming in C",* Oxford, 2012
2. B. A. Forouzan & R. F. Gilberg "*Computer Science – A structured programming Approach Using C",* 2011.

Introduction to communication: Types of communication, Process of communication, Principles of communication, Channels of communication, Verbal and non-verbal communication, Formal and informal communication, Barriers to communication; **Vocabulary:** Word formation, Affixes, Compound words, Synonyms, Antonyms, Homophones and Homonyms, Misspelt words; **Grammar:** Punctuations, Parts of speech, Active and passive voice, Direct and indirect speech, Concord, Common errors; **Techniques of effective sentence constructions, Précis writing**; **Structure and format of letter writing**: Letter of Enquiry, Quotations, Orders, Tenders, Complaint/adjustment letters, Job application letter, Resume, **Group discussion; Art of Public Speaking**: Tips for effective presentations.

Text Book

1. A Koneru, *"Professional Communication*", New Delhi: Tata McGraw Hill, 1998.
2. L. C. Bovee, J. V. Thill and B. E. Schatzman, *"Business Communication Today",* 7thEdition, New Delhi: Pearson Education, 2004.
3. L Sen, "*Communication Skills*", New Delhi: Prentice Hall, 2006.
4. M Raman and S Sharma, *"Technical Communication: Principles and Practice 2/e"*, New Delhi: Oxford University Press, 2013.

Reference Book

1. N Krishnaswamy, *"Modern English: A Book of Grammar Usage and Composition, New Delhi"*: Macmillan India, 2000.
2. R V Lesikar and M E Flatley, *"Basic Business Communication: Skills for Empowering the Internet Generation"*, New Delhi: Tata McGraw-Hill, 2002.
3. V K Jain and O P Biyani, *"Business Communication",* New Delhi: S. Chand, 2007

CA1130   **C PROGRAMMING LAB**   **[0 0 3 2]**

Simple C Programs (expression oriented operations); Programs to illustrate various operators in C. Programs using branching constructs (if, if-else-if, switch-case); Programs using looping constructs (for, while, do-while, continue, break) ; Programs on 1D Arrays; Programs on 2D Arrays; Programs on strings; Programs using functions (with and without recursion), passing parameters by value and reference.

CA1131   **DIGITAL ELECTRONICS LAB**   **[0 0 3 2]**

Study of BASIC Gates, Universal Gates , Study of Full & Half Adder & Subtractor using Gates, Study of Magnitude Comparator, Study of Multiplexer, Study of Demultiplexer, Implementation of Flip-Flops using NAND, Study of Shift Register, Design of Counter & Study of IC 7490,Vi Characteristic of TTL & CMOS.

SEMESTER-II

MA1222   **MATHEMATICS –II**   **[3 1 0 4]**

Differential Calculus: Successive Differentiation, Leibnitz's Theorem, Polar curve, Angle between radius vector and tangent, Angle of intersection between two curves, Derivative of arc (Cartesian and polar), Curvature, Radius of curvature, Evolute, related problems. Rolle's Theorem, Mean value theorem (Cauchy's and Lagrange's), In-determinant form, Partial derivatives, Euler's theorem, Maxima and Minima of functions of two variables. **Linear Algebra:** Basic Concepts, Matrix Addition, Scalar Multiplication, Matrix Multiplication, Linear System of Equations, Gauss Elimination, Rank of a Matrix, **Solution of Linear Systems:** Existence, Uniqueness, Determinants, Cramer's Rule, Inverse of a Matrix, Gauss-Jordan Elimination. **Infinite Series:** Convergence, Divergence, Comparison test, Ratio Test, Cauchy's root test, Cauchy's integral test, Alternating series, Leibnitz's theorem, Absolute and conditional convergence, Expansion of functions into Taylor's and Maclaurin's series.

Text Books
1. Shanti Narayan, Differential calculus, S. Chand & Co, 2008.
2. Shanti Narayan, Integral calculus, S. Chand & Co, 2008.
3. M.D. Raisinghania,H.C. Saxena & H.K. Dass, Differential

CM1221   **FINANCIAL AND ACCOUNTING MANAGEMENT**   **[3 1 0 4]**

General Purpose Cost Statement: Evolution of Cost Accounting, Cost Accounting Concepts, Generally Accepted Cost Accounting Principles & Cost Accounting Standards, Cost Accounting Standards, **Business Process Analysis:** Materials, Employee Costs, Direct Expenses, Overheads, Treatment of Special Items, Cost Sheet, **Overview of Financial Management:** Objective of Financial Management, Key Decisions of Financial Management, Planning Environment, Functions of Financial Management, Sources of Finance, International Sources, Emerging Role of Finance Manager, Securities and Exchange Board of India Act. 1992, Future Value, Present Value, **Tools for Financial Analysis and Planning:** Funds Flow Statement Cash Flow Statement, Ratio Analysis, Identification of Information Required to Assess Financial Performance, **Working Capital Management and Leverage Analysis:** Working Capital - Meaning & Definition, Kinds of Working Capital, Adequacies and Inadequacies of Working Capital, Danger of too high amount of Working Capital, Danger of inadequacies or low amount of Working Capital, Working Capital Cycle, Working Capital Financing, Inventory Management, Management of Receivable, Determinants of Credit Policy, Cash Management, Leverages, EBIT-EPS Indifference Point Level, Calculation of Indifference Point, **Cost of Capital:** Cost of Capital, Capital Structure, Dividend Decisions.

Text Book

1. Pratt, J., *" Financial Accounting in an Economic Context"*, 5th ed., John Wiley & Sons, Inc, 2010.

CA1202 **LINER DATA STRUCTURES** **[3 1 0 4]**

Introduction: Definitions, Concept of Data Structures, Overview of Data Structures. **Arrays**: Definitions, terminologies, 1D Array: Memory allocation, Operations on array, Application of Arrays, 2D and 3D Array representation, **Linked Lists:** Definition, Single Linked List: Representation in memory, operations (insertion, deletion, modify etc.) on a Single Linked List, Circular Linked List, Double Linked List, **Stacks:** Definition, Array and linked-list representation of stack, Operations on Stack: Push, Pop, application of stack: infix to postfix, evaluation of arithmetic expression, tower of Hanoi etc., **Queues:** Definition, Array and linked-list representation of Queue. Operations on Queue: Insertion, Deletion. Various Queue Structure: Circular Queue, Priority Queue. Insertion, Deletion operations on a Circular Queue and Priority Queue, **Sorting and Searching:** Insertion Sort, Selection Sort, Merge Sort, Linear Search, Binary Search.

Text Book

1. D. Samanta, *"Classic Data Structures"*, Prentice Hall India, 2004
2. Tannenbaum, A & Longsu, *"Data Structures using C"*, Prentice Hall India, 2005

Reference Book

1. A M.Tanenbaum, *"Data Structures using C and C++"*, Prentice Hall India, 2005

CA1203   **INTRODUCTION TO INTERNET & HTML**   **[3 1 0 4]**

Internet: Evolution, Concepts, Internet Vs Intranet, Growth of Internet, ISP, ISP in India, Types of connectivity - Dial-up, Leased line, DSL, Broadband, RF, VSAT etc., Methods of sharing of Internet connection, Use of Proxy server. Internet Services – USENET, GOPHER, WAIS, ARCHIE and VERONICA, IRC; **WORLD WIDE WEB (WWW):** History, Working, Web Browsers, Its functions, URLs, web sites Domain names, Portals. Concept of Search Engines, Search engines types, searching the Web, Web Servers, TCP/IP and others main protocols used on the Web. E-Mail: Concepts, POP and WEB Based E-mail, merits, address, Basics of Sending & Receiving, E-mail Protocols, Mailing List, Free E- mail services, e-mail servers and e-mail clients programs; **HTML:** introduction, features, uses & versions Using various HTML tags, Elements of HTML syntax, Head & Body Sections, , Inserting texts, Text alignment, Using images in pages, Hyperlinks – text and images, bookmarks, Backgrounds and Color controls, creating and using Tables in HTML, and presentation, Use of font size & Attributes, List types and its tags. Cascading Style sheets – defining and using simple CSS. Design tools for HTML, Overview of MS FrontPage, Macromedia Dream weaver, and other popular HTML editors, designing web sites using MS FrontPage (using at least FrontPage 2000) Use of Frames and Forms in web pages, Image editors, Issues in Web site creations & Maintenance.

Text Book

1. K. Jamsa, K. King, *"HTML & Web Design"*, TMH Publications, 2011
2. Box, *"Essential XML"*, Addison-Wesley Professional
3. W. Stallings, *"Cryptography and Network Security"*, Pearson Education Publication, 2005

Reference Book

1. J. Hunter, W. Crawford. Java, *"Servlet Programming"*, O'REILY, 2004
2. T. Negrino and D. Smith, *"JavaScript for The World Wide Web"*, 3rd Edition, 1999
3. Lovejoy, *" Essential of ASP for professionals"*, Pearson Education, 2003

CA1204   **PRINCIPLES OF PROGRAMMING LANGUAGES**   **[3 1 0 4]**

Introduction: Programming language - design, spectrum and the study motivation, Compilation and interpretation; Programming environments; **Names, Scope, and Bindings:** Concept of binding time, Object lifetime and storage management, Scope rules and implementing scope, The binding of reference environments, Binding within a scope, Separate compilation**; Control Flow:** Expression evaluation, Structured and unstructured flow, Sequencing, Selection, Iteration, Recursion, Non-determinacy; **Data Types:** Type systems and checking, Records and variants, Arrays, Strings, Sets, Pointers and recursive types, Lists, Files and Input/Output, Equality testing and assignment; **Subroutines and Control Abstraction: S**tack layout, Calling sequences, Parameter passing, Generic subroutines and modules, Exception handling, Co-routines; **Data Abstraction, Object Orientation:** Object oriented programming, Encapsulation and Inheritance, Dynamic method binding; **Functional Languages:** Origins, Concepts, Scheme, Evaluation order, Higher-order functions, Functional programming in perspective; **Logic Languages:** Concepts, Prolog, Logic programming in perspective**; Scripting Languages:** Common characteristics.

Text Book
1. M.L. Scott, "Programming Language Pragmatics", 2nd Edition, Elsevier, 2006.

Reference Book
1. R. Sethi, *"Programming languages Concepts and Constructs"*, 2nd Edition, Pearson Education, 1996.
2. R Sebesta, *"Concepts of Programming Languages"*, 8th Edition, Pearson Education, 2008.
3. A. Tucker, R.Nonan, *"Programming languages"*, Tata McGraw-Hill, 2002.

CA1230   **DATA STRUCTURES LAB**   **[0 0 3 2]**

Programs based on Sorting and Searching algorithms: Bubble, Insertion, selection, Merge sort. Linear and Binary search. Programs based on Array and its operation insertion, deletion etc. Stacks: Push, Pop, Queues, Linked Lists, Implement generalizes representation of Link List for polynomial, matrix.

CA1231   **INTERNET & HTML LAB**   **[0 0 3 2]**

Simple HTML document using basic elements like: <HTML>, <body>, <head>, <title>, <br>, <hr>. Text formatting tag: center, sup, em, ins, sub, font, h1 to h6, computer output tag: code, kbd, samp, tt, var, pre,

SEMESTER-III

MA1322   **Basic Statistics and Probability**   **[3 1 0 4]**

Population, Sample and Data Condensation Definition and scope of statistics, concept of population and simple with Illustration, Raw data, attributes and variables, classification, frequency distribution, Cumulative frequency distribution.

Measures of Central Tendency Concept of central Tendency, requirements of a good measure of central tendency, Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean for grouped and ungrouped data. Measures of Dispersion: Concept of dispersion, Absolute and relative measure of dispersion, range variance,

Standard deviation, Coefficient of variation

Permutations and Combinations Permutations of 'n' dissimilar objects taken 'r' at a time (with or without repetitions). $nPr = n!/(n-r)!$ (without proof). Combinations of 'r' objects taken from 'n' objects. $nCr = n!/(r!(n-r)!)$ (Without proof). Simple examples, Applications.

Sample space, Events and Probability Experiments and random experiments, Ideas of deterministic and non-deterministic experiments; Definition of sample space, discrete sample space, events; Types of events, Union and intersections of two or more events, mutually exclusive events, Complementary event, Exhaustive event; Simple examples. Classical definition of probability, Addition & multiplication theorems of probability without Proof (upto three events are expected). Definition of conditional probability Definition of independence of two events, total probability theorem and Bay's theorem, simple numerical problems. Multiple Correlation and Regression (for the three variables only).

Text Books

1. S. C. Gupta - Fundamentals of statistics - Sultan chand & sons, Delhi.
2. Goon, Gupta And Dasgupta - Fundamentals of statistics - The World Press Pvt. Ltd., Kolkata.

References Books:

1. 2. D. N. Elhance - Fundamentals of statistics - Kitab Mahal, Allahabad.
3. D.C. Montogomery - Statistical Quality Control - John Welly and Sons
4. 5. Hogg R.V. and Craig R.G. – Introduction to mathematical statistics Ed 4 {1989} – Macmillan Pub. Co., New York.
 6. S.P. Gupta – Statistical Methods, Sultan Chand and sons, New Delhi

CA1301   **COMPUTER ORGANIZATION AND ARCHITECTURE**   **[3 1 0 4]**

General Computer Architecture: Block Diagram of typical Computer, Memory Section, Input/Output Section, CPU, Registers, Arithmetic Unit, Instruction handling Areas, Stacks. **Micro operations:** Register Transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shit Unit. **Basic Computer Organization and Design:** Instruction Codes, Operation code, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input Output Instructions and Interrupts. **Control Memory:** Control Word, Microinstruction, Microprogramming, Control Memory, Hardwired **Central Processing Unit:** General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC, CISC **Pipelining and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors **Input Output Organization:** I/O Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, IOP, Serial Communication. **Memory Organization:** Associative Memory, Cache Memory, Virtual Memory **Introduction to Microprocessor:** Machine Language, Assembly Language, Assembler, High Level Language, Compiler, Interpreter, Internal Architecture 8085.

Text Books:

1. Carl Hammacher, *"Computer Organization"* (5th Edition), TMH, 2011

Reference Books:

1. M.M. Mano, *"Computer System Architecture"*, PHI, 2009.
2. Govindarajalu, *"Computer Architecture and Organization"*, (2nd Edition), TMH, 2008.

Overview: Overview of .Net framework and C#.Structure of C# programming language & features. Variables, Data types, Loops, Classes and Objects, Array, Methods, Inheritance, Polymorphism, Event handling, Abstraction and Encapsulation. **ASP.NET**: Understanding ASP.NET Controls, Applications, Web servers, installation of WS-.Web forms, web form controls. Running a web application, creating a multiform web project. Internet Explorer Control-State management- View state, Session state, Application state. **ADO.NET:** Architecture of ADO.NET, Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, Command Class, Data Adapter Class, Dataset Class. Display data on data bound Controls and Data Grid. **Web applications:** Database Accessing on web applications: Data Binding concept with web, creating data grid, Binding standard web server controls. Display data on web form using Data bound controls. Application deployment.

Text Books:

1. Shelly Powers, "*Dynamic Web Publishing*", Techmedia, 1998.

2. Jamie Jaworski*, "Java 1.2 Unleashed"*, Techmedia, 1998

Reference Books:

1. Robert Niles,*"CGI by Example"*, Que, 1996
2. Scot Johnson, "*Using Active Server Pages"*, Que,2000

CA1303   **OBJECT ORIENTED PROGRAMMING USING C++**   **[3 1 0 4]**

Overview of C++: Concepts of Object Oriented Programming, Introduction to C++ classes and objects, basic concepts of OOP; **Classes & Objects:** Classes, Structure & classes, Union & Classes, Inline function, Friend function, Friend Classes, Scope resolution operator, Static data member, Static member function, passing objects to function, Returning objects; **Constructor & Destructor:** Introduction, Constructor, Parameterized constructor, Multiple Constructor in a Class, Copy constructor, Destructor, Array, Pointers: Array of Objects, Pointers to Object, Type checking C++ pointer; **Function & Operator overloading:** Function overloading, Overloading unary and binary operators, Overloading; **Inheritance:** Introduction to Inheritance; **Types of Inheritance:** Single, Multiple, Multilevel, Hierarchical and Hybrid inheritance, Making private member inheritable, virtual base class, abstract class; **Virtual Functions & Polymorphism:** Virtual function, pure virtual functions, early vs. late binding; **Templates:** Introduction, class template and function template.

Text Books:

1. E. Balaguruswamy, *"Object Oriented Programming with C++"* , (2nd Edition), TMH, 2010

Reference Books:

1. Herbert Schildt, *"C++ The Complete Reference"*, (3rd Edition), TMH, 2011

Introduction to multimedia systems: Multimedia elements, applications, architecture; system components, types, evolving technologies; Defining objects for multimedia systems; Multimedia Data Interface Standards; **Storage requirements and multimedia Databases**; **Media and Data Streams:** Media of Perception, Representation, Presentation, Storage, Transmission, Information Exchange; Discrete, continuous and independence media; Characterizing Data Streams; **Audio Technology**: Audio representation on computers; Three Dimensional Sound Projection; Speech Signals; Speech input, output and transmission; **Graphics and Images, Video Technology, Computer-Based Animation:** Capturing graphics and images, Reconstructing Images; Graphics and Image Output Options; Specification, controlling, display and transmission of animation; **Data Compression:** Basic Compression Techniques; JPEG, Hierarchical Mode H.261 (Px64) and H.263, MPEG: Video Encoding, Audio Coding, Data Stream, MPEG-2, MPEG-4, MPEG-7; Fractal Compression; **Optical Storage Media:** History and basics of optical technology; Video Discs and Other WORMs; CD Digital Audio; CD-ROM Extended Architecture; CD-Recordable; CD Magneto-Optical; CD Read/Write; DVD; **Content Analysis** : Simple Vs. Complex Features; Analysis of Individual Images; Analysis of Image Sequences; Audio Analysis; D**ata and File Format Standards:** Rich-Text, TIFF, RIFF, MIDI, JPEG,DIB, AVI, MPEG Standards, TWAIN.

Text Books:

1. R. Steinmetz, K. Narstedt, "*Multimedia Fundamentals: Vol 1-Media Coding and Content Processing*", 2nd Edition, Pearson Education, 2003.
2. P.K. Andleigh, K. Thakrar, "*Multimedia Systems Design*", PHI, 2003.

Reference Books:

1. K.R Rao, Z. S. Bojkovic and D. A. Milovanovic,"*Multimedia Communication Systems: Techniques, Standards, and Networks*", Pearson Education, 2002.
2. N. K Sharad, "*Multimedia information Networking*", PHI, 2002.

CA1330   **WEB TECHNOLOGY LAB**   **[0 0 3 2]**

Programing based on HTML, HTML with CSS, DHTML with JavaScript, Servlet, JSP and Database Connectivity Web pages.

CA1331   **C++ PROGRAMMING LAB**   **[0 0 3 2]**

Simple C++ programs without using the concept of classes and objects, classes, friend functions, Parameterized, default and copy constructor, destructor, static members Inheritance, Dynamic method dispatch, Files, Dynamic allocation, operator overloading, Templates, overloaded functions, virtual functions, implement various console I/O functions i.e. width(), precision().

SEMESTER-IV

MA1422   **Numerical Methods**   **[3 1 0 4]**

Finite Differences: Definition of operators and derivation of inter-relations among them, Properties of Δ and E (without proof), Factorial notation for positive and negative exponent, Representation of polynomial in factorial notations. **Interpolation with equal intervals:** Newton's forward difference formula, Newton's backward difference formula. Interpolation with unequal intervals. **Central Difference Interpolation formula:** Gauss Forward, Gauss Backward, Stirling's formula. **Numerical Integration:** Trapezoidal rule and its geometrical significance, Simpson's one-third rule, Simpson's three-eighth rule. **Solution of algebraic and transcendental equations**: Secant, Regula-Falsi method, Newton-Raphson Method, Iterative method. **Solution of Ordinary differential equations:** Picard method, Taylor series method, Euler methods, Euler's modified method, Runge-Kutta methods.

Text Books
  1. Numerical Methods : R. K. Jain, S.R.K. Iyengar and M.K. Jain
References Books:
1. Numerical Methods using MATLAB : Mathews and Finle
2. Applied Numerical Analysis: Gerald and Whealtey

CA1401   **DATABASE MANAGEMENT SYSTEM**   **[3 1 0 4]**

Introduction: Introduction to Database management system, some examples, characteristics of the database approach, Relational Model. **ER Models:** Database modeling using the entity-relationship model, entity types, entity sets attributes and keys, relationships. **Database Design:** Functional dependencies and normalization for relational databases. **SQL the Relational Database Standard:** Data definition, constraints, Basic Queries in SQL, More complex SQL queries, Insert, Update and Delete Statements in SQL. **Transaction Processing:** Transaction processing concepts: Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, schedules and recoverability.

Text Books:

1. Ehmasri & Navathe, *"Fundamentals of Database Systems"*, (3rd Edition), Addison-Wesley, 1999

2. Korth & S.Sudarshan, *"Database System Concepts"*, (5th edition), TATA McGraw Hill, 2002

Reference Books:

1. C.J. Date, *"Introduction to Database Systems"*, Addison-Wesley, 1995.

CA1402 **VISUAL PROGRAMMING USING .NET** **[3 1 0 4]**

Introduction: The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation; **Classes and Objects:** Framework Base Classes, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Events. Type conversion, Error Handling; **Database and Connectivity**: ADO.Net. Distributed Application in C#, Visual programming interface with C#. Web controls, Web Forms.

Text Books:

1. Wiley, *"Beginning Visual C# 2008"*,Wrox Publication, 2009
2. Fergal Grimes*," Microsoft .Net for Programmers"*, SPI, 2011

Reference Books:

1. Balagurusamy, *"Programming with C#"*, TMH,2010
2. Mark Michaelis, *"Essential C# 3.0: For .NET Framework 3.5"*, (2nd Edition), Pearson Education,2010

CA1403   **E-COMMERCE**   **[3 1 0 4]**

Introduction: Motivation, Forces behind E-Commerce Industry Framework, Brief history of Ecommerce, Inter Organizational E-Commerce, Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, Architectural framework, Network Infrastructure for E-Commerce, Component of I way Access Equipment, Global Information Distribution Network, Broad band Telecommunication. **Mobile Commerce:** Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices, Web Security, Introduction to Web security, Firewalls & Transaction Security, Client Server Network, Emerging Client Server Security Threats, firewalls & Network Security. **Basic cryptography for enabling E-commerce:** World Wide Web & Security, Encryption, Transaction security, Secret Key Encryption, Public Key Encryption, Virtual Private Network (VPN). **Electronic Payments:** Overview of Electronics payments, Digital Token based Electronics payment System, Smart Cards; Credit Card, Debit Card based EPS, Emerging financial Instruments**.**

Text Books:

1. Ravi lalakota, Andrew Whinston *"Frontiers of Electronic Commerce"*, Addision Wesley,2008

Reference Books:

1. V.K. Garg and N.K. Venkita Krishna, *"Enterprise Resource Planning-Concepts and Practice"*, PHI,2009.

Introduction to Data Communication: Networks-protocols, applications, Line Configuration, topology, Transmission mode, Classification of networks. Parallel & Serial Transmissions, Analog & Digital Signals, Periodic & Aperiodic Signals; **Modulation**: Amplitude Modulation, Frequency Modulation, Phase Modulation, Pulse Amplitude Modulation, Pulse Code Modulation, Sampling. Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Bit/ Baud Comparison, DTE-DCE Interface, 56 K Modem, Cable Modem; **OSI Model, Transmission Media**: Twisted Pair Cable, Coaxial Cable, Fiber-Optics Cable, Radio frequency Allocation, Terrestrial Microwave, Infrared rays, Satellite Communication, Cellular Telephony; **Introduction to ISDN:** Framing, Line Discipline, Types of Errors, Error Detection & Correction, Flow Control, Error Control. CSMA/CD, IEEE802.X Standards; **Introduction to Bridges:** Internal Organization of Network Layer, Routing Algorithms-----Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, General Principles of Congestion, Congestion Prevention Policies. Duties of Transport Layer, Connection Establishment & Connection Termination; **Introduction to TCP/IP:** Data Link Layer in Internet----SLIP & PPP, Network Layer in Internet---IP protocol, IP addressing, Subnetting & Internet Control Protocols, Transport Layer in Internet-TCP & UDP.

Text Books:

1. Bertsekas, Dimitri, Gallager, Robert, *"Data Networks"* (2nd Edition). Prentice Hall Indi, 2009.
2. Tanenbaum A. S., *"Computer networks"* (5th Edition). Pearson Education, 2009
3. Behrouz Forouzan, *"Data communication & networking"* (5th Edition). TMH, 2011

Reference Books:

1. Peterson and Davie *"Computer Networks: A Systems Approach"* (5th Edition), Morgan Kaufmann Publishers, 2009
2. William Stallings, *"Data and Computer Communications"* (9th Edition). Pearson Education, 2009
3. Stevens, *"TCP/IP Illustrated"*, Addison-Wesley Publication, 2010
4. Kleinrock, Leonard, *"Queueing Systems, Vol 1: Theory"*, Wiley Publication, 2011

CA1430   **DBMS LAB**   **[0 0 3 2]**

MySQL setup: data migration from MySQL to portable file as well as uploading data from portable file to MySQL; **SQL:** Creating, Altering, and Dropping tables with Constraints, Insert Table. Detailed SELECT with sub-queries, EQUI-JOINS, correlated sub-queries. GROUPING, SET, UPDATE, DELETE, VIEWS, TRIGGERS; **PL/SQL:** Program Development: Iterative PL/SQL Blocks.

CA1431   **VISUAL PROGRAMMING USING C#.NET LAB**   **[0 0 3 2]**

Classes and Objects, Display records by using database, Data list link control & Data binding using dropdown list control , Inserting record into a database & Deleting record into a database, Data binding using data list control & Data list control templates , Data binding using data grid & Data grid control template, Data grid hyperlink & Data grid button column, Creating own table format using data grid , Web Form application

SEMESTER-V

CA1501   **SOFTWARE ENGINEERING**   **[3 1 0 4]**

Introduction to System Concepts: Definition, Elements of System, Characteristics of System, Types of System, System Concepts. **Introduction to Software Engineering:** Definition, Need for software Engineering, Software Characteristics, Software Qualities (McCall's Quality Factors) **Requirement Analysis:** Definition of System Analysis, Requirement Anticipation, Knowledge and Qualities of System Analyst, Role of a System Analyst, Feasibility Study And It's Types, User Transaction Requirement, User design Requirements, SRS(System Requirement Specification) **Software Development Methodologies:** SDLC (System Development Life Cycle), Waterfall Model, Spiral Model, Prototyping Model. **Analysis and Design Tools:** Entity-Relationship Diagrams, Data Flow Diagrams (DFD), Data Dictionary & Elements of Data Dictionary, Pseudo code, Input And Output Design. **Structured System Design:** Modules Concepts and Types of Modules, Structured Chart, Qualities of Good Design, Coupling, Types of Coupling, Cohesion, Types of Cohesion. **Software Testing:** Definition, Test characteristics, Types of testing - Black-Box Testing, White-Box Testing, Stress Testing, Performance Testing

Text Books:

1. Roger S. Pressman, *"Software Engineering"*, Tata McGraw Hills, 5th Edition, 2009.

2. Ian Sommerville, *"Software Engineering"*, Pearson Education Asia, 6th Edition, 2005.

Reference Books:

1. Pankaj Jalote, "*An Integrated Approach to Software Engineering"*, Springer Publications, 2010.

Introduction: Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors, resolution, Introduction to Interactive. Computer Graphics: Picture analysis, Overview of programmer's model of interactive graphics, Fundamental problems in geometry. SIMPLE LINE DRAWING METHODS: Point Plotting Techniques, Qualities of good line drawing algorithms, The Digital Differential Analyzer (DDA), Bresenham's Algorithm, Generation of Circles., Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm). 2D & 3D Co-ordinate system: Homogeneous Co-ordinates, Translation, Rotation, Scaling, Reflection, Inverse transformation, Composite transformation.

Text Books:

1. Edward Angel, Interactive, *"Computer Graphics: A Top-Down Approach with OpenGL"*, 4th edition, Addison-Wesley, 2005.

Reference Books:

1. Edward Angel, *"OpenGL : A primer"*, 2nd edition, Addison-Wesley, 2005.
2. *"The OpenGL Programmer's Guide"* , Addison-Wesley.
3. *"The OpenGL Reference Manual"*, Addison-Wesley.
4. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, *"Computer Graphics : Principles & Practices"*, 2nd edition, Addison Wesley Longman,1994.
5. Donald Hearn, M. Pauline Baker, *"Computer Graphics"*, 2nd edition, C version, Prentice Hall, 1996.

Introduction to OOP: Features of Java, How Java is different from C++, Data types, Control Statements, identifiers, arrays, and operators. **Inheritance**: Multilevel hierarchy, method overriding, abstract classes, Final classes, String Class. **Packages and Interfaces**: Defining, Implementing and Importing Packages. **Exceptions**: Fundamentals, Types, Uncaught Exceptions, Multiple catch Clauses, Java's Built-in Exception. **Multithreading**: Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads. **String**: String Constructors, Various Types of String Operations. **Basic Packages of Java**: Java.lang, Java.util, Java.i.o. **Event Handling:** Event Model, Event Classes, Sources of Events, Event Listener Interfaces **AWT**: Working with Windows, AWT Controls, Layout Managers Applet Class, Architecture, Skeleton, Display Methods. **Swings**: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes.

Text Books:

1. Herbert Schildt, *"Java The Complete Reference"* (8th Edition), TMH, 2008.
2. E. Balaguruswamy, *"Introduction to JAVA Programming"*, TMH, 2009.

Reference Books:

1. Daniel Young, *"Introduction to JAVA Programming"*, PHI, 2008.

CA1504   **INTRODUCTION TO UNIX PROGRAMMING**   **[3 1 0 4]**

Introduction: UNIX System Overview, Program and Processes, Error Handling, User Identification, Signals, System Calls and Library Functions.: **File I/O:** File Descriptors, Function for File Modification, I/O Efficiency, File Sharing, Atomic Operations.; **Directories:** Stat, Fstat, and Lstat Functions, File Types, Set-User-ID and Set-Group-ID, File Access Permissions , Function for modifying file permission and ownership, Symbolic Links, **System Data Files and Information:** Password File, Shadow Passwords and Other Data Files.; **Process Environment**: Process Termination, Memory Layout of a C Program, Memory Allocation, setjmp and longjmp Functions.; **Process Control:** fork Function, vfork Function, exit Functions, wait and waitpid Functions, Race Conditions, Changing User IDs and Group IDs.; **Process Relationship:** Logins, Process Groups, Sessions, Controlling Terminal, Job Control.; **Signals:** Signal Concepts, Functions to raise and handle Signals, Program Termination, abort and system functions.; **Threads:** Thread Concepts, Creation, Termination and Synchronization, Threads Control, Threads and Signals, Threads and fork, Threads and I/O.; **Daemon Processes:** Daemon Characteristics, Coding Rules, Error Logging, Single-Instance Daemons, Daemon Conventions, **Advanced I/O:** Different types of I/O Mechanism, Record Locking, STREAMS, I/O Multiplexing, **Interprocess Communication:** Pipes, FIFOs, Message Queues, Semaphores, Shared Memory.; **Network IPC: Sockets:** Socket Descriptors, Addressing, Connection Establishment, Data Transfer,Socket Options.

Text Books:

1. W. Richard Steven and Stephen A. Rago *"Advanced Programming in the Unix environment"*, Addision Wesley, 2011

Reference Books:

1. Yashavant P Kanetkar *"Unix Shell Programming"*. BPB Publication, 2009 .

CA1505   **NON LINEAR DATA STRUCTURES & ALGORITHMS**   **[3 1 0 4]**

NONLINEAR DATA STRUCTURE: Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Threaded binary tree, insertion and deletion, Binary search trees, Applications Of Trees- Some balanced tree mechanism, eg. AVL trees, 2-3 trees, Height Balanced, Weight Balance , B Tree, B+ Tree, Graph-Matrix Representation Of Graphs, Elementary Graph operations,(Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree)

ALGORITHMS: Algorithm Definition, Complexity of Algorithms: Time & space complexity, Best-case, worst-case, average-case, Asymptotic notations, Searching Algorithm: Linear or sequential search, Binary search, Interpolation search using array, Complexity of Linear search, Binary search, Interpolation Search Sorting Algorithm: Bubble sort, Selection sort, Insertion sort, Merge sort Complexity of sorting algorithms.

Text Books:
1. O.G. Kakde &U.A. Deshpandey, *"Data Structures and Algorithms"*, ISTE/EXCEL BOOKS,2003
2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., *"Data Structures and Algorithms"*, Addison Wesley , 2002
3. Drozdek, "Data Structures and Algorithms", Vikas Publications,2003

Reference Books:
1. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, *"Introduction to Algorithms"*,2002
2. Heileman, *"Data Structure Algorithims & OOP"*, Tata McGraw Hill., 2003
3. M.Radhakrishnan and V.Srinivasan, *"Data Structures Using C"* ISTE/EXCEL BOOKS,1983
4. Horowitz Ellis & Sartaj Sahni, *"Fundamentals of Data Structures"*, Galgotria Publication, 2004.
5. Tanenbaum A. S., *"Data Structures using C"* Pearson Publication, 2004.
6. Ajay Agarwal *"Data structure Through C"*, Cybertech Publication, 2005.

CA1530   **JAVA PROGRAMMING LAB**   **[0 0 3 2]**

Java programs using classes & objects and various control constructs such as loops etc, and data structures such as arrays, structures and functions. Java programs for creating Applets for display of images and texts. Programs related to Interfaces & Packages. Input/Output and random files programs in Java. Java programs using Event driven concept. Programs related to network programming.

CA1531   **SOFTWARE ENGINEERING LAB**   **[0 0 3 2]**

Assign any one project to a group of exactly two students covering all of the experiments from given experiment list. Each group is required to prepare the following documents for projects assigned to them and develop the software using software engineering methodology.

- Problem Analysis and Project Planning Thorough study of the problem- identify project Scope, infrastructure.
- Software Requirement Analysis- Describe the individual Phases/modules of the project Deliverables.
- Data Modeling Use work products – data dictionary, use case diagrams and activity diagrams, build and test lass diagrams, sequence diagrams and add interface to class diagrams.
- Software Testing – Prepare test plan, perform validation testing coverage analysis, develop test case hierarchy, Site check and site monitor.

Describe: Relevance of CASE tools, high – end and low – end CASE tools, automated support for data dictionaries, DFD, ER diagrams

SEMESTER-VI

CA1601   **OPERATING SYSTEMS**   **[3 1 0 4]**

Introduction: Basic concepts, Simple Batch Systems, Multi-programmed Batched Systems, Time-Sharing Systems, Protection; **Processes and CPU scheduling:** Process Concept, Process scheduling, Operation on Processes, Cooperating Processes, Inter-process Communication. Scheduling Criteria, Scheduling algorithms; **Process Synchronization:** The Critical-Section problem, Synchronization Hardware, Basics of Semaphores; **Deadlocks:** Deadlock characterization, Methods of Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection & Recovery from Deadlock; **Memory Management:** Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging. Virtual Memory: Demand paging, Page replacement, Page-replacement algorithms.

Text Books:

1. Silberschatz and Galvin, "*Operating system concepts*", Addison- Wesley 1999

Reference Books:

1. . H.M.Diatel, "*An introduction to operating system*", Addison- Wesley 1980

Introduction: **IPv4 Addresses** Classfull addressing, other issues, Sub-netting Classless, addressing, variable length blocks, Sub-netting, address allocation, **IP Protocol:** options, checksum, Types of messages, message format, error reporting, Query, Checksum, fragmentation, IP Package, **ICMP Protocol**: Messages, Debugging tools, **Unicasting Protocols:** Unicasting routing, RIP: RIP Message Format ,Requests and Responses, Timers in RIP **,** Introduction to OSPF and BGP**, Multicasting Protocol:** IGMP : Group Management, IGMP Messages, IGMP Protocol Applied to Host ,IGMP Protocol Applied to Router, Role of IGMP in Forwarding **ARP package & RARP**: Introduction, packet format, Encapsulation, RARP: Introduction, datagram, **UDP Protocol**: Process to process communication, User datagram, checksum; UDP package, **TCP Protocol** :Introduction, TCP services, TCP features, segment, TCP connection, State transition diagram, Flow control, Error control, Congestion control, TCP timers, options, TCP package **SCTP Protocol:** SCTP features, packet format, association, state transition diagram, flow control, error control, congestion control

Text Books:

1. A. S. Tanenbaum, *"Computer Networks"*, Pearson Education Asia, 4th Ed., 2003.

Reference Books:

1. Behrouz A. Forouzan, *"Data Communication and Networking"*, 3rd edition, Tata McGraw Hill, 2004.

Data Warehousing Introduction: Data Warehouse, Data Warehouse Architecture, Implementation, Data Warehousing to Data Mining, Data warehousing components, building a data warehouse, mapping the data warehouse to an architecture, data extraction, cleanup transformation tools, metadata, Data Warehouse characteristics and definition; The purpose of Data Warehouse; **Data Marts:** Data Warehouse Cost-Benefit Analysis / Return on Investment; **OLAP:** Patterns and models – Data visualization principles, Data Mining functionalities, Major issues in Data Mining.

Text Books:

1. Han, M. Kamber, *"Data Mining Concepts and Techniques"*, Elsevier, 2007.
2. M. Berry, G. Linoff, *"Data Mining Techniques"*, Wiley Publishing, 2004.

Reference Books:

1. T. Davenport, *"Competing on Analytics"*, Harvard Business Review (Decision Making), January 2006.
2. R.N Prasad, S. Acharya, *"Fundamentals of Business Analytics"*, John Wiley & Sons, 2011.

Python concepts: Expressions, values, types, variables, programs & algorithms, control flow, file I/O, the Python execution model. **Data structures:** List, set, dictionary (mapping), tuple, graph (from a third-party library), List slicing (sublist), list comprehension (shorthand for a loop), Mutable and immutable data structures, Distinction between identity and (abstract) value. **Functions:** Procedural abstraction, functions as values, recursion, function design methodology. **The Python Library:** String and Text Handling, Data Structures and Algorithms, Threading, Networking, Web Programming, Graphical Programming, Database Access

Text Books:

1. David M. Beazley, *"Python Essential Reference"*, Amazon Books, 2010.
2. M. Lutz, *"Programming Python, 4th Edition"*, O'Reilly Media, 2010

CA1605   **SOFT COMPUTING TECHNIQUES**   **[3 1 0 4]**

Introduction and mathematical preliminaries: What is pattern recognition?, Clustering vs. Classification; Applications; Linear Algebra, vector spaces, probability theory, estimation techniques. **Classification:** Bayes decision rule, Error probability, Error rate, Minimum distance classifier, Mahalanobis distance; K-NN Classifier, Linear discriminant functions and Non-linear decision boundaries. Fisher's LDA, Single and Multilayer perceptron, training set and test sets, standardization and normalization. **Clustering:** Different distance functions and similarity measures, Minimum within cluster distance criterion, K-means clustering, single linkage and complete linkage clustering, MST, medoids, DBSCAN, Visualization of datasets, existence of unique clusters or no clusters. **Feature selection:** Problem statement and Uses, Probabilistic separability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, (l,r) algorithm. **Feature Extraction:** PCA, Kernel PCA. **Recent advances in PR:** Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy.

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Text Books:

1. S.N. Deepa, "*Principles Of Soft Computing, 2Nd Ed*", Wiley-India 2011

CA1682 **Project** **[0 0 0 2]**

The duration of BCA final year project is one Semester of 6th semester. Students are required to undertake innovative and research oriented projects, which not only reflect their knowledge gained in the earlier semesters but also additional knowledge gained from their own effort. They must show the phase wise development of their project submitting the appropriate documents at the end of each phase. The student must put in effort to find answers to questions about the applications, which will also enhance the value of the project report. There will be one interim and one final seminar for evaluation of the project