MASTER OF COMPUTER APPLICATIONS

Department of Computer Science and Engineering

Master of Computer Applications (MCA) emphasizes on the design and application of information systems and provides a solid background in business functions and Information Technology and covers latest developments in areas where commerce and computing and in general, applications and technology blend together successfully and define the state of art.

MCA students acquire strength in principles, concepts and foundations of computer science, information technology and various applications. They would also have extensive programming / software development experience over a wide variety of platforms / applications. The curriculum has explicitly identified lab components for every course that discusses the principles with an implementation component.

The course is well balanced with significant emphasis on planning, designing and building complex commercial application software and system software. The application areas include transaction processing (such as banking, stock exchange order processing), simulation, database management, e-commerce, networking, embedded technologies, bioinformatics etc.

This MCA programme is not only a complete professional grooming for students for a successful career in the IT industry, but also, provides value-based education through a system of wholesome learning.

CURRICULUM

First Semester

Course Code	Course	L T P	Cr
MA281	Discrete Structures	3 1 0	4
EN281	English for Professional Purposes	0 0 1	1
CA201	Computer Organization and Architecture	3 0 1	4
CA203	Computer Programming	3 0 1	4
CA205	Database Management System	3 0 1	4
CA207	Problem Solving Techniques	2 0 1	3
HU601	Cultural Education*		P/F
		Credits	**20**

*Non-credit Course

Second Semester

Course Code	Course	L T P	Cr
MA282	Statistics and Numerical Methods	3 1 0	4
CA202	Object Oriented Programming	3 0 1	4
CA204	Data Structures	3 0 1	4
CA206	Operating Systems	3 0 1	4
HU282	Financial Accounting	2 0 0	2
CA208	Java Programming	0 0 1	1
		Credits	**19**

Third Semester

Course Code	Course	L T P	Cr
CA301	Computer Networks	3 0 1	4
CA303	Design and Analysis of Algorithms	3 1 0	4
CA305	Internet Programming	3 0 1	4
CA307	Software Engineering	3 0 1	4
MA381/ MA383	Operations Research / Discrete Structures and Probability Theory (*)	3 1 0	4
CA309	Web Scripting	0 0 1	1
CA311	Computer Programming (*)	2 0 1	3
		Credits	**21/24(*)**

Fourth Semester

Course Code	Course	L T P	Cr
CA302	.Net Technologies	3 0 1	4
CA304	Service Oriented Architecture	3 0 1	4
CA306	Data Mining and Business Intelligence	3 0 1	4
	Elective I	3 0 0	3
	Elective II	3 0 0	3
EN600	Technical Writing		P/F
CA308	Programming Practices in Operating Systems and Databases (*)	0 0 1	1
		Credits	**18/19(*)**

Fifth Semester

Course Code	Course	L T P	Cr
CA401	Design Patterns	3 1 0	4
CA403	System Security	3 1 0	4
	Management Elective	3 0 0	3
	Elective III	3 0 0	3
CA499	Dissertation		5
		Credits	**19**

Sixth Semester

Course Code	Course	L T P	Cr
CA499	Dissertation		12
		Credits	**12**

Total Credits: 109/74(*)

(*) refers to Lateral entry

Open Electives

Course Code	Course	L T P	Cr
CA312	Advanced Database Management System	3 0 0	3
CA314	Information Security	3 0 0	3
CA316	Structure and Interpretation of Computer Programs	3 0 0	3
CA318	Software Quality Assurance	3 0 0	3
CA322	Computational Intelligence	3 0 0	3
CA324	Bioinformatics	3 0 0	3
CA326	Advanced Computer Networks	3 0 0	3
CA328	Information Retrieval	3 0 0	3
CA332	Network Management and System Administration	3 0 0	3
CA334	Intelligent Systems	3 0 0	3
CA336	Open Source Systems	3 0 0	3
CA338	Natural Language Processing	3 0 0	3
CA411	Embedded Systems	3 0 0	3
CA413	Distributed Computing	3 0 0	3
CA415	Mobile Application Development	3 0 0	3
CA417	Wireless Communications and Networks	3 0 0	3
CA419	Computer Graphics and Visualization	3 0 0	3
CA421	Computer Language Engineering	3 0 0	3
CA423	Semantic Web Technologies	3 0 0	3
CA425	Cloud Computing	3 0 0	3
CA427	Advanced Databases	3 0 0	3

CA429	Database Administration	3 0 0	3
CA431	Digital Image Processing	3 0 0	3
	MANAGEMENT ELECTIVE		
HU481	Management Information Systems	3 0 0	3
HU483	Principles of Economics and Management	3 0 0	3
HU485	Software Project Management	3 0 0	3

MA281 DISCRETE STRUCTURES 3-1-0-4

Logic: Logic- Prepositional Equivalence- Predicates and Quantifiers. Countings: Basics of Counting- The Pigeonhole Principle- Permutations and Combinations. Relations: Relations and their Properties- Representing Relations- Closure of Relations- Equivalence Relations. Matrices: Linear Systems of Equations- Rank of a Matrix- Linear dependence. Solutions of Linear Systems: Existence- Uniqueness- General Form- Eigen values- Eigen vectors- Symmetric- Skew-Symmetric and Orthogonal Matrices. Complex Matrices: Hermitian- Skew Hermitian- Unitary- Similarity of Matrices (Definition and Examples only)- Diagonalization. Graph Theory: Graph Terminologies- Representation of Graphs and Graph Isomorphism. Graph Connectivity - Planar Graphs and Graph Coloring. Modeling Computation: Languages and Grammars. Finite State Machines with Output and with no Output. Language Recognition- Turing Machine.

TEXT BOOKS / REFERENCES:

1. Rosen K. H., *Discrete Mathematics and its Applications*, Sixth Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Grimaldi R. P., *Discrete and Combinatorial Mathematics*, Fourth Edition, Pearson Education Asia, New Delhi, 2008.
3. E Kreyszig, *Advanced Engineering Mathematics*, Eighth Edition, John Wiley and Sons, 2002.

EN281 ENGLISH FOR PROFESSIONAL PURPOSES 0-0-1-1

Common errors committed while writing and speaking– An introduction to Pronounciation - Stress and Intonation– Body Language- Gestures and Postures-Affected Idiosyncrasies and Mannerisms - Self Introduction- Self Appraisals- Resume Writing- Participation in Conversations - Expressing ideas and information - Job interviews - Telephonic interviews - Group discussions - Panel discussions and Debates- Prepared speeches and Extempore speeches- Writing professional reports - Oral presentations.

TEXT BOOKS / REFERENCES:

1. Garside, Barbara and Tony Garside. *Essential Telephoning in English*, U.K.CUP, 2002.
2. Judith S. Van Alstyne, *Professional and Technical Writing Strategies*: *Communicating in Technology and Science*, Fourth Edition, New Jersey: Prentice Hall, 1999.
3. Michael Swan. *Practical English Usage*, Fourth Impression, International Students' Edition, Oxford University Press, 2000.

CA201 COMPUTER ORGANIZATION AND ARCHITECTURE 3-0-1-4

Logic Circuits: Basic Logic Functions- Synthesis of Logic Functions- Minimization of Logic Expressions- K-Maps- Synthesis with NAND and NOR Gates- IC Packages- Decoders and Encoders- Multiplexers and De Multiplexers- Flip Flops- Registers- Counters. Basic

Organization of a Computer: Functional Units- Basic Operational Concepts- Bus Structure - Performance- Processor Clock- Clock Rate- Instruction Sets- Instruction Formats. Types of Instructions:ALU Instructions – Branch Instructions - Assembly Language - I/O Operations - Subroutines- Program Examples- Addressing Modes. RISC and CISC Architectures. Basic Processing Unit: Fundamental Concepts- Execution of a Complete Instruction- Multiple Bus Organization- Hardwired Control - Micro Programmed Control. Arithmetic: Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive numbers- Signed-Operand Multiplication. Memory System: Basic Concepts– Semiconductor RAM Memories– Read-Only Memories– Cache Memories– Mapping Functions– Replacement Algorithms– Performance Considerations– Virtual Memories. Input-Output Organization: Accessing I/O devices – Programmed Input / Output – Interrupts– Direct Memory Access- Buses – Interface circuits- Standard I/O Interfaces (PCI, SCSI, USB) – I/O devices and Processors.

TEXT BOOKS / REFERENCES:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, *Computer Organization*, Fifth Edition, Tata McGraw-Hill, 2002.
2. David A. Patterson and John L. Hennessy, *Computer Organization and Design: The Hardware / Software Interface*, Third Edition, Elsevier, 2005.
3. Thomas L.Floyd, *Digital Fundamentals* , Ninth Edition, Prentice Hall, 2005.

CA203 COMPUTER PROGRAMMING 3-0-1-4

Introduction to Structured Programming- Data Types- Variables- Constants- Operators- Expressions- Type Cast- Enumerations- Data Input and Output- Control Structures- Arrays – Strings- String Handling Functions- User defined functions- Recursion- Storage Classes- Pointers- Dynamic Memory Allocation- Structures- Union. File Access: File Operations for Binary and Text files- Command Line Arguments- Preprocessor- Macros-Graphics Library.

TEXT BOOKS/ REFERENCES:

1. Paul J.Deitel and Harvey M. Deitel, *C: How to Program*, Sixth Edition, Prentice Hall, 2010.
2. Kernighan Brian W. and Ritchie Dennis M., *C Programming Language: [ANSI C]*, Second Edition, PHI, 2012.
3. Byron S. Gottfried, *Schaum's Outline of Theory and Problems of Programming with C*, Third Edition, Manohar Publishers & Distributors, 2010.
4. Yashavant Kanetkar, *Let Us C*, Thirteenth Edition, BPB, 2013.

CA205 DATABASE MANAGEMENT SYSTEM 3-0-1-4

Introduction and the Relational Model: Introduction to DBMS- Data Models. Structure of Relational Databases- Relational Algebra Operations. SQL: Background- SQL Data Types and Schemas- Integrity Constraints– Data Definition- Basic Structure of SQL Queries- Set Operations- Aggregate Functions- Null Values. Database Design: Overview of the Design Process- The Entity-Relationship Model– Constraints - Entity-Relationship Diagrams. Database Design– The E-R Model– Constraints- E-R Diagrams- Design Issues- Weak Entity Sets -

Extended E-R Features– E-R Reduction to Relational Schemas. UML Class Diagram Notations.SQL: Nested Sub Queries- Complex Queries- Views- Join Relations - Authorization - Functions and Procedural Constructs. Relational Database Design: Features of Good Relational Designs- Atomic Domains and 1NF- Decomposition using Functional Dependencies (2NF) – 3NF, 4NF, BCNF- Functional Dependency Theory- Decomposition using Multi-valued Dependencies– PJNF and DKNF. Introduction to Transaction Management: Transactions- Concept- State- Atomicity and Durability- Concurrent Executions- Lock Based Protocols – Introduction to Deadlock Handling.

TEXT BOOKS/ REFERENCES:

1. Silberschatz A, Korth H.F. and Sudharshan.S, *Database System Concepts*, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, 2010.
2. Elmasri.R and Navathe.S.B, *Fundamentals of Database Systems*, Sixth Edition, Pearson Education, 2010.
3. Date C.J, *An Introduction to Database Systems*, Eighth Edition, Addison Wesley, 2003. (For SQL related topics).
4. Ramakrishnan.R. and Gehrke.J, *Database Management Systems*, Third Edition, Tata McGraw-Hill, 2003.

CA207 PROBLEM SOLVING TECHNIQUES 2-0-1-3

General Problem Solving Concepts: Problem Solving in Everyday Life- Types of Problems- Difficulties with Problem Solving- Defining Problem – Data representation in Computer – Introduction to Unified Modeling Language using the tools, testing and coding the solution – Software Development Life Cycle. Algorithms: Introduction to Programming : Structure – Loops, Variables and Conditions – Modules: Functions, Cohesion and Coupling. Abstraction and Creativity: Programming paradigms – Functional Programming and Procedure Abstraction. Data abstraction and Data Structures: Queues and Stacks, Lists and Higher Order functions - Trees and fractals using recursion. Concurrency – Recursive reporters – Simulator Design – Broadcast- Animations and Music.

TEXT BOOKS/ REFERENCES:

1. Maureen Sprankle and Jim Hubbar, *Problem Solving and Programming Concepts*, Ninth Edition, Prentice Hall, 2011.
2. Hal Abelson, Ken Ledeen and Harry Lewis, *Blown to Bits: Your Life, Liberty, and Happiness after the Digital Explosion*, Addison-Wesley Professional, First Edition, 2008.
3. Paul Vickers , *How to Think like a Programmer: Problem Solving for the Bewildered*, First Edition, Gaynor Redvers, 2008.
4. Dromey R.G, *How to Solve it by Computers*, Fourth Edition, Prentice Hall, 2001.

MA282 STATISTICS AND NUMERICAL METHODS 3-1-0-4

Probability Theory: Experiments - Outcomes- Probability- Conditional Probability and Bayes' Theorem. Random Variables and Probability Distributions- Mean and Variance of a Distribution. Binomial - Poisson and Normal Distributions. Statistics: Correlation and Regressions. Testing of

Hypothesis. Testing of Population Mean (Normal and t distributions). Chi-Square Test for Goodness of fit and Independence. Solving Non Linear Equations: Interval Halving - Secant Method- False Position Method- Newton's Methods. Fixed Point Iteration - Newton's Method for Polynomials. Solving System of Equations: Matrix Notations- Gaussian Elimination and Gauss Jordon Methods- Iterative Methods - Relaxation Method. Interpolation: An Interpolation Problem- Lagrangian Polynomials- Divided Differences - Case Studies.

TEXT BOOKS / REFERENCES:

1. Curtis F. Gerald and Patrick O. Wheatley, *Applied Numerical Analysis*, Fifth Edition, Addison Wesley, 2002.
2. Jain M. K., Iyengar S. R. K. and Jain R. K., *Numerical Methods for Engineering and Scientific Computation*, Third Edition, New Age International (P), 1995.
3. Ravichandran. J, *Probability and Statistics for Engineers*, First Edition, Wiley India, 2012.
4. Douglas C. Montgomery and George C. Runger, *Applied Statistics and Probability for Engineers*, Third Edition, John Wiley and Sons Inc., 2003.
5. Ronald E. Walpole, *Probability and Statistics for Engineers and Scientists*, Seventh Edition, Pearson Education, Asia, 2002.

CA202 OBJECT ORIENTED PROGRAMMING 3-0-1-4

OO System Development Life Cycle- Object Oriented Methodologies - Comparison (OOP and SP)- Introduction to Object Oriented Programming- Object Basics. C++ Environment: Manipulators- Classes and Object- Data Members- Access Specifiers- Array within a Class- Array of Objects- Scope Resolution Operators- Inline Functions- Constructors- Default Constructors- Destructors - Static Members- This Pointer - Constant Members- Mutable- Intializer List- References and Reference Parameters- Default Arguments- Type Conversion- Free Storage Operators. Compile Time Polymorphism: Overloading Operators- Function Overloading- Overloading Constructors- Friend Functions- Friend Classes- Inheritance Types- Function Overriding- Virtual Base Class- Constructors in Base Derived Classes- Class Containership. Run time Polymorphism: Virtual Functions- Pure Virtual Functions- Abstract Class- Class Templates- Function Templates- Exception Handling.

TEXT BOOKS/ REFERENCES:

1. Stanley B. Lippman, *The C++ Primer*, Fifth Edition, Pearson Education, 2012.
2. Deitel H.M and Deitel P.J , *C++ How to Program*, Ninth Edition, Prentice Hall, 2013.
3. Bjarne Stroustrup, *The C++ Programming Language*, Fourth Edition, Addison Wesley, 2013.
4. Ali Bahrami, *Object Oriented Systems Development*, Second Edition, McGraw-Hill, 2008.

CA204 DATA STRUCTURES 3-0-1-4

Algorithms: Introduction and Notations- Linear Data Structures- Arrays- Stacks- Queues and Variants- Linked Lists and its Variants (Operations and Applications). Nonlinear data Structures:

Trees- Binary Tree- Binary Search Tree- Threaded Binary Tree (Traversals and Applications). Search Trees: Weight Balanced Trees- Height Balanced Trees- 2-3 Trees- Lexicographic Search Trees- B Trees- B+ Trees- AVL Trees. Graphs: Matrix and other Representation of Graphs- Breadth First Search- Depth First Search- Spanning Trees – Applications. Hash Table Methods: Introduction- Hashing Functions- Collision Resolution Techniques. File Structures: Definition – Sequential Files- Indexed Sequential Files - Direct Files- Introduction to External Searching and its Hashing Functions.

TEXT BOOKS/REFERENCES:

1. Jean-Paul Tremblay and G. Sorenson, *An Introduction to Data Structures with Applications*, Second Edition, Tata McGraw-Hill, 2008.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, *Fundamentals of Data Structures in C*, Second Edition, Silicon Press, 2008.
3. Robert L.Kruse, Bruce P. Leung, Clovis.L. Tondo and Shasshi Mogalla, *Data Structures and Program Design in C*, Second Edition, Pearson Education, 1997.

CA206 OPERATING SYSTEMS 3-0-1-4

Introduction to OS: Layered Approach- Kernel booting Users View- Basic Linux Commands and Linux Architecture. Interrupts- System Calls and Protection. Process Management: Process States - Schedulers - Operations on Processes - Inter-Process Communication – Synchronization- pipes- Linux Processes- Process Creation in Linux- Fork. CPU Scheduling- Scheduling Mechanisms in Linux and Solaris-Signals and Threads- Threading Concepts in C-Process Synchronization- Critical Section Problem- Synchronization Hardware - Semaphore- Classical Problems of Synchronization - Critical Region- Monitors- Deadlocks: Deadlock Characterization -Methods of handling Deadlocks- Deadlock Prevention- Avoidance- Detection and Recovery. Storage Management: Memory Management- Swapping- Contiguous Memory Allocation. Paging: Paging in Linux- Segmentation- Segmentation with Paging- Virtual Memory- Demand Paging- Page Replacement Algorithms- Thrashing. File Systems in Linux: Directory Structure- Directory implementation- Disk Scheduling- Experiments in VM. Virtual Machines: Overview of VMware and Linux Demos- Case Study: The Linux system- Android.

TEXT BOOKS/REFERENCES:

1. Silberschatz and Galvin, *Operating System Concepts*, Eighth Edition, John Wiley and Sons, 2009.
2. Robert Love, *Linux Kernel Development*, Third Edition, Addison-Wesley Professional, New York, 2010.
3. H. M. Deitel, P. J. Deitel and Choffnes, *Operating System*, Third Edition, Prentice Hall, 2003.
4. Andrew S. Tannenbaum, *Modern Operating Systems*, Third Edition, Prentice Hall, 2007.
5. D.M.Dhamdhere, *Operating Systems – A Concept – Based Approach*, Second Edition, Tata McGraw-Hill, 2006.

HU282 FINANCIAL ACCOUNTING 2-0-0-2

Accounting Principles- Concepts. Conventions: Double Entry System of Book Keeping - Basic terms used in Accountancy - Journal Procedure Merits and Demerits - Ledger posting Procedure Merits and demerits. Cash Book: Simple Cash Book- Double Column Cash Book - Triple column cash book - Petty cashbook – Preparation - Merits and Demerits. Trial Balance: Need- Preparation- Uses- Trading and Profit and Loss Account- Balance Sheet of Sole Proprietary concerns with Simple Adjustments. Depreciation Accounting: Need– Objectives- Straight Line Method and Written down Method - Cash Budget- Need - Objectives - Preparation - Merits and Demerits.

TEXT BOOKS / REFERENCES:

1. Nagarajan K.L, Vinayagam.N, and Mani P.L, *Principles of Accounting*, Second Edition, Eurasia Publishing House(P), 2009.
2. Sharma R.K, and Shashi K. Gupta, *Management Accounting*, Fifth Edition, Kalyani Publishers, 2009.
3. T.S.Grewal, *Double Entry Book Keeping*, First Edition, New Age International (P), 2009.
4. Chandra Prasanna, *Financial Management - Theory and Practice*, Sixth Edition, Tata McGraw-Hill, 2009.
5. Maheshwari S.N, *Principles of Management Accounting*, Fourth Edition, Sultan Chand and Sons, 2009.

CA208 JAVA PROGRAMMING 0-0-1-1

Overview of the Language: Compiling and Interpreting Java Applications. JDK Objects and Classes: Defining Class- Creating Object– Constructors- Access Modifiers - Encapsulation. Input / Output Streams: Overview of Streams - Bytes vs. Characters - File Object- Binary Input and Output - Reading and Writing Objects. Inheritance in Java: Casting - Method Overriding - Polymorphism - Super - Interfaces and Abstract Classes. Packages: The Import Statement - Static Imports. Package Scope Multithreading**:** Introduction to Threads - Creating Threads - Thread States - Runnable Threads - Coordinating Threads - Interrupting Threads. Runnable Interface Applets: Applet Architecture- Parameters to Applet - Embedding Applets in Web page. Designing Graphical User Interfaces in Java: Components and Containers - Layout Managers - AWT Components- Adding a Menu to Window- Extending GUI Features using Swing Components.

TEXT BOOKS / REFERENCES:

1. Naughton P. and Schildt H., *Java2 Complete Reference*, Eighth Edition, Tata McGraw- Hill, 2011.
2. Arnold, Gosling and Holmes, *The Java Programming Language*, Fourth Edition, Addison-Wesley, 2005.
3. Eckel.B, *Thinking in Java,* Fourth Edition, Prentice Hall, 2006.

CA301 COMPUTER NETWORKS 3-0-1-4

Introduction to Networks: The Network Edge- The Network Core– Delay– Loss and Throughput in Packet Switched Networks- Protocol Layers and Their Service Models- Physical Layer. Principles of Network Applications: The Web and HTTP - DNS- The Internet's Directory Service - Peer-to-Peer Applications. Socket Programming with TCP: Socket Programming with UDP. Introduction to Transport Layer Services: Multiplexing and Demultiplexing - Connectionless Transport- UDP - Principles of Reliable Data Transfer- Connection Oriented Transport- TCP- Principles of Congestion Control. Introduction to Network Layer: Simple Networking (IP) - Routing- Global Internet– Multicast. The Link Layer and Local Area Networks: Link Layer - Introduction and Services – Error-Detection and Correction Techniques - Multiple Access Protocols - Link-Layer Addressing - Ethernet - Link - Layer Switches- PPP.

TEXT BOOKS / REFERENCES:

1. James F. Kurose and Keith W. Ross, *Computer Networking: A Top-Down Approach*, Fourth Edition, Addison Wesley, 2008.
2. Larry Peterson and Bruce Davie, *Computer Networks: A Systems Approach,* Fourth Edition, Morgan Kaufmann, 2007.
3. Richard Stevens, Bill Fenner and Andrew M. Rudoff, *UNIX Network Programming, Volume 1: The Sockets Networking API*, Third Edition, Addison Wesley, 2004.
4. Andrew S.Tanenbaum, *Computer Networks*, Fourth Edition, Prentice Hall of India, 2002.

CA303 DESIGN AND ANALYSIS OF ALGORITHMS 3-1-0-4

Introduction: Upper bound in Graph– Asymptotic Notations- Monotonicity vs. Nonmonotonicity - Examples. Recurrence Relation: Recursion Tree Methods- Master Method. Sorting: Bubble – Insertion Sort- Selection Sort. Divide and Conquer: Quick Sort- Merge Sort- Bucket Sort-Lower Bounds- Heap Sort – Comparisons of Sorting. Greedy Algorithm: Fractional Knap-sack Problem- Task Scheduling Problem. Dynamic Programming: Matrix Multiplication Problem- 0/1 Knap-sack Problem. String Matching: FSA- KMP- Boyer- Moore Algorithm. Graph Algorithms: Graph Traversals (DFS, BFS with Analysis) - Shortest Path Algorithms (with Analysis) – Dijkstra - Bellman Ford- Floyd Warshall all Pair Shorest Path Algorithm- Minimum spanning Tree (with Analysis) – Kruskal– Prims. NP Problems: Definition: P-NP-NP Complete-NP Hard. Examples:P-NP.

TEXTBOOKS/REFERENCES:

1. Baase.S and Gelder A.V., *Computer Algorithms- Introduction to Design and Analysis*, Third Edition, Pearson Education Asia, 2003.
2. Ellis Horowitz ,Sartaj Sahni.S and Rajasekaran.S, *Fundamentals of Computer Algorithms*, Silicon Press, 2008.
3. Goodrich M.T and Tamassia.R, *Algorithm Design Foundations, Analysis, and Internet Examples*, Fourth Edition, John Wiley and Sons, 2002.
4. Cormen T.H , Leiserson C.E, Rivest R.L and Stein C, *Introduction to Algorithms*, Third Edition, Prentice Hall of India, 2009.

5. Dasgupta.S, Papadimitriou.C. and Vazirani.U, *Algorithms*, Eighth edition, Tata McGraw-Hill, 2009.

CA305 INTERNET PROGRAMMING 3-0-1-4

Introduction to Internet: Internet Architecture- Application Servers - Internet Services - Service Providers - Database Server – Gateway – Functioning of Search Engines – Browsers - Tools for Website Design - Creation and Design of Static and Dynamic Web Pages - Web Design Characteristics. Client Side Technologies: Client Side Technology for a Web Project - Integrating JavaScript with Various Elements of HTML. XML: DTD – XSD - XML Elements – Attributes- Entities - XSL - Namespaces – XSLT – XQUERY – XPATH - Comparison with HTML - Integrating XML with Other Applications - JDBC – RMI. Server Side Technologies: Configuring Servers. J2EE Architecture and Application Development: Servlets - Java Server Pages - JavaBeans. J2ME Architecture and Application Development: MIDP - Creating User Interface - Managing Data - Accessing Network and Services.

TEXTBOOKS / REFERENCES:

1. Deitel and Deitel, *Internet and WWW — How to Program?*, Fifth Edition, Prentice Hall, 2012.
2. Naughton P. and Schildt H, *Java2 Complete Reference*, Fifth Edition, Tata McGraw Hill, 2007.
3. Chris Bates, *Web Programming – Building Internet Application*, Second Edition, Wiley-Dreamtech India Pvt. Ltd, 2006.
4. Ed Roman, *Mastering Enterprise Java Beans,* Third Edition, Wiley- Dreamtech India Pvt Ltd., 2005.
5. John W Muchow, *Core J2ME Technology*, The Sun Micro Systems Press, 2001.

CA307 SOFTWARE ENGINEERING 3-0-1-4

Software Engineering Concepts: A Generic View of Process – Process Models – Perspective Models– Waterfall Model– Incremental Models– Evolutionary Models– Specialized Models-Unified Process Models. Requirements Engineering: Tasks– Initiation– Elicitation– Developing Use Cases – Building the Analysis Model – Negotiation – Validation – Building the Analysis Model. Requirement Analysis: Approaches– Data Modeling Concepts– OO Analysis- Scenario Based Modeling- Flow Oriented Modeling – Class Based Modeling – Behavioral Modeling. Design Engineering: Design Process and Quality – Design Concept – Model – Creating an Architectural Design – Software Architecture – Data Design – Architectural Styles and Patterns-Architectural Design - Mapping Data Flow into Software Architecture – Modeling Component Level Design – Component – Class Based Components – Conducting Component Level Design-Designing Conventional Components – Performing User Interface Design – Golden Rules–User Interface Analysis and Design– Interface Analysis– Interface Design Steps. Testing strategies: Testing Tactics – Testing Fundamentals - Black-Box and White-Box Testing – Product Metrics– Web Engineering – Attribute – Layers – Processes and Best Practices – Initiating – Analysis – Design and Testing of Web App Projects.

TEXTBOOKS/ REFERENCES:

1. Roger S. Pressman, *Software Engineering-A Practitioner's Approach*, Seventh Edition, Tata McGraw-Hill, 2010.
2. Sommerville Ian, *Software Engineering*, Sixth Edition, Addison Wesley, 2007.

MA381 OPERATIONS RESEARCH 3-1-0-4

Linear Programming: Introduction - Mathematical Formulations - Solutions - Graphical Method- Simplex Method - Artificial Variables- Big M - Two Phase Methods - Variants in Simplex Method - Duality Theory and Problems- Dual Simplex Method. Transportation and its Variants: Definition - Transportation Algorithms and Solutions - Assignment Model - Hungarian Method- Traveling Salesman Problem - Transshipment Model. Simulation: Definition - Types of Simulations - Monte Carlo Simulation. Queuing Theory: Characteristic of Queuing System - Steady State M/M/I Model Finite and Infinite Population and M/M/C Infinite Population Model. Game Theory: Competitive Games - Rectangular Game - Saddle point - Minimax (Maximin) Method of Optimal Strategies - Value of the Game. Solution of Games with Saddle Points - Dominance Principle. Rectangular Games without Saddle Point – Mixed Strategy for 2 X 2 Games. PERT and CPM: Network Representation - Critical Path Method. PERT-time Estimates- Various Types of Floats- Critical Path Computation. Inventory Theory: Cost Involved in Inventory Problems - Single Item Deterministic Models - Economic Size Model with and without Shortages having Production Rate Infinite and Finite.

TEXTBOOKS / REFERENCES:

1. Hamdy A. Taha, *Operations Research – An Introduction*, Seventh Edition, Macmillan Publishing Company, 2004.
2. Kantiswarup, P. K. Gupta and Manmohan, *Operations Research*, Seventh Edition Sultan Chand, 1991.
3. F. Hiller and G. J. Lieberman, *Introduction to Operations Research*, Eighth Edition, Tata McGraw-Hill, 2006.
4. S. D. Sharma, *Operations Research*, Eighth Edition, KedarNath, Ram Nath and Company, 1997.

MA383 DISCRETE STRUCTURES AND PROBABILITY THEORY 3-1-0-4

Relations: Relations and Their Properties - Representing Relations - Closure of Relations - Equivalence Relations. Graph Theory: Graph Terminologies - Representation of Graphs and Graph Isomorphism - Graph Connectivity - Planar Graphs and Graph Coloring. Modeling Computation: Languages and Grammars. Finite State Machines with output and with no output - Language Recognition - Turing Machine. Probability Theory: Experiments, Outcomes, Probability, Conditional Probability and Bayes' Theorem. Random Variables and Probability Distributions: Mean and Variance of a Distribution – Binomial - Poisson and Normal Distributions. Statistics: Correlation and Regression - Testing of Hypothesis - Testing of

Population Mean (Normal and t distributions)-Chi-square Test for Goodness of Fit and Independence.

TEXT BOOKS / REFERENCES:

1. Rosen K. H., *Discrete Mathematics and its Applications*, Sixth Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Grimaldi R. P., *Discrete and Combinatorial Mathematics*, Fourth Edition, Pearson Education Asia, New Delhi, 2008.
3. Ravichandran. J, *Probability and Statistics for Engineers*, First Edition, Wiley India, 2012.
4. Douglas C. Montgomery and George C. Runger, *Applied Statistics and Probability for Engineers*, Third Edition, John Wiley and Sons Inc., 2003.
5. Ronald E. Walpole, *Probability and Statistics for Engineers and Scientists*, Seventh Edition, Pearson Education, Asia, 2002.

CA309 WEB SCRIPTING 0-0-1-1

Web Scripting Essentials: Scripting vs. Programming Languages – Anatomy of the Web Applications – Markup Languages – HTML –Adding Style Elements to Web Pages(CSS) - Document Object Model – Client Side HTML Form Processing – Dynamic Web Server Applications – Client Side vs. Server Side Scripting – Java Script – PHP – AJAX Controls for PHP. Basic Web Security: Sessions and Cookies. Multimedia and Game Scripting: Action Script and Flash – General Design Guidelines on Developing Web Applications. Case Study: VB Script – Ruby – Perl.

TEXT BOOKS / REFERENCES:

1. Craig Riecke, Rawld Gill and Alex Russell*, Java Script and Ajax Tools for Great Web Experience,* Pragmatic Bookshelf, 2008.
2. Gregory T. Brown, *Ruby Best Practices,* First Edition, O'Reilly Media, 2009.
3. Ed Wilson, *Microsoft VBScript: Step by Step,* Microsoft Press, 2006.
4. Hugh E. Williams and David Lane, *Web Database Applications with PHP & MySQL,* Second Edition, O'Reilly Media, 2004.
5. Adobe Creative Team, *Action Script 3.0 for Adobe Flash Professional CS5 Classroom in a Book,* First Edition, Adobe Press, 2010.

CA311 COMPUTER PROGRAMMING 2-0-1-3

Structured Programming: Language Basics – I/O Statements - Control Structures- Array - Functions- Recursion- Storage Classes. Pointers: Dynamic Memory Allocation- Structures- Union. File Access: File Operations for Binary and Text files- Command Line Arguments- Preprocessor- Macros- Graphics Library. Object Oriented Programming: Objects – Classes – Constructors and Destructor- Function Overloading –Friend Functions and Friend Classes - Operator Overloading – Inheritance – Virtual functions – I/O streams – Templates and Exception Handling.

TEXT BOOKS / REFERENCES:

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1. Paul J.Deitel and Harvey M. Deitel, *C: How to Program*, Sixth Edition, Prentice Hall, 2010.
2. Kernighan Brian W. and Ritchie Dennis M., *C Programming Language: [ANSI C],* Second Edition, PHI, 2012.
3. Stanley B. Lippman, *The C++ Primer* , 5th Edition, Pearson Education, 2012.
4. Deitel H.M and Deitel P.J , *C++ How to Program*, Ninth Edition, Prentice Hall, 2013.

CA302 .NET TECHNOLOGIES 3-0-1-4

.NET Components: .NET Frame Work Overview - Class Libraries - Common Language Runtime – Assemblies - Metadata and MSIL.Working with C#: Built-in Variables – Operators - Control Structures and Parameter Passing - User-Defined Value Types – Classes - Interfaces – Encapsulation – Inheritance - Conversion Operators - Built-in-Functions (Numeric and String handling) – Polymorphism-.NET Existing Classes – User-Defined Classes – Interfaces - Namespaces - Exception Handling(class level - database level) - Event Driven Programming. VB.NET: Control Classes – Creating Applications for Database Handling. Application Development using ASP.NET:ASP.NET framework - Control Classes in ASP.NET - Web Controls - Data Binding using ASP.NET -Data Access with ASP.NET - Reporting Services (Crystal Reports).

TEXT BOOKS / REFERENCES:

1. Christian Nagel , Bill Evjen, Jay Glynn, Karli Watson and Morgan Skinner, *Professional C# 2008*, First Edition, Wiley India , 2008.
2. Kogent Learning Solutions Inc, *ASP.NET Black Book*, Wiley India, 2008.
3. Herbert Scildz , *C# Complete Reference*, First Edition, Tata McGraw-Hill, 2010.
4. Sanjeev Rohilla, Surbhi Malhotra and Senthil Nathan, *Microsoft ADO .NET Professional Projects*, Premier Press, 2002.

CA304 SERVICE ORIENTED ARCHITECTURE 3-0-1-4

SOA Fundamentals: Defining SOA - Business Value of SOA – Architecture- Infrastructure Services Web Services Technologies: Web Services & SOA - WSDL, SOAP – UDDI - WS-Transaction, WS- Security - WS- Reliable Messaging. WS- Policy - WS- Attachments. BPEL for Web Services SOA Planning and Analysis: Lifecycle - Capturing Business IT Issues - Determining Non-Functional Requirements - Enterprise Solution Assets - Tools Available for Appropriate Designing - Implementing SOA. SOA Platform Basics: SOA Support in J2EE, JAX-WS, JAXB, JAXR, JAX-RPC, WSIT, SOA support in .NET, ASP.NET web services - Introduction to Cloud Computing**:** Cloud Computing (NIST Model) Properties - Service Models (XaaS). The Google File System - Virtualization Techniques in Cloud - Parallelization in Cloud - Privacy in Cloud - Data Processing in Large Clusters. Google's MapReduce Programming Model.

TEXT BOOKS / REFERENCES:

1. Thomas Erl, *Service Oriented Architecture, Concepts, Technology and Design*, Prentice Hall of India, 2005.
2. Norbert Bieberstein, Sanjay Bose, Marc Fiammente, Keith Jones and Rawn Shah, *Service Oriented Architecture Compass: Business Value, Planning and Enterprise Roadmap*, Second Edition, IBM Press, 2005.
3. Sandy carter, *The New Language of Business: SOA and Web 2.0*, IBM press, 2007.
4. Thomas Erl, *Service Oriented Architecture: A Field Guide to Integrating XML and Web Services*, First Edition, Prentice Hall, 2004.
5. Toby Velte, Anthony Velte and Robert Elsen Peter ,*Cloud Computing A Practical Approach*, First Edition, Tata McGraw-Hill,2009.

CA306 DATA MINING AND BUSINESS INTELLIGENCE 3-0-1-4

Introduction: Evolution and Importance of Data Mining-Types of Data and Patterns Mined-Technologies-Applications-Major Issues in Data Mining. Knowing about Data-Data Preprocessing: Cleaning– Integration–Reduction–Data Transformation and Discretization. Data Warehousing: Basic Concepts-Data Warehouse Modeling- OLAP and OLTP Systems -Data Cube and OLAP Operations–Data Warehouse Design and Usage-Business Analysis Framework for Data Warehouse Design- OLAP to Multidimensional Data Mining. Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods - Mining Association Rules – Association to Correlation Analysis- Classification and Predication: Issues - Decision Tree Induction - Bayesian Classification – Rule Based Classification – k-Nearest mining Classification. Prediction –Accuracy and Error measures- Clustering: Overview of Clustering – Types of Data in Cluster Analysis – Major Clustering Methods. Introduction to BI -BI Definitions and Concepts- BI Frame Work-Basics of Data Integration- Introduction to Business Metrics and KPI - Concept of Dash Board and Balance Score Card**.** Tool for BI: Microsoft SQL Server: Introduction to Data Analysis using SSAS Tools- Introduction to Data Analysis using SSIS Tools- Introduction to Reporting Services using SSRS tools- Data Mining Implementation Methods.

TEXT BOOKS / REFERENCES:

1. Jiawei Han, Micheline Kamber and Jian Pei, *Data Mining Concepts and Techniques*, Third Edition, Elsevier Publisher, 2006.
2. K.P.Soman, Shyam Diwakar and V.Ajay, *Insight into Data Mining Theory and Practice*, Prentice Hall of India, 2006.
3. William H Inmon , *Building the Data Warehouse* , Wiley, Fourth Edition 2005.
4. R N Prasad and Seema Acharya , *Fundamentals of Business Analytics*, Wiley India, 2011.
5. Loshin D, *Business Intelligence*, First Edition, Elsevier Science, 2003.
6. Darren Herbold, Sivakumar Harinath, Matt Carroll, Sethu Meenakshisundaram, Robert Zare and Denny Guang-Yeu Lee, *Professional Microsoft SQL Server Analysis Services 2008 with MDX*, Wrox, 2008**.**

EN600 TECHNICAL WRITING P/F

Technical terms – Definitions - extended definitions - grammar checks - error detection – punctuation - spelling and number rules - tone and style - pre-writing techniques - Online and offline library resources- citing references – plagiarism - Graphical representation - documentation styles- instruction manuals- information brochures - research papers, proposals – reports (dissertation, project reports etc.) - Oral presentations.

TEXTBOOKS/REFERENCES

1. Hirish and Herbert L, *Essential Communication Strategies for Scientists, Engineers and Technology Professionals,* Second Edition, New York: IEEE press, 2002.
2. Anderson and Paul V, *Technical Communication: A Reader-Centred Approach*., Sixth Edition, Cengage Learning India Pvt. Ltd., New Delhi, Reprint 2010.
3. Strunk, William Jr. and White E B, *The Elements of Style*, New York, Alliyan & Bacon, 1999.

CA308 PROGRAMMING PRACTICES IN OPERATING SYSTEMS AND DATABASES 0-0-1-1

Basic UNIX Commands and File Systems- Shell Programming - Process Creation and Execution - Thread – IPC - Pipes, Signals and Semaphores - Scheduling Algorithms -Critical Section Problem - CPU Scheduling- Deadlock - Page Replacement and Memory Allocation. Working with Objects using SQL : DDL; DML; TCL –Constraints: Simple Selection, Projection and Selection with Conditions - Functions; Aggregate Functions, Group by, Order by, Date and Conversion. Functions -Set Operators. Joins and Subquery: Simple, Nested, Correlated, Existence Test, Membership Test. PL/SQL Programs: Cursors, Functions, Procedures, Packages, Triggers, Exception handling.

TEXT BOOKS / REFERENCES:

1. Brian, *Beej's Guide to Unix IPC*, version 1.1.2., Beej Jorgenson Hall, 2010.
2. Linux Shell Scripting Tutorial v.1.05r3, *A beginner's handbook*, vivek-tech.com, 2002.
3. Silberschatz and Calvin, *Operating Systems Concepts*, Eighth Edition, John Wiley and Sons, 2009.
4. Date C.J., *An Introduction to Database systems*, Eighth Edition, AddisonWesley, 2003.

CA401 DESIGN PATTERNS 3-1-0-4

Introduction to Design Patterns **-** Observer Pattern - Decorator Pattern - Factory Pattern- Singleton Pattern - Command Pattern- Adapter and Facade Patterns - Template Method Pattern - Iterator and Composite Patterns - The State Pattern- The Proxy Pattern - Compound Patterns – MVC-Overview of other patterns – GRASP and Anti-Patterns: Case study: Use of patterns in the Design of a Modern Web Framework.

TEXT BOOKS / REFERENCES:

1. Erich Freeman, Elisabeth Robson, Bert Bates and Kathy Sierra, *Head First Design Patterns*,

O'Reilly Media Inc., October 2004.
2. Erich Gamma, Richard Helm, Ralph Johnson and John M. Vlissides, *Design Patterns: Elements of Reusable Object Oriented Software*, Second Edition, Addison Wesley, 2000.
3. James W. Cooper, *Java Design Patterns: A Tutorial*, Second Edition, Pearson Education, 2003.
4. Mark Grand, *Patterns in Java – A Catalog of Reusable Patterns Illustrated with UML,* Wiley – Dream tech India, 2002.

CA403 SYSTEM SECURITY 3-1-0-4

Program Security: Secure Program -Non Malicious Program Errors -Malicious Code -Program Controls. Operating System Security: Memory Protection -Access Control -File Protection Mechanisms -User Authentication -Trusted Operating System- Database Security: Security Requirements -Reliability and Integrity-Sensitive Data –Inference -Multilevel Security- Network Security: Threats in Networks -Security Controls – Firewalls-Intrusion Detection Systems-Administering Security: Security Planning -Risk Analysis-Organizational Security Policies-Physical Security -Ethical Issues: Protecting Programs and Data -Information and the Law -Rights of Employers and Employees -Redress for Software Failures -Computer Crime -Ethical Issues. Case Study: Privacy Rights, Fraud, Accuracy of Information, Denial Of Service.

TEXTBOOKS / REFERENCES:

1. Charles P. Pfleeger and Shari Lawrence Pfleeger, *Security in Computing*, Fourth Edition, Prentice Hall, 2007.
2. Ross J. Anderson and Ross Anderson, *Security Engineering: A Guide to Building Dependable Distributed Systems*, Wiley India Pvt Ltd, 2001.
3. C.K Shyamala, N. Harini and T.R.Padmanabhan, *Cryptography and Security*, First Edition, Wiley India Pvt Ltd, 2011.
4. Matthew Bishop, *Computer Security: Art and Science*, Addison-Wesley, 2003.
5. William Stallings, *Cryptography and Network Security: Principles and Practice*, Fifth Edition, Pearson Education, 2011.

CA312 ADVANCED DATABASE MANAGEMENT SYSTEMS 3-0-0-3

Database Design Theory and Normalization: Overview - Relational Database Design Algorithms and Further Dependencies - File Structures. Indexing and Hashing**:** Disk Storage - Basic File Structures - and Hashing - Indexing Structures for Files. Query Processing and Optimization: Database Tuning - Algorithms for Query Processing and Optimization - Physical Database Design and Tuning - Concurrency Control Techniques - Database Recovery Techniques. Additional Database Topics: Introduction to Database Security.

TEXTBOOKS/ REFERENCES:

1. Ramez Elmasri and Shamkant Navathe, *Fundamentals of Database Systems*, Sixth Edition, Addison Wesley, 2010
2. Silberschatz, Korth and Sudarshan, *Database Concepts*, Sixth Edition, Tata McGraw-Hill,

2010.
3. Hector Garcia-Molina, Jeffrey Ullman and Jennifer Widom, *Database Systems: The Complete Book*, Second Edition, Prentice Hall, 2008.

CA314 INFORMATION SECURITY 3-0-0-3

Introduction to Computer Security: Basic Concepts - Threat Models- Common Security Goals. Cryptography and Cryptographic Protocols including Encryption, Authentication, Message Authentication Codes, Hash Functions, One-way Functions, Public-key Cryptography, Secure Channels, Zero Knowledge in Practice, Cryptographic Protocols and their Integration into Distributed Systems and other Applications - Authentication: Overview – Requirements - Functions-Protocols –Applications –Kerberos – X.509 Directory Services. Electronic Mail Security: Email Architecture – Security –Pretty Good Policy Variations – Operational Descriptions – PGP Session Keys Key Rings – Key management – Message Exchange formats – Trust Model - IP Security: Introduction to IP - IP security Overview- Pros and Cons – IP Sec Applications – IP Security Architecture – IPSec Services - Authentication Header -Encapsulating Security Payload – IPSec Modes - Combining Security Associations - Key Management. Web Security: Web Security Requirements- Secure Sockets Layer Objectives – Versions – Certificates – Protocols – Transport Level Security - Secure Electronic Transaction Entities – Certificates – DS Verification.

TEXTBOOKS/ REFERENCES:

1. C K Shyamala, N Harini and T R Padmanabhan, *Cryptography and Security*, First Edition, Wiley India Pvt. Ltd, 2011.
2. Stallings W, *Cryptography and Network Security*, Third Edition, Pearson Education Asia. Prentice Hall, 2000.
3. Forouzan B A, *Cryptography and Network Security*, Special Indian Edition, Tata McGraw Hill, 2007.

CA316 STRUCTURE AND INTERPRETATION OF COMPUTER PROGRAMS 3-0-0-3

Introduction to the Elements of Programming Languages: Different Types of Programming Languages - Modeling Programming Languages, Computability versus Complexity, Computer Science for Computation. Introduction to LISP and Scheme - Building Abstractions with Procedures - The Elements of Programming Procedures and the Process they Generate – Formulating Abstractions with Higher-Order Procedures. Building Abstractions with Data: Introduction to Data Abstraction- Hierarchical Data and the Closure Property – Symbolic Data – Multiple Representations for Abstract Data – Systems with Generic Operations. Modularity, Objects, and State: Assignment and Local state – The Environment Model of Evaluation – Modeling with Mutable Data – Concurrency- Streams. Metalinguistic Abstraction: The Metacircular Evaluator – Lazy Evaluation - Variation on a Scheme- Nondeterministic Computing – Logic Programming – Introduction to PROLOG.

TEXTBOOKS/ REFERENCES:

1. Abelson H and Sussman G J, *Structure and Interpretation of Computer Programs*, Second Edition, MIT Press, 2005.

2. Sebesta R W, *Concepts of Programming Languages*, Ninth Edition, Addison Wesley, 2009.
3. Pierce B C, *Types and Programming Languages*, MIT Press, 2002.
4. Sethi R, *Programming Languages Concepts and Constructs*, Second Edition, Addison Wesley, 1996.
5. T W Pratt and Marvin V Z, *Programming Languages: Design and Implementation*, Third Edition, Prentice Hall, 1995.

CA318 SOFTWARE QUALITY ASSURANCE 3-0-0-3

Introduction: The Software Quality Challenge - Software Quality Factors-The Components of Software Quality System-Integrating Quality Activities in the Project Life Cycle. Software Testing: Strategies and Implementation-Building the Software Testing Process-Software Quality Management Components: Metrics and Costs-Software Quality in the Business Context- Product Quality and Process Quality - ISO 9001: The Origins of ISO 9001- need for ISO 9001-Assessment and Audit Preparation-The Assessment Process - Software CMM and other Process Improvement Models-Software Configuration Management-Introduction to Six Sigma - Case Studies: Indian Software Industry in Perspective.

TEXT BOOKS/ REFERENCES:

1. Daniel Galin, *Software Quality Assurance: From Theory to Implementation,* Pearson Education, 2008
2. Nina Godbole, *Software Quality Assurance, Principles and Practice*, Narosa Publications, 2011.
3. William Perry, *Effective Methods of Software Testing*, Third Edition, Wiley, 2006.

CA322 COMPUTATIONAL INTELLIGENCE 3-0-0-3

Artificial Intelligence – a Brief Review – Pitfalls of Traditional AI – Need for Computational Intelligence – Importance of Tolerance of Imprecision and Uncertainty - Constituent Techniques – Overview of Artificial Neural Networks - Fuzzy Logic - Evolutionary Computation. Neural Network: Biological and Artificial Neuron, Neural Networks, Supervised and Unsupervised Learning. Single Layer Perceptron - Multilayer Perceptron – Backpropagation Learning. - Neural Networks as Associative Memories - Hopfield Networks, Bidirectional Associative Memory. Topologically Organized Neural Networks – Competitive Learning, Kohonen Maps. Fuzzy Logic: Fuzzy Sets – Properties – Membership Functions - Fuzzy Operations. Fuzzy Logic and Fuzzy Inference - Applications. Evolutionary Computation - Constituent Algorithms. Swarm Intelligence Algorithms - Overview of other Bio-inspired Algorithms - Hybrid Approaches (Neural Networks, Fuzzy Logic, Genetic Algorithms etc.).

TEXT BOOKS/ REFERENCES:

1. Kumar S, *Neural Networks - A Classroom Approach*, Tata McGraw Hill, 2004.
2. Ross T J, *Fuzzy Logic with Engineering Applications*, McGraw Hill, 1997.
3. Eiben A E and Smith J E, *Introduction to Evolutionary Computing*, Second Edition, Springer, Natural Computing Series, 2007.

4. Engelbrecht, A.P, *Fundamentals of Computational Swarm Intelligence*, John Wiley & Sons, 2006.
5. Konar. A, *Computational Intelligence: Principles, Techniques and Applications*, Springer Verlag, 2005.

CA324 BIOINFORMATICS 3-0-0-3

Introduction to Bioinformatics**:** Definition - Importance and Uses of Bioinformatics- Information Technology - Systems Biology. Introduction to Nucleic Acids**:** DNA and RNA as Genetic Materials - Structure of Nucleic Acids - Nucleosides and Nucleotides - DNA Double Helix. Central Dogma of Molecular Biology - Nature of Genetic Code - Deciphering Genetic Code - Wobble Hypothesis - Universalities and Exceptions. Applications of Data Mining to Bioinformatics Problems - Biological Data – Databases - Protein Sequencing - Nucleic Acid Sequencing - Sequence to Structure Relationship. Bioinformatics Software**:** Clustal V - Clustal W 1.7 - RasMol – Oligo – Molscript – Treeview – Alscript - Genetic Analysis Software- Phylip. Biocomputing**:** Introduction to String Matching Algorithms - Database Search Techniques - Sequence Comparison and Alignment Techniques - Use of Biochemical Scoring Matrices - Introduction to Graph Matching Algorithms - Automated Genome Comparison and its Implication - Automated Gene Prediction - Automated Identification of Bacterial Operons and Pathways - Introduction to Signaling Pathways and Pathway Regulation. Gene Arrays - Analysis of Gene Arrays - Machine Learning Methods in Bioinformatics - Hidden Markov models - Applications of HMM in gene identification and Profiles HMMs - Neural Networks and Support Vector machines.

TEXT BOOKS/REFERENCES:

1. Claverie J.M and Notredame C, *Bioinformatics for Dummies*, Second Edition,Wiley, 2003.
2. Pierre Baldi and Soren Brunak, *Bioinformatics - The Machine Learning Approach*, Second Edition,A Bradford Book, 2001.
3. RastogiS.C, Mendiratt N. and Rastogi P *Bioinformatics: Concepts, Skills & Applications*, CBS Publishers & Distributors, 2004.
4. Fogel G.B. and Corne D.W, *Evolutionary Computation in Bioinformatics*, Morgan Kaufmann, 2003.

CA326 ADVANCED COMPUTER NETWORKS 3-0-0-3

Information Network and Technology: Service Architecture - Protocol Stack Architecture - IP Protocol Stack Architecture - Router Architecture - Network Topology Architecture - Network Management Architecture - Public Switched Telephone Network - IP Addressing - Classful Addressing Scheme - Subnetting/Netmask - Classless Interdomain Routing – FDDI- Ethernet: switched, and duplex LAN, Gigabit LAN, VLAN. Broad Band Network and Technology: ATM, MPLS, SONET /SDH – Architecture and Protocol Stack. Network Routing in IP Networks: Overview, Algorithms: Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra's Algorithm, Widest Path Algorithm, Protocols: Distance Vector Routing Protocol, Link State Routing Protocol, IP Routing and Distance Vector Protocol Family: Static Routes, Routing Information Protocol (RIPv1 & RIPv2), Interior Gateway Routing Protocol, Enhanced Interior

Gateway Routing Protocol, OSPF and Integrated IS-IS. Traffic Control**:** Packet Scheduling, TCP Congestion Control, Implicit Feedback Schemes, RED, Weighted RED, Adaptive RED, Explicit Feedback Scheme- Service Level Agreements, Integrated Services and Differentiated Services, Traffic Shaping - Leaky Bucket, Token Bucket, Traffic Policing, Packet Marking.

TEXTBOOKS / REFERENCES:

1. Deep Medhi and Karthik Ramasamy, *Network Routing – Algorithms, Protocols, and Architectures*, First Edition, Morgan Kaufmann Publisher, 2013.
2. James F. Kurose and Keith W. Ross, *Computer Networking: A Top-Down Approach*, Sixth Edition, Addison-Wesley, 2012.
3. Peterson & Davie, *Computer Networks: A Systems Approach*, Fifth Edition, Morgan Kaufmann Publisher, 2011.

CA328 INFORMATION RETRIEVAL 3-0-0-3

Boolean Expression Based Retrieval: Vocabulary and Postings – Lists – Dictionaries and Tolerant Retrieval – Index Construction and Compression - Scoring and Vector Space Model – Score Computation – Evaluating Information Retrieval Systems – Relevance Feedback and Query Expansion – XML Based Retrieval– Probabilistic Models – Language Models – Text Classification – Vector Space Classification – SVM Based Document Classification – Latent Semantic Indexing – Web Search – Web Crawlers – Link Analysis – Unstructured Data Retrieval – Semantic Web – Ontology - Implementations using Natural Language Toolkit.

TEXT BOOKS / REFERENCES:

1. C. Manning, P. Raghavan and H. Schütze, *Introduction to Information Retrieval*, Cambridge University Press, 2008.
2. R. Baeza-Yates and B. Ribeiro Neto, *Modern Information Retrieval: The Concepts and Technology Behind Search*, Second Edition, Addison Wesley, 2011.
3. David A. Grossman and Ophir Frieder, *Information Retrieval: Algorithms and Heuristics*, Second Edition, Springer 2004.

CA332 NETWORK MANAGEMENT AND SYSTEM ADMINISTRATION 3-0-0-3

Basic Hardware**:** Network Fundamentals: Local Area Networking - Defining Networks with the OSI Model - Wired and Wireless Networks - Internet Protocol - Implementing TCP/IP in the Command Line- Working with Networking Services - Understanding Wide Area Networks - Defining Network Infrastructures and Network Security. Security Fundamentals**:** Security Layers – Authentication – Authorization - Accounting - Security Policies - Network Security - Server and Client Protection. Windows Server Fundamentals**:** Server Overview - Managing Windows Server 2008 R2 - Managing Storage - Monitoring and Troubleshooting Servers - Essential Services - File and Print Services - Popular Windows Network Services and Applications. Linux Fundamentals**:** System Architecture-Determine and Configure Hardware Settings- Boot the System - Change Run Levels and Shut Down or Reboot System **-**Linux Installation and Package Management - File Systems**-** Create Partitions and File systems - Maintain the Integrity of File

Systems - Control Mounting and Unmounting of File Systems - Manage Disk Quotas - File Permissions and Ownership - Create and Change Hard and Symbolic Links. Network Management Lab: Windows Network Configurations and Linux Network Configurations.

TEXT BOOKS / REFERENCES:

1. 98-366*: Networking Fundamentals, Microsoft Official Academic Course* (Microsoft Corporation), Wiley, 2011.
2. 98-367: *MTA Security Fundamentals, Microsoft Official Academic Course* (Microsoft Corporation), Wiley, 2011.
3. 98-365: *Windows Server Administration Fundamentals, Microsoft Official Academic Course* (Microsoft Corporation), Wiley, 2011.
4. Adam Header, Stephen Addison Schneiter, James Stanger and Bruno Gomes Pessanha, *Linux Certification in Nutshell*, Third Edition, O'Reilly, 2010.

CA334 INTELLIGENT SYSTEMS 3-0-0-3

Introduction to Agents **:** Structure of Intelligent Agents – Problem Solving Agents- Formulating Problems – Overview of Uninformed Searching Strategies – Informed Search Methods . Game Playing as Search. Knowledge Based Agents Representation - Logics- First Order Logic - Reflex Agents - Building a Knowledge Base - General Ontology -Inference - Logical Recovery. Planning Agents – Planning in Situational Calculus - Representation of Planning - Partial Order Planning- Practical Planners – Conditional Planning. Agents Acting Under Uncertainty – Probability Notation – Bayes' Rule. Probabilistic Reasoning - Belief Networks - Utility Theory - Decision Network- Value of Information- Learning Agents – Learning from Observations – Knowledge in Learning -Case Studies on Applications of AI.

TEXT BOOKS / REFERENCES:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence – A Modern Approach*, Third Edition, Prentice Hall, 2009.
2. Elaine Riche, Kevin Knight and Shivashankar B. Nair, *Artificial Intelligence*, Third Edition, TMH Educations Pvt. Ltd., 2008.
3. Nils J. Nilsson, *The Quest for Artificial Intelligence*, Second Edition, Cambridge University Press, 2009.

CA336 OPEN SOURCE SYSTEMS 3-0-0-3

Overview of Free/Open Source Software**:** Definition - Examples of OSD - Compliant Licenses - Example Product - Development Process – History – BSD - The Free Software Foundation – Linux - Apache – Mozilla. Open Source Software Qualification**:** Specific Characteristics of Open Source Software Transformation -Development Process - Taboos and Norms in OSS Development - Life Cycle. Deriving a Framework for Analyzing OSS **:**Zachman's Framework for IS Architecture - CATWOE and Soft System Method. Deriving the Analytical Framework for OSS Environment. World View**:** Classifying OSS Motivations - Technological Micro-level

Motivation - Economic Micro level and Macro-level Motivation - Socio-Political Micro-level and Macro-level Motivation. Open Source Server Applications: Infrastructure Services - Web Servers - Database Servers - Mail Servers - Systems Management. Open Source Desktop Applications**:** Graphical Desktops - Web Browsers - The Office Suite - Mail and Calendar Clients - Personal Software - Cost of OSS – Licensing. FOSS Programming: Python.

TEXT BOOKS / REFERENCES:

Joseph Feller, Brian Fitzgerald and Eric S. Raymond, *Understanding Open Source Software Development*, Addison Wesley Professional, 2000.

CA338 NATURAL LANGUAGE PROCESSING 3-0-0-3

Introduction: Mathematical Foundations- Elementary Probability Theory- Essential Information Theory. Linguistic Essentials: Part of Speech and Morphology- Phrase Structure. Corpus Based Work: Looking Up Text- Marked up Data. Statistical Inference: Bins-Forming Equivalence Classes- Statistical Estimators- Combining Estimators. Word Sense Disambiguation: Supervised and Dictionary Based Disambiguation. Markov Models: Hidden Markov Models- Implementation- Properties and Variants. Part of Speech Tagging: Hidden Markov Model Taggers- Transformation Based Learning Of Tags- Tagging Accuracy and Use of Taggers. Probabilistic Context Free Grammars and Probabilistic Parsing. Statistical Alignment and Machine Translation: Text Alignment – Word Alignment – Statistical Machine Translation- Implementation Using Natural Language Toolkit (NLTK) and Open Source Tools.

TEXTBOOKS/ REFERENCES:

1. Daniel and James H Martin, *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition*, Second Edition, Prentice Hall of India, 2008.
2. Christopher D. Manning and Hinrich Schutze, *Foundations of Statistical Natural Language Processing*, MIT Press, 1999.
3. James Allen, *Natural Language Processing with Python*, O'Reilly Media, July 2009.

CA411 EMBEDDED SYSTEMS 3-0-0-3

MicroProcessors: Introduction – Architecture of 8086 - Addressing Modes - Instruction Sets - Programmed I/O - Interrupts - DMA - System Timings. Introduction to Peripherals: Parallel Verses Serial Transmission - Synchronous and Asynchronous Serial Data Transmission - Interfacing to Hex Decimal Key Board - CRT Interface - Printer Interface - DMA Controller. Interface Standards: RS232 C - RS 422 - RS423 - Serial Interfaces - Current Loops – USB – Ethernet. Introduction to Microcontroller and Embedded Systems – CISC Vs RISC - Architecture of any 8 bit Microcontroller - I/O ports - Parallel Slave Port - Timer/ Counters. Software Tools for Embedded Systems - Emulators and Simulators - Types of Memory - Memory Testing - Flash Memory - Built-in on the Micro Processor - Control and Status Registers - Device Drivers and its Design.ARM Processor Architecture - Organization and Implementation - Instruction Set - The Thumb Instruction Set - Basic ARM Assembly Language Program - ARM CPU Cores. Real Time Operating System: Tasks and Task States – Mutexes and

Semaphores - Shared Data - Message Queues, Mail Boxes And Pipes - Memory Management - Interrupt Routines - Encapsulating Semaphore And Queues - Hard Real-time Scheduling - Power Saving. Case Studies.

TEXT BOOKS / REFERENCES:

1. Douglas. V. Hall, *Microprocessors and Interfacing*, Second Edition, Tata McGraw Hill,2006.
2. Han-Way Huang, *PIC Micro Controller an Introduction to Software and Hardware Interfacing*, Third Edition, Thomson Publishers, 2005.
3. Steave Furber, *ARM System on Chip Architecture*, Addison Wesley, 2000.
4. Arnold S. Berger, *Embedded System Design*, CMP Books, USA 2002.
5. Michael Barr, *Programming Embedded Systems with C and GNU*, O' Reilly, 2003.

CA413 DISTRIBUTED COMPUTING 3-0-0-3

Introduction to Distributed Systems – Primitives for Distributed Communication – Design Challenges – Distributed Systems like Models for Distributed Computations – Overview of Distributed Databases -Structure of Distributed Databases. Virtual Time in Distributed System: Logical Time - Scalar Time – Vector Time Lamport's Algorithm - Case Study -Logical Clocks in Riak - Global and Snapshot Recording Algorithms – Model - Snapshot Algorithms for FIFO Channels - Chandy–Lamport Algorithm - Snapshot Algorithms for Non FIFO Channels. Message Ordering And Group Communication - Message Ordering Paradigms – Asynchronous and Synchronous Execution - Causal Order – Total Order – Group Communication – Case Study (Horus , Totem) - Distributed Multicast Algorithms. Distributed Mutual Exclusion: Lamports Algorithm -Ricart– Agrawala Algorithm - Quorum-based Mutual Exclusion Algorithms. Deadlock Detection : Models of Deadlock – Classification of Deadlock Detection Algorithms - Mitchell and Merritt's algorithm for the Single Resource Model - Chandy–Misra–Haas Algorithm For The AND/OR Model. Consensus and Agreement Algorithms and Failure Detection - Agreement in Failure Free Systems and Systems with Failures - The Consensus Problem – Byzantine Fault Tolerance. Case Study : Condor. Distributed Database Design: Design Strategies - Design issues - Fragmentation and Allocation. Semantic Data Control: View Management - Distributed Query Processing: Overview of Query Processing – Transforming Global Queries to Fragment Queries - Query Decomposition - Localization of Distributed data. Distributed Transaction Processing and Concurrency Control – 2PC -3PC.

TEXTBOOKS/ REFERENCES:

1. Ajay D. Kshemkalyani and MukeshSinghal, *Distributed Computing: Principles, Algorithms, and Systems*, Cambridge University Press, 2011.
2. George Coulouris, Jean Dollimaore, Tim Kindberg and Gordon Blair, *Distributed Systems: Concepts & Design*, Fifth Edition, Addison Wesley, 2012.
3. Douglas Thain, Todd Tannenbaum and Miron Livny, *Distributed Computing in Practice: The Condor Experience*, Concurrency and Computation: Practice & Experience - Grid Performance, Volume 17, Issue 2- 4, 2005.

4. M.Tamer Ozsu and Partrick Valduriez, *Principles of Distributed Database Systems*, Third Edition, Springer, 2010.

CA415 MOBILE APPLICATION DEVELOPMENT 3-0-0-3

Introduction to Mobile Computing: Mobility and Portability - Mobile and Wireless Devices - Mobile Platforms - Mobile Apps Development. Overview and Evolution of Android: Features of Android - Android Architecture. Basic Building Blocks: Activities, Services, Broadcast Receivers and Content Providers. UI Components: Views and Notifications. Component for Communication: Intents & Intent Filters. Android Application Structure: Android Manifest.xml, Resources and R.Java, Assets, Values – Strings.xml, Layouts and Draw Able Resources - Activities and Activity Lifecycle. Basic UI Design: Form Widgets, Text Fields, Layouts, Relative Layout, Table Layout, Frame Layout, Linear Layout, Nested Layouts, Preferences from xml. Menu: Option Menu, Context Menu, Sub Menu, Menu via code, Time and Date, Images and Media, Composite, Alert Dialogs and Toast, Popup. SQLite Programming: SQLiteOpenHelper, SQLiteDatabase Cursor, Content Providers, Defining and Using Content Providers - Sharing Database among Different Applications Using Content Providers - Reading and Updating Contacts. Notifications: Broadcast Receivers, Services and notifications, Toast, Alarms. Threads: Threads Running on UI Thread (runOnUiThread), Worker Thread, Handlers & Runnable, AsynTask. Graphics and Animation – Custom Views, Canvas, Animation APIs, Multimedia – Audio/Video Playback and Record, Location Awareness, and Native Hardware Access (Sensors Such As Accelerometer and Gyroscope), Debugging and Monitoring (DDMS), Test Automation. Black Box Testing: Robotium and MonkeyTalk.

TEXTBOOKS / REFERENCES:

1. Barry Burd, *Android Application Development: All in one for Dummies*, First Edition, Wiley Publication, 2011.
2. Anubhav Pradhan and Anil V Deshpande, *Mobile Apps Development*, First Edition, Infosys, 2013.

CA417 WIRELESS COMMUNICATIONS AND NETWORKS 3-0-0-3

Introduction to Wireless Systems: Brief History of Wireless Communication. Transmission Fundamentals: Time Domain, Frequency Domain, Bandwidth vs. Data Rate - Channel Capacity - Transmission Media - Protocols and TCP/IP Suite: TCP/IP Protocol Architecture - OSI Model. Antennas and Wave Propagation: Antennas, Propagation Modes, Fading in the Mobile Environment - Free Space Propagation. Modulation Techniques: Signal Encoding, Digital Data - Analog Signal, Analog Data - Analog Signal, Analog Data - Digital Signal, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access (CDMA). Wireless Networking: Satellite Communications- Capacity Allocation – Frequency Division, Time Division, WiMax and IEEE 802.16 Broadband Wireless Access Standards. Wireless LAN Technology: Infrared, Spread Spectrum, Narrowband LANS- Wi-Fi and IEEE 802.11 Standard, Bluetooth and IEEE 802.15 Standard. Wireless Routing Protocols: Infrastructure, AdHoc Networks, ProActive vs. ReActive,Dynamic Source Routing(DSR),

AdHoc On Demand Distance Vector (AODV),Temporarily Ordered Routing Algorithm(TORA), Destination Sequenced Distance Vector(DSDV). Case Study using NS2 / NS3.

TEXTBOOKS / REFERENCES:

1. William Stallings, *Wireless Communication and Networks*, Third Edition, Pearson Education, 2002.
2. Jochen Schiller, *Mobile Communications*, Second Edition, Pearson Education, 2003.

CA419 COMPUTER GRAPHICS AND VISUALIZATION 3-0-0-3

Computer Graphics Fundamentals**:** Overview of CG - Video Displays -Color Models- Output Primitives. Introduction to OPENGL- Points, Lines – Specifying a 2D World Coordinate Reference Frame in OpenGL- OpenGL Point Functions, Line Functions Polygon Fill Area Functions, Vertex Arrays - Line Drawing Algorithms - Circle Generation Algorithm - Filled Area Primitives OpenGL fill Area Functions - Scan Line Polygon Filling Algorithms - Boundary Fill - Flood Fill Algorithms - Attributes of Output Primitives. Geometric Transformations**:** Basic 2Dtransformations-Other Transformations- Reflection and Shearing. OpenGL Geometric Transformation Functions. 3D Object Representation: Fractals - Geometrical Transformation for - 3D Objects - Viewing and Clipping 2D Viewing Functions Clipping Operations. Three Dimensional Viewing: Viewing Pipeline, Viewing Coordinates. Projections: Parallel Projections, Perspective Projections. OpenGL Two-Dimensional and Three-Dimensional Viewing Functions- OpenGL Animation. Visible Surface Detection and Illumination Models: Visible SurfaceDetection Methods – Illumination Methods and Surface Rendering – Polygon. Rendering Methods: Constant Intensity Shading, Gouraud Shading, Phong Shading. OpenGL Illumination and Surface Rendering Functions, GUI – OpenGL Interactive Input Device Functions. The User Dialog – Interactive Picture Construction Techniques – Color Models - Computer Animation.

TEXT BOOKS / REFERENCES:

1. Donald Hearn and Pauline Baker, *Computer Graphics with OpenGL*, Third Edition, Prentice Hall of India, 2009.
2. Roy A. Plastock and Gordon Kalley, *Schaum's Outline Series - Theory and Problems of Computer Graphics*, Second Edition, Tata McGraw-Hill, 2000.
3. Foley J.D, Van Dam A, Eiener S.K. and Hughes J.F., *Computer Graphics Principles and Practice*, Second Edition, Pearson Education, 1996.

CA421 COMPUTER LANGUAGE ENGINEERING 3-0-0-3

Introduction to Translators – Phases of Compiler and its Overview. Lexical Analysis: Regular Expressions, Finite Automata, Lexer Generator. Parser: Context Free Grammars, Predictive Parsing, LR Parsing, Hierarchy of Parsers, Error Recovery, Parser generator. Semantic Analysis: Symbol Table, Type Checking using Abstract Syntax Tree, Type Checking using Attributed

Grammars . Activation Records: Structure of Frames. Intermediate Representation: Conversion to IR Trees, Canonicalization of IR Trees and Three Address Code – Basic Block and Traces**.**

TEXTBOOKS / REFERENCES:

1. Appel A.W, *Modern Compiler Implementation in Java*, Cambridge University Press, 2002.
2. Aho, Sethi, and Ullman, *Compilers: Principles, Techniques and Tools*, Addison-Wesley, 1986.
3. Keith Cooper and Linda Torczon, *Engineering a Compiler*, Second Edition, Morgan Kaufmann, 2011.
4. Kenneth C. Louden, *Compiler Construction: Principles and Practice*, Course Technology Inc, 1997.

CA423 SEMANTIC WEB TECHNOLOGIES 3-0-0-3

Introduction to Semantic Web: Semantic Web Concepts- Need for the Semantic Web- Information Overload - Stovepipe Systems - Poor Content Aggregation - XML and the Semantic Web - Web Services and the Semantic Web -Current Applications of the Semantic Web - Business Case for the Semantic Web Decision Support - Business Development - Information Sharing and Knowledge. Understanding the Resource Description Framework: What Is RDF - Capturing Knowledge with RDF - Other RDF Features - RDF Schema – Non-Contextual Modeling. Web Ontology Language: Motivation and Overview - The OWL Language- Defining the Ontology Spectrum - Thesaurus, Logical Theory - Ontology - Topic Maps Standards and Concepts – Occurrence – Association - Subject Descriptor – Scope. Ontologies: Overview of Ontologies - Ontology Example – Definitions – Syntax – Structure – Semantics - and Pragmatics - Expressing Ontologies Logically - Ontology and Semantic Mapping Problem. Knowledge Representation**:** Languages - Formalisms, Logics - Description Logics - Ontology Design and Management using the Protege Editor - Ontology Reasoning with Pellet/FACT++, Ontology Querying with SPARQL.

TEXT BOOKS / REFERENCES:

1. Michael C. Daconta, Leo J. Obrst and Kevin T. Smith, *The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management*, Fourth Edition, Wiley Publishing, June 2003.
2. Jeffrey T. Pollock, *Semantic Web FOR DUMMIES*, Wiley Publishing, 2009.
3. John Davies, Rudi Studer and Paul Warren John, *Semantic Web Technologies: Trends and Research in Ontology-based Systems*, John Wiley and Sons, 2006.
4. John Davies, Dieter Fensel and Frank Van Harmelen, *Towards the Semantic Web: Ontology-Driven Knowledge Management*, John Wiley and Sons, 2003.

CA425 CLOUD COMPUTING 3-0-0-3

Cloud Computing Overview: Cloud and Grid and Web 2.0 and Other Computing- Cloud Computing Environments- Platforms. Parallel and Distributed Computing- Virtualization: Characteristics-Taxonomy- Pros and Cons – Xen- VMware- Hyper V. Cloud Computing Architecture- Service Models – Deployment Models- Infrastructure as a Service- Resource Virtualization-Server-Storage-Network-Platform as a Service- Cloud Platform and Management-Software as a Service- Case Study on Eucalyptus. Service Management in Cloud Computing-Service Level Agreement-Billing and Accounting- Managing Data. Cloud Security: Infrastructure, Data and Storage Security.

TEXT BOOKS / REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola and S. ThamaraiSelvi, *Mastering Cloud Computing: Foundations and Applications Programming* , First Edition, McGrawHill Education, 2013.
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, *Cloud Computing: Principles and Paradigms*, First Edition, Wiley, 2011.
3. Barrie Sosinsky, *Cloud Computing Bible*, First Edition , Wiley-India, 2010.
4. Nikos Antonopoulos and Lee Gillam, *Cloud Computing: Principles, Systems and Applications*, First Edition , Springer, 2012.
5. Ronald L. Krutz and Russell Dean Vines *Cloud Security: A Comprehensive Guide to Secure Cloud Computing*, First Edition, Wiley-India, 2010.

CA427 ADVANCED DATABASES 3-0-0-3

Object-Based Databases: Overview – Complex Data Types – Structured Types and Inheritance in SQL – Table Inheritance – Array and Multiset Types in SQL – Object-Identity and Reference Types in SQL – Implementing O-R Features – Persistent Programming Languages – Object – Relational Mapping. XML: Structure of XML data – XML Document Schema – Querying and Transformation – Application Program Interfaces to XML – Storage of XML data – XML Applications. Database-System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems – Distributed Systems. Parallel Databases: I/O Parallelism – Interquery Parallelism – Intraquery Parallelism – Intraoperation Parallelism – Interoperation Parallelism. Distributed Databases : Homogenous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control in Distributed Databases – Availability – Distributed Query Processing – Heterogeneous Distributed Databases – Cloud-Based Databases. Advanced Application Development: Performance Tuning – Performance Benchmarks – Standardization. Spatial and Temporal Data and Mobility: Time in Databases – Spatial and Geographic Data – Multimedia Databases – Mobility and Personal Databases.

TEXTBOOKS/ REFERENCES:

1. Silberschatz A, Korth H.F and Sudharshan.S, *Database System Concepts*, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, 2010.

2. Ramez Elmasri and Shamkant Navathe, *Fundamentals of Database Systems*, Sixth Edition, Addison Wesley, 2010.

CA429 DATABASE ADMINISTRATION 3-0-0-3

Introduction: DBMS Architecture and Data Independence - DBA Roles and Responsibilities. SQL * PLUS Overview: SQL plus Fundamentals, Producing more readable outputs, Accepting Values at Runtime, Using iSQL *Plus. Modifying Data**:** Using DML, TCL- Managing Constraints -Managing Views. User Access and Security**:** Creating and Modifying User Accounts, Managing User Groups with Profiles. Oracle Overview and Architecture**:** Overview of Logical and Physical Storage Structures. Managing Oracle Instances. Control and Redo Log Files: Managing the Control Files. Managing Tables, Indexes and Constraints. Managing Users and Security. Introduction to Network Administration: Network Design Considerations, Network Responsibilities for the DBA, Network Configuration, Overview of Oracle Net Features, Oracle Net Stack Architecture. Backup and Recovery Overview: Defining a Backup and Recovery Strategy, Testing- The Backup and Recovery Plan. Introduction to Performance Tuning**:** Brief Overview of Tuning methodology, General Tuning Concepts

TEXT BOOKS/REFERENCES:

1. Craig S. Mullins, *Database Administration: The Complete Guide to DBA Practices and Procedures*, Second Edition, Addison Wesley, 2012.
2. C.J. Date, *Introduction to Database Systems*, Eighth Edition, Addison Wesley, 2003.
3. Chip Dawes and Biju Thomas, *Introduction to Oracle 9i SQL*, BPB, 2002.
4. Bob Bryla and Biju Thomas, *Oracle 9i DBA Fundamental I*, BPB, 2002.
5. Joseph C. Johnson, *Oracle 9i Performance Tuning*, BPB, 2002.

CA431 DIGITAL IMAGE PROCESSING 3-0-0-3

Introduction and Fundamentals of Image Processing: Origins of Digital Image Processing – Examples - Fundamental Steps in Digital Image Processing - Elements of Visual Perception - A Simple Image Formation Model - Basic Concepts in Sampling and Quantization- Representing Digital Images- Zooming and Shrinking Digital Images - Some Basic Relationships between Pixels - Linear and Nonlinear Operations - Connectivity and Relations between Pixels. Simple Operations- Arithmetic, Logical, Geometric Operations. Image Enhancement in the Spatial Domain and Frequency Domain: Some Basic Gray Level Transformations - Histogram Processing - Basics of Spatial Filtering - Smoothing Filters-Mean, Median, Mode Filters - Edge Enhancement Filters – Sobel, Laplacian, Robert, Prewitt filter, Contrast Based Edge Enhancement Techniques. Design of Low Pass Filters - High Pass Filters- Edge Enhancement - Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain. Comparative Study of Filters in Frequency Domain and Spatial Domain. Image Restoration - Segmentation and Morphology: 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. Edge Detection - Line Detection - Curve Detection - Edge Linking and Boundary Extraction -Thresholding Algorithms- Region Based Segmentation - Region Growing - Connected Components Labeling -

Region Growing and Region Adjacency Graph (RAG), Split and Merge Algorithms - Morphology - Dilation, Erosion, Opening and Closing.

TEXTBOOKS/ REFERENCES:

1. Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*, Third Edition, Addison Wesley, 2007.
2. Arthur R.Weeks, Jr., *Fundamentals of Electronic Image Processing*, First Edition, PHI, 1996.
3. Milan Sonka, Vaclav Hlavac and Roger Boyle, *Image processing, Analysis, and Machine Vision*, Third Edition,Vikas Publishing House, 2007.

HU481 MANAGEMENT INFORMATION SYSTEMS 3-0-0-3

Fundamental Concepts: Information Systems in Business- Roles of IS, Trends, E-Business, Types of IS, Managerial Challenges. Components of IS: System Concepts, Components, IS Resources, Activities, Case Studies. Strategic Role of IT - Competing with IT: Strategic IT, Competitive Strategy Concepts, Customer-Focused Business, Uses of IT, Value Chain, Reengineering, Agile Company, Virtual Organizations, Knowledge Creation, Case Studies-E-Business Applications. E-business Systems: Introduction, Cross-functional Enterprise Application, Architecture, Application Integration, Transaction Processing, Enterprise Collaboration Systems. Functional Business Systems: IT in Business, Marketing Systems, Manufacturing Systems, HR Systems, Accounting and Financial Systems, Case Studies; Enterprise Business Systems: CRM, ERP, SCM. Case Studies; Electronic Commerce Systems & DSS. E-Commerce Systems: Introduction, Scope, Processes, Payment Processes, Applications and Issues, Case Studies. Decision Support Systems: Introduction, Structure of Decisions, Trends, Systems, OLAP, Usage, EIS, Portals, Artificial Intelligence and its Applications in Business, Case Studies. Business / IT Strategy: Planning Fundamentals- Organizational Planning, Scenario approach, SWOT, Business Models, IT Planning, IT Strategies, Application Planning- Implementation Challenges, Barriers, Change Management- Case Studies.Management Challenges: Security and Ethical Challenges- IT Security, Ethics, Computer Crime, Privacy Issues, Ethical responsibilities, Cyber Laws, Challenges. Security Management: Tools, Security defense in the Internet, Security Measures, System Controls and Audits, Case Studies. Enterprise and Global Management of IT: Business and IT, Managing IT, IT Function In Enterprises, Organizing IT, Outsourcing, Off Shoring, Failures. Managing Global IT: Cultural, Political, Geo-Economic Issues, Global IT Applications, Platforms and Strategies, Data Access Issues, Global System Development, Case Studies.

TEXTBOOKS / REFERENCES:

1. James O'Brien, George Marakas and Ramesh Behl, *Management Information Systems*, Tenth Edition, Tata McGraw-Hill, 2013.
2. Kenneth C. Laudon and Jane P. Laudon, *Management Information Systems: Managing the Digital Firm*, Twelfth Edition, Pearson India, 2013.

HU483 PRINCIPLES OF ECONOMICS AND MANAGEMENT 3-0-0-3

Introduction to Management**:** Managers and Management - History Module - The Historical Roots of Contemporary Management Practices, The Management Environment. Planning: Foundations of Planning - Foundations of Decision Making - Quantitative Module Quantitative Decision-Making Aids. Organizing: Basic Organization Designs - Staffing and Human Resource Management - Career Module Building Your Career - Managing Change, Stress, and Innovation .Leading- Foundations of Individual and Group Behavior - Understanding Work Teams - Motivating and Rewarding Employees - Leadership and Trust - Communication and Interpersonal Skills. Introduction to Economics**:** The Firm and Its Goals - Review of Mathematical Concepts used in Managerial Economics, Supply and Demand - The Mathematics of Supply and Demand, Demand Elasticity - Applications of Supply and Demand, Demand Estimation and Forecasting, The Theory and Estimation of Production - The Multiple-Input Case - Expressing the Production Function with the Use of Calculus, The Theory and Estimation of Cost - A Mathematical Restatement of the Short-Run Cost Function - The Estimation of Cost. Pricing and Output Decisions: Perfect Competition and Monopoly - The Use of Calculus in Pricing and Output Decisions - Break-Even Analysis (Volume-Cost-Profit), Monopolistic Competition and Oligopoly - Special Pricing Practices.

TEXTBOOKS/REFERENCES:

1. Stephen P, Robbins David A. De Cenzo**,** *Fundamentals of Management*, Sixth Edition, Prentice Hall, 2008.
2. Philip K. Y. Young, Steve Erfle and Paul G. Keat, *Managerial Economics: Economic Tools for Today's Decision Makers*, Seventh Edition, Pearson, 2013.

HU485 SOFTWARE PROJECT MANAGEMENT 3-0-0-3

Introduction to Software Project Management: Software Projects-Other Types of Projects - Problems with Software Projects. Project Evaluation and Programme Management: Evaluation of Individual Projects – Cost Benefit Evaluation Techniques – Risk Evaluation. Step Wise: An Overview of Project Planning. Selection of an Appropriate Project Approach: Build or Buy? - Waterfall Model – Spiral Model – Prototyping – Incremental Delivery – RAD – Agile Methods – XP - Scrum. Software Effort Estimation**:** Bottom up Estimating – Top down Estimating – FP Analysis – COCOMO II – Cost Estimation**.** Activity Planning**:** Project Schedules - Sequencing and Scheduling Projects - Network Planning Models – AOA – AON - CPM - Shortening Project Duration – Crashing - Identifying Critical Activities. Risk Management: A Framework for Dealing with Risk – Risk Management **–** PERT. Resource Allocation**:** Identifying Resource Requirements – Scheduling Resources – Publishing Resource Schedule – Cost Schedule. Monitoring and Control: Visualizing Progress - Earned Value Analysis. Managing People in SW Environments: Organizational Behavior – Motivation. Working in Teams: Organizing Teams. Software Quality Management: Defining Software Quality – Metrics – Process Capability Models – Software Reliability.CaseStudy: PMBOK - MS Project.

TEXTBOOKS / REFERENCES:

1. Mike Cotterell and Bob Hughes, *Software Project Management*, Fifth Edition, Tata McGraw-Hill, 2010.
2. Roger S. Pressman, *Software Engineering a Practitioner's Approach*, Seventh Edition, Tata McGraw-Hill, 2010.
3. Jalote P, *Software Project Management in Practice,* Addison Wesley, 2002.