

# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**SYLLABUS FOR MCA & PGDCA (CSE) PROGRAMME  
CHOICE BASED CREDIT SYSTEM**



**RAJIV GANDHI UNIVERSITY,  
RONO HILLS, DOIMUKH**

**PROPOSED MCA SYLLABUS 2020-21**

COURSE	SEM	CODE	COURSE TITLE	Credit (L-T-P)	Mark Distribution			
					End Sem	Sessional	Practical	Total
<b>PGDCA [Non CS]</b>	<b>I</b>	PGDCA-0411	Discrete Mathematics	3-1-0	80	20	-	100
		PGDCA-0412	Programming using C	2-1-2	50	20	30	100
		PGDCA-0413	Introduction to Web Design	2-1-2	50	20	30	100
		PGDCA-0414	Computer Organization and Assembly language Programming	3-1-1	80	20	-	100
		PGDCA-0415	Communication skills and Technical Writing	3-1-0	80	20	-	100
		<b>Total</b>				<b>22</b>		
<b>PGDCA [Non-CS]</b>	<b>II</b>	PGDCA-0421	Data and File Structure	3-1-1	50	20	30	100
		PGDCA-0422	Object Oriented technologies and Java Programming	2-1-2	50	20	30	100
		PGDCA-0423	Operating System Concepts and Network Management	3-1-0	80	20	-	100
		PGDCA-0424	Introduction to Database Management System	3-1-1	50	20	30	100
		PGDCA-0425	Principles of Management	3-1-0	80	20	-	100
		<b>Total</b>				<b>22</b>		
<b>MCA</b>	<b>I</b>	MCAC-0511	Theory of Computation	3-1-0	80	20	-	100
		MCAC-0512	Advanced Database Management System	3-1-1	50	20	30	100
		MCAC-0513	Programming with C++	2-1-2	50	20	30	
		MCAC-0514	Probability and Statistics	3-1-0	80	20	-	100
		MCAC-0515	Management Accountancy	3-1-0	80	20	-	100
		<b>Total</b>				<b>22</b>		
<b>MCA</b>	<b>II</b>	MCAC-0521	Design and Analysis of Algorithms	3-1-0	50	20	30	100
		MCAC-0522	Computer Networks	3-1-1	50	20	30	100
		MCAC-0523	Introduction to AI with Python	3-1-1	50	20	30	100
		MCAE-0524X	Elective 1	3-0-0	80	20	-	100
		MCAE-0525X	Elective 2	3-1-0	80	20	-	100
<b>Total</b>				<b>22</b>			<b>500</b>	
<b>MCA</b>	<b>III</b>	MCAC-0611	Data Science	3-1-0	50	20	30	100
		MCAC-0612	Sensor Networks and Internet of Things	3-1-1	50	20	30	100
		MCAE-0613X	Elective 3	3-1-0	80	20	-	100
		MCAO-0614X	Elective 4	3-1-1	50	20	30	100
		MCAC-0615	SYSTEM PROJECT – I	0-0-4				100
		<b>Total</b>				<b>22</b>		
<b>MCA</b>	<b>IV</b>	MCAC-0621	SYSTEM PROJECT – II	0-0-16				<b>400</b>

**Elective 1  
(MCAE-0524x)**

1. Management Information System
2. Resource Management Techniques
3. Enterprise Resources Planning
4. Organizational Behavior
5. E-Commerce

**Elective 2  
(MCAE-0525x)**

1. Compiler Design
2. Data Mining & Warehousing
3. Android Application Components
4. Advanced Web Technologies
5. Cryptography and Network Security

**Elective 3  
(MCAE-0613x)**

1. Embedded Systems
2. Machine Learning
3. Android Application Development
4. Full stack Web Development
5. Cloud Computing
6. Software Quality Assurance and Testing

**Elective 4  
(MCAE-0622x)**

1. Wireless Networks
2. Introduction to Robotics
3. Deep Learning
4. Natural Language Processing
5. Image Processing and Computer Vision
6. Multi-platform Web Development
7. Mobile Computing
8. Blockchain Technologies

# **PGDCA**

## **1<sup>ST</sup> SEM**

### **PGDCA-0411**

#### **Discrete Mathematics**

#### **Unit I**

Logic: Propositional equivalence, predicates and quantifiers, Methods of proofs, proof strategy, sequences and summation, mathematical induction, recursive definitions and structural induction, program correctness. Counting: The basics of counting, the pigeonhole principle, permutations and combinations, recurrence relations, solving recurrence relations, generating functions, inclusion-exclusion principle, application of inclusion-exclusion.

#### **Unit II**

Relations: Relations and their properties, binary relations, equivalence relation and partitions, partial ordered relations, n-array relations and their applications, representing relations, closure of relations, equivalence of relations, partial orderings.

#### **Unit-III**

Graph theory: Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, matrix representations, degree, operations on graphs, cut-vertices, cut-edges, blocks, weighted graphs, Euler and Hamilton paths, planar graphs, graph coloring, introduction to trees, application of trees.

#### **Unit IV**

Group theory: Groups, subgroups, generators and evaluation of powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, automorphisms, homomorphism and normal subgroups, rings, integral domains and fields.

#### **Unit V**

Lattice theory: Lattices and algebras systems, principles of duality, basic properties of algebraic systems defined by lattices, distributive and complemented lattices, Boolean lattices and Boolean algebras, uniqueness of finite Boolean expressions, propositional calculus. Coding theory: Coding of binary information and error detection, decoding and error correction.

## Referred Books:

- 1) K.H. Rosen: Discrete Mathematics and its application, 5th edition, Tata McGraw Hill.
- 2) C.L.Liu:ElementsofDiscreteMathematics, 2ndedition, TMH 2000.

## **PGDCA-0412 PROGRAMMING USING C**

### **Unit -I Fundamentals of C**

Elementary data types, variables, constants and identifiers. Integer, character floating point and string constants. Variable declarations. Syntax and semantics. Reserved words. Initialization of variable during declaration. Constant data types. Expressions in C-Operator precedence and associativity. Unary, binary and ternary operators. C arithmetic operators, assignment operators, relational operators, logical operators and bit-wise operators. L-value and R-value. Side effects of operators. Expression statement. Conditional statements –if, if –else, switch Iterative statements –while, do –while, for Other statements-break, continue, go-to, return, null statement , block statement. Simple programs like programs to compute –an arithmetic expression, unit conversion, the sum of a series (like trigonometrical series), gcd, factorial, fibonacci number, generation of prime numbers, reversing digits of an integer, finding the square root of a number, generation of pseudo random numbers, prime factors of an integer, base conversion of numbers. Test if three points form a triangle and classify the triangle to right angled, isosceles, equilateral etc. Roots of a quadratic equation. Generating simple patterns of characters on screen.

### **Unit –II Functions**

Declaration and definition of functions. Calling a function. Parameters-call by value, call by reference and its absence in C.

Cast and size of operator. Automatic type conversion.

### **Unit –III Arrays and pointers**

Different types of variables-local, global, register, static extern. Scope and lifetime of variable. Arrays and pointers and corresponding operators. Pointer arithmetic. Programs using arrays and pointers like sum, average, minimum, maximum of an array of numbers. Add and delete an element of an array.

Searching - Linear and binary search methods, sorting - Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.

Merge two sorted arrays. String manipulation programs-like reverse, test for palindrom, copy, concatenate, find length etc. Matrix manipulation programs like addition, subtraction, multiplication and their combinations. Sum rows, columns, and diagonal elements of a matrix. Transpose a matrix. Selection and bubble sort.Linear search and binary search.

## **Unit –IV Structures**

Structure –Declaration and use. Structure dereference and structure pointer dereference operators. Programs to show the use of structures. Array of structure. Standard C library. Suggested

## **Unit-V File Handling**

Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Random Access to Files, Files functions – fopen(), fclose(), fprintf(), fscanf(), fseek(), ftell(), rewind(), putc(), getc(), putw(), getw(), Command Line Arguments.

## **REFERRED BOOKS:**

Programming with C, B.S. Gottfried, Tata Mc-Graw Hill.

.Programming in ANSI C, E.Balagurusamy, Tata McGraw –Hill

The C Programming Language, B.W. Kernighan and D.M.Ritchie, PHI

**PGDCA-0413**  
**Introduction to Web Design**

**Unit-I**

**Internet Basics**

Network Connectivity Types, dial up- PPP, SLIP; leased, VSAT, ISP, HTTP, TCP/IP, IP Address, Domain Names, DNS, Services-email, WWW, Search Engine. Concept of Client–Server Computing Paradigm, Thin Client vs. Flat Client, Middle ware, Client Pull, Server Push, Hypermedia Information, Concept of Threading/Multithreading Web Client Browser and its Architecture, Basic features & Functions, Client-side Inclusive-Scripts, VB Scripts, Java Scripts, ActiveX, ASP, Plugins, Case Study -Netscape Communicator, IE

**Unit-II**

**Servers**

File Server and Mail Server: FTP, Telnet, SMTP, MIME etc. Web Server: Stateful vs. Stateless Servers, Web Server Architecture, Basic features & Functions, URL, Server side inclusive – CGI, API, PERL, Web database Connectivity-JDBC, ODBC, Case Study-IIS, Apache, Tomcat.

**Unit-III**

**Application Design**

HTML, DHTML with DTD concept <head>&<body> section, able, form, Frame, hyperlinks, CSS: CSS Syntax, CSS Selectors(ID, Class, Tags, Attributes), CSS Styling, CSS Styling Backgrounds, CSS Transitions, 2D, 3D Transforms, CSS Box Modeling, Fonts, colors, and decorations with CSS, ASP.Net Basics, Web Page Design using HTML authoring tools -FrontPage/ Dream weaver.

**Unit-IV**

**Security**

Firewalls, Tunnels, SSI, X-HTTP, IPV & IPV6 security, Digital Signature, **WebSecurity Objects, Methods.**

**Unit-V**

**Web Object Models**

CORBA, COM, DCOM, IIOP, Coexistence with VRML & XML, CSS Object Model (CSSOM)

Referred Books:

- 1. HTML & CSS: Design and Build Websites** by Jon Duckett, ISBN: 1118008189

## PGDCA-0414

### Computer Organization and Assembly Language Programming

#### Unit-I

Block diagram of a computer system, Instruction execution model. Computer Components and Functions, Interconnection Structures. Bus Interconnections, Input / Output: I/O Module, Programmed I/O, Interrupt Driven I/O, Direct Memory Access or Memory interfacing

#### Unit-II

Boolean algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps. Combinational Circuits: Adders, Mux, De-Mux, Sequential Circuits: Flip-Flops (SR, JK & D), Counters: synchronous and asynchronous Counter

#### Unit-III

Classification and design parameters, Memory Hierarchy, *Internal Memory*: RAM, SRAM and DRAM, Interleaved and Associative Memory. *Cache Memory*: Design Principles, Memory mappings, Replacement Algorithms, Cache performance, Cache Coherence. Virtual Memory, *External Memory*: Magnetic Discs, Optical Memory, Flash Memories, RAID Levels

#### Unit-IV

Instruction set - types, formats, addressing modes, Computer registers, design of Accumulator Unit, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Looping Counting, and Indexing, 16 Bit Arithmetic Instructions, Logic Operations Rotate, compare etc. Examples with Assembly Language [8085/8086]

#### Unit-V

Microprocessor Architecture and Operations, Register Organization, Instruction Cycle, Instruction Pipelining. Introduction to RISC and CISC Architecture, Instruction Level Parallelism and Superscalar Processors: Design Issues.

Referred Books:

1. Stokes, Jon . Inside the Machine: An Illustrated Introduction to Microprocessors and Computer Architecture. San Francisco: No Starch Press.
2. B. Ram, [Fundamentals of Microprocessor and Microcontrollers](#) ,Dhanpat Rai Publications

3. Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, PENRAM-PRI

# PGDCA

## 2<sup>ND</sup> SEM

### PGDCA-0421: DATA AND FILE STRUCTURE

#### Data Structures:

Basic Data Structures: Arrays, Linked Lists, Stack, Queue, Dequeue, Tree, Heap, Hash Table and Collision resolution. Basic algorithms for Creation, Manipulation of Data Structures. Internal Sorting Algorithms : Bubble, Heap, Quick Sort. Tape sorting and Merging. C++ as the programming language for implementation of these algorithms.

#### File Structures:

Primary File Organization: Sequential, Direct, Indexed Sequential.

Multi-list File Organization, Inverted Files.

File Sorting, Hashing

#### BOOKS/REFERENCES:

1. Lipshutz, Data Structure, McGraw Hill.
2. Standish, Data Structure, Addison-Wesley.
3. B. Salzberg, File Structures, Prentice-Hall.
4. A.L. Tharp, File Organization and Processing, John Wiley and Sons.
5. M. Tennenbaum, Y. Langsam and M. J. Augenstein, Data Structures using C++, PHI.
6. C++ Primer Plus, Stephen Prata, Pearson, 6th Edition, 2012.

### PGDCA-0422: OBJECT ORIENTED PROGRAMMING AND DESIGN

**Fundamentals of object oriented programming:** Introduction to Object Oriented Paradigm, procedural Paradigm, An overview of classes, objects and Methods, inheritance and polymorphism.

Describe the key language features and compile and run a Java technology application, Create programs using language syntactic elements, constructs, and object-oriented paradigm

Implement exception-handling and use collections application programming interface (API), Create programs to read and write to files, Create event driven GUI using Swing

Create multithreaded Java applications, Develop Java client and server programs

Define the layers in JDBC architecture, Identify different types of JDBC drivers, Manage transactions and perform batch updates in JDBC, Create JDBC applications to access and query a database

**UML:** Basics, Use Case, Class, Object, Sequence, Activity, State Chart, Collaboration, Component and Deployment diagrams in Object oriented project design.

**Books/References:**

1. Herbert Schildt, The Complete Reference- Java, TMH Publication
2. Deitel and Deitel, Java Programming, PHI
3. E. Balagurusamy, Programming with JAVA a Primer, TMH Publication

4. Object - Oriented Modeling and Design With UML, Michael Blaha, James Rumbaugh, Pearson, 2nd Edition, 2007

## **PGDCA-0423: OPERATING SYSTEMS**

### **Concepts, Processes and Threads**

Operating system as an Extended Machine and as a Resource Manager, Operating system concepts (Files, Deadlocks, Memory Management, Input/Output, Processes, The Shell, Security), The evolution of Operating Systems (Serial Processing, Simple Batch Systems, Multiprogrammed Batch Systems, Mainframe Operating Systems, Server Operating Systems, Time Sharing Systems, Multiprocessor Operating Systems, Real-Time Systems, Embedded Operating Systems, Smart Card Operating), System Calls (Process Management, File Management, Directory management), Introduction to Processes (The Process Model, Process Creation, Process Termination, Process Hierarchies, Process States, Implementation of Processes, Process Control Block), Threads (The Thread Model, Thread Usage, Implementing Threads (In User Space and Kernel), Scheduler Activation, Pop Up Threads, Interprocess Communication (Race conditions, Critical Sections, Mutual Exclusion with Busy Waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message Passing), Classical IPC problems (The Dining Philosophers Problem, The Sleeping Barber Problem), Process Scheduling (Scheduling in Batch Systems, Scheduling in Batch Systems, Scheduling in Interactive Systems, Scheduling in Real-Time Systems, Thread Scheduling)

### **Deadlocks and Memory Management**

Resources, Deadlock (Conditions for Deadlock, Deadlock modeling), Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention

Memory management without swapping or paging (Monoprogramming without swapping or paging, Multiprogramming with fixed partitions, Relocation and Protection), Swapping, Virtual Memory (Paging, Page Tables), Page Replacement Algorithms (Not-recently-used, First in first out, Second Chance page replacement algorithm, The Clock Page Replacement Algorithm, Least Recently used page replacement algorithm, The Working Set Page Replacement Algorithm, Modeling Paging Algorithms (Belady's Anomaly, Stack Algorithms, Predicting page fault rates), Design issues for Paging Systems, Implementation issues, Segmentation (Implementation of pure segmentation, Segmentation with Paging: MULTICS)

### **Input/Output and File Systems**

Principles of I/O hardware (I/O devices, Device Controllers, Direct memory access), Principles of I/O software, I/O Software Layers, Disks (Disk hardware, disk formatting, disk arm scheduling algorithms, Error handling, Track-at-a-time caching, RAM disks) Clocks (Clock hardware, Clock software), Terminals (Terminal hardware, Input software, Output software)

Files (File Naming, File structure, File types, File access, File attributes, File operations, Memory mapped files), Directories, File System layout (Implementing files, Implementing directories, Shared files), Security (The security environment, Generic Security Attacks, Design Principles For Security, User Authentication), Protection mechanisms (Protection Domains, Access Control Lists, Capabilities, Multilevel Security, Covert Channels), Type of File Systems (FAT, VFAT, FAT32, NTFS)

### **Introduction to Linux OS design –Case study**

Overview of Unix, Processes in Unix (Fundamental Concepts, Process Management System Calls in Unix, Implementation of Processes in Unix), Memory Management in Unix, Input/Output in Unix, The Unix File System, Security in Unix

*(Laboratory in Shell Programming and Python)*

### **Books/References:**

1. Tanenbaum, Modern Operating Systems, PHI (EEE)
2. Milenkovic, Operating Systems: Concepts and Design, McGraw Hill.
3. Sillberschatz et al, Operating Systems, Wiley India.
4. W.R. Steevens, Advanced Programming in the UNIX Environment, Addison Wesley.
5. M.J. Bach, The Design of the UNIX Operating System, PHI(EEE).  
Singhal and Shivaratri, Advanced Concepts in Operating Syst

## **PGDCA-0424: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM**

### **Basic concepts**

Database & Database Users. Characteristics of the Database Approach advantages of using DBMS. Data Models, Schemas & Instances. DBMS Architecture & Data independence. System Architecture for DBMS and Data Dictionary, Database Users Data Base languages & Interfaces. Data Modeling using the Entity-Relationship Model -Entity types, Entity Sets, Attributes and Keys, Relationship, Relationship Types, Weak Entity Types, Structural Constraints, Enhanced ER Model- Specialization Generalization, Constraints on Specialization Generalization.

### **Relational Model, Languages & Systems**

Relational Data Model Concepts and Constraints. Relational Algebra - select, project, set theoretic, join operations. Overview of Relational Calculus. SQL - A Relational Database Language. Data Definition commands, View and Queries, transaction commands, Specifying Constraints & Indexes in SQL.

### **Relational Data Base Design**

Function Dependencies & Normalization for Relational Databases. Informal design guidelines for relation schemas, Functional Dependencies. Normal forms based on primary keys (1NF, 2NF, 3NF & BCNF). Lossless join & Dependency preserving decomposition. Multivalued dependencies, join dependencies (4NF & 5NF), Denormalization.

### **Transactions, Concurrency Control, Recovery Techniques**

Basic concept; ACID properties; transaction state; implementation of atomicity and durability; concurrent executions; basic idea of serializability; view and conflict serializability Recovery Techniques Failure Classification, Storage Structure, Recovery and Atomicity Log Based Recovery, Shadow Paging, stable storage implementation, data access; recovery and atomicity - log based recovery, deferred database modification, immediate database modification, checkpoints.

### **Emerging fields in DBMS**

Distributed databases; Basic idea; distributed data storage; data replication; data fragmentation horizontal, vertical and mixed fragmentation. Concepts of Multimedia databases, Object oriented data base management systems. Data Warehousing & mining.

### **Text Books**

1. Elmsari and Navathe, "Fundamental of Database System", Addison Wesley. New York.
2. H.Korth& A. Silberschatz, "DATABASE SYSTEM CONCEPTS", TMH.

### **Reference Books**

1. Date. CJ, "An Introduction to Database System", Narosa Publishing House. New Delhi.
2. Desai, B, "An Introduction to Database Concepts", Galgotia Publications. New Delhi.
3. Ullman. J.D, "Principles of Database Systems", Galgotia Publications, New Delhi.

## **MCA 1<sup>ST</sup> SEM**

### **MCAC-0511 Theory of Computation**

#### **UNIT-I**

##### **FINITE AUTOMATA (FA)**

Introduction, Deterministic Finite Automata (DFA) -Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA)- Definition of NFA, language of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion.

#### **UNIT – II**

##### **REGULAR EXPRESSIONS (RE)**

Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions.REGULAR GRAMMARS: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. Proving languages to be non-regular -Pumping lemma, applications, Closure properties of regular languages.

#### **UNIT – III**

##### **CONTEXT FREE GRAMMER (CFG)**

Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization of CFG's, CNF, GNF, Pumping Lemma for CFL's, Enumeration of Properties of CFL ( Proof's omitted ).

#### **UNIT-IV**

##### **PUSHDOWN AUTOMATA**

Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA.TURING MACHINES (TM): Formal

definition and behaviour, Languages of a TM, TM as accepters, and TM as a computer of integer functions, Types of TMs.

## **UNIT- V**

### **RECURSIVE AND RECURSIVELY ENUMERABLE LANGUAGES (REL)**

Properties of recursive and recursively enumerable languages, Universal Turing machine, The Halting problem, Undecidable problems about TMs. Context sensitive language and linear bounded automata (LBA), Chomsky hierarchy, Decidability, Post's correspondence problem (PCP), undecidability of PCP

#### **TEXT BOOKS:**

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages and Computation, 3rd edition, Pearson Education, India.

#### **REFERENCE BOOKS**

1. K. L. P Mishra, N. Chandrashekar (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.

## **MCAC-0512**

### **Advanced Database Management System**

#### **Unit-1**

##### **Comparison between different databases**

Significance of Databases, Database System Applications, Advantages and Disadvantages of different Database Management systems, Comparison between DBMS, RDBMS, Distributed and Centralized DB.

#### **Unit-II**

##### **RDBMS and SQL**

Relational Query Languages, The SQL Query Language, Querying Multiple Relations, Creating Relations in SQL, Destroying and Altering Relations, Adding and Deleting Tuples, Integrity Constraints (ICs), Primary and Candidate Keys in SQL, Foreign Keys, Referential Integrity in SQL, Enforcing Referential Integrity, Categories of SQL Commands, Data Definition, Data Manipulation Statements: SELECT - The Basic Form Subqueries, Functions, GROUP BY Feature, Updating the Database, Data Definition Facilities, Views, Embedded SQL \*, Declaring Variables and Exceptions, Embedding SQL Statements, Transaction Processing, Consistency and Isolation, Atomicity and Durability, Dynamic SQL.

#### **Unit-III**

##### **Normalization**

Functional Dependency, Anomalies in a Database, The normalization process: Conversion to first normal form, Conversion to second normal form, Conversion to third normal form, The boyce-code normal form(BCNF), Fourth Normal form and fifth normal form, normalization and database design, Denormalization

#### **Unit-IV**

##### **Query Optimization**

Algorithm for Executing Query Operations: External sorting, Select operation, Join operation, PROJECT and set operation, Aggregate operations, Outer join, Heuristics in Query Optimization, Semantic Query Optimization, Converting Query Tree to Query Evaluation Plan, multiquery optimization and application, Efficient and extensible algorithms for multi-query optimization, execution strategies for SQL sub queries, Query Processing for SQL Updates

## **Unit-V**

### **Query Execution**

Introduction to Physical-Query-Plan Operators, One-Pass Algorithms for Database, Operations, Nested-Loop Joins, Two-Pass Algorithms Based on Sorting, Two-Pass, Algorithms Based on Hashing, Index-Based Algorithms, Buffer Management, Parallel Algorithms for Relational Operations, Using Heuristics in Query Optimization, Basic Algorithms for Executing Query Operations, Query processing mechanisms, Enforcing, Serializability by Locks, Locking Systems With Several, Lock Modes, Architecture for a Locking Scheduler, ACID properties, , Managing Hierarchies of Database Elements, Concurrency Control by Timestamps, Concurrency Control by Validation, Database recovery management, distributed locking.

Referred/Text Books:

1. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.
2. RamezElmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education India

## **MCAC-0513**

### **Programming with C++**

## **Unit-I**

### **Basics**

Overview, Input/output, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures, Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions

## **Unit-II**

Basics of object and class in C++, Private, Public and Protected members, static data and function members, constructors and their types, destructors, operator overloading, type conversion, Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, virtual base class.

## **Unit-III**

Pointers in C++, Pointers and Objects, this pointer, virtual and pure virtual functions, implementing polymorphism, Concept of streams, cin and coutobjects, C++ stream classes, Unformatted and formatted I/O, manipulators, File stream, C++ File stream classes, File management functions, File modes, Binary and random Files.

## **Unit-IV**

Template, function templates, Overloading of Function templates, Arguments in function templates, class templates, inheritance of class Templates, class templates with overloaded operators

## **Unit-V**

Introduction to exception, try-catch-throw, multiple catch, catch all, rethrowing exception, implementing user defined exceptions, Overview and use of Standard Template Library, Exceptions in constructors and Destructors, Uncaught Exceptions handling, Exceptions in Class Templates, Exceptions in operator overloaded functions.

Referred/Text Books

1. KR Venugopal, Rajkumar, T Ravishankar, Mastering C++, TATA McGRAW HILL
2. E Balguruswami, Object-Oriented Programming with C++, McGraw Hill Education
3. Herbert Schildt, C++: The Complete Reference, McGraw Hill Education

## **MCAC-0514 Probability and Statistics**

### **Unit-I**

The axioms of probability, Random experiment, outcome, trial and event, Exhaustive events, favourable events, Independent events, sample space, definition of probability, addition theorem of probability, conditional probability, independent events, Mutually and pair wise independent events, multiplication theorem of probability for independent events, Baye's theorem.

### **Unit-II**

Random Variable, Distribution function, discrete random variable, Probability mass function, Distribution function of discrete random variable, Continuous random variable, Probability density function. Distribution functions of continuous random variable. Two dimensional probability mass function, Marginal probability function, conditional probability function, Two dimensional distribution function, marginal distribution function, Joint density function, marginal density function.

### **Unit-III**

Expected value of random variable, expected value of function of a random variable, properties of expectations, Various measures of Central Tendency, Dispersion, skewness and Kurtosis for continuous probability distribution, continuous distribution function, Variance, Properties of variance, covariance.

### **Unit-IV**

Moment Generating Function, Properties of moment generating function, cumulants. Explain the meaning and application of averages, define the meaning and calculation of positional averages, and discuss merits, demerits and limitations of averages.

### **Unit-V**

Control charts for measurements -X and R charts, – Control charts for attributes p, c and np charts – Tolerance limits – Acceptance sampling. Explain the meaning of dispersion, describe the measures of dispersion, and classify the measures of shape of data. raw moments & central moments, Effect of change of origin and scale on moments, Pearsonian coefficients Measures of

skewness, kurtosis, Standard Distribution- Binomial, Poisson, Negative Binomial Distribution, Normal Distribution and their properties.

Referred/Text Books:

1. Modern Mathematical Statistics by E.J.Dudewicz& S.N. Mish
2. Introduction to the Theory of Statistics by A.M. Mood, F.A. Graybill and D.C. Boes

## **MCAC-0515**

### **Management Accountancy**

#### **Unit-I**

Introduction to Management Accountancy, Features, Scope, Importance, Functions, Differences between Financial accounting, Cost accounting and Management accounting, Budgetary Control, Characteristics, Objectives, Steps, Advantages, Limitations, Types of budgets Fixed and Flexible Budget, Cash Budget and master Budget, Zero based Budgeting

#### **Unit-II**

Cost, Technique of Costing, Classification of Cost, Elements of Cost, Statement of Cost Sheet, Solved Problems, Standard Costing, Advantages, Limitations, Preliminaries, Steps in setting up of standard costs, Differences between Budgetary control and standard costing, Estimated cost, Marginal Costing, Merits and Demerits, Absorption Costing, Difference between Absorption Costing and Marginal Costing, Cost-Volume-Profit (CVP) Analysis, Contribution, Break even analysis, Profit Volume Ratio, Margin of safety. Variance Analysis, Favorable and Unfavorable variances, Controllable and uncontrollable variances, Uses of variances, Analysis of variances, Types of variances

#### **Unit-III**

Final Accounts, Adjustments before preparing final accounts , Depreciation , Bad Debts and accounting treatment of bad debts , Provision for doubtful debts , Reserves for Discount on Debtors , Reserve for Discount on Creditors , Closing Stock, Trading Account , Profit and Loss Account, Balance Sheet. Dividend policy, Types of dividend policy, Factors influencing dividend policy.

#### **Unit-IV**

Management accounting ,The Role of Management Accounting , Management Accounting Framework , Functions of Management Accounting ,Tools of Management Accounting ,The Balanced Scorecard , Cost Management System , Value Added Concept , Merits of Management Accounting , Demerits of Management Accounting , Distinction between Management Accounting and Financial Accounting, Financial Statement Analysis, Meaning of Ratio , Steps in Ratio Analysis ,Classification of Ratios , Du Pont Chart , Solved Problems , Advantages of Ratio Analysis , Limitation of Ratio analysis. Working capital, kinds of working capital, estimation of working capital requirement.

## **Unit-V**

Funds Flow Analysis, Funds Flow Statement, Ascertainment of flow of funds, Technique of preparing funds flow statement, Schedule of Changes in Working Capital, Adjusted Profit and Loss account, Funds Flow Statement, Cash Flow Analysis, Cash Flow Statement , Purpose of Cash Flow Statement , Preparation of Cash Flow Statement , Format of Cash Flow Statement (AS3: Revised Method) , Cash Flow from Operating Activities , Cash Flow Statement under Direct Method , Different between Cash Flow Analysis and Fund Flow Analysis, Uses of Cash Flow Statement

Referred/Text Books:

1. Jawahar Lal, Cost Accounting, Tata McGraw Hill New Delhi
2. B.M. Lall Nigam and I.C. Jain, Cost Accounting, Principles, Methods and Techniques, PHI Pvt. Ltd, New Delhi
3. H. V. Jhamb, H. V. Jhamb, Fundamentals of Cost Accounting, Ane Books Pvt Ltd, New Delhi

**MCA SEM II**  
**MCAC-0521**  
**Design and analysis of Algorithms**

**UNIT – I**

Elementary Data Structures, Basic Computational Models.

**UNIT – II**

Simple Algorithms. Analyzing Algorithms, Asymptotic Notation, Recurrence relations.

**UNIT – III**

Design Methods: General Consideration, Algorithm design paradigms and representative problems: Divide and Conquer (Binary search, Merge Sort, Quick Sort, Arithmetic with Large integers, etc.), Greedy Method (Minimal Spanning Tree, Shortest Paths, Knapsack, etc.), Dynamic Programming (Chained Matrix Multiplication, Optimal Storage on Tapes, Shortest Paths, Optimal Search Trees, etc.), Backtracking (8-queens problem, Graph Colouring, Hamiltonian Cycles, etc.), Branch and Bound (0/1 Knapsack problem, Travelling Salesperson, etc.), Approximation (Graph Colouring, Task Scheduling, Bin Packing, etc.), Probabilistic Algorithms (Numerical Integration, Primality Testing, etc.).

**UNIT – IV**

Polynomial Evaluation and Interpolation, Fast Fourier transforms.

**UNIT – V**

Intractable Problems: Basic Concepts, Nondeterministic Algorithms, NP Completeness, Cook's Theorem, Examples of NP-Hard and NP-Complete problems. Problem Reduction.

**Books/References:**

1. Aho, J. Hopcroft and J.Ullman, The design and Analysis of Computer Algorithms, Addison Wesley.
2. E. Horowitz and S. Sahani, Fundamentals of Computer Algorithms, Galgotia, New Delhi.
3. S.E. Goodman and S.T. Hedetniemi, Introduction to the Design and Analysis of Algorithms, McGraw Hill.
4. G. Brassard and P.Brately, Algorithmics, PHI.
5. S.K. Basu, Design Methods and Analysis of Algorithms, PHI.
6. T.H. Coremen, et. al, Introduction to Algorithm, PHI

## **MCAC-0522**

### **Computer Networks**

#### **UNIT – I**

Review of Computer Network Architecture and the Subnet layers.

#### **UNIT – II**

Quality of Service: Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping policies for BE and GS models – Traffic Shaping algorithms – End to End solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in inelastic traffic

#### **UNIT – III**

High Performance Networks: Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behavior – Admission Control – MPLS Networks – Principles and Mechanisms – Label Stacking – RSVP – RTP/RTCP

#### **UNIT – IV**

High Speed Networks: Gigabit Network

#### **UNIT – V**

Network Management: ICMP the Forerunner – Monitoring and Control – Network Management Systems – Abstract Syntax Notation – CMIP – SNMP Communication Model – SNMP MIB Group – Functional Model – Major changes in SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB

#### **Books/References:**

1. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, Elsevier.
2. Behrouz A. Forouzan: Data Communications and Networking, Tata McGraw Hill.
3. William Stallings: Data and Computer Communication, Pearson Education.
4. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, Tata McGraw-Hill.

## **MCAC-0523**

### **Introduction to AI with Python**

#### **UNIT – I**

Introduction: Philosophy of AI, History, Definitions, Agents, Modeling a Problem

## **UNIT – II**

Concept of search ,Uninformed Search, Heuristic Search, Local Search, Genetic Algorithm, Adversarial Search,

## **UNIT – III**

Knowledge representation and logic, Constraint Satisfaction, Propositional Logic & Satisfiability, first order logic, knowledge engineering ,forward and backward chaining

## **UNIT – IV**

Uncertainty in AI, Bayesian Networks, Bayesian Networks Learning & Inference, probability theory, Decision Theory, Markov Decision Processes, learning decision trees, Reinforcement Learning

## **UNIT – V**

Introduction to Deep Learning & Deep RL, Natural language Processing

### **Books/References:**

1. Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall, Third Edition (2009) (required).
2. Ian GoodFellow, YoshuaBengio& Aaron Courville, Deep Learning, MIT Press (2016).

## **ELECTIVE I**

**MCAE-05241**

### **MANAGEMENT INFORMATION SYSTEM**

#### **UNITI**

An overview of MIS Structure of a MIS Hardware, Software and Communication technology for information systems concepts of information

#### **UNITII**

Storage and retrieval of data transaction processing office automation and information processing - control functions Decision making process phases in the decision making process Intelligence and design phases concepts of decision making Behavioural models of the decision maker/decision making.

### **UNITIII**

System concepts system concepts applied to management information systems concepts of planning and control Organizational structure and management concepts

### **UNITIV**

Decision support systems support systems for planning, control and decision making support systems for management of knowledge work Information systems requirements strategies for the determination of Information requirements.

### **UNITV**

Data base requirements user interface requirements developing and implementing application systems Quality assurance and evaluation of Information systems future developments and their organizational and social implications.

### **Books/References:**

1. Gordon B. Davis, Margrethe H. Olson , Management Information Systems Conceptual foundations, Structure and Development , 2nd edition Mc-Graw Hill
2. James A. Senn , Analysis & Design of Information System , Second edition, McGraw Hill.

**RESOURCE MANAGEMENT TECHNIQUES**

**UNIT I**

Linear programming (LP) LP formulation and graphical solution - the simplex method - revised simplex method-sensitivity analysis.

**UNIT II**

Duality and networks - definition of the dual problem - primal - Dual relationships - Dual simplex method - transportation and assignment models - transshipment models - network minimization - shortest route problems .

**UNIT III**

Integer programming - Cutting plane algorithms, Branch and Bound Algorithm. Multistage (dynamic) programming solution of LP by dynamic programming.

**UNIT IV**

Classical optimization theory: unconstrained external problem, Newton-Ralphson method-Equality Constraints - Jacobian method - Lagrangean method - khun tucker conditions - simple problems.

**UNIT V**

Project scheduling. network diagram representation - critical path Computation - time charts and resources levelling – PERT Networks

**TEXT BOOK:**

1. Taha A.H.,operations research an introduction , macmillan publishing company, New york,1997.

**REFERENCES:**

1. Billey E. gillet, “Introduction To Operations Research A Computer OrientedAlgorithmicApproach”,Tata McGraw Hill,New Delhi, 1979.
2. Paneer Selvam, “Operations Research”, Prentice Hall of India,2002.

**ENTERPRISE RESOURCE PLANNING**

**UNIT-I**

Integrated Management Information System, Seamless Integration – Supply Chain Management – Integrated Data Model – Benefits of ERP – Business Engineering and ERP – Definition of Business Engineering – Principles of Business Engineering – Business Engineering with Information Technology.

**UNIT-II**

Building the Business Model ERP Implementation – An Overview – Role of Consultant-Vendors and Users Customisation–Precautions–ERP Post Implementation Options-ERP Implementation Technology –Guidelines for ERP Implementation.

**UNIT-III**

ERP domain MFG/PRO – IFS/Avalon – Industrial and Financial Systems – Baan IV SAP-Market Dynamics and Dynamic Strategy.

**UNIT-IV**

Description – Multi-Tier Client/Server Solutions – Open Technology – User Interface-Application Integration.

**UNIT-V**

Basic Architectural Concepts – The System Central Interfaces-Services-Presentation-Interface – Database Interface.

**TEXT BOOK:**

1. Vinod Kumar Garg and N.K.Venkita Krishnan, “Enterprise Resource Planning – Concepts and Practice”, PHI, 2003.
2. Jose Antonio Fernandz, The SAP R/3 Handbook, TMH, 2006.

## **ORGANIZATIONAL BEHAVIOUR**

### **UNIT-I**

Introduction to organizations and individuals, what is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.), models of analysing organizational phenomena, organizational and business variables,

### **UNIT-II**

Organizations in the Indian context, institutions and structures, basic roles in an organization, etc., perception, attitudes, motives (achievement, power and affiliation), commitment, values creativity and other personality factors, profile of a manager and an entrepreneur.

### **UNIT-III**

Interpersonal and Group Processes - Interpersonal trust, understanding the other person from his/her point of view, interpersonal communication, listening, feedback, counseling, transactional analysis, self-fulfilling prophecy, etc.

### **UNIT-IV**

Leadership, motivating people, working as a member of a team, team functioning, team decision-making, team conflict resolution, team problem solving.

### **UNIT-V**

Organizational Structure and Integrating Interpersonal and Group Dynamics-Elements of structure, functions of structure, determinants of structures, dysfunctionalities of structures, structure-technology environment-people relationships, principles underlying design of organizations; organizational culture, organizational politics, issues of power and authority, organizational communications, organizational change, integrating cases(s).

Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role plays, and behaviour simulation exercise.

### **References**

1. Arnold, John, Robertson, Ivan T. and Cooper, Cary, L., "Work Psychology: Understanding Human Behaviour in the Workplace", MacMillan India Ltd., Delhi, 1996.
2. Dwivedi, R.S., "Human Relations and Organisational Behaviour: A Global Perspective", MacMuillan India Ltd., Delhi, 1995. "
3. Arnold, John, Robertson, Ivan T. and Cooper, Cary, L., "Work Psychology: Understanding Human Behaviour In the Workplace", MacMillan India Ltd., Delhi, 1996.
4. Dwivedi, R.S., "Human Relations and Organisational Behaviour: A Global Perspective", MacMillan India Ltd., Delhi, 1995.
5. French and Bell (4th ed), "Organization Development: Behavioral Science Interventions for Organization Improvement", Prentice Hall of India Pvt. Ltd., New Delhi, 1994.
6. Hellriegel, Slocum and Woodman, "Organizational Behaviour", West Publishing Co. USA, 1986.

7. Hersey and Blanchard (6th 00), "Management of Organizational Behaviour: Utilising

Human Resources", Prentice Hall of India Pvt. Ltd., New Delhi, 1996.

8. Prasad, Kesho, "Organisational Development for Excellence", MacMillan India Ltd., New Delhi, 1996.
9. Robbins (4th 00), "Essentials of Organizational Behaviour", Prentice Hall of India Pvt. Ltd. New Delhi, 1995.
10. Schermerhorn, Hunt and Osborw, "Managing Organization Behaviour", John Willey & Sons, USA. 1982.
11. Weston, Mergers, "Restructuring and Corporate Control", Prentice Hall of India Pvt. Ltd. New Delhi, 1995.

## **MCAE-05245**

### **E-COMMERCE**

#### **UNIT-I**

Introduction to E-Commerce: Benefits – Impacts - Classification and Application of E-Commerce - Business Model - Architectural Framework

#### **UNIT-II**

Network Infrastructure: Local Area Network – Ethernet – Wide Area Network- Internet – TCP/IP Reference Model – Domain Name System – Internet Industry structure – Information Distribution and Messaging: FTP Application – Electronic Mail – World Wide Web Server - HTTP – Web Server Implementations

#### **UNIT-III**

Information Publishing Technology: Information Publishing – Web Browsers – HTML-CGI- Multimedia Content- Other Multimedia Objects – VRML- Securing the Business on Internet- Why Information on Internet is Vulnerable?- Security Policy-Procedures and Practices –Site Security- Protecting the Network-Firewalls-Securing the Web Service

#### **UNIT-IV**

Securing Network Transaction- Electronic Payment Systems: Introduction – Online Payment Systems – Pre-paid Electronic Payment System-Post-paid Electronic Payment System – Requirement Metrics of a Payment System

#### **UNIT-V**

Search Engines and Directory Services: Information Directories - Search Engines – Internet Advertising – Agents in Electronic Commerce: Needs and Types of Agents – Agent Technologies – Agents Standards and Protocols – Agents Applications - Case Study.

#### **TEXT BOOK:**

1. Bharat Bhasker, „Electronic Commerce Framework Technologies and Applications“, Tata McGraw Hill Publication 2003.

#### **REFERENCES**

1. Ravi Kalakota and Andrew B Whinston, “ Frontiers of Electronic Commerce “, Pearson Education Asia, 1999.( Chapters 1,2,3,6-10,16)
  2. Marilyn Greenstein and Todd M Feinman , ” Electronic commerce: Security, Risk Management and Control “ Tata McGraw-Hill , 2000.(Chapters 7,8,10-12)
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## **ELECTIVE 2**

### **MCAE-05251: COMPILER DESIGN**

#### **UNIT 1**

Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool-based approach to compiler construction.

#### **UNIT2**

Lexical analysis: interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition, Transition diagrams, LEX.

#### **UNIT 3**

Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.

#### **UNIT3**

Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.

#### **UNIT 4**

Intermediate code generation: intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls. Implementation issues.

#### **UNIT 5**

Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from dags, peep hole optimization, code generator generators, specifications of machine.

#### **Books/References:**

1. V. Aho, R. Sethi, and J. D. Ullman: Compilers: Principles, Techniques and Tools, PEARSON Education.
2. C. Fischer and R. LeBlanc: Crafting a Compiler in C , PEARSON Education.
3. Holub: Compiler Design in C, PHI
4. Andrew W. Appel and Maia Ginsburg: Modern Compiler Implementation in C, Cambridge Press.

### **MCAE-05252 DATA MINING AND WAREHOUSING**

#### **Unit 1:**

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and

correlations; Sequential Pattern Mining concepts, primitives, scalable methods;

### **Unit 2:**

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,

### **Unit 3:**

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;

### **Unit 4:**

Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;

### **Unit 5:**

Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.

### **References:**

Jiawei Han and M Kamber, Data Mining Concepts and Techniques,, Second Edition, Elsevier Publication, 2011.

Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.

G Dong and J Pei, Sequence Data Mining, Springer, 2007.

## **MCAE-05253 : ANDROID APPLICATION COMPONENTS**

### **Unit 1**

Introduction: What is Android, Android versions and its feature set The various Android devices on the market , The Android Market application store , Android Development Environment - System Requirements, Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs)

## **Unit 2:**

Android Architecture Overview and Creating an Example Android Application: The Android Software Stack, The Linux Kernel, Android Runtime - Dalvik Virtual Machine, Android Runtime – Core Libraries, Dalvik VM Specific Libraries, Java Interoperability Libraries, Android Libraries, Application Framework, Creating a New Android Project ,Defining the Project Name and SDK Settings, Project Configuration Settings, Configuring the Launcher Icon, Creating an Activity, Running the Application in the AVD, Stopping a Running Application, Modifying the Example Application, Reviewing the Layout and Resource Files,

## **Unit 3:**

Android Software Development Platform Understanding Java SE and the Dalvik Virtual Machine , The Directory Structure of an Android Project , Common Default Resources Folders , The Values Folder , Leveraging Android XML, Screen Sizes , Launching Your Application: The AndroidManifest.xml File ,Creating Your First Android Application

## **Unit 4:**

Android Framework Overview Android Application Components, Android Activities: Defining the UI, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications Content Providers: Data Management, Android Intent Objects: Messaging for Components Android Manifest XML: Declaring Your Components

## **Unit 5:**

Understanding Android Views, View Groups and Layouts Designing for Different Android Devices, Views and View Groups, Android Layout Managers, The View Hierarchy, Designing an Android User Interface using the Graphical Layout Tool

Reference:

1. Android application development for JAVA programmers, James Sheusi
2. Fundamental of android app development ,Sujitkumarmishra.

## **MCAE-05254: ADVANCED WEB TECHNOLOGIES**

### **UNIT 1**

Introduction to advanced web technology - Mark-up language technology (XML structures and tools), Advanced web technologies (such as AJAX and advanced web security), Searching and pattern matching using regular expressions, Issues and challenges of modern Web Technologies and Web 2.0, Advanced web topics (such as web services and Unicode)

### **UNIT 2**

Technological issues: XML processing, RDF processing

### **UNIT 3**

Taxonomies and ontologies for advanced web applications: Ontology modelling, Languages for representing ontologies on the web, Rules and inferences

### **UNIT 4**

Web services: Design and modelling of web services, Technologies for implementing web services

### **UNIT 5**

Current applications of advanced web technologies

### **Books/References:**

1. Semantic Web Primer, Semantic Web Primer, MIT Press, 2nd Edition, 2010
2. Semantic Web Technologies: Trends and Research in Ontology-based Systems by John Davies, Rudi Studer, and Paul Warren John Wiley & Son's

## **MCAE-05255: CRYPTOGRAPHY AND NETWORK SECURITY**

### **UNIT 1**

Introduction to Cryptography: Terminology, Security Aspects, Attack Models, Classical Cryptography, Shift Cipher, Substitution Cipher, Vigenere Cipher, Basic Cryptanalysis

### **UNIT 2**

Mathematics of Cryptography: Groups, Rings, and Fields, Integer Arithmetic, Modular Arithmetic, The Euclidean Algorithm, Finite Fields of The Form  $GF(p)$ , Polynomial Arithmetic, Finite Fields Of the Form  $GF(2^n)$ , Linear Congruence

### **UNIT 3**

Introduction to Number Theory: Prime Numbers, Primality Testing, Factorization, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms

### **UNIT 4**

Conventional Encryption: Attacks on Encryption Schemes, Perfect Security, Cipher Machines, Modes of Operation (ECB, CBC, CFB, OFB) , Multiple Encryption , DES, Triple-DES, AES,RC4 Stream Cipher , Attacks on DES.

### **UNIT 5**

Pseudo-random Number Generators (PRNGs): Random and Pseudorandom Numbers, Next-bit Test, Removing Biases, ANSI X9.17 Generator Blum-Blum-Shub Generator, Statistical Tests.

### **UNIT 6**

Hash Functions and MAC: Standard hashes (MD5, SHA-1, SHA-256/384/512, RIPEMD-160), Birthday Attack , Collision freeness and recent attacks , Message Authentication Code (MAC) Algorithms , Authenticated Encryption Key Establishment and Public-key Cryptography: Key Management, Diffie-Hellman Key Exchange ,Attacks on Diffie Hellman, RSA, Attacks on RSA , ElGamal , Attacks on ElGamal , Semantic Security and Chosen-ciphertext Security, Provably Secure Schemes Digital Signature, Variation and Applications

### **Books/References:**

1. William Stallings, Cryptography and Network Security, Principles and Practice, Prentice Hall India.
2. Behrouz A Forouzan, Cryptography & Network Security, Tata McGraw-Hill Publications
3. Atul Kahate, Cryptography and network security, TMGH

## **MCA SEM III MCAC-0611 Data science**

### **UNIT – I**

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

### **UNIT – II**

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources.

### **UNIT – III**

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

### **UNIT–IV**

Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

### **UNIT- V**

Applications of Data Science, Technologies for visualization, Bokeh (Python)

### **UNIT- VI**

Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science

References:

1. Cathy O'Neil and Rachel Schutt. *Doing Data Science, Straight Talk From The Frontline*. O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. *Mining of Massive Datasets*. v2.1, Cambridge University Press.

# MCAC-0612

## Sensor Networks and Internet of Things

### UNIT – I

Introduction and Applications: smart transportation, smart cities, smart living, smart energy, smart health, and smart learning. Examples of research areas include for instance: Self-Adaptive Systems, Cyber Physical Systems, Systems of Systems, Software Architectures and Connectors, Software Interoperability, Big Data and Big Data Mining, Privacy and Security

### UNIT – II

**IoT Reference Architecture-** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

**Real-World Design Constraints-** Introduction, Technical Design constraints- hardware, Data representation and visualization, Interaction and remote control

### UNIT – III

**Industrial Automation-** Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things,

**Commercial Building Automation-** Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

### UNIT – IV

Hardware Platforms and Energy Consumption, Operating Systems, Time Synchronization, Positioning and Localization, Medium Access Control, Topology and Coverage Control, Routing: Transport Protocols, Network Security, Middleware, Databases

### UNIT – V

IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device Board, Linux on Raspberry , Interface and Programming & IOT Device

References:

1. Mandler, B., Barja, J., MitreCampista, M.E., Cagáová, D., Chaouchi, H., Zeadally, S., Badra, M., Giordano, S., Fazio, M., Somov, A., Vieriu, R.-L., Internet of Things. IoT Infrastructures, Springer International Publishing

## **Elective 3**

### **MCAE-06131 Embedded System**

#### **UNIT 1**

Introduction to Embedded Systems(ES), their examples and applications. Concept, Definition and Classification. Advanced hardware fundamentals. Criteria for Processor and Memory Selection for ES.

#### **UNIT 2**

Interrupts- Basics, Shared-Data Issues, Latency. ES software architectures. Round-Robin with interrupts; Function-Queue scheduling. Issues of context, latency and deadline.

#### **UNIT 3**

Introduction to Real-Time Operating Systems(RTOS). Tasks, Task States, Semaphores and Shared Data. Use of OS services e.g. Timer functions, Message Queues, Events, Pipes and ISRs.

#### **UNIT 4**

Discussion of basic design using RTOS and examples. Hard Real-Time scheduling considerations. Memory and power conservation. Embedded Software Development tools: Host/Target machines, Linker/Re-Locator, Debugging Techniques.

#### **UNIT 5**

Case study of Programming(at least one) industry-standard RTOS e.g. Micro-C/OS , VxWorks, (Embedded) Linux. Detailed study of its services and use of its API.

#### **References:**

David Simon, “An Embedded Software Primer”, Pearson (Asia).

Raj Kamal, ”Embedded Systems – Architecture, Programming & Design”, TMH.

Qing Li, “Real-Time Concepts for Embedded Systems”, CMP.

Arnold Berger, “Embedded Systems Design – An Introduction to Processes, Tools & Techniques”, CMP.

### **MCAE-06132 (Machine Learning)**

#### **UNIT 1**

##### **Supervised Learning (Regression/Classification)**

Basic methods: Distance-based methods, Nearest-Neighbors, decision Trees, Naive Bayes

Linear models: Linear Regression, Logistic Regression, Generalized Linear Models

Support Vector Machines, Nonlinearity and Kernel Methods

Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

## **UNIT 2**

## **Unsupervised Learning**

Clustering: K-means/Kernel K-means

Dimensionality Reduction: PCA and kernel PCA

Matrix Factorization and Matrix Completion

Generative Models (mixture models and latent factor models)

### **UNIT 3**

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests).

### **UNIT 4**

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

### **UNIT 5**

Scalable Machine Learning (Online and Distributed Learning)

A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

### **References:**

Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)

Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

## **MCAE-06133 (Android Application Development)**

### **UNIT 1**

Introduction: What is Android, Android versions and its feature set The various Android devices on the market , The Android Market application store , Android Development Environment - System Requirements, Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs)

### **UNIT 2**

Android Architecture Overview and Creating an Example Android Application: The Android Software Stack, The Linux Kernel, Android Runtime - Dalvik Virtual Machine, Android Runtime – Core Libraries, Dalvik VM Specific Libraries, Java Interoperability Libraries, Android Libraries, Application Framework, Creating a New Android Project ,Defining the Project Name and SDK Settings, Project Configuration Settings, Configuring the Launcher Icon, Creating an Activity, Running the Application in the AVD, Stopping a Running Application, Modifying the Example Application, Reviewing the Layout and Resource Files,

### **UNIT 3**

Android Software Development Platform Understanding Java SE and the Dalvik Virtual Machine , The Directory Structure of an Android Project , Common Default Resources Folders , The Values Folder , Leveraging Android XML, Screen Sizes , Launching Your Application: The AndroidManifest.xml File ,Creating Your First Android Application

### **UNIT 4**

Android Framework Overview Android Application Components, Android Activities: Defining the UI, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications Content Providers: Data Management, Android Intent Objects: Messaging for Components Android Manifest XML: Declaring Your Components

### **UNIT 5**

Understanding Android Views, View Groups and Layouts Designing for Different Android Devices, Views and View Groups, Android Layout Managers, The View Hierarchy, Designing an Android User Interface using the Graphical Layout Tool.

Reference:

3. Android application development for JAVA programmers, James Sheusi
4. Fundamental of android app development ,Sujitkumarmishra.

## **MCAE-06134 (Full Stack web Development)**

### **UNIT 1**

Introduction to advanced web technology - Mark-up language technology (XML structures and tools), Advanced web technologies (such as AJAX and advanced web security), Searching and pattern matching using regular expressions, Issues and challenges of modern Web Technologies and Web 2.0, Advanced web topics (such as web services and Unicode) **UNIT 2**

Technological issues: XML processing, RDF processing

### **UNIT 3**

Taxonomies and ontologies for advanced web applications: Ontology modelling, Languages for representing ontologies on the web, Rules and inferences

### **UNIT 4**

Web services: Design and modelling of web services, Technologies for implementing web services.

### **UNIT 5**

## Current applications of advanced web technologies

## References:

1. Semantic Web Primer, Semantic Web Primer, MIT Press, 2nd Edition, 2010
2. Semantic Web Technologies: Trends and Research in Ontology-based Systems by John Davies, Rudi Studer, and Paul Warren John Wiley & Son's
3. Web Technologies: A Computer Science Perspective by Jeffrey C. Jackson, Prentice Hall, 2006.

## MCAE-06135 (Cloud Computing)

### UNIT 1

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

### UNIT 2

Cloud Computing Architecture Requirements, Introduction Cloud computing architecture, On Demand

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

### Unit 3:

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

### Unit 4:

Security Management in the Cloud Security Management Standards, Security Management in the Cloud,

Model Curriculum of Engineering & Technology PG Courses [Volume-I] Availability Management: SaaS, PaaS, IaaS Privacy Issues Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud,

Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

### Unit 5:

Audit and Compliance Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud

## **References:**

Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Publication Date: November 2, 2009  
Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance

(Theory in Practice), Tim Mather, ISBN-10: 0596802765, O'Reilly Media, September 2009.

## **MCAE-06136 (Software Quality Assurance)**

### **UNIT 1:**

#### **INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE**

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall's quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

### **UNIT 2:**

#### **SQA COMPONENTS AND PROJECT LIFE CYCLE**

Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations –

### **UNIT 3:**

Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management.

### **UNIT 4:**

#### **SOFTWARE QUALITY INFRASTRUCTURE**

Procedures and work instructions – Templates – Checklists – 3S developing – Staff training and certification Corrective and preventive actions .

### **Unit 5:**

Configuration management – Software change control – Configuration management audit - Documentation control – Storage and retrieval.

## **REFERENCES:**

Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.

Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 1997.

## Elective – IV

### **Unit I: MCAE-06221: WIRELESS NETWORK**

Wireless transmission fundamentals: Electromagnetic spectrum, radiation patterns, Power Density, intensity, beamwidth, directivity and gain, isotropic and omni-directional antenna, Friis transmission equation. free space propagation, free space propagation model, introduction to large-scale path-loss models, fast and slow fading and distributions.

#### **Unit II:**

Modulation Techniques for Mobile radio: FM and AM, digital modulation overview, BPSK, QPSK and variants, Gram-schmidtorthogonalization procedure. Spread-spectrum modulation techniques, DSSS and FHSS and their performance.

#### **Unit III:**

Mobile cellular communication: frequency reuse, cluster size; cellular system architecture, channel assignment strategies, call splitting, sectoring, Introduction to GSM architecture, channel types, call setup, mobility in cellular networks and handoff. introduction to CDMA

#### **Unit IV:**

Introduction to WiFi networks and ad-hoc networks, Routing protocols in ad-hoc networks, specialized sensor networks. Emerging trends in wireless networking.

#### **Books/References:**

1. Rappaport, Wireless Communications: Principles and Practice, PEARSON
2. Andreas F. Molisch, Wireless Communications, Wiley India Pvt Ltd
3. W. Stallings, Wireless Communications and Networks, Pearson education publishing

### **MCAE-06222: INTRODUCTION TO ROBOTICS**

#### **Unit 1:**

Introduction, Origin of automation, robot joints, classification of robots, work volume.

#### **Unit 2:**

Vectors, spatial descriptions, rotation matrix, homogenous transformation matrix

#### **Unit 3:**

DH parameters, Forward kinematics, Inverse kinematics Jacobian, singularity, manipulation ability Trajectory planning, Statics and dynamics of robotic manipulators Linear control of robot manipulators

#### **Unit 4:**

Force control, Manipulator – mechanism design, Programming in VAL II

Books and references

1. Introduction to robotics, john craig

2. Robotics engineering ,richardklafter

3. Industrial robotics, m p groover, r. Nagel, n .ordey , a. Dutta

## **MCAE-06223: DEEP LEARNING**

### **Unit 1:**

Introduction to Deep Learning, Bayesian Learning, Decision Surfaces Linear Classifiers, Linear Machines with Hinge Loss Optimization Techniques, Gradient Descent, Batch Optimization

### **Unit 2:**

Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning Unsupervised Learning with Deep Network, Autoencoders

### **Unit 3:**

Convolutional Neural Network, Building blocks of CNN, Transfer Learning Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization

### **Unit 4:**

Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc. Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation, Object Detection etc.

### **Unit 5:**

LSTM Networks Generative Modeling with DL, Variational Autoencoder, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Books and references

1. Deep Learning- Ian Goodfellow, YoshuaBengio, Aaron Courville, The MIT Press
2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

## **MCAE-06224: NATURAL LANGUAGE PROCESSING**

### **Unit 1:**

Introduction, Machine Learning and NLP, ArgMax Computation, WSD : WordNet, Wordnet; Application in Query Expansion, Wiktionary; semantic relatedness, Measures of WordNet Similarity, Similarity Measures (contd.)

### **Unit 2:**

Resnick's work on WordNet Similarity, Parsing Algorithms, Evidence for Deeper Structure; Top Down Parsing Algorithms, Noun Structure; Top Down Parsing Algorithms- contd, Non-noun Structure and Parsing Algorithms, Probabilistic parsing; sequence labeling, PCFG

### **Unit 3:**

Probabilistic parsing; PCFG (contd.), Probabilistic parsing: Training issues, Arguments and Adjuncts, Probabilistic parsing; inside-outside probabilities, Speech : Phonetics, HMM , Morphology ,

#### **Unit 4:**

Graphical Models for Sequence Labelling in NLP, Graphical Models for Sequence Labelling in NLP (contd.), Phonetics, Consonants (place and manner of articulation) and Vowels, Vowels (contd.), Forward Backward probability; Viterbi Algorithm

#### **Unit 5:**

Phonology, Sentiment Analysis and Opinions on the Web, Machine Translation and MT Tools - GIZA++ and Moses. Text Entailment, POS Tagging, Phonology; ASR, Speech Synthesis, HMM and Viterbi, HMM and Viterbi (contd), Precision, Recall, F-score, Map, Semantic Relations; UNL; Towards Dependency Parsing. Universal Networking Language, Semantic Role Extraction, Baum Welch Algorithm; HMM training, Baum Welch Algorithm; HMM training

References:

1. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
2. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
3. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
4. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

## **MCAE-06225: IMAGE PROCESSING AND COMPUTER VISION**

#### **Unit 1:**

Introduction to Computer Vision and Basic Concepts of Image Formation: Introduction and Goals of Computer Vision and Image Processing, Image Formation Concepts.

#### **Unit 2:**

Fundamental Concepts of Image Formation: Radiometry, Geometric Transformations, Geometric Camera Models.

#### **Unit 3:**

Fundamental Concepts of Image Formation: Camera Calibration, Image Formation in a Stereo Vision Setup, Image Reconstruction from a Series of Projections.

#### **Unit 4:**

Image Processing Concepts: Image Transforms. Image Processing Concepts: Image Transforms, Image Enhancement. Image Processing Concepts: Image Filtering, Colour Image Processing, Image Segmentation Image Descriptors and Features: Texture Descriptors, Colour Features, Edges/Boundaries.

Image Descriptors and Features: Object Boundary and Shape Representations. Image Descriptors and Features: Interest or Corner Point Detectors, Histogram of Oriented Gradients, Scale Invariant Feature Transform, Speeded up Robust Features, Saliency

### **Unit 5:**

Fundamentals of Machine Learning: Linear Regression, Basic Concepts of Decision Functions, Elementary Statistical Decision Theory, Parameter Estimation, Clustering for Knowledge Representation, Dimension Reduction, Linear Discriminant Analysis.

### **Unit 6:**

Applications of Computer Vision: Artificial Neural Network for Pattern Classification, Convolutional Neural Networks, Autoencoders. Applications of Computer Vision: Gesture Recognition, Motion Estimation and Object Tracking, Programming Assignments.

### **Books and references**

1. Forsyth & Ponce, “Computer Vision-A Modern Approach”, Pearson Education.
2. M.K. Bhuyan , “ Computer Vision and Image Processing: Fundamentals and Applications”, CRC Press, USA, ISBN 9780815370840 - CAT# K338147.
3. Richard Szeliski, “Computer Vision- Algorithms & Applications”, Springer.

## **MCAE-06226: MULTI PLATFORM WEB DEVELOPMENT**

### **Unit 1:**

Introduction to advanced web technology - Mark-up language technology (XML structures and tools), Advanced web technologies (such as AJAX and advanced web security), Searching and pattern matching using regular expressions, Issues and challenges of modern Web Technologies and Web 2.0, Advanced web topics (such as web services and Unicode)

### **Unit 2:**

Technological issues: XML processing, RDF processing

### **Unit 3:**

Taxonomies and ontologies for advanced web applications: Ontology modelling, Languages for representing ontologies on the web, Rules and inferences

### **Unit 4:**

Web services: Design and modelling of web services, Technologies for implementing web services.

### **Unit 5:**

Current applications of advanced web technologies

### **References:**

4. Semantic Web Primer, Semantic Web Primer, MIT Press, 2nd Edition, 2010
5. Semantic Web Technologies: Trends and Research in Ontology-based Systems by John Davies, Rudi Studer, and Paul Warren John Wiley & Son's
6. Web Technologies: A Computer Science Perspective by Jeffrey C. Jackson, Prentice Hall, 2006.

## **MCAE-06227: MOBILE COMPUTING (3-0-1)**

### **Unit 1:**

Introduction: Cellular networks, wireless LANs, application adaptation.

Cellular Overview : Cellular concepts, location management, handoffs.

### **Unit 2:**

Wireless LAN overview : MAC issues, mobile IP, ad hoc networks, TCP issues.

Applications overview : wireless applications, disconnected operations, data broadcasting, mobile agents.

### **Unit 3:**

GSM : Air-interface, channel structure, timing, architecture.

WAP: Architecture, protocol stack, application environment.

TCP: Asymmetric links, wireless errors, handoffs; i-tcp, snoop, link rxmit, m-tcp.

### **Unit 4:**

Ad hoc networks: MAC, routing, transport.

Routing: Virtual backbone, Kelpi, mobile-IP.

Data broadcasting : Push-pull, consistency.

Location management : HLR-VLR, hierarchical.

### **Unit 5:**

Access Technologies: Blue Tooth, GPRS, IEEE 802.11, CDMA. QoS in Wireless

### **Books/References:**

1. Schiller, Mobile Communications, Pearson, 2<sup>nd</sup> Edition, 2008
2. Mobile Communications, V. JeyasriArokiamary, Technical Publications, 1st Edition
3. Mobile Computing, Kumkum Garg, Pearson, 1st Edition, 2010
4. Mobile Computing, Raj Kamal, Oxford University Press, Usa, 1st Edition, 2008
5. Mobile Computing: Technology, Application and Service Creation, Asoke K Talukder, Hasan Ahmed, RoopaYavagal, Tata Mcgraw Hill Education Private Limited, 2nd Edition, 2010

## **MCAE-06228: BLOCKCHAIN TECHNOLOGIES**

### **Unit1:**

Introduction – basic ideas behind blockchain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles,

### **Unit2:**

Introduction to Bitcoin Blockchain Bitcoin Blockchain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bitcoin – mining .

### **Unit 3:**

Alternative coins – Ethereum and Smart contracts  
Alternative coins – Ethereum continued, IOTA

### **Unit4:**

The real need for mining – consensus – Byzantine Generals Problem, and Consensus as a distributed coordination problem – Coming to private or permissioned blockchains –

### **Unit5:**

Introduction to Hyperledger Permissioned Blockchain and use cases – Hyperledger, Corda Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems, and other

### **Reference:**

1. Bellare, Mihir; and Rogaway, Phillip. (September 21, 2005). "Introduction." In *Introduction to Modern Cryptography* (p. 10).

## **MCA 4<sup>TH</sup> SEMESTER**

### **MCAC-0621: SYSTEM PROJECT - II**