Syllabus Workshop on 04-09-2014
University of Kalyani
Department of Computer Science & Engineering
Proposed syllabus for M.C.A. (Master in Computer Applications)
with effect from September 2014.

Part I, Ist Semester

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks		
		Lecture	T	P	Total		S	Exam.	Total
Theoretical									
MCA 101	Mathematical Foundation - 1	3	1	-	4	4	30	70	100
MCA 102	Introduction to Computing & C	3	1	-	4	4	30	70	100
MCA 103	Basic Electronics & Digital Logic	3	1	-	4	4	30	70	100
MCA104	Introduction to Management Functions	3	1	-	4	4	30	70	100
MCA 105	Communicative English & Business Presentation	2	2	-	4	4	10	40 (Gr. A)	100 (A+ B)
							10	40 (Gr. B)	
Practical									
MCA 101L	C Programming Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 102L	Digital Logic Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 103L	Unix & Shell Programming Lab.	0	1	3	4	3	20	P-60,V-20	100
						Total Credit: 29		**Total Marks: 800**	

Part I, 2nd Semester

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks		
		Lecture	T	P	Total		S	Exam.	Total
Theoretical									
MCA 201	Data Structures	3	1	-	4	4	30	70	100
MCA 202	Numerical & Statistical Computing	3	1	-	4	4	30	70	100
MCA 203	Computer Organization & Architecture	3	1	-	4	4	30	70	100
MCA 204	Microprocessor	3	1	-	4	4	30	70	100
MCA 205	Mathematical Foundation II	3	1	-	4	4	30	70	100
Practical									
MCA 201L	Data Structures Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 202L	Numerical Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 203L	Microprocessor Lab.	0	1	3	4	3	20	P-60,V-20	100
						Total Credit: 29		**Total Marks: 800**	

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks		
		Lecture	T	P	Total		S	Exam	Total
Theoretical									
MCA 301	Database Management Systems	3	1	-	4	4	30	70	100
MCA 302	Operating Systems	3	1	-	4	4	30	70	100
MCA 303	Theory of Computing	3	1	-	4	4	30	70	100
MCA 304	Object Oriented Programming	3	1	-	4	4	30	70	100
MCA 305	Analysis & Design of Algorithm	3	1	-	4	4	30	70	100
Practical									
MCA 301L	DBMS Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 302L	OOPs Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 303L	System Software Lab.	0	1	3	4	3	20	P-60,V-20	100
						Total Credit:29		**Total Marks: 800**	

Part II, 2nd Semester

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks		
		Lecture	T	P	Total		S	Exam	Total
Theoretical									
MCA 401	Computer Graphics	3	1	-	4	4	30	70	100
MCA 402	Java & Web Technology	3	1	-	4	4	30	70	100
MCA 403	Computer Networks	3	1	-	4	4	30	70	100
MCA 404	Software Engineering	3	1	-	4	4	30	70	100
MCA 405	Artificial Intelligence	3	1	-	4	4	30	70	100
Practical									
MCA 401L	Graphics Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 402L	Java & Web Technology Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 403L	AI Lab.	0	1	3	4	3	20	P-60,V-20	100
						Total Credit:29		**Total Marks: 800**	

Part III, 1st Semester

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks		
		Lecture	T	P	Total		S	Exam	Total
Theoretical									
MCA 501	Digital Image Processing	3	1	-	4	4	30	70	100
MCA 502	Elective I	3	1	-	4	4	30	70	100

MCA 503	Elective II	3	1	-	4	4	30	70	100
MCA 504	Elective III	3	1	-	4	4	30	70	100
MCA 505	Elective IV	3	1	-	4	4	30	70	100
Practical	*** R-Report, P- Presentation, V - Viva**								
MCA 501L	Image Processing lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 502L	Web based DBMS Lab.	0	1	3	4	3	20	P-60,V-20	100
MCA 503P	Project I(Minor)	0	0	4	4	3		P-60,V-20	100
							Total Credit:29		**Total Marks: 800**

Part III, 2ⁿᵈ Semester

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks			
		Lecture	T	P	Total		Report	Presentation	Viva	Total
Dissertation										
MCA-CS-601	Project II (Project Work & Presentation + Viva)	-	-	24	24	16	200	100	100	400
MCA-IT-601	Grand Viva	-	-	-	-	8	-	-	200	200
						Total Credit: 24			**Total Marks: 600**	

Total Marks for Three Year M.C.A. (6-Semesters) Course is 4600, Total Credit is 169.

For sessional at least two intermediate examinations are to be taken, average mark will be the sessional marks for each subject. Corrected paper of these intermediate exams are to be returned to the respective students.

 # T – Tutorial, P – Practical, S – Sessional, Th – Theory, A – Asignment, R-Report, P- Presentation, V – Viva

Elective-I	Elective-II
1. MCA-E/01 Soft Computing	1. MCA-E/08 VLSI Design
2. MCA-E/02 Pattern Recognitions	2. MCA-E/09 Managerial Economics
3. MCA-E/03 Advanced DBMS	3. MCA-E/10 Computational Geometry
4. MCA-E/04 Parallel Processing	4. MCA-E/11 Data Mining
5. MCA-E/05 Embedded System Design	5. MCA-E/12 Distributed Computing
6. MCA-E/06 Simulation & Modeling	6. MCA-E/13 Compiler Design
7. MCA-E/07 Mobile Computing	7. MCA-E/14 Graph Algorithm
Elective-III	**Elective-IV**
1. MCA-E/15 Advance Data Structure	1. MCA-E/24 E-Commerce
2. MCA-E/16 Network Programming	2. MCA-E/25 Values & Professional Ethics
3. MCA-E/17 Remote Sensing & GIS Applications	3. MCA-E/26 Cloud Computing
4. MCA-E/18 Network Security	4. MCA-E/27 Bioinformatic**s**
5. MCA-E/19 Real Time Operating Systems	
6. MCA-E/20 Multi Object Optimization Technique	
7. MCA-E/21 Computer Communication Principles	
8. MCA-E/22 Managerial Economics	
9. MCA-E/23 Managerial Accounting	

MCA-101. MATHEMATICAL FOUNDATION – I
FULL MARKS: 100, Contact Hours: 3 + 1 + 0
Allotted Hrs: 40L

Sets, operation on sets, Cartesian products, relations   equivalence relation and classes ,partition function, natural numbers, induction and inductive definition and proofs, cardinality of set-finite, infinite, countable and uncountable , diagonalisation argument.

Binary operation- Groupoid , semigroup and monoid , subgroup, coset, Lagrange's theorem, cyclic group, order of a group , generators, normal subgroup, quotient group, homomorphism, isomorphism ,permutation group, direct product. Rings,subrings, ideals and quotient rings, integral domains and field, fields of fraction, Euclidian domain, and unique factorization domain.

Posets, Lattices and Boolean algebra

Vectors space, linear transformation, Matrices and Determination, characteristics polynomials, Eigen values.

Propositional Calculus- propositions and connectives, syntax, semantics- truth assignments and truth tables, validity and satisfiability, tautology, adequate set of connectives.

Introduction to Predicate calculus, Concept of quantifiers.

Text Books:
1. D. F. Stanat and D.E. McAllister: Discrete Mathematics in Computer Science.
2. Fraleigh: A first course in Algebra.

Reference Books:
1. S .D. Conte and C. De Boor: Elementary Numerical analysis: An Algorithmic Approach.
2. F. Mendelson : Introduction to Mathematical Logic.

MCA- 102.   INTRODUCTION TO COMPUTING AND C
Full Marks: 100, Contact Hours:3+1+0
Allotted Hrs: 40L

*Introduction to computers and operating environment
* Program development cycle
* Algorithm – Representations of Algorithm
              -Pseudocode
              -Flowchart
*Programming Languages
* Introduction to C
* Data representation and data types
* Control Structures
        -Conditional execution and transfers
        -repetitions
* Subprograms
        -Functions
        -procedures
        -parameter passing
* string processing
* Structures and enumerated data types.
        -Arrays, lists, stacks.
* Records and set
*Files
*Pointers
*Recursion
* Structured Programming

Text Books:

1. Tennence W.Pratt, "Programming languages design and implementation", Prentice Hall of India.
2. Allen B. Tucker, "Programming Languages", Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH pub.
4. Balagurusamy:ANSI C TMH
5. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB
5. Kanetkar, Yashvant - Let us C. - 3rd revised Edn. BPB

Reference Books:
1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas
3. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
4. Fundamentals of Programming Languages, R. Bangia,Cyber Tech

MCA-103. BASIC ELECTRONICS & DIGITAL LOGIC
Full Marks: 100, Contact Hours: 3 +1+0
Allotted Hrs: 40L

Introduction to electronics and electronic systems, Semiconductor and devices like diodes, BJT, FET, MOSFET, Rectifier and Filters, Transistor biasing. Small signal transistor amplifiers, Operational amplifiers, Feedback and Oscillators.
Number System and Codes- Algorithms for Conversation Between Different Number System and Between Different Codes; Representation of Real Number as Fixed Point and Floating Point Signed Binary Numbers, IEEE Standards of Representation. Error Correction and Error Detection Codes.
Boolean Algebra- Postulates, Fundamental Theorems and Fundamental Operations, Boolean Function and their Representation using Venn Diagrams, Truths Table and Karnaugh Maps, Duality and Complementation, Canonical SP and PS Forms.
Minimization of Boolean Function through Fundamentals Theorems, Karnaugh Maps and Quine McCluskey's Tabular Methods.
Common Combination Circuits Like Encoder / Decoder, Code Converter, Comparator, Multiplexer/Demultiplexer, Parity Generator/Check, Adder/ Subtractor Etc. Design of Combinational Circuits Using Universal Gates, Multiplexer, ROM and PLA.
Introduction to Sequential Circuits, Different Types of Flip Flops and Their Characteristics and Excitation Tables , Simple Sequential Circuits Like Storage Registers Shifts Registers, Counters, Etc. Design of Binary, Decade and Modulo-N Counters. Counters using Shift Register with Feedback, Design of Finite State M/C's.

Text Books:
1. Givone: digital Principles &design ,TMH
2. Digital Electronics – Dr. Saroj Rangnekar , ISTE/EXCEL BOOKS
3. Malvino:Digital Principles &application TMH
4. Jain :Modern Digital Electronics 2/e TMH

Refrence Books:
1. Marcovitz:Intro to logic Design Tata Mcgraw-hill
2. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill
3. Digital Technology- Virendra Kumar, New Age
4. Digital Logic Design- Morries Mano, PHI
5. Yarbrough- Digital Logic,Vikas
6. Salivahan- Digital Circuits and Design, Vikas

MCA-104   INTRODUCTION TO MANAGEMENT FUNCTIONS
Full Marks: 100, contact hours: 3+1+0
Allotted Hrs: 40L

Accountancy- Its origin and scope, fundamental principal of double entry system single entry system, books of original entry and prime entry, cash book and its different uses, Trial Balance, Preparation of final account and Balance sheet , Accounting for noon-trading concerns.

Financial Management: Discipline and scope of Finance as distinct from accountancy, analysis of the Profit and Loss A/C and Balance Sheet, including Ratio Analysis and their implication. Fund Flow Statement. Business Budget & its control. Concept of cost and method costing their application, (IT Act)

Text Books:
1. Financial Management and Accounting - P. K. Jain, S. Chand & Co.
2. Management & Accounting: Principles and Practice - R. K. Sharma & Shashi Kumar Gupta, Kalyani Publishers.
3. Advanced Management Accounting - Kaplan & Atkinson, PHI.
4. Fundamentals of Financial Management - Van Home, PE.

Reference Books:
1. Financial Mgmt Accounting, Gupta,Pearson
2. Financial Mgmt, I.M. Pandey, Vikas
3. Financial Mgmt., Khan & Jain, TMH
4. Financial Mgmt , Mcmenamin, OUP
5. Financial Mgmt & Policy, Van Horne, PHI
6. Financial Mgmt,Kulkarni & Satyaprasad, Himalaya

MCA-105   COMMUNICATIVE ENGLISH & BUSINESS PRESENTATION
Full Marks: 100, Contact Hours: 3+0+1
Allotted Hrs: 40L

This should cover general and technical writing, oral communication and listening skills: letter writing, technical report writing, and business communication.

Expression: Practical communication skill development, business presentation with multimedia, speaking skill, prepared speech, extempore speech.

Reading skill: comprehension test.

Writing: Precise, technical/business letter, organization of writing material, poster presentation writing technical document, preparing software user manual, preparing project documentation.

Text Books:
1. Business Correspondence & Report writing, Sharma,THM
2. Business Communication strategies monipally, THM
3. English for Technical Communication, Laxminarayana,Scitech

Reference Books:
1. Business communication, Kaul, PHI
2. Communication Skill for Effective Mgmt. Ghanekar, EPH

MCA-101 L.   C programming Lab
Full Marks: 100, Contact Hour: 0+0+3=3
Allotted Hrs: 40P   Lab pertaining to MCA-102

MCA-102L. Digital Logic Lab
Full Marks: 100, Contact Hour:0+0+3
Allotted Hrs: 40P   Lab Pertaining to MCA-103

MCA-103   UNIX Lab and Shell Programming
Full Marks: 100, Contact Hour: 0+0+3
Allotted Hrs: 40P

Windows basics, UNIX, Shell programming
MS-DOS, MS-word, Windows/NT, MS-Excel, Power Point.

2nd Semester

MCA – 201. DATA STRUCTURES
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40L

Data Types and Algorithms: Time and Space Analysis Of Algorithms-Order Natations: Linear Data Structures: Sequential Storage Representation-Arrays, Strings, Stacks, Queues, Dequeues and other their Applications: Linear Data Structures: Linked Storage Lists, Circularly Linked Lists, Doubly Linked Lists, Applications: Recursion-Design of Recursive Algorithms, Tail Recursion, When Not to use Recursion, Removal of Recursion; Non-Linear Data Structures: Trees, Binary Trees, Binary Search Tree, Traversals and Threads, Insertion and Deletion Algorithms, Height-Balanced and Weight-Balanced Trees, B-Trees, B+ Trees, Applications of Trees: Graphs-Representation, Sorting and Searching-Review of Various Algorithms, Hashing.

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

Reference Books:
1.Heileman:data structure algorithims &Oop Tata McGraw Hill
2. Data Structures Using C – M.Radhakrishnan and V.Srinivasan, ISTE/EXCEL BOOKS
3. Weiss Mark Allen, "Algorithms, Data Structures, and Problem Solving with C++", Addison Wesley.
4. Horowitz Ellis & Sartaj Sahni, "Fundamentals of Data Structures", Galgotria Pub.
5 Tanenbaum A. S. , "Data Structures using 'C' "
6 Ajay Agarwal: Data structure Through C.Cybertech

MCA – 202. NUMERICAL & STATISTICAL COMPUTING
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40L

Prerequisite: A Good Knowledge of Linear Algebra and Calculus.
Floating – Point Representation of Number with Finite Precision and Its Consequences. Concepts of Truncation and Round-Off Errors. Roots of Equation: Iterative Methods, Bisection Methods, False Position Method, Newton-Raphson Method, Solution of Polynomial Equation, Solution of Simultaneous Linear Equation. Gaussian Elimination, Pivoting, Ill Conditioning, Gauss-Siedel Iterative Methods, Comparison of Direct and Iterative Methods. Interpolation: Finite Differences, Polynomial Interpolation, Spline Interpolation. Differentiation & Integration: Differentiation by Polynomial Fit, Trapezoidal and Simpson Rules, Gaussian Quadrature. Numerical Solution Of Ordinary Differential Equations: Solution by Taylor Series, Euler's Method, Predictor Corrector Method, Rungi-Kutta Method. Statistical Methods: Sampling, Frequency Distribution. Measures of Central Tendency and Dispersion, Moments, Discrete.
Distribution Binomial and Poisson Distribution, Regression Analysis/Curve Fitting, Correlation Co-Efficient, Multiple, Partial and Rank Correlations, Tests of Significance- X Test, T-Test and F-Test.

Text Books:
1. R. L. Burden and J. D. Faires: Numerical Analysis, Cengage Learning India; 09 edition 2012

Reference Books:
1. David Kincaid & Ward Cheney : Numerical Analysis, American Mathematical Society; Third edition (2010)
2. J. Stoer and R. Bulirsch : Introduction To Numerical Analysis , Springer (sie) (2009)

MCA – 203. COMPUTER ORGANIZATION AND ARCHITECTURE
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40L

Introduction to basic structures and operational concepts. Instruction formats, instruction execution process and addressing modes. Stacks and subroutines.
Control unit – hardwired and micro programmed control, concept of horizontal and vertical microprogramming, Nano programming.
Bit-slice processors emulation.
Main memory organization and memory interleaving. Memory hierarchy – virtual memory; cache memory and secondary memories. Input/output organization-memory mapped, standard (isolated) and linear selection techniques of I/O processors.
Data transfer over synchronous and asynchronous buses; discussions on some standard interface buses.
A brief introduction to RISC processors and parallel processing techniques.

Text Books:
1 Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
2 Hamacher, "Computer Organisation",
3 Computer Organization and System Software, EXCEL BOOKS
4. Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
5. Mano, M.M., "Computer System Architecture", PHI.

Reference Books:
1. Burd- System Architecture,Vikas
2. Computer Organization & Architecture (TMH WBUT Series), Ghosh & Pal, TMH

MCA – 204. MICOPROCESSOR
Full Marks: 100, Contact Hours: 3 + 1 + 0
Allotted Hrs: 40L

Introduction to microprocessors. Microprocessor architecture organization and programming of microprocessor inter-8085.
Data transfer techniques and their implementation: programmed data transfer, DMA transfer, interrupt driven data transfer, serial and parallel communication.
Some common peripherals & their interfacing: key board & display, programmable parallel interface, programmable timer, ADC & DAC etc. development aids and troubleshooting techniques: self-test concepts, memory testing techniques, single stepping technique etc. basic features of some advanced microprocessors: single chip microcomputer, 16-bit & 32-bit microprocessors, RISC & CISC concepts, idea of transputer.

Text Books:
1. Krishna Kant, "MICROPROCESSORS AND MICROCONTROLLERS Architecture,
programming and system design using 8085, 8086, 8051 and 8096". PHI 2007.
2. Douglas V Hall, "MICROPROCESSORS AND INTERFACING, PROGRAMMING AND HARDWARE" TMH, 2006.

Reference Books:
1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.
2. Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing The PC", Delmar Publishers, 2007.
3. A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 2007.

MCA – 205. MATHEMATICAL FOUNDATION-II
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40L

Combinatorics- Quick review of permutations and combinations binomial thermo, multinomial theorem, principle of inclusion and exclusion. Recurrence relations (applications to recursive algorithms), linear homogeneous relations-characteristic root method (distinct and repeated roots). Generating functions ordinary and exponential. Introduction to Polya's theory of counting equivalence classes, burnside's lema.
Graph theory-graphs and digraphs, subgraphs, complement, isomorphism, walks, paths, circuits, distance, connectedness and reachability, cut-sets, adjacency matrix and lists, Euler cycle trails and Hamiltonian cycle, spanning trees, Planar graphs, Kuratowski's Theorem, dual, independence number, clique number, chromatic number and 4-color theorem, matching.
Probability and Statistics – Total and conditional probability, Distributions: Binomial, Poisson, Normal, Tabulation, Frequency Distribution, Measures of Central Tendency, Dispersion, Moments curve fitting, correlation and regression.

Text Books:
1. C. L. Liu: Elements of Discrete Mathematics
2. R. A. Brualdi: Introduction to Combinatorics
3. J. L. Moot, A. Kandel and T. P. Baker: Discrete Mathematics for Computer Scienctists.

References:
1. N. Deo: Graph Theory with applications to Computer Science
2. W. Feller: Introduction to Probability

MCA – 201 L   Data Structure Lab
Full Marks: 100, Contact Hours: 0 + 0 + 3
Allotted Hrs: 40 P   Lab pertaining MCA – 201

MCA – 202L   Numerical Lab
Full Marks: 100, Contact Hours: 0 + 0 + 3
Allotted Hrs: 40 P   Lab pertaining MCA – 202

MCA – 203L   Microprocessor Lab
Full Marks: 100, Contact Hours: 0 + 0 + 3
Allotted Hrs: 40 P   Lab pertaining MCA – 204

3rd Semester

MCA 301.   DATABASE MANAGEMENT SYSTEMS
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction: Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.
Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.
Relational Model: Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations,
Views, Modifications Of the Database.
SQL and Integrity Constraints: Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design: Functional Dependency, Different anamolies in designing a Database., Normalization using funtional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Nomalization using multi-valued depedencies, 4NF, 5NF.

Internals of RDBMS: Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

File Organization & Index Structures: File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree.

Text Books:
1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
7. Ullman JD., "Principles of Database Systems", Galgottia Publication.

Reference Books:
1. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
2. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
3. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

MCA 302.   OPERATING SYSTEMS
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction:
Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure: Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Process Management:
Processes: Concept of processes, process scheduling, operations on processes, co-operating processes, interprocess communication.

Threads: overview, benefits of threads, user and kernel threads.

CPU scheduling : scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Storage Management:
Memory Management: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory : background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character

devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management : Disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks. Protection & Security:Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Text Books:
1. Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
2. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
3. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
4. Dhamdhere: Operating System TMH

Reference Books:
1. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
2. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.

MCA 303.   Theory of Computing
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Finite automata, regular expressions, push-down automata, context free grammars, pumping lemmas.

Turing machines, Church-Turing thesis, decidability, halting problem, reducibility, recursion theorem.

Introduction to Language Processors: Interpreters, Compilers, Assemblers; overview of a compiler, Elements of Formal Language Theory, Regular Grammars and Regular Expressions, Lexical Analyzer, Context free grammar and parsing techniques, Shift reduce parsing operator, Precedence parsing, Top-down parsing, predictive parsers, LR parsers; Intermediate code generation, symbol tables, code optimization, code generation, error detection and recovery.

Text Books:
1. Principles of compiler construction – Aho, Ullman
2. Compilers – Aho, Sethi, and Ullman
3. System Software – An Introduction to System Programming – L. L. Beck 2e, Addison Wesley
4. System programming & OS – D. M. Dhamdere – T. M. H.

Reference Books:
1. Systems Programming – J. J. Donovan, McGraw Hill
2. Structured System Programming – Welsh &Mckeag, EEE, and PHI.
3. UNIX& Borland C Manuals.

MCA 304.   OBJECT ORIENTED PROGRAMMING
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

History of the development of object-oriented programming languages, object-attributes and methods, message passing, Classes: Notion of abstraction, encapsulation/information hiding and modularity, Instantiation and initialization of objects: Constructors and destructor, Class hierarchy: single, multilevel, multiple and repeated inheritance, polymorphism, Object hierarchy – Aggregation; Advantages and disadvantages of object-oriented programming language, Features of C++.

Text Books:
1. Jana, C++ & Object Oriented Programming, PHI
2. Folk M. J. , Zoellick B., Riccard G. : File Structures : An Object-Oriented Approach with C++

Reference Books:
1. Herbert Schild : The Complete Reference to C++, Osborne McGrawHill. McGraw Hill Education (India) Private Limited; 4 edition
2. Bjarne Stroustrup: Programming: Principles and Practice Using C++, Addison Wesley; 2 edition
3. James R Rumbaugh, Michael R. Blaha, William Lorensen, Frederick Eddy , William Premerlani. : Object Oriented Modeling and Design, Prentice Hall; 1 edition

MCA305.   ANALYSIS AND DESIGN OF ALGORITHMS
Full Marks: 100, Contact Hours: 3L + 1T
Allocation Hrs: 40L

Basic concepts – complexity measures, worst and average case, upper and lower bounds. Algorithm design principles – divide and conquer, recursion, greedy method, dynamic programming.
Bounds for selecting and sorting – finding maximum, finding minimum and quick sort, radix sort.
Union – Find algorithms
Graph algorithms – Breadth first search, depth first search, topological sort, connected and biconnected components, Minimum spanning trees – Kruskal's and Prim's, shortest paths – Dijkstra's, Bellman-Ford's and Floyd-Warshall's.
Algebraic algorithms – evaluation of polynomials, Strassen's matrix multiplication.
Pattern matching algorithms.

Text Books:
1. U. Manber: Introduction to Algorithms
2. T. Cormen, C. Leiserson and R. Rivest: Introduction to Algorithms
3. Randomised algorithms by R. Motwani& P. Raghavan, Cambridge University Press, 1995,   ISBN 0-521-47465-5.

Reference Books:
1. Text algorithms by M. Gochemore& W. Rytter, Oxford University Press, 1994.
2. Analysis of algorithms by M. Hofri, Oxford University Press, 1995.

MCA 301 L.   DBMS LAB (Web Based)
Full Marks: 100, Contact Hours: 0 + 0 + 3
Allotted Hrs: 40 P   Lab pertaining MCA-301

MCA 302 L.   OOPS Lab
Full Marks: 100, Contact Hours: 0 + 0 + 3
Allotted Hrs: 40 P   Lab pertaining MCA-304

MCA 303 L. System Software Lab
Full Marks: 100, Contact Hours: 0 + 0 + 3
Allotted Hrs: 40 P Lab pertaining MCA-303

4th Semester:

MCA - 401.   COMPUTER GRAPHICS
Full Marks:100,Contact Hours: 3L +1T
Allotted Hrs: 40 L

Display Devices : Line and point plotting systems; raster, vector, pixel and plotters, Continual refresh and storage displays, Digital frame buffer, Plasma panel displays, Very high resolution devices, High-speed drawing, Display processors, Character generators, Colour-display techniques (Shadow-mask and penetration CRT, colour look-up tables. analog false colours, hard-copy colour printers.)

Display Description : Screen co-ordinates, user co-ordinates; Graphical data structures (compressed incremental list, vector list, use of homogeneous co-ordinates); Display code generation; Graphical functions; The view algorithms, two-dimensional transformation.
Interactive Graphics : Pointing and positioning devices (cursor, light pen, digitizing tablet, the mouse, track balls). Interactive graphical techniques; Positioning, Elastic Lines, Inking, Zooming, Panning, Clipping, Windowing, Scissoring.
Graphic Languages : Primitives (constants, actions, operators, variables), plotting and geometric transformations, display subroutines.
3-D Graphics: Wire-frame perspective display, Perspective depth, Projective transformations, Hidden line and surface elimination, Transparent solids, Shading. GKS is to be used as the standard teaching tool.

Text Book:
1. Hearn D., Baker P.M. : Computer Graphics, Prentice-Hall, 1986.
2. James D. Foley, Andries van Dam, Steven K. Feiner and John HughesComputer Graphics: Principles and Practice, Addison-Wesley Professional; 3rd edition.

Reference Books:
1. Akenine-Moller, Tomas, Eric Haines and Naty Hoffman. Real-Time Rendering. 3rd ed. A K Peters/CRC Press, 2008
3. Peter Shirley, Michael Ashikhmin, Steve Marschner : Fundamentals of Computer Graphics, A K Peters/CRC Press; 3 edition (21 July 2009)

MCA 402 Java and Web Technology
Full Marks:100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Java Programming: Fundamentals of Object-Oriented Programming, Java Evolution, Overview of Java Language, Constants, Variables, and Data Types, perators and Expressions, Decision making and Branching, Decision making and Looping, Classes, Objects and Methods, Arrays, Strings and vectors, Interfaces, Multiple Inheritances, Packages: Putting Classes Together, Multithreaded Programming, Managing Errors and Exceptions, Applet Programming, Graphics Programming, Managing Input/output Files in Java. Internet-working concept and architectural Model: Introduction, application level Interconnection, network level interconnection, properties of the Internet, Internet architecture, Interconnection through IP gateways or routers. Internet and intra-net. Internet address: Introduction, Universal identifiers, three primary classes of IP addresses, Classless IP address, network and broadcast address, mapping internet addresses to physical addresses (ARP): ARP protocol format transport gateways and sub net addressing, multi-cast addressing. Internet Protocol: Internet architecture and philosophy, the concept of unreliable delivery, connectionless delivery system, the Internet datagram, routing direct and indirect delivery. Table driven IP routing. Protocol layering, reliable stream transport(TCP), TCP performance. Bootstrap protocol (BOOTP). Routing: The origin of gateway routing tables, original Internet architecture and cores, core gateways, automatic route propagation, vector distance(Bellman-Ford) routing gateway-t gateway protocol (GGP), autonomous system concept, exterior gateway protocol (EGP), interior gateway protocol (RIP, OSPF, HKELO): routing information protocol (RIP), the hello protocol, combining RIP, Hello and EGP, routing with partial information. Application: Remote Login (TELNET, Rlogin): Side, Forcing the server to read a control function, TELNET options, TELNET option navigation, Electronic mail (822, SMTP and POP): Electronic mail, Mailbox names and aliases, the relationship of inter-networking and mail. Interment Management (SNMP, COMP) protocols, Electronic Data Interchange. WWW. CGI, PERL ASP, Core Java, XML, E-commerce.

Text Books:
1. Shelly Powers et al., Dynamic Web Publishing, Techmedia, 1998.
2. Jamie Jaworski, Java 1.2 Unleashed, Techmedia, 1998.
3. Robert Niles et.al., CGI by Examples , Que, 1996.

Reference Books:

1. Scot Johnson et.al., Using Active Server Pages , Que,, Information Technology.
2. Web Technologies by Achyut S Godbole and Atul Kahat

MCA 403. Computer Networks
F.M. 100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Communications: Concepts of data transmission, signal encoding, modulation methods, synchronization, multiplexing and concentration, coding method, cryptography.
Networks: Communication system architecture OSI reference model, topology types, selections, design, local area networks(LAN), CSMA/CD, token bus token ring techniques, link level control(LLC) protocols, HDLC, analysis of protocols and performance, concepts in network layer, switching techniques, routing methods.
TCP/IP, Session, Presentation and Application Layers function. Data communication fundamentals-signals and communication channels. Baseband communication, modulation and MODEMS. Channel sharing techniques -FDM, TDM, polling and concentration. Error Detection -CRC codes, Framing techniques. Stop-and-wait (PAR) protocol with efficiency analysis.
Network structure and architecture-communication subnet and local access. Circuit, message and packet switching. Elementary queuing theory (results only) with network applications. OSI reference model. Local area networks-Ethernet and token ring LANS. Network layer services and functions. Routing techniques. Network access protocols-X.25 and IP.
Important functions of transport, session and presentation layers-TCP and ISO protocols. Network application-file transfer and file servers, electron mail, virtual terminals, and distributed systems.

Text Book:
1. Behrouz A Forouzan, DeAnza CollegeFirouz Mosharraf: Computer Networks: A Top-Down Approach, McGraw Hill Education (India) Private Limited (11 November 2011)
2. Comer D E., Internetworking With TCP/IP Principles, Protocols, And Architecture, PHI
(2013)

References Books:
1. Tanenbaum A.S., David J. Wetherall : Computer Network, Pearson; Pearson; 5 edition
2. Stalling W.: Data and Computer Communication, Pearson; Nineth edition (2013)
3. Peterson L L, Davie B S, Computer Networks: A Systems Approach, Morgan Kaufmann
Publishers In; 5th Revised edition edition
4. Stevens, UNIX Network Programming, Pearson Education; 1ST edition (2003)

MCA- 404   SOFTWARE ENGINEERING
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction to software engineering, concept of a software project, size factor, quality and productivity factor, different phase of a software development life cycle, managerial issues. Software project planning: Problem definition, development of a solution strategy, development process planning, software development models and their comparative study; Organizational structure planning, project formats and team structures; Planning for quality assurance and configuration management; Planning for verification and validation. Software economics: Cost estimation and evaluation techniques, cost estimation based on
COCOMO model and Raleigh model. Software requirements analysis and specifications techniques- their notations & languages. Software design: Concept of fundamental design; Design approaches- top-down & bottom-up, structured, object-based & object oriented design; Design specification and notations. Software implementation: Structured coding techniques, coding styles, and standards; Guidelines for coding and documentation. Software verification and validation: Theoretical foundation, black box and white box approaches; Integration and system testing. Software reliability: Definition and concept of reliability, software faults, errors, repair and availability, reliability and availability models.

Text Books:
1. Pressman, R.S., Software Engineering: A Practitioner's Approach, McGraw Hill.
2. Rajib Mall: Fundamentals of Software Engineering, Prentice Hall India Learning Private
Limited; Fourth edition (2 April 2014)

Reference Books:
1. Ian Sommerville: Software Engineering, Pearson Education; Nineth edition (2013)
2. Fairley, R.E., Software Engineering Concepts, McGraw Hill Education (India) Private Limited
(23 April 2001)

MCA- 405   ARTIFICIAL INTELLIGENCE
Full Marks: 100, Contact Hours: 3L + 1T
Allotted Hrs:40 L

Introduction – What is AI – Importance of AI – objectives.
Introduction to LISP and PROLOG.
Knowledge – Its representation, Organization – Manipulation and Acquisition.
Predicate calculus in AI – First order predicate logic & its use in knowledge representation-Resolution principle. Use of resolution in reasoning and question answering. Production systems and search strategies production system and its variants-Heuristic search methods, AND/OR Graphs and AO
Algorithm. Searching Game Tree.
Uncertainly Management-Fuzzy logic, Bayesian inferencing, dempster-shafer theory of beliefs, structured representation of knowledge- - Semantic networks, frames, conceptual dependency & scripts. Expert systems-rule based system architecture non-production system architecture-knowledge acquisition methods-Explanation methods-Expert system shells, Application of AI in natural language processing, speech understanding. Computer Vision, planning, etc.

Text Books:
1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International

Reference Books:
1. Expert Systems, Giarranto, VIKAS
2. Artificial Intelligence, Russel, Pearson

MCA 401 L. Graphics Lab.
Full Marks: 100, Contact Hours: 0 + 0 +3
Allotted Hrs: 40 p Lab pertaining MCA-401

MCA 402 L. Java & Web Technology Lab
Full Marks: 100, Contact Hours: 0 + 0 + 3
Allotted Hrs: 40 P Lab pertaining MCA-402

MCA 403 L. Al Lab.
Full Marks: 100, Contact Hours: 0 + 0 +3
Allotted Hrs: 40 P Lab pertaining MCA-403

5ᵗʰ Semester

MCA 501. DIGITAL IMAGE PROCESSING

F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction : Digital Image representation; Fundamental steps in Image processing, Elements of digital Image processing systems.
Digital Image Fundamentals: Sampling and quantization, Imaging geometry.
Image Transforms: Fourier, Walsh, Hademord, discrete cosine and Hotelling transforms and their properties.
Image Enhancement: Enhancement by point processing, spatial filtering, Frequency domain enhancement, Color image processing.
Image Restoration: Unconstrained and constraint restoring, inverse filtering, Wiener Filter, Geometric transforms.
Image Compression: Image Compression models, Error-free compression, Lossy compression, Image compression standards.
Image Segmentation: Detection of discontinuities, edge linking, Thresholding.
Representations and Descriptions: Chain codes, shape numbers, moments and Fourier and other descriptors.
Recognition & Interpretations.

Text Book:
1. Digital Image Processing, Gonzalves,Pearson
2. Digital Image Processing, Jahne, Springer India
3.Digital Image Processing & Analysis,Chanda & Majumder,PHI
4.Fundamentals of Digital Image Processing, Jain, PHI

References Books:
1.Image Processing, Analysis & Machine Vision, Sonka, VIKAS
2. Getting Started with GIS- Clarke Keith. C; PE.
3. Concepts & Techniques of GIS - Lo C.P, Albert, Yeung K.W- PHI.

MCA 502. Elective I
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

MCA 503   Elective II
Full Marks: 100, Contact Hours: 3L+1T
Allotted Hrs: 40 L

MCA 504   Elective III
Full Marks: 100, Contact Hours: 3L+1T
Allotted Hrs: 40 L

MCA 505   Elective IV
Full Marks: 100, Contact Hours: 3L+1T
Allotted Hrs: 40 L

MCA 501 L.   Image Processing Lab
Full Marks: 100, Contact Hours: 0+0+3
Allotted Hrs: 40 P   Lab pertaining to MCA-501

MCA 502 L.   Web based DBMS Lab.
Full Marks: 100, Contact Hours: 0+0+3
Allotted Hrs: 40 P   Lab pertaining to MCA-502

MCA 503 P. Project 1(Minor)
Full Marks: 100, Contact Hours: 0+0+3
Allotted Hrs: 40 P

MCA-E/01 Soft Computing

F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction: Introduction to soft computing; introduction to biological and artificial neural network; introduction to fuzzy sets and fuzzy logic systems.
Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.
Artificial neural networks and applications: Different artificial neural network models; learning in artificial neural networks; neural network applications in control systems. Neural Nets and applications of Neural Network.
Fuzzy systems and applications: fuzzy sets; fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering; applications of fuzzy systems.
Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control.
Applications: Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Text Books:
1. M. Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall.
2. J.S.R.Jang, C.T.Sun and E.Mizutani: Neuro-Fuzzy and Soft Computing, PHI,   Pearson Education.
3. Timothy J.Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill.
4. Davis E.Goldberg: Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley.

Reference Books:
1. S. Rajasekaran and G.A.V.Pai: Neural Networks, Fuzzy Logic and Genetic   Algorithms, PHI.
2. D. E. Goldberg: Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley.

MCA-E/02 Pattern Recognitions
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction - Definitions, data sets for Pattern Recognition
Different Paradigms of Pattern Recognition
Representations of Patterns and Classes
Metric and non-metric proximity measures
Feature extraction, Different approaches to Feature Selection
Nearest Neighbor Classifier and variants
Efficient algorithms for nearest neighbour classification
Different Approaches to Prototype Selection
Bayes Classifier, Decision Trees, Linear Discriminant Function
Different Approaches to Prototype Selection, Bayes Classifier
Decision Trees, Linear Discriminant Function
Support Vector Machines, Clustering, Clustering Large datasets, Combination of Classifiers, Applications - Document Recognition.

Text Books:
1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, Wiley, 2000.

Reference Books:
1. Pattern Recognition Paperback by Narasimha Murthy and Susheela Devi
2. Pattern Recognition and Machine Learning (Information Science and Statistics) by Christopher Bishop

MCA-E/03 Advanced DBMS
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design –fragmentation, allocation criteria. Storage mechanisms. Translation of global queries. / Global query optimization. Query execution and access plan. Concurrency control – 2 phases locks. Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking

commitment protocols. Partitioned networks. Checkpoints and cold starts.
Management of distributed transactions- 2 phase unit protocols. Architectural aspects. Node and link failure recoveries. Distributed data dictionary management. Distributed database administration. Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled. Alternative architecture. Development tasks, Operation- global task management. Client server databases -SQL server, open database connectivity. Constructing an application.

Text Books:
1. Database System Concepts, Silberschatz Korth, Sudarshan, MH
2. Database Management Systems,Ramakrishnan, MH
3. Beginning SQL Server 2000 programming, Dewson,SPD/WROX

Reference Books:
1. Database Management Systems, Leon, VIKAS
2. My SQL :Enterprise Solutions, Alexender Pachev, Wiley Dreamtech

MCA-E/04 Parallel Processing
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction to Parallel Processing, Parallelism in sequential Mechanics, Abstract
model, Multiprocessor architecture, Architecture classifications and Techniques. Pipelining, Arithmetic and Instruction Pipelines, Pipelining Hazard. Interconnection Networks, Hyper cubes, Shuffle Exchanges, Trees, Meshes and
Butterfly networks, parallel Algorithm for, linear Algebra, Matrix Multiplication,
solving linear systems, probabilistic algorithm, possibility of super linear speedup, Sorting, Vector and Array Processors. Shared Memory Programming, general model of shared Memory Programming, Thread management, attributed, Thread implementation Java Threads. Parallel Processing – Operating Systems for parallel Processors, types, tools and languages Parallel Programming Languages – FORTRAN 90 (Introduction)
Characterization of Distributed Systems – Introduction, Examples of Distributed Systems, Resource sharing and the Web, Challenges. Message passing Model, programming model, PVM, Remote procedure Call – parameter passing, Java Remote Method Invocation Other parallelism paradigms – Data Flow Computing, Systolic Architecture.

Text Books:
1. Scientific Computing, An introduction with parallel computing: Gene Golub/James M.Ortega
2. Introduction to parallel processing: M Sasikumar, Dinesh S., P. Ravi Prakesh: PHI, 2002.

Reference Books:
1.Parallel Computing, Quinn,TMH
2.Introduction to Parallel Processing ,Sashi Kumar,PHI
3.Parallel Programming, Wilkinson, Pearson
4.Elements of Parallel Computing, Rajaraman,PHI
5.Fundamentals of Parallel Processing, Jordan, PHI
6. Advanced Computer Architecture, Hwang, TMH

MCA-E/05 Embeded System Design
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction: Characteristics of embedded systems; Applications; Concept of real time systems; Challenges in embedded system design.

Embedded Processors: Review of structure of a basic computer system: CPU, memory, I/O devices on a bus; Memory System Mechanisms – Caches, Memory Management Units and Address Translation; I/O subsystem – input and output devices, busy-wait I/O, interrupt driven I/O; Interrupts – Basics, interrupt latency; Co-processors; Processor Performance Enhancement-Pipelining, Superscalar execution, caching.

The Embedded Computing Platform: Board Buses – Bus Arbitration and Timing; The CPU Bus; Memory Devices and their Characteristics – Random-Access memories, Read-Only memories; I/O devices – Timers and Counters, Watchdog timers, GPIO, A/D, D/A, Displays, Keyboards; Component Interfacing – Memory interfacing, device interfacing, interfacing protocols; Designing with processors – System architecture, Hardware design; Target Devices-FPGA, CPLD.

Embedded Software Architectures: Round-Robin; Round-Robin with Interrupts; FunctionQueue-Scheduling Architectures; Real-Time Operating System Architecture; Selecting an Architecture.

Real-time operating systems: Tasks and Task States; Tasks and Data; Context Switching-Cooperative multitasking, Preemptive multitasking; Scheduling Policies-Rate-Monotonic scheduling, Earliest-Deadline-First scheduling, RMS versus EDF; Semaphores and Shared Data; Message Queues; Timer Functions; Events; Memory Management; Priority Inversion; Interrupt Routines in an RTOS Environment.

Low-power computing: Sources of energy consumption: toggling, leakage – Instruction-level nstrategies for power-management: functional unit management - Memory system power consumption: caches, off-chip memory - Power consumption with multiple processes – Systemlevel power management: deterministic, probabilistic methods.

Hardware Accelerators: CPUs and Accelerators – Why Accelerators, Accelerator Design; Accelerated System Design – Performance Analysis, System Architecture Framework, Partitioning, Scheduling and Allocation, System Integration and Debugging. Networked embedded systems: Why networked embedded systems - Example networked embedded systems: automobiles, factory automation systems - Types of network fabrics - Network performance analysis - Internet-enabled embedded systems.

Design and Development of Embedded Systems: Creating an Embedded System Architecture; Implementing the Design - Embedded Software Development Tools, Host and Target Machines, Linker/Loader for Embedded Software, Getting Embedded Software into Target System, Debugging Techniques and Tools, Testing on the host machine, instruction set simulators, oscilloscopes, logic analyzers, in-circuit emulators, monitors, System Boot-Up; Quality
Assurance and Testing of the Design.

Text Books:
1.Frank Vahid, Tony Givargis: Embedded System Design: A Unified Hardware/Software
Introduction, Wiley; Student edition (21 July 2006)
2. Mazidi M. Ali , Mazidi J. G., and Rolin McKinlay, The 8051 Microcontroller and Embedded
Systems; Pearson; Second edition (2008)

Reference Books :
1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System
Design, Morgan Kaufmann; 2 edition (June 16, 2008)
2. David E. Simon, Embedded Software Primer,, Addison-Wesley Professional; 1 edition
(August 15, 1999)
3. Raj Kamal: Embedded Systems ; McGraw-Hill Education (India); 2nd Edition (March 9,
2009)

MCA-E/06 Simulation and Modeling
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

System and system environment, components of system, discrete and continuous System, static and dynamic systems, model of a system, steps required in deriving a model of a system. Verification and validation of simulation model, stochastic nature of the output data. Introduction to the simulation, why and when simulation is an appropriate tool, advantages and disadvantages of Simulation, Areas of application, general steps followed in simulation experiment.

Simulation of continuous system, description of continuous model using differential equations, chemical reactor system, integration vs. simulation, selection of integration formula, other examples of continuous system simulation, water reservoir system. Discrete system simulation, fixed time step vs. next event models, use of random numbers. test of randomness, generation of non uniform random numbers, Monte-Carlo vs. stochastic simulation.

Simulation of queuing system, elements of queuing theory, Poisson arrival pattern, negative exponential service time, simulation of single server queue, two severs queue and more general queues.

Simulation of PERT, network model of project, critical path computation, uncertainties in the activity durations, normal PERT calculations, simulation of activity network, comparison of normal PERT calculation and calculation through simulations.

Simulation of inventory system, elements of inventory theory, more complex inventory models, examples of simulation of inventory system : with respect to service level considerations and minimum cost considerations, generation of Erlang distributed variates. simulation languages, continuous and discrete simulation languages, features of

some popular simulation languages : SIMSCRIPT, GPSS, SIMULA etc. Factors in selection of simulation language.

Text Books:
1. Gorden, G. : System Simulation, Parentice Hall, 1978
    2. Payer T. A. : Introduction to Simulation, McGraw-Hill, 1982
    3. Reitman, J. : Computer Simulation Application, Wiley, 1971
    4. Spriet, W.A. : Computer-aided Modeling and Simulation, Academic Press, 1982

Reference Books:
1. Barnes, B. : Modelling and Performance measure, ment of Computer Systems, 1982
    2. Deo, N. : Systems Simulation with Digital Computer, Prentice Hall, New Delhi, 1979
    3. Banks J., Carson II J.S., Nelson B.L. : Discrete-Event system Simulation, Prentice Hall, New Delhi, 1996

MCA-E/07 Mobile Computing
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction, enabling concepts for mobile and personal communications. Terminal mobility, personal mobility and service mobility. The Intelligent Networks (IN) concept: Mobile and personal communication: Past, Present & Future some related network aspects.

Mobile computing Architecture: History of computers, History of internet, Internet – The ubiquitous Network Architecture for mobile computing, Three tier Architecture, Design considerations for mobile computing, Mobile computing through Internet, Making existing applications mobile enabled.

The cellular concept and its initial implementations: The cellular concept, Multiple access technologies for cellular systems, Cellular system operation and planning (General principles, System Architecture, Location updating and call setup), Handoff and power control. Initial implementations of the cellular concept: The AMPS system, TACS system, NMT system, NTT system, concluding remarks.

Digital cellular mobile systems: Introduction, GSM : The European TDMA digital cellular standard, GSM standardization and service aspects GSM reference architecture and function partitioning, GSM radio aspects, Security aspects, GSM protocol model, Typical call

flow sequences in GSM, Evolutionary directions for GSM IS-136 : The North American TDMA digital cellular standard(D-AMPS), Background on North American digital cellular, Service aspects of D-AMPS(IS-136), Network reference, Radio aspects, Security aspects, Protocol model and typical flow sequences, Evolutionary directions

Text Book:
1. Mobile Communications by Jochen Schiller, 2nd Edition, Pearson Education Limited
2. Mobile and Personal Communication systems and services, Raj Pandya, Prentice Hall of India, 2001.

Reference Books: 1
1. T. S. Rappaport: Wireless Communications: Principles and Practice, 2nd Edition, PHI
2. Stefano Basagni, Marco Conti, Silvia Giordano, Ivan Stojmenovic: Mobile Ad Hoc Networking: The Cutting Edge Directions, Wiley-IEEE Press; 2 edition (March 4, 2013)

MCA-E/08 VLSI Design
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Review of Microelectronics and Introduction to MOS Technologies: MOS, CMOS, BiCMOS Technology. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: Ids – Vds relationships, Threshold Voltage VT, Gm, Gds and ωo, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.
Layout Design and Tools: Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.
Logic Gates & Layouts: Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.
Combinational Logic Networks: Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.
Sequential Systems: Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.
Floor Planning: Floor planning methods, Global Interconnect, Floor Plan Design, Off-chip connections.

Text Book:
1. Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.

Reference Books:
1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Principals of CMOS VLSI Design – N.H.E Weste, K. Eshraghian, 2nd Ed., Addison Wesley.

MCA-E/09 Managerial Economics
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

The Fundamentals of Managerial Economics:
Goals and Constraints The Nature and Importance of Profits Understanding Incentives Economic rationality,Scarcity and opportunity cost Marginal and IncrementalAnalysis Basic Calculus: The Calculus of Optimization.
Theory of Demand:
Demand and Supply Market Equilibrium Price Ceilings and Price Floors Comparative Statics: Changes in Demand and Supply. Price Elasticity of Demand Price Elasticity, Total Revenue, and Marginal Revenue Factors Affecting Price Elasticity Cross Price Elasticity. Income Elasticity of Demand Other Elasticities ,Elasticities for Nonlinear Demand Functions. Elasticity of Supply Demand Forecasting Choice and Utility Theory Law of Diminishing marginal utility Consumer Equilibrium Indifference curve Analysis Consumer Surplus Price effect,Substitution Effect and Income Effect.
Theory of Production and Cost:

The Production Function Profit-Maximizing Input Usage. Isoquants and Isocosts Cost Minimization and Optimal Input Substitution. The Cost Function Breakeven analysis, Contribution analysis Long-run Costs and Economies of Scale Multiple Cost Functions and Economies of Scope. Learning curve.
Theory of Market and pricing:
The Nature of Industry Perfect Competition Monopoly Monopolistic Competition Oligopoly Game theory Product pricing.

Text Books:
1. Yogesh Maheswari, Managerial Economics, Phi Learning, Newdelhi, 2005 Gupta G.S.
2. Managerial Economics, Tata Mcgraw-Hill, New Delhi Moyer &Harris.

Reference Books:
1. Anagerial Economics, Cengage Learning, Newdelhi, 2005 Geetika, Ghosh & Choudhury, ,
2. Managerial Economics, Tata Mcgrawhill, Newdelhi, 2011

MCA-E/10 Computational Geometry
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

The following list of topics is very tentative. Depending on time, some topics may be added or dropped, and the order of topics may change.

Preliminaries:
Basic Euclidean geometry
Grids and Hulls:
Fixed-radius near neighbors, convex hull algorithms, dominance and applications.
Linear Programming:
Half-plane intersection and randomized LP, backwards analysis, applications of low-dimensional LP.
Intersections and Triangulation:
Plane-sweep line segment intersection, triangulation of monotone subdivisions, plane-sweep triangulation of simple polygons.
Point Location:
Kirkpatrick's method, trapezoidal decompositions and analysis, history DAGs.
Voronoi Diagrams:
Basic definitions and properties, Fortune's algorithm.
Geometric Data Structures:
kd-trees, range trees and range searching, segment trees.
Delaunay Triangulations:
Point set triangulations, basic definition and properties, randomize incremental algorithm and analysis.
Arrangements and Duality:
Point/line duality, incremental construction of arrangements and the zone-theorem, applications.
Geometric Approximation:
Dudley's theorem and applications, well-separated pair decompositions and geometric spanners, VC dimension, epsilon-nets and epsilon-approximations,
Geometric Retrieval:
kd-trees, range trees, hereditary segment trees, nearest neighbor searching.

Text Books:
1. M. de Berg, M. Van Kreveld, M. Overmars, and O. Schwarzkopf, Computational Geometry: Algorithms and Applications (3rd Edition), Springer, 2008.
2. F. Preparata and M. Shamos, Computational Geometry, Springer-Verlag, 1985.
3. K. Mulmuley, Computational Geometry: An Introduction Trough Randomized Algorithms, Prentice-Hall, 1994.
4. J. O'Rourke, Computational Geometry in C, 2nd ed., Cambridge Univ. Press, 1998.

Reference Books:
1. K. Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice Hall, 1994.
2. T. Cormen, et.al., Introduction to Algorithms, 2nd ed., MIT Press, 2001.
3. J. O'Rourke, Art Gallery Theorems and Algorithms, Oxford Univ. Press, 1987.
4. R. Motwani and P. Raghavan, Randomized Algorithms, Cambridge Univ. Press, 1995.

MCA-E/11 Data Mining
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Data Warehousing
Concept of Data Warehouse, Differences between Operational Databases and Date Warehouse, Multi-dimensional Data Model, Schemas for Multi-dimensional Databases, Data Cube Representations, Data Warehouse Architecture, OLTP vs OLAP, Efficient Query Processing in data Warehouses, Indexing of OLAP data, Meterialization concept;
Data Mining
Data Clustering: Partitioning, Hierarchical, Density-based, Grod Based and Model Based Methods;
Classification & Prediction: Decision Tree Techniques, Back-Propagation Method, Bayesian Method
Association Rule Mining Techniques: Frequent Itemset Generation, Apriori, Horizontal Method, Sampling Approach, Hashing Approach; Dynamic Association Rule Mining;
Mining of Complex Types of Data: Mining of Spatial Databases, Multimedia Databases, Timeseries and sequence Data, Text Databases, WWW Data;

Text Book:
1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson; 1 edition (May 12, 2005)

Books/References:
1. Jiawei Han and Micheline Kamber: Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers In; 3rd Revised edition edition (25 July 2011)

MCA-E/12 Distributed Computing
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Fundamentals:
Evolution of Distributed Computing Systems, System models, issues in design of Distributed Systems, Distributedcomputing environment, web based distributed model, computer networks related to distributed systems and web based protocols.
Message Passing:
Inter process Communication, Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.
Remote Procedure Calls:
The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, Lightweight RPC, Optimization for Better Performance.
Distributed Shared Memory:

Design and Implementation issues of DSM, Granularity, Structure of Shared memory Space, Consistency Models, replacement Strategy, Thrashing, Other Approaches to DSM, Advantages of DSM.
Synchronization:
Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms.
Resource and Process Management:
Desirable Features of a good global scheduling algorithm, Task assignment approach, Load Balancing approach, Load Sharing Approach, Process Migration, Threads, Processor allocation, Real time distributed Systems.
Distributed File Systems:
Desirable Features of a good Distributed File Systems, File Models, File Accessing Models, File-shearing Semantics, Filecaching Schemes, File Replication, Fault Tolerance, Design Principles, Sun's network file system, Andrews file system, comparison of NFS and AFS.
Naming:
Desirable Features of a Good Naming System, Fundamental Terminologies and Concepts, Systems-Oriented Names, Name caches, Naming & security, DCE directory services.
Case Studies Mach & Chorus (Keep case studies as tutorial)

Books:
1. Distributed OS by Pradeep K. Sinha (PHI)
2. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair: Distributed SystemsConcepts and Design, Addison Wesley; 5 edition

Reference Books:
1. Tanenbaum S.: Distributed Operating Systems, Pearson Education
2. Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms, (Pearson Education)

MCA-E/13 Compiler Design
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Compiler Structure & Lexical Analysis Compiler Structure: Compilers and Translators, Analysis- Synthesis Model of Compilation, Various Phases of Compiler, Pass Structure, Bootstrapping & Compiler Construction Tools. Lexical Analysis: Interface with input, parser and
symbol table, token, lexeme and patterns, difficulties in lexical analysis, Error Reporting, Regular definition, Transition diagrams, LEX. Capabilities of Lexical Analyzer
Finite Automata: Nondeterministic Finite Automata, Deterministic Finite Automata, Subset Construction, Thompson's construction, DFA State Minimization. The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.
Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, No recursive Predictive Parsers, Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers. YACC, Syntax Directed Definitions, Type checking.

Text Books:
1. Alfred V Aho , Jeffrey D. Ullman: "Principles of Compiler Design", Narosa Publ. House.
2. A.V. Aho, R. Sethi and J.D Ullman: "Compiler: principle, Techniques and Tools", Addison Wesley.

Reference Books:
1. *Compiler Construction: Principles and Practice*, Kenneth C. Louden, PWS Publishing, 1997, ISBN 0-534-93972-4.
2. Tremblay and Sorenson: "The theory and Practice of Compiler Writing" – McGraw Hill.

MCA-E/14 Graph Algorithm
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

PageRank algorithm. DFS, BFS, Tarjan's algorithm for strongly connected components. Representation of graphs.

Maze and river network simulation via invasion percolation case study. Minimum spanning trees, Prim-Dijkstra-Jarnik algorithm, Boruvka's algorithm, Kruskal's algorithm.

DAGs and topological ordering.

Road map path planning case study. Shortest paths, relaxation algorithms, Dijkstra's algorithm, Bellman-Ford algorithm, Johnson's algorithm.

A* algorithm, Euclidean distance based distance estimation, landmark-based distance estimation.

Transportation scheduling case study. Euler tours. Travelling salesman problem.
Exponential-time dynamic programming for the TSP, approximation algorithms and the approximation ratio, MST-doubling heuristic, Christofides' heuristic.

Baseball elimination case study. Maximum flow problem, minimum cut problem, max-flow min-cut theorem, augmenting path (Ford-Fulkerson) algorithm.

Medical school residency assignment case study. Matchings, stable marriage, Gale-Shapley algorithm for stable marriage.

Bipartite graphs, formulating bipartite maximum matching as a flow problem, Hopcroft–Karp algorithm.

Using matchings to find vertex covers and independent sets, partition into a minimum number of rectangles.

Graph coloring, greedy coloring, interval graphs, and perfect graphs.
Chordal graphs and using Lexicographic breadth-first search to find an elimination ordering.

Cliques, Moon-Moser bound on maximal cliques, Bron-Kerbosch algorithm.

Planar graphs; review of planarity-related topics from earlier weeks (graph drawing, road maps, invasion percolation via minimum spanning trees of grid graphs, graph coloring and the four-color theorem).

Duality, duality of Euler tours and bipartiteness, Euler's formula, greedy 6-coloring, Boruvka in linear time. Planarity testing, and Fáry's theorem.

Text Books:
1. Introduction to Graph Theory (Dover Books on Mathematics) 2nd Edition by Richard J. Trudeau.
2. Graphs, Algorithms, and Optimization (Discrete Mathematics and Its Applications) by William Kocay and Donald L. Kreher.

Reference Books:
1. Algorithm Design 1st Edition, by Jon Kleinberg and Éva Tardos
2. The textbook Algorithms, 4th Edition by Robert Sedgewick and Kevin Wayne

MCA-E/15 Advanced Data Structure
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Complexity of algorithms: worst case, average case, and amortized complexity. Algorithm analysis techniques, Amortized Analysis, Garbage collection, Analysis of Quick sort, Fibonacci Heaps, van Emde Boas Trees, Multithreaded Algorithms, Number Theoretic Algorithms, Strings and String Matching Algorithms, Computational Geometry, Lower Bound Theory – NP Completeness, Approximation Algorithms. Non-linear Data Structure: Trees - Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs - Representations, Breadth-first and Depth-first Search.

Text Books:
1. A.V. Aho, J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms, Addison Wesley, Reading Massachusetts, USA, 1983.
2. Donald Knuth. The Art of Computer Programming: Fundamental Algorithms, Third Edition. Addison-Wesley, 1997. ISBN 0-201-89683-4
3. Donald Knuth. The Art of Computer Programming Volume 3: Sorting and Searching, Third Edition. Addison-Wesley, 1997. ISBN 0-201-89685-0.

Reference Books:
1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms, Third Edition. MIT Press and PHI, 2010.
2. Samet, Hanan, Foundations of multidimensional and metric data structures. Morgan Kaufmann, 2006, ISBN 978-0-12-369446-1.
3. Dinesh Mehta and Sartaj Sahni Handbook of Data Structures and Applications, Chapman and Hall/CRC Press, 2007.
4. M.A. Weiss, Data Structures and Algorithms Analysis in C++, Benjamin/Cummins, Redwood City, California, USA, 1994

MCA-E/16 Network Programming
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction to networking and Internet protocols via programming and hands-on labs.
TCP/IP protocol architecture; user datagram protocol (UDP); multicasting; transmission control protocol (TCP); standard Internet services, and protocol usage by common Internet applications. Sockets programming; client/server; peer-to-peer; Internet addressing; TCP sockets; UDP sockets; raw sockets. Multithreading and exception handling. Finger, DNS, HTTP, and ping clients and servers. Routers and architectures, routing protocols.

Router and switch configurations, Internet operating systems. Internetwork setup, network topology, wireless internetworking.

Network protocol analyzers; traffic generation.

Text Books:

1. Stevens, UNIX Network Programming, Pearson Education; 1ST edition (2003)
2. Behrouz A Forouzan, DeAnza CollegeFirouz Mosharraf: Computer Networks: A Top-Down Approach, McGraw Hill Education (India) Private Limited (11 November 2011)

Reference Books:
1. Comer D E., Internetworking With TCP/IP Principles, Protocols, And Architecture, PHI (2013)
2. Stalling W.: Data and Computer Communication, Pearson; Nineth edition (2013)

MCA-E/17 Remote Sensing and GIS Apllications
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction: Sun and atmosphere, Remote Sensing a historical perspective.
Electromagnetic Radiations: EM radiators, polarization, attenuation.
Thermal radiations, EM for remote sensing.
Fundamental of Radiometry.
Physical Basics of Signatures: Signature OIR, TIR & Microware Region
Remote Sensor: Classifications of Sensors, Sensor parameters.
Resolution- Spatial & Spectral
Optical, Microwave Sensors
Platform: Principle of Sattelite Motion, Types of orbit, Orbit perturbations.
GPS – Data Products: Dataformats, data product generation output media
Date analysis: Visual analysis, Digital Classifications
Application of Remote Sensing: Agriculture, Forestry, Land Cover Studies
Water Resource, Earth System Science
Geographical Interaction System Application.

Text Books:
1.Peter Burrough, Rachael A. McDonnell, Principles of Geographical Information Systems, OUP
Oxford; 3rd edition (2015)
2. Marble D F and Calcins, H. W. , Basic Readings in Geographic Information System. Spad Systems Ltd.
Refrence Books:
1. Burrough, P. A., Principles of GIS for land Resource Assesment, Oxford publications
2. Jeffery Star and John Estates, Geographic Information Systems, An Introductory, Prentice
Hall Inc.

MCA-E/18 Network Security
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

Email privacy: Pretty Good Privacy (PGP) and S/MIME.

IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3. Intruders, Viruses and related threats.

Firewall Design principles, Trusted Systems. Intrusion Detection Systems.

Text Books:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, Wiley Dreamtech

Reference Books:

1. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson
4. Principles of Information Security, Whitman, Cengage Learning.

MCA-E/19 Real Time Operating Systems
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

REVIEW OF OPERATING SYSTEMS
Basic Principles – System Calls – Files – Processes – Design and Implementation of processes – Communication between processes – Operating System structures.
DISTRIBUTED OPERATING SYSTEMS
Topology – Network types – Communication – RPC – Client server model – Distributed file system – Design strategies.
REAL TIME MODELS AND LANGUAGES
Event Based – Process Based and Graph based Models – Petrinet Models – Real Time Languages – RTOS Tasks –RT scheduling - Interrupt processing – Synchronization – Control Blocks – Memory Requirements.
REAL TIME KERNEL
Principles – Design issues – Polled Loop Systems – RTOS Porting to a Target – Comparison and study of RTOS VX works and COS – Case studies.
RTOS APPLICATION DOMAINS
RTOS for Image Processing – Embedded RTOS for voice over IP – RTOS for fault Tolerant Applications – RTOS for Control Systems.

TEXT BOOKS:

1. Tanenbaum, "Distributed Operating Systems", Pearson Education.
2. Raymond J.A.Bhur, Donald L.Bailey, "An Introduction to Real Time Systems", PHI 1999.

REFERENCE BOOKS

1. Charles Crowley, "Operating Systems-A Design Oriented approach", McGraw Hill 1997.
2. C.M. Krishna, Kang, G.Shin, "Real Time Systems", McGraw Hill, 1997.

MCA-E/20 Multi Object Optimization Technique
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L
Linear Programming: Mathematical model, assumptions of linear programming, graphical solution, simplex method, Dual simplex method, Applications, Sensitivity analysis.
Introduction to integer programming, Branch and Bound techniques.
Special types of linear programming problems - transpolation and assignment models. Traveling saleman problem, Applications. Introduction to Dynamic programming: Deterministic and probabilistic Dynamic programming. Network Analysis, Shortest Route problem, Applications. Project Scheduling in PERT-CPM. Diagram representation, critical path calculation, time chart, resource leveling, cost consideration in project scheduling, project control, Applications.

Sequencing models and its applications. Replacement models and its applications.

Text Books:
1. TAHA, H.A.: Operations Research Macmillan, New York (1987).
2. Gillet, B.E.: Introduction to Operations Research-a Computer Oriented Algorithmic-Approach. McGraw-Hill (1976).

Reference Books:
1. Churchman, C.W. and Arnchoff E.L.: Introduction to Operations Research John Wiley and sons.
2. Srinath, L.S.: Linear Programming, East-West, New Delhi.

MCA-E/21 Computer Communication Principles
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Amplitude and Frequency Modulation – their generation and detection Bandwidth requirements Low Power and High
Modulators and Modulated amplifiers. Superheterodyne detection. Signal to Noise ratio of A.M. and P.M. transmission.
A/D, D/A Converters. Shannon's sampling Theorem. PAM, PWM, PPM and PCM. Their generation and detection.
Digital Modulation : ASK, FSK, PSK performance evaluation. Time Division Multiplexing and Demultiplexing.
Modems, Error control and coding, Channel capacity.
Data Transmission Synchronization, Data protection, error detection and correlation.
Elements of Satellite Communication tracking and control.

Text Books:
1. Taub H. and Shilling D. L., "Principles of Communication Systems", 2/e,TMH
2. Carlson R. B., "Communication Systems ,4/e, Mc.Graw Hill
3. Lathi B. P., "Communication Systems", John Wiley.

Reference Books:
1. Kennedy—Electronic Communication Systems, 4/e , TMH
2. Haykin S. S., "An Introduction to Analog and Digital Communication Systems", Wiley Eastern.

MCA-E/22 Managarial Accounting
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Financial Accounting – An Introduction: Introduction , Meaning of Accountancy, book-keeping and Accounting , Accounting Process, Objectives for accounting , Differences between book-keeping and accounting Users of accounting information , Limitations of Accounting , Basic terminologies

Accounting Concepts, Principles, Bases and Policies: Introduction , Accounting Concepts, Principles, Policies and Standards, Types of accounting concepts - Business Separate entity concept - Going concern concept - Money measurement concept - Periodicity concept - Accrual concept, Accounting Principles - Principle of Income recognition - Principle of expense - Principle of matching cost and revenue - Principle of Historical costs - Principle of full disclosure - Double aspect principle - Modifying Principle - Principle of materiality - Principle of consistency - Principle of conservatism or prudence, Accounting Policies - Changes in Accounting Policies - Disclosure in case of changes in Accounting Policies, Accounting Standards - Scope and functions of Accounting Standards Board -   International Financial Reporting System

Double Entry Accounting: Introduction , Meaning of double entry accounting, Classification of accounts under Traditional approach, Classification of accounts under Accounting Equation approach, Comparison of traditional approach with Modern approach equal approach, Accounting Trail , Transactions and events , Meaning and roles of debit and credit , Accounting equation

Secondary Books: Introduction , Secondary books , Purchases Book/Purchases Day book - Cash discount, Trade discount - Difference between cash discount and trade discount, Sales Book or Sales Day book - Purchase Returns Book - Sales Returns Book, Bills receivable book - Bills payable book - Cash book , Posting to Ledger accounts Posting to Ledger

Trial Balance: Introduction , Meaning , Objectives of preparing a trial balance , Methods of preparing a trial balance, Preparation of Trial balance, Adjusting Entries , Errors and their rectification, Errors disclosed by Trial Balance , Errors not disclosed by Trial Balance , Steps to locate the errors

Final Accounts: Introduction , 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

Introduction to Management Accounting: Introduction, Meaning of 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: Introduction , Meaning of Ratio , Steps in Ratio Analysis, Classification of Ratios , Du Pont Chart , Solved Problems , Advantages of Ratio Analysis, Limitation of Ratio analysis

Funds Flow Analysis: Introduction, Meaning of 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: Introduction, Meaning of 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

Understanding Cost: Introduction, Meaning of Cost, Objective of Costing, Methods of Costing, Technique of Costing, Classification of Cost, Elements of Cost, Statement of Cost Sheet, Solved Problems

Marginal Costing and Break Even Analysis: Introduction , Concept of Marginal Costing , Characteristics of Marginal Costing , Difference between Absorption Costing and Marginal Costing , Marginal Cost, Contribution , Cost Volume Profit (CVP) Analysis , Break Even Chart , Break Even Point, Profit Volume ratio or MCSR , Target profit , Margin of Safety , Application of Marginal cost , Limitations of Marginal cost, Solved Problems

Decisions Involving Alternative Choices: Introduction, Decision Making, Types of Costs, Types of Choices Decisions, Make or Buy Decisions, Addition / Discontinuance of a Product line, Sell or Process Further, Operate or Shut down, Exploring New Markets, Maintaining a desired level of profit

Budgetary Control: Introduction , Meaning of a Budget , Budgetary control , Objectives of budgetary control, Merits of budgetary control, Essential features of Budgetary Control , Steps in budgetary Control , Types of Budgets , Cast Budget , Flexible Budget , Limitation of Budget Control

Standard Costing: Introduction , Definition of Standard Costing, Meaning, Difference between Standard cost and Budgetary Control, Establishment of standards, Variance analysis, Material cost variance, Material price variance, Material usage variance , Material Mix variance, Material Yield variance, Direct labor variance, Labor Efficiency Variance, Labor Rate variance, Labor mix variance, Labor Yield Variance

Text Books:
1. Managerial Accounting, ISV (WSE) Paperback – 2012 by James Jiambalvo
2. Managerial Accounting 5th Edition by John Wild and Ken Shaw

Reference Books:
1. Managerial Accounting, 14th Edition 14th Edition by Ray Garrison (Author), Eric Noreen (Author), Peter Brewer
2. Managerial Accounting, 2nd Edition, Ramji Balakrishnan

MCA-E/24 E-Cmmerce
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Computer Systems in Electronic Business
Business Process Re-Engineering
Electronic commerce Policy and Theory
Supply Chain Management
Customer Relationship Management
International trading network & communication protocols
Electronic payment standards
E-Commerce strategy, Marketing and Business Processes.

Text Books:
1. E-Commerce & managerial Perspective,Joseph,PHI
2. E Commerce, Rayport, TMH

Reference Books:
1. E Commerce, Diwan & Sharma, EXCEL
2. Creating & winning E-Business, Napier,VIKAS

MCA-E/25 Values & Professional Ethics
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Science, Technology and Engineering as Knowledge and as Social and Professional Activities.
Effects of Technological Growth:
Rapid Technological growth and depletion of resources. Reports of the Club of Rome. Limits to growth; sustainable development. Energy Crisis; Renewable Energy Resources.
Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics. Appropriate Technology Movement of Schumacher: later developments. Technology and developing nations.
Problems of Technology transfer. Technology assessment/ impact analysis; Industrial hazards and safety, safety regulations safety engineering. Politics and technology, authorization versus democratic control of technology; Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centred Technology.
Ethics of Profession:Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical Responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond.
Case studies: Profession and Human Values, Value Crisis in contemporary society. Nature of values: Value Spectrum of a 'good' life Psychological values: Integrated personality; mental health. Societal values: The

modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity Moral and ethical values: Nature of moral judgments; canons of ethics; Ethics of virtue; ethics of duty; ethics of responsibility. Work ethics, professional ethics.

Text Books:
1.Blending the best of the East & West, Dr. Subir Chowdhury, EXCEL
2.Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
3.Business Ethics,Pherwani,EPH

Reference Books:
1. Ethics,Indian Ethos & Mgmt., Balachandran,Raja,Nair, Shroff Publishers
2. Business Ethics: concept and cases, Velasquez, Pearson

MCA-E/26 Cloud Computing
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Defining a Cloud, Cloud Types - NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models - Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing - a shift in paradigm Benefits and advantages of Cloud Computing A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients IaaS - Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS - Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform, Identity as a Service (IDaaS), Compliance as a Service (CaaS)

Text Books:
1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill
3. Education (India) Private Limited, 2013

Reference Books:
1. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
2. Cloud Computing, Miller, Pearson
3. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson

MCA-E/27 Bioinformatics
F.M.100, Contact Hours: 3L + 1T
Allotted Hrs: 40 L

Introduction:
Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy.
Protein Information Resources, Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.
Genome Information Resources
DNA sequence databases, specialized genomic resources
DNA Sequence analysis
Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence a nalysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

Pair wise alignment techniques

Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

Multiple sequence alignment

Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

Secondary database searching

Importance and need of secondary database searches, secondary database structure and building a sequence search protocol

Analysis packages

Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages

Text Books:

1. Bioinformatics- A Beginner's Guide, Jean-Michel Claveriw, Cerdric Notredame, WILEY DreamTech India Pvt. Ltd
2. Sequence Analysis in A Nutshell, Scott Markel &Darryl Leon, O'REILLY

Reference Books:

1. Molecular Cell Biology by Daid Baltimar
2. Aurther M. Lesk, Introduction to Bioinformatics, Oxford University Press, 4th edition (2014)
3. Dan E. Krane and Michael L. Raymer, Fundamental Concepts of Bioinformatics Krane and Raymer, DORLING KINDERSLEY (RS); First edition (2003)
4. David Mount : Bioinformatics: Sequence and Genome Analysis, CBS; 2 edition (2005)

6th Semester

MCA-CS 601Project (Project work + Presentation**)**   **Full Marks: 400 (300+100)**
MCA-IT 601   Grand Viva   **Full Marks: 200**