DEPARTMENT OF COMPUTER SCIENCE & INFORMATICS

UNIVERSITY OF KOTA, KOTA

Master of Computer Application (MCA), session 2021-2022

Structure and Syllabus for MCA

Important information about the course

Name of faculty & Name of Course	Intake	Duration	Admission Eligibility	Admission fee (in Rs.) & Admission Process
MCA	60 [30(SFS) + 30(GAS)]	04 Sem. (2 years)	Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree. **OR** Passed B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level . Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.	As per RMCAAP

Scheme of Course Based on CBCS

MCA –I Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 101	Computer organization & Architecture	4	4	0	0	30	70	100
2.	MCA 102	Data structures	4	4	0	0	30	70	100
3.	MCA 103	Discrete Mathematics	4	4	0	0	30	70	100
4.	MCA 104	Data Base Management System	4	4	0	0	30	70	100
5.	MCA 105	Technical Communication	2	1	0	2	15	35	50
6.	MCA 106	Lab on Data structures	4	0	0	8	30	70	100
7.	MCA 107	Lab on DBMS using PHP	2	0	0	4	15	35	50
8.	MCA 108	Seminar	1	0	0	2	7.5	17.5	25
9.	MCA 109	***Bridge Course	4(3+1)	3	0	2	30 (15L+15P)	70 (35L+35P)	100
Total Credit			25	Total Marks					625

L* = Lecture T*= Tutorial P*= Practical

*** NOTE: Only for students admitted on the basis of B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level. Students have to pass compulsorily the bridge course examination. Marks of this paper will not be mentioned in the mark-sheet, only pass/fail will be mentioned. Bridge course shall be an Audit Course whose award shall not be considered for overall MCA Course credit and percentage.

MCA - II Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 201	Data Science	4	4	0	0	30	70	100
2.	MCA 202	Computer Oriented Numerical Methods	4	4	0	0	30	70	100
3.	MCA 203	Data Communication & Networking	4	4	0	0	30	70	100
4.	MCA 204	Python Programming	4	4	0	0	30	70	100
5.	MCA 205	Software Engineering	4	4	0	0	30	70	100
6.	MCA 206	Lab on Computer Oriented Numerical Methods	2	0	0	4	15	35	50
7.	MCA 207	Lab on Python	2	0	0	4	15	35	50
8.	MCA 208	Summer training	1	0	0	##	0	25	25
Total Credit			25	Total Marks					625

L* = Lecture T*= Tutorial P*= Practical

##			
Paper	**Credit**	**Duration**	**Marks**
MCA 208 (Summer Training)	1	45 days	25

MCA - III Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 301	Information and Network Security System	4	4	0	0	30	70	100
2.	MCA 302	Programming with JAVA	4	4	0	0	30	70	100
3.	MCA 303	Theory of Computation	4	4	0	0	30	70	100
4.	MCA 304	Design and Analysis of Algorithms	4	4	0	0	30	70	100
5.	MCA 305	Elective	2	2	0	0	15	35	50
6.	MCA 306	Lab on Java	4	0	0	8	30	70	100
7.	MCA 307	Lab on DAA	2	0	0	4	15	35	50
8.	MCA 308	Lab on Elective	1	0	0	2	7.5	17.5	25
Total Credit			25	Total Marks					625

L* = Lecture T*= Tutorial P*= Practical

List of Electives:

MCA 305.1: Big Data Analytics
MCA 305.2: Cloud Computing
MCA 305.3: Advanced DBMS

MCA - IV Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 401	Computer Graphics	4	4	0	0	30	70	100
2.	MCA 402	Operating System	4	4	0	0	30	70	100
3.	MCA 403	Artificial Intelligence	4	4	0	0	30	70	100
4.	MCA 404	Elective-1	4	3	0	2	30	70	100
5.	MCA 405	Elective-2	4	3	0	2	30	70	100
6.	MCA 406	Lab on Computer Graphics	1	0	0	2	7.5	17.5	25
7.	MCA 407	Lab on Operating System	1	0	0	2	7.5	17.5	25
8.	MCA 408	Major Project	3	0	0	6	22.5	52.5	75
Total Credit			25	Total Marks					625

L* = Lecture T*= Tutorial P*= Practical

List of Elective - I

MCA 404.1: Wireless Technologies

MCA 404.2: Image Analysis & Computer Vision

MCA 404.3: System testing

List of Elective - II

MCA 405.1: Natural Language Processing

MCA 405.2: Internet of Things (IoT)

MCA 405.3: Software Project Management

Note: Student have to elect one elective paper from each list**.**

Distribution of Marks (I to IV Semester)

Major Project [75]: Break-up

The following competencies will be acquired by the student through Major Project:

1. An ability to identify, formulate and implement computing solutions.
2. An ability to design and conduct experiments, analyze and interpret data related software development projects.
3. Able to design a system, component or process as per needs and specification of the clients.
4. Development of the skill to work on multidisciplinary tasks and will be aware of the new and emerging disciplines that will impact development.

Internal Evaluation(Max. Marks 22.5)	SRS (Document + Presentation)	7
	SDS (Document + Presentation)	7
	Mid-term demo of Project	8.5
External Evaluation(Max. Marks 52.5)	Project Report	30
	Viva-Voce + final Presentation	10+12.5
	Total Marks	**75**

Internal Marks [30] Break-up

Class Test – I	15
Presentation/ Case-Study/ Group Activity/ Class Test / Lab work	15
Total Marks	**30**

Seminar [25] Break-up

Internal Evaluation (Max. Marks 7.5)	Article Submission (Based on Latest developments in the field of Computer Science)	3.5
	Presentation (Based on Article submitted)	4
External Evaluation (Max. Marks 17.5)	Viva-Voce+ Presentation (Based on Article submitted)	7+10.5
	Total Marks	25

Summer Training Marks [25] Break-up

Report Submission (Based on Summer Training)	10
Presentation (Based on work done during Summer Training)	8
Viva-Voce	7
Total Marks	25

Semester wise-marks	MCA I Semester	MCA II Semester	MCA III Semester	MCA IV Semester
	625	625	625	625
Total Marks	2500			

Important Notes:

1. A student**,** who remains absent (defaulter) or fails or want to improve the marks in the internal assessment, may be permitted to appear in the desired paper(s) (only on time) in the same semester with the permission of the concerned Head of Department. A defaulter/ improvement fee of rupees 250/- per paper shall be charged from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after depositing the defaulter/improvement fee. A record of such candidates shall be kept in the Department.

Passing Rules:

2. Minimum Pass Marks and Rules regarding Determination of Result are recommended as follows:

(i) The candidate shall be declared as pass in a semester examination. If he/she secures at least 40% marks in each theory paper separately in external & internal examination and 50% marks in each practical paper and at least 50% marks in project/dissertation with 50% aggregate marks in that semester.

(ii) A candidate declared as fail/absent in one or more papers at any odd semester examination shall be permitted to take admission in the next higher semester (even semester) of the same academic session.

(iii) A candidate may be promoted in the next academic session (odd semester) if he/she has cleared collectively at least 50 % of the paper of both semester of previous academic session with 50 % of the aggregate marks. The candidate who does not fulfill the above condition will remain as an ex-student and will reappear

in the due paper along with next odd/even semester exams.

(iv) If any student who is provisionally admitted in higher odd semester but could not secure prescribed minimum marks in previous semester will be treated as ex-student and his/her admission fee will be carry forwarded to the next odd semester of forthcoming academic session.

(v) If a candidate, who is declared as pass, wishes to improve his/her performance in the theory papers of previous semester. He/she may re-appear only one time in these papers in next odd/even semester examinations.

(vi) Candidate shall not be permitted to re-appear or improve the marks obtained in the external examination of practical/dissertation in any condition.

(vii) If the number of paper prescribed in a semester examination is an odd number. It shall be increased by one for the purpose of reckoning 50% of the papers for considering the student pass/fail.

(viii) A candidate may be given only two additional chances for passing the semester thus maximum tenure for completing the two years' postgraduate course will be limited to four years.

3. Classification of Successful Candidates after Last Semester Examination is recommended as follows:

Description of Marks Obtained	**Division / Result**
• 80% and above marks in a paper	Distinction in that paper
• A candidate who has secured aggregate 60% and above marks	First Division
• A candidate who has secured aggregate 50% and above but less than 60% marks	Second Division

Fee Refund : As per University Rules.

Bridge Course (Only for students admitted on the basis of B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level)

Unit-I

Generations of Computer, Block Diagram of a Computer, Functions of the Different Units, Input & Output Devices, Memories, Software: application and system software, Hardware, Computer Languages, firmware, Classification of computers on the basis of data handling and size.

Unit-II

The steps involved in computer programming, problem analysis, algorithms & flow charts. Computer Programming(in C): various data types (simple and structured) and their representation (BCD,ASCII and EBCDIC), constants and variables, arithmetic and logical expressions, data assignments, input and output statements. Program header & declarations. High level and low level programming languages, Programming paradigms.

UNIT-III

An overview of object oriented programming system: Object oriented programming, Classes & Objects fundamentals, OOP principles: Abstraction, Polymorphism, Inheritance, Encapsulation.

UNIT-IV

Number System, LCD & GCD, Fibonacci numbers, Sequences and series : AP, GP and HP, Sum of n terms, Derivative, derivatives of sum, differences, product & quotients, derivatives of composite functions, logarithmic differentiation, L'Hospitals rule, maxima & minima, Integrations, Introduction to matrix, determinants, Inverse of matrix

UNIT-V

Internet: Network, World Wide Web, Uniform Resource Locator, Web Browsers, IP Address, Domain Name, Internet Service Providers, Introduction to Internet Security, Internet Requirements, Web Search Engine, Net Surfing, Internet Services, Intranet and Extranet, how to connect with internet.

NOTE: Students have to pass compulsorily the bridge course examination. Marks of this paper will not be mentioned in the mark-sheet, only pass/fail will be mentioned.

Text/Reference Books:.

1. Let us C by Y.Kanetkar, BPB Publications.
2. Mastering C by Vijay Prasad, TMH.
3. Programing with C, Balaguruswamy, Tata McGraw-Hill.
4. How to Solve it by Computers, Dromey, PHI.
5. C Project by Kanetkar, BPB Publications,2006.
6. Object Oriented Modeling and design, Rambaugh, Blaha et.al , Pearson Education.
7. Mastering C++, Venugopal K.R. Tata McGraw – Hills.
8. Let us C++, Kanetkar Yashwant, BPB Publications.
9. Object Oriented programming with C++, Balaguruswami E., Tata Mc Graw Hill.
10. An Introduction to OOP and Silvertalk – Addison Wesley, L. Pinson and R. Wiener,.
11. Computer Fundamentals by P.K. Sinha, BPB Publications.

Semester - I

COMPUTER ORGANIZATION AND ARCHITECTURE (MCA- 101)

Unit-1

Brief introduction to computer organization, representation of data, bits and bytes, Number system (binary, octal, decimal, hexadecimal), Representation of integers, real numbers, positive and negative numbers. Binary arithmetic, Simple concepts and theorems of Boolean Algebra. Representation of characters: BCD, ASCII, EBCDIC Codes, Self Complementary Codes, Error Detecting and Error correcting codes (Parity, Gray& Hamming Codes).

Unit-II

Logic Gates and Boolean Algebra, Basics of logic families, Karnaugh Map, Combinational Circuit Design: Adder, subtractor, Encoder, Decoder, Multiplexer, Demultiplexer, Magnitude Comparator. Sequential Circuits, Flip-Flops, Shift Registers, Asynchronous and Synchronous Counters.

Unit-III

CPU Organization: Design of ALU, design of shifter and accumulator, Status Register, Processor unit, Control unit organization. Micro instruction format, Hardwired and micro-programmed control.

Unit-IV

Data bus and address bus, stack organization, various registers, instruction formats, addressing techniques. I/O Organization – Simple I/O devices and their properties, device interfacing, DMA interface, program & interrupt control transfer.

Unit-V

Semiconductor Memories: Types of Memories, Sequential and Random Access Memory (RAM, ROM, PROM, EPROM), Storage location and address, fixed and variable word length storage, Cache Memory, bubble memory, Secondary Memory devices and their characteristics. Development of Indian super computer 'PARAM': History, Characteristics, Strengths, weakness and basic architecture.

Text/Reference Books

1. Malvino C.P., Leach D.P., Digital Principles and Applications, Tata Mc- Graw Hill, 1985.
2. Bartee, Thomas C., Digital Computer Fundamentals, 1991, 6th Edition, McGraw Hill.
3. Mano, M.M., Computer System Architecture, Prentice Hall, 1988.
4. Hayes John P., Computer Architecture and Organization, Mc-Graw Hill 1988 (International Edition)
5. Nicholas Carter and Raj Kamal, Schaum Series "Computer Architecture and Organization" 2nd Ed. 2010.

Data Structures (MCA-102)

Unit I

Introduction: structure and problem solving, algorithmic notation, Data Structure, Algorithms and sub algorithms, introduction to algorithm analysis for time and space requirement, rate of growth, basic time and space analysis of an algorithm.

Unit II

Primitive and non primitive data structure concept, representation and manipulation of strings, linear data structures and their sequential storage representation, concept and terminology for non primitive data structure, storage structure for arrays, stacks, queues. Operations on arrays, stacks & queues.

Unit III

Linear data structures and their linked storage representation: pointers and linked allocation, linked linear list, singly linked list, circularly linked lists, doubly linked list, application of linked linear lists.

Unit IV

Non Linear data structure: Trees, types of trees, binary tree, application of trees, Graphs and their representations, applications of graph.

Unit V

Sorting and searching: sorting, selection sort, bubble sort, merge sort, tree sort, radix sort, sequential search, binary search, File structure, sequential files, indexed sequential files, direct files.

Text / Reference Books

1. J.P. Tremblay & P.G.Sorensons, An Introduction to Data Structures with Applications, Tata McGraw Hills publications. (Pdf available).
2. Aho., Alfred V., Data structure and algorithms, Pearson Education.
3. Horowitz, Ellis, Fundamentals of Data structure in C, Galgotia publication.
4. Rowe, Glenn W., Introduction to Data Structure and algorithms with C++, Prentice , Hall
5. Langsun , Augenstein , Tenenbaum Aaron M, Data structures using C and C++ , Prentice Hall

Discrete Mathematics (MCA- 103)

Unit I

Fundamentals: Sets and Subsets, Operations on Sets, Sequences, Properties of Integers, Matrices, Mathematical Structures. Logic & Propositional Logic: Introduction to Logic, Propositional Logic and Predicate Logic, Elements of Propositional Logic - Negation, Conjunction, Disjunction; Truth Table, Tautology, Connectives, Construction of Proposition, Semantics, normal forms, Reasoning with Propositions, Implications, Proof of Identities, Proof of Implications.

Unit II

Predicate Logic: Well Formed Formula of Predicate Logic, Predicate, Validity, Quantification, Constructing Formulas, Reasoning with Predicate Logic, Quantifiers and Connectives.

Unit III

Verification**:** Model checking, Linear-time temporal logic, program verification. Induction and Recursion, Recurrence Relations, Proof by Induction. Set and Functions: Sets, relations, functions, operations, and equivalence Relations, relation of partial order, partitions, binary relations, Equivalence relations, growth of functions, Complexity of Algorithms.

Unit IV

Combinatorics: Permutation, combinations, Binomial theorem, Counting, Pigeon hole principle. Generalized Inclusion-Exclusion Principle (GIEP), Discrete probability.

Unit V

Trees and Graphs**:** Trees - traversals, spanning trees; graphs – path, connectivity, reachability, cycles and circuits, planar graphs, Euler and Hamilonian graphs, graph traversals, topological sorting, graph coloring.

Text/References Books

1. Winfried Karl Grassmann, Jean-Paul Tremblay, Logic and Discrete Mathematics: A Computer Science Perspective, Prentice Hall.
2. David J. Hunter, Essentials of Discrete Mathematics.
3. C. L. Liu, Element of Discrete Mathematics, McGraw-Hill, 2nd Edition, 1985, reprinted 2000.
4. Bernard Kolman, Robert Busby, Sharon C. Ross, Discrete Mathematical Structures, 6/E. Pearson Education.
5. Discrete Mathematics and its Applications by Kenneth H. Rosen, 5th Edition, McGraw Hill, Inc, 2003.
6. Narsingh Deo, Graph Theory, PHI.

Database Management System (MCA- 104)

Unit-I

Introduction: DBMS, Basic DBMS terminology and Data base System versus file System, Data independence architecture of DBMS. Entity Relationship model : Basic Concepts, keys, design issues, E-R diagram, weak entity sets, extended E-R features, reduction of E-R scheme to tables.

Unit-II

Relational model: structure of relational database relational algebra, tuple relational calculus, domain relational calculus. SQL: Basic structure, set operations, aggregate functions, null values.

Unit-III

Data Base Design: Functional Dependencies, normal forms, first, second and third normal form, BCNF multivalued dependencies, fourth normal form, join dependencies.

Unit-IV

Query processing and optimization: Transaction processing concepts, ACID Properties, Concurrency control technique, locking techniques, time stamping, Recovery, Integrity and security of database.

Unit-V

Distributed database system: Fragments of relations, optimization, Distributed Concurrency Control, management of deadlocks and crashes, Database recovery Management.

Text /Reference books

1. H. Korth, A. Silbertz, Sudarshan, Data base system and concepts, Fifth Edition, McGraw – Hill.
2. Elmasari, Navathe, Fundamentals of Database Systems, Addison Wesley
3. Date C.J, An Introduction to Database systems, Addison Wesley
4. Majumdar & Bhattachrya, Database Management System, TMH
5. Ramakrishna, Gehkre, Database Management System, McGraw – Hill
6. Leon alexis, leon Mathews, Database Management systems, Vikash publication
7. Rob, coronel, Database system, 7th edition, Cengage Learning.

Technical Communication (MCA- 105)

Unit -1

Fundamentals of Technical Communication: Technical Communication: Features; Distinction between General and Technical Communication; Language as a tool of Communication; Dimensions of Communication: Reading & comprehension; Technical writing: sentences; Paragraph; Technical style: Definition, types & Methods; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication.

Unit - II

Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Key-Note Speech: Introduction & Summarization; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration.

Unit - III

Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear: Confident speaking; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Unit - IV

Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Unit - V

Kinesics & Voice Dynamics: Kinesics: Definitions; importance; Features of Body Language; Voice Modulation: Quality, Pitch; Rhythm; intonation; Pronunciation; Articulation; stress & accent; Linguistic features of voice control: Vowel & Consonant Sounds.

Text /Reference books

1. Meenakshi Raman & Sangeeta Sharma, Technical Communication – Principles and Practices, Oxford Univ. Press, 2007, New Delhi.
2. Prof. R.C. Sharma & Krishna Mohan, Business Correspondence and Report Writing, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. L.U.B. Pandey, Practical Communication: Process and Practice, A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.
4. Sherman, Theodore A, Modern Technical Writing, Apprentice Hall, New Jersey; U.S.
5. S.D. Sharma, A Text Book of Scientific and Technical Writing, Vikas Publication, Delhi

Semester -II

Data Science (MCA-201)

UNIT-I

Data Scientist's Tool Box: Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio.

UNIT-II

R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling

UNIT-III

Getting and Cleaning Data: Obtaining data from the web, from APIs, from databases in various formats. Basics of data cleaning and making data tidy.

UNIT-IV

Exploratory Data Analysis: Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize high-dimensional data.

UNIT-V

Reproducible Research: Concepts and tools behind reporting modern data analyses in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others.

Text/Reference Books:

1. Rachel Schutt, Cathy O'Neil, Doing Data Science: Straight Talk from the Frontiline, Schroff/O'Reilly, 2013.
2. Foster Provost, Tom Fawcett, Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking, O'Reilly, 2013.
3. John W. Foreman, Data Smart: Using data Science to Transform Information into Insight, John Wiley & Sons, 2013.
4. Ian Ayres, Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart, Ist Edition Bantam, 2007.
5. Eric Seigel, Predictive Analytics: The Power to Predict who Will Click, Buy, Lie, or Die, 1st Edition, Wiley, 2013.
6. Matthew A. Russel, Mining the Social Web: Data mining Facebook, Twitter, Linkedln, Google+, GitHub, and More, Second Edition, O'Reilly Media, 2013.

Computer Oriented Numerical Methods (MCA- 202)

Unit I

Computer Arithmetic: Floating point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences. Error in number representation-pitfalls in computing.

Unit II

Iterative methods: Bisection, False position, Newton-raphson methods. Discussion of convergence.Polynomial evaluation. Solving polynomial.

Unit III

Solution of simultaneous linear equation and ordinary differential equations: Gauss elimination method-pivoting, Conditioned equations, refinements of solutions, Gauss-seidel methods: Acceleration of its native methods.Taylor series and Euler methods, Local and global error analysis, RungeKutta method, Predictor-corrector method, Automatic Error monitoring, Stability of solution.

Unit IV

Interpolation & Approximation: Polynomial interpolation. Difference regression.Polynomial fitting and curve fitting. Approximation of function by Taylor series and chebyshev polynomials.

Unit V

Numerical differentiation and integration : Differentiation formula based on polynomial fit. Pitfalls in differentiation, Trapezoidal, Simpson rules, Gaussian quadrature.

Text / Reference Books

1. E. Balagurusamy, Computer Oriented Statistical and Numerical Method, Macmillan India Ltd.
2. R.S. Salaria, Computer Oriented Numerical Methods, Khanna Book Publishing Co. (P) Ltd.
3. M.K. Jain, S.R.K. Iyengar & R.K. Jain, Numerical Methods, for scientific and Engineering computation, New Age International, 6th Edition.
4. Rajaraman, Computer Oriented Numerical Method, PHI

Data Communication and Computer Networking (MCA- 203)

Unit-1

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

Unit- II

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

Unit-III

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

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

Unit- IV

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

Unit -V

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

Text / Reference Books

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

Python Programming (MCA- 204)

UNIT-I

Introduction to Python: Structure of a Python Program, Elements of Python, Python Interpreter, Using Python as calculator, Python shell, Indentation, Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

UNIT-II

Creating Python Programs : Input and Output Statements, Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments.

UNIT-III

Lists, Tuples, Dictionary, Sets, Numpy, Array, Matrix and associated operations, Linear algebra and related operations, Reading files, Exploratory data analysis, Data preparation and pre-processing, Reading files, Exploratory data analysis, Data preparation and pre-processing, Data visualization using matplotlib and seaborn libraries, Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot

UNIT-IV

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries. Data Structures: Arrays, list, set, stacks and queues. Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting.

UNIT-V

I/O and Error Handling In Python : Introduction Data Streams, Creating Data Streams, Access Modes, Reading/ Writing Data from/to a File, Additional File Methods, Using Pipes as Data Streams, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

Text/ Reference Books

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Python Tutorial/Documentation www.python.or 2015
3. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012
4. http://docs.python.org/3/tutorial/index.html
5. http://interactivepython.org/courselib/static/pythonds
6. http://www.ibiblio.org/g2swap/byteofpython/read/
7. Pooja Sharma, Programming In Python, BPB, 2017

Software Engineering (MCA- 205)

Unit- I

Software engineering concepts, historical perspective, software evaluation, program design paradigms. Software project planning: identifying software scope, resources.

Unit- II

Analysis concept, analysis modeling (behavioral model, data model, functional model), analysis tools & techniques, risk management, project scheduling, tracking Cost estimation : project metrics, cost factors, cost estimation techniques (decomposition, empirical, automated estimation, Delphi).

Unit- III

System design: Design concepts & principles (modularization abstraction, refinement, cohesion, coupling) design methods (structured design, object oriented design, real time system design), Implementation : modern programming language features & characteristics, language classes, coding style, efficiency.

Unit- IV

Software Quality Assurance : Quality factors and criteria, SQA metrics, SQA techniques. Verification and

Validation: software testing methods (WBT, BBT), software testing strategy (Unit testing, integration testing, validation system, testing).

Unit- V

Maintenance: Maintenance characteristics, Maintainability, software reuse, re-engineering, reverse engineering, CASE tools.

Text / Reference books

1. Roger S. Pressman, Software Engineering: A practitioners approach, McGraw Hill, (Third and Forth Edition), 1992.
2. Pankaj Jalote , An Integrated approach to Software Engineering, Narosa publishing House.
3. H. Sommervill Ian , Software Engineering, Addition Wesley Pub. Co.
4. Fairley Richard , Software Engineering Concepts, McGraw Hill, 1985.
5. Braude, E.J., Software Engineering: An object Oriented Perspective, Willey, 2001.

Semester-III

Information and Network Security System (MCA - 301)

Unit-1

Basic Security Concept, Computer Security, Threats to Security, attacks, Security services & Mechanisms, Communication Security-Encryption, Classical Encryption Model, Steganography.

Unit-2

Cryptography- transposition/ substitution, Caesar Cipher, Cryptosystem, Symmetric and Asymmetric crypto primitives, Private Key Cryptography, Block Cipher Principles, Data encryption Standards, Encryption and Decryption using round functions, AES, Triple DES, Random number generation, Key distribution.

Unit-3

Message Authentication and hash functions-message digest, strong and weak collision, message authentication code, MD5, Hash functions, Secure Hash algorithm (SHA), Birthday paradox, digital signature, Digital signature standards (DSS).

Unit-4

Public Key Cryptography – Number Theory: Euclidean algorithm, Euler Theorem, Fermat theorem, Totent function, multiplicative and additive inverse. Principles of Public key cryptography, Public Key infrastructure (PKI), RSA algorithm, Key management, Elliptic Curve cryptography, Diffie Hellman Key Exchange.

Unit-5

Network and System Security – Network Attacks, IP Security (IPSec): AH & ESP, Web security: SSL /TLS, Kerberos, E-mail Security: Pretty good Privacy (PGP), S/Mime, Network scanning, System security: intruders, viruses, firewall Design Principles, Intrusion Detection system (IDS), Concept of Cyber Security.

Text/Reference Books

1. William Stallings, Cryptography and Network Security, Pearson Education, 6th edition, 2013.
2. Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw Hill.
3. Atul Kahate, Cryptography and Network Security, McGraw Hill Education India (Pvt. Ltd.) 2nd edition, 2009.
4. Micki Krause & Harold F.Tipton, Handbook of Information Security Management, Vol. – 3, CRC Press LLC, 2004.

Programming with JAVA (MCA- 302)

Unit I:

An overview of Java, JVM, byte code, Java class libraries, Data types, Variable, Data types and casting, Operators, operator precedence and Control statements.

Unit II:

Declaring object reference variable, Introducing methods, constructors, the key word, garbage collection, Overloading methods, String handling, and String buffer.

Unit-III

Inheritance and polymorphism: super class and subclass, protected members, Relationship between super and sub class. Inheritance hierarchy, abstract classes and methods, final methods and classes, nested classes, Packages and Interfaces: Defining a package, importing package, defining an interface, implementing and applying interfaces.

Unit IV:

Exception Handling: Fundamentals, exception types, using try and catch. File handling: Character based file and binary file, Multithreaded Programming: Creating a single and multiple threads, thread priorities, synchronization.

Unit-V

Applets: Applets basics, applets architecture, applets skeleton, the html applet tag, passing parameters in applets, event-handling: event classes and event listener interfaces, introduction to swing and servlets.

Text/Reference Books

1. P. Naughton and H. Schildt, Java 2: The Complete Reference, Tata Mc-Graw Hill. (Pdf available).
2. Patrick Naughton, Michael Morrison, The Java hand books, Osborne/McGraw-Hill
3. David Flanagan, Java in a Nutshell: A Desktop Quick Reference for Java Programmers, O'Reilly& Associates, Inc.
4. E. Balaguruswamy, Programming with Java: A Primer, TMH. (Pdf available).
5. Cay Horstmann, Big Java, Wiley India edition, 2nd Edition.
6. Dietel and Dietel, Core Java, Pearson/Prentice Hall , 7th Edition.
7. Rajkamal, Internet and Web-Technologies, TataMcGraw-Hill, 6th Edition, 2011.

Theory of Computation (MCA- 303)

Unit- I

Mathematical preliminaries, alphabets, strings, Languages, states, transitions, finite automata and regular expressions, applications e.g. Lexical analyzers and text editors.

Unit- II

The pumping Lemma & closure property of regular sets, decision algorithms for regular sets.

Unit- III

Context free grammars, Chomsky and Greibach normal form theorems, ambiguity, Pushdown automata and the equivalence of context free languages to sets accepted by non-deterministic PDA, the Pumping Lemma for CFL's,closure properties of CFL's and decision algorithms for CFL's.

Unit- IV

Turing Machines: Introduction, Turing hypothesis, Turing computability, nondeterministic, multi tape and other versions of Turing machine, Church's hypothesis, primitive recursive function, Generalization, recursively enumerable Languages and Turing Computability.

Unit- V

Undecidability: Universal Turing machines and unsolvability of the halting problem, an undecidable problem, Post Correspondence problem.

Text/Reference Books

1. Hopcroft J.E. and Ullman J., Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, 1988. (Pdf available).
2. Derickwood, Theory of Computation, Harper & Row Publishers, New York, 1987.
3. Lewis H.R. & Papadimitriou C.H, Elements of the Theory of Computation, Prentice Hall International Inc. 1981.
4. Michal Sipear, MA, Introduction to the Theory of Computation,. Thomson course technology, 2nd edition, 2006.
5. J. Hopcroft, R. Motwani and Jeffery Ullman, Automata Theory, language and Computation, Addison wisely, 3rd edition,2013.
6. K.L.P. Mishra, N. Chandrasekaran, Theory of Computer Science: Automata, Language and computation, PHI Learning Pvt. Ltd.

Design and Analysis of Algorithms (MCA- 304)

Unit-I

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

Unit-II

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

Unit-III

Algorithm design strategies: Divide and conquer, Merge sort, Quick sort, matrix multiplication. Greedy method: General method, knapsack problem, job sequencing with deadlines, minimum cost spanning trees). Dynamic programming (0/1 knapsack, travelling salesman problem).

Unit-IV

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

Unit-V

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

Text/Reference Books

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

Big Data Analytics (MCA- 305.1)

UNIT I :

Introduction to big data, Challenges of Conventional Systems, distributed file system, Big Data Platform, Big Data and its importance, Drivers, Big data analytics, Big data applications, Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

UNIT-II

Mining data streams : Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

UNIT-III

Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run- Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment

UNIT-IV

Frameworks: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere Big Insights and Streams

UNIT-V

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications, Introduction of Big Data Analytics with BigR.

Text/References books:

1 Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2 Tom White “Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.
3 Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
4 Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012.
5 Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Cloud Computing (MCA- 305.2)

Unit -I

Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , usage scenarios and Applications , Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim.

Unit -II

Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service – Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to MapReduce, GFS, HDFS, Hadoop Framework.

Unit -III

Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management – Collaborating on Word Processing ,Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs and Wikis.

Unit -IV

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

Unit -V

Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers
– Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Text/Reference books

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz “Cloud Computing for Dummies” (Wiley India Edition),2010
2. John Rittinghouse & James Ransome, “Cloud Computing Implementation Management and Strategy”, CRC Press, 2010.
3. Antohy T Velte ,Cloud Computing : “A Practical Approach”, McGraw Hill,2009
4. Michael Miller, Cloud Computing: “Web-Based Applications That Change the Way You Work and Collaborate Online”, Que Publishing, August 2008.
5. James E Smith, Ravi Nair, “Virtual Machines”, Morgan Kaufmann Publishers, 2006.

Advanced DBMS (MCA- 305.3)

Unit-I

Comparison between different databases, Comparison between DBMS, RDBMS, Distributed and Centralized DB, RDBMS and SQL: Relational Query Languages, Creating Relations in SQL, Destroying and Altering Relations, Adding and Deleting Tuples, Enforcing Referential Integrity, Categories of SQL Commands, Embedding SQL Statements, Dynamic SQL, Normalization and Denormalization

Unit-II

Tree and Hash based Indexing: Intuition for tree indexes; Indexed sequential access method; B+ trees, Search, Insert, Delete, Duplicates, B+ trees in practice, Static hashing; Extendible hashing, Linear hashing,comparisons.

Unit-III

Query Optimization: External sorting, Select, Join, PROJECT, set, and Aggregate operations. Heuristics and semantics in query optimizations. Algorithms for multiquery optimization. Query Execution: One-Pass and Two-Pass Algorithms for Database. Buffer Management, Parallel Algorithms for Relational Operations, Using Heuristics in Query Optimization, Basic Algorithms for Executing Query Operations. Adaptive Query Processing (AQP) and Query Evaluation
: Need for AQP, eddy, query evaluation techniques and plans.

Unit-IV

Concurrency Control Serializability: Enforcing, Serializability by Locks, Locking Systems With Several, Lock Modes, Architecture for a Locking Scheduler, Managing Hierarchies of Database Elements, Concurrency Control by Timestamps and Validation. Database recovery management. Transaction processing: online transaction processing system, serializability and recoverability, view serializability, resolving deadlock, distributed locking. Transaction management in multi - database system, long duration transaction, high-performance transaction system.

Unit-V

Object Oriented DBMS: OODBMS architectural approaches, Object identity, procedures and encapsulation, Object oriented data model: relationship ,identifiers, Basic OODBMS terminology, Inheritance , Basic interface and class structure, Type hierarchies and inheritance, Type extents and persistent programming languages, OODBMS storage issues, Concept of ORDBMS, Comparing RDBMS, OODBMS &ORDBMS. XML Query processing: XML-QL, Lorel, Quilt, XQL, XQuery.

Text/ Reference Book:

1. Avi Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill, USA.
2. C. J. Date, An Introduction to Database Systems, Addison-Wesley Longman Publishing Co., USA.
3. Alexis Leon, Mathews Leon, Database Management Systems, Leon Vikas, 2002
4. Elamasri R . and Navathe, S., Fundamentals of Database Systems (3rd Edition), Pearsson Education, 2000.
5. Rini Chakrabarti, Shilbhadra Dasgupta, “Advanced Database Management System”, Dreamtech press.

Semester-IV

Computer Graphics (MCA- 401)

Unit- I

Geometry and Line generation**:** Lines, line segments and perpendicular lines, distance between a point and a line, vectors, pixels and frame buffers, vector generation, Bresenham's algorithm, anti aliasing of line, thick line segments, character generation, displaying the frame buffer.

Unit- II

Graphics Primitives**:** Display devices, primitive operations, The display-file Interpreter, Normalized device coordinates, Display file structure and display-file algorithms, display control, text, the line style primitive. Polygons **:** Polygon representation, Entering polygons, polygon interfacing algorithms, filling polygons, filling with a pattern, initialization, anti aliasing.

Unit- III

Transformations : Matrices, scaling transformations, Rotation, Homogenous co-ordinates and Translations, coordinate transformations, rotation about an arbitrary point, inverse transformations, transformation routines, transformation and patterns initialization and display procedures.

Segments **:** Creation of segment, closing, deletion and renaming segments, visibility, image transformations, saving and showing segments.

Unit- IV

Windowing and clipping **:** The viewing transformation and its implementation, clipping, the Cohen-Sutherland Outcode algorithm, The Sutherland-Hodgman algorithm, clipping of polygons, Generalized clipping, multiple windowing.

Unit- V

Three Dimensions : 3D geometry, 3D primitives and transformations, Parallel projection, Viewing projections and special projections, conversion to view plane co-ordinates, clipping in three dimensions, clipping planes. Hidden surfaces and Lines**:** Back-face algorithm, Z-buffers, Scanline algorithm, Franklin algorithm. Illumination, Reflection, shadows, Ray tracing, halftones.

Text/Reference Books

1. D. Hearn & P. Baker, Computer Graphics – C version, Pearson Education, 2nd edition, 2004.
2. Steven Harrington, Computer Graphics: A programming Approach, McGraw-Hill Inc.,US
3. David F. Rogers, J. Alan Adams, Mathematical elements for computer graphics, McGraw Hill
4. David F. Rogers, Procedural elements for Computer Graphics, McGraw Hill
5. James D. Foley, Andries Van Dam et.al., Computer Graphics –Principles and Practice, Pearson education 2nd edition,2007.
6. B.M. Havaldar, Computer Graphics & Project, Anmol Publications.

Operating System (MCA- 402)

Unit- I

Operating system as resource Manager: Overview of processor management, memory management, file management, Device management; operating system services; operating system classifications-single user, multiuser, multiprocessing, batch processing, time sharing, real time operating system.

Processor management: Process overview, process states, multiprogramming, levels of schedulers and scheduling algorithms, multi-processor scheduling, deadlock prevention, avoidance, detection and recovery.

Unit- II

Memory management**:** Partition, paging and segmentation; types of memory management schemes, virtual memory-demand paging, procedure sharing, run time storage allocation.

File Management**:** File supports, access methods, allocation methods- continuous, linked and index allocation; directory systems-single level, tree structured, acyclic graph and general graph directory, file protection, layered file system.

Unit- III

Resource Protection: Mechanism, policy and domain of protection, access matrix and its implementation, dynamic protection structure.

Unit- IV

Device Management**:** Dedicated, shared and virtual devices, sequential access and direct access devices , channel and control units, I/O buffering, I/O schedulers, spooling system.

Unit – V

Concurrent Process and Programming: Precedence graph, Bernstein condition, process hierarchy, process synchronization-critical section and mutual exclusion, classical process co-ordination problems, critical region, monitors, concurrent languages.

Text/Reference Books

1. A.Silberschatz, PterB. Galvin and G.Gagne, Operating System Concepts, Principles, Wiley India Ltd., 6 edition.
2. Andrew S. Tannenbaum, Modern Operating Systems, Pearson Edition, 2nd edition, 2004.
3. Gary Nutt, Operating Systems, Pearson Education, 3rd Edition, 2004.
4. Harvey M. Deitel, Operating Systems, Pearson Education, 3rd edition, 2004.
5. A. M. Lister, Fundamentals of Operating Systems, Springer Science+Business Media, LLC
6. D.M. Dhamdhere, Operating systems : A Concept Based Approach, Tata McGraw-Hill Edition.

Artificial Intelligence (MCA- 403)

UNIT-I

General Issues and Overview of AI: The AI problems, what is an AI technique? Problem Solving, Search and Control Strategies**:** General problem solving, production systems, control strategies: Forward and backward chaining. Exhaustive searches: Depth and Breadth first search.

UNTT-II

Heuristic Search Techniques: Hill climbing, Branch and Bound technique, Best first search & A* algorithm, AND/ OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems, means ends analysis. Knowledge Representation: First order predicate calculus, skolemization, resolution principle & unification, interface mechanism, Horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

UNIT-III

AI Programming Language: PROLOG: Introduction, Clauses: Facts, goals and rules. Prolog

unification mechanism, arithmetic operator, list manipulations, Fail and Cut predicates recursion.

UNTT-IV

Planning: Overview-An Example Domain: The block word, component of planning systems, goal stack planning (linear planning), non-linear planning using goal sets. Handling Uncertainty: Probability theory, Bayes theorem and Bayesian networks, Certainty factor, Fuzzy Logic.

UNIT-V

Natural Language Processing: Parsing techniques, context-free grammar, Case and Logic grammars, Semantic Analysis. Expert Systems: Introduction to expert system, knowledge acquisition, case studies: MYCIN.

Text / Reference books

1. , Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw Hill.

2. D.W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India.
3. W. F. Clocksin, C. S. Mellish, Programming in PROLOG, Narosa Publishing.
4. Timothy J. Ross, Fuzzy logic with Engineering Applications, McGraw Hill, 1995.
5. Melnaic Mitchell, An Introduction to Generic Algorithm, PHI, 1998.

ELECTIVE – I: Wireless Technology (MCA- 404.1)

Unit-I

Introduction to wireless Communication System: Evolution, Generations of wireless communication, Wireless transmission concepts: Frequencies, signals, Antennas. Comparison of wireless communication system: Land- Mobile technologies (GSM, CDMA) , Satellite, Personal Communication Systems.

Unit-II

Wireless MAC Protocols: S/F/T/CDMA, CSMA protocols, specialized MAC, Cellular Systems, Spread Spectrum: DSSS & FHSS; Wireless WAN, GSM: Mobile Service, GSM architecture, Radio Interface, Protocols, Localization & Calling, Handover & security.

Unit-II

Wireless LAN: IEEE 802.11 b/a/g: System architecture, Protocol architecture, MAC management; introduction to HIPERLAN. Concept of Bluetooth - IEEE 802.16.

Unit-IV

Mobile IP – Packet delivery – Registration process, Tunneling and Encapsulation, Routing protocols, DHCP, Unicast & multicast Communication, Wireless TCP- Indirect, Snooping & mobile TCP; Introduction to wireless PAN.

Unit-V

Ad-Hoc Networks- (Infrastructure and Ad-Hoc networks) Routing algorithms, Support for mobility WAP, WAP architecture, Transport Security – Transaction protocol, Session protocol, Introduction to pervasive computing-Applications, Devices, Software. Introduction to Mobile Operating System / Android 5.0/ Windows 8.1 and Macintosh OS.

Text/Reference Books

1. Jochen Mobile Schiller. Communications, Pearson Education
2. Stojmenovic HandBook Ivan, of Wireless Networks and Mobile Computing, John Wiley & Sons
3. Theodore S. Rappaport, Wireless Communications: Principles and Practice, Second Edition, Prentice Hall. 2002.
4. Chander Dhawan, Mobile Computing- A System Integrator's Approach, McGraw-Hill
5. William Stallings, Wireless Communication and Networking, PHI, 2003.
6. C. Siva Ram Murthy, B.S. Manoj, Ad-hoc Wireless Networks- Architecture and Protocols, Pearson Education, 2nd Edition, 2005.
7. Raj Kamal, Mobile Computing, Oxford Univ. Press.

ELECTIVE – I: Image Analysis and Computer Vision (MCA- 404.2)

Unit-I

The Digitized Image and its Properties: Applications of image processing, image function, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

Unit-II

Image Pre-processing: Pixel brightness transformation, geometric transformation, local pre-processing- image smoothening, zero-crossing, scale in image processing, spatial operation, intensity transformation and spatial filtering, color models, gray scale transformation. Image Restoration: Image degradation and re-storage process.

Unit-III

Morphological properties of image: Erosion and Dilation, opening and closing, basic morphological algorithms.

Segmentation: point, line and edge detection, Threshold detection methods, parametric edge models, edges in multi spectral images, Thresholding, Region based segmentation.

Unit-IV

Image representation and description: Representation, border following and chain codes, boundary descriptors, regional descriptors.

Unit-V

Pattern Recognition Fundamentals: Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model.

Text/Reference Books:

1. Rafel C. Gonzalez Richard E. Woods, Digital Image Processing:, Second edition, Addison-Wisley.

2. A K Jain, Digital Image Processing:, PHI

3. R. M. Haralick, L. G. Shapiro. Computer and Robot Vision.Addison-Wesley, 1993.

4. A. Rosenfeld, A. C. Kak. Digital Picture Processing.Addison-Wesley, 1983

ELECTIVE – I: System Testing (MCA 404.3)

Unit- I

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

Unit- II

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

Unit- III

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

Unit- IV

Reducing the number of test cases: Prioritization guidelines, Priority category scheme, Risk analysis, Regression Testing, slice based Testing,

Testing activities: Unit Testing, Levels of Testing, and Integration Testing, System Testing, Debugging, Domain Testing.

Unit – V

Testing Tools: Static Testing Tools, Dynamic testing Tools, and characteristics of Modern Tools.

Building and applying standards to test Documentation: Configuration management, Reviews, Industry Standards – ISO 9001, CMM for Software, IEEE standards.

Text: References:

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

ELECTIVE – II: Natural Language Processing (MCA- 405.1)

Unit-I

Introduction to Natural Language, Understanding Language as a knowledge base process, Basic linguistics.

Morphology-Types and Parsing, N-gram Model, Maximum Likelihood Estimation, Smoothing techniques on N-gram Model, Words and Word Classes, POS Tagging.

Unit-II

Grammar and Parsing – Top-Down Parsing, Bottom-up Parsing, Dependency Grammar, Parsing Indian Language.

Unit-III

Meaning Representation, First Order Predicate Calculus, Elements of FOPC, Semantics and FOPC, Syntax Driven Semantic Analysis, Principal of Compositionally, Semantic Augmentation of CFG Rules, Robust Semantic Analysis.

Unit-IV

Introduction to Semantic Grammar, Structure of word, Thematic Roles, Word Sense Disambiguation-Selection

Restrictions, Machine Learning Approaches, Dictionary Based Approaches.

Unit-V

Context and World Knowledge: Knowledge Representation and Reasoning. Local Discourse context and Reference. Discourse structure and understanding using World Knowledge, Language Learning and Concept Learning.

Text/Reference Books

1. James Allen, Natural Language Understanding, Pearson Education India.

2. Rich & Knight, Artificial Intelligence, Tata Mc Graw Hill Pub.

3. Dan W. Patterson, Artificial Intelligence: A Modern approach, Pearson Education, India

4. Russell Norwig, Artificial Intelligence: A Modern approach, Pearson Education, India.

5. Jurafsky and Martin, Speech and Language Processing, Prentice Hall, 2000.

Elective-II Internet Of Things(IoT) (MCA 405.2)

Unit-I

Introduction to IoT, Technology behind IoT: RFID, Sensors, Actuators, Design principles, IoT architecture, Communication Protocols for connected devices.

Unit-II

Sensor Networks, Machine-to-Machine Communications, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

Unit-III

Internet connectivity principles for IoT, Introduction to Raspberry, Implementation of IoT with Raspberry Pi.

Unit-IV

Introduction to Software Defined Network (SDN), SDN for IoT, Sensor-Cloud, Data Handling and Analytics, Fog Computing.

Unit-V

IoT security and privacy, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring.

Text/Reference Books:

1. Charalampos Doukas, "Building Internet of Things with Arduino V.10", CreateSpace/Amazon, 2012
2. Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
3. Waher Peter, "Learning Internet of Things", PACKT publishing, BIRMINGHAM
4. Raj Kamal, "Internet of Things, Architecture and design principles", Mc Graw Hill, Education
5. Reiter Bernd Scholz, Michahelles Florian, "Architecting the Internet of Things", Springer ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2.
6. Arsheep Bahga, Vijay Madisetti , "Internet of Things: A Hands-On Approach", Orient Blackswan Private Limited - New Delhi; First edition (2015).

Elective-II Software Project Management (MCA-405.3)

Unit-1

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

Unit-2

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

Unit-3

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

Unit-4

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

Unit-5

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

Text/Reference Books

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