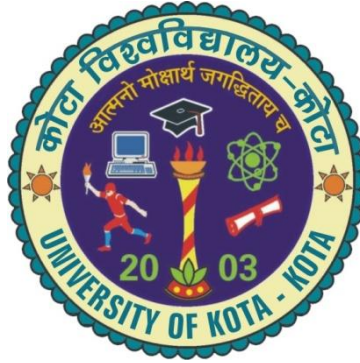


SCHEME OF EXAMINATION AND
COURSES OF STUDY



Department of Computer Science & Informatics
Faculty of Science

Syllabus (2022-23)
Integrated MCA

UNIVERSITY OF KOTA
MBS Marg, Near Kabir Circle, KOTA (Rajasthan)-324 005
INDIA

Structure and Syllabus for Integrated MCA

Important information about the course

Name of faculty & Name of Course	Intake	Duration	Admission Eligibility	Admission fee per Annum (in Rs.)
Integrated MCA	60	10 Sem. (5 years)	<u>Qualifying Examination:</u> Passed 10+2 examination with Mathematics / Statistics / Accountancy as compulsory subjects. <u>Min. Marks Obtained required in Qualifying Examination:</u> Obtained at least 45% marks (40% in case of candidates belonging to reserved category) in the above subjects taken together.	Rs 17000/-

Attendance:

Each student should earn 75% attendance in the courses of the particular semester failing which he or she shall not be permitted to sit for the End-Semester Examinations.

Innovation and Employability:

Integrated MCA is an emerging undergraduate degree course in the field of computer applications. The duration of the course is five years. After completion of Integrated MCA, students can try for job opportunities or they can even try for higher study. Integrated MCA is a course that is customized for students, who want to pursue their career in the emerging field of computers and information technology. There are ample opportunities of employment and entrepreneurship after completion of Integrated MCA. Degree holder can go in government sector as well as in IT sector. This degree helps the students to get a sound knowledge on computer applications with the help of which they can have a perfect launch pad for challenging career in the field of information technology. Most of the students doing their higher secondary education think that science students alone can apply for the Integrated MCA course. But, this is not true, student having mathematics as a subject in their 10+2 level can also apply.

After completion of the course, students will be trained graduate/post graduate software developers, and will be able to:

1. Apply a broad and coherent knowledge of computer science and software development in diverse contexts and domains using critical thinking and judgment.
2. Apply software engineering methods and contemporary software development tools to the scoping, analysis, design, construction, verification and operation of software systems.
3. Communicate proficiently to a variety of audiences, function as an effective member or leader of a software development team, and use the basic tools and practices of project management within project work.
4. Demonstrate professionalism, integrity, ethical conduct, professional accountability and an awareness of professional software development practice in a global context.
5. Apply problem analysis and decision-making methodologies to identify, design and implement solutions to industry relevant problems with intellectual independence.
6. Reflect on personal performance, learning, and self-management processes as a means of continued professional development and lifelong learning.

Course Structure with Distribution of Marks

Semester I

Coding	Title	Credit	Contact Hrs.	Internal Marks	External Marks	Total Marks
			L – T – P			
IMCA - 101	Programming Fundamentals using C	4	4 – 0-0	30	70	100
IMCA - 102	Discrete Structures	4	4 – 0-0	30	70	100
IMCA - 103	Digital Electronics	4	4 – 0-0	30	70	100
IMCA - 104	Mathematics - I	4	4 – 0-0	30	70	100
IMCA - 105	Lab Based on a)Programming in C and b) Office Management (MS-Word, PowerPoint, Excel, MS-Access)	8	0-0- 16	100	100	200 (100+100)
	Total Credit	24	Total Marks			600

Semester II

Coding	Title	Credit	Contact Hrs.	Internal Marks	External Marks	Total Marks
			L – T – P			
IMCA - 201	Data Structures	4	4 – 0-0	30	70	100
IMCA - 202	Computer Architecture	4	4 – 0-0	30	70	100
IMCA - 203	Technical Writing and Communication in English	4	4 – 0-0	30	70	100
IMCA - 204	Mathematics - II	4	4 – 0-0	30	70	100
IMCA - 205	Lab based on a)Data Structure and b)Communication Lab	8	0 – 0-16	100	100	200 (100+100)
	Total Credit	24	Total Marks			600

Semester III

Coding	Title	Credit	Contact Hrs.	Internal Marks	External Marks	Total Marks
			L – T – P			
IMCA - 301	Object Oriented Programming Using C++	4	4 - 0 - 0	30	70	100
IMCA - 302	Systems Programming	4	3 - 0 - 1	30	70	100
IMCA - 303	Database Systems	4	4 - 0 - 0	30	70	100
IMCA - 304	Statistics and Probability	4	4 - 0 - 0	30	70	100
IMCA - 305	Lab based on A) C++, B) Database Systems	8	0 - 0 - 16	100	100	200 (100+100)
	Total Credit	24	Total Marks			600

Semester IV

Coding	Title	Credit	Contact Hrs.	Internal Marks	External Marks	Total Marks
			L – T – P			
IMCA - 401	Operating Systems	4	4 - 0 - 0	30	70	100
IMCA - 402	Computer Networks	4	4 - 0 - 0	30	70	100
IMCA - 403	Computer Oriented Numerical Methods	4	4 - 0 - 0	30	70	100
IMCA - 404	System Analysis & Design	4	4 - 0 - 0	30	70	100
IMCA - 405	Lab based on A) O.S. (Shell Programming) B) CONM	8	0 - 0 - 16	100	100	200 (100+100)
	Total Credit	24	Total Marks			600

Semester V

Coding	Title	Credit	Contact Hrs.	Internal Marks	External Marks	Total Marks
			L – T – P			
IMCA - 501	Python Programming	4	4 – 0 – 0	30	70	100
IMCA - 502	Data Science	4	4 – 0 – 0	30	70	100
IMCA - 503	Android Mobile Application Development	4	0 – 0 – 4	30	70	100
IMCA - 504	Elective	4	4 – 0 – 0	30	70	100
	E-1 Pervasive Computing					
	E-2 Cloud Computing					
IMCA - 505	Lab based on A) Python programming B) Android app development	8	0 – 0 – 16	100	100	200 (100+100)
	Total Credit	24	Total Marks			600

Semester VI

Coding	Title	Credit	Contact Hrs.	Internal Marks	External Marks	Total Marks
			L – T – P			
IMCA – 601	Computer Graphics	4	4 – 0 – 0	30	70	100
IMCA – 602	Introduction to JAVA Programming	4	4 – 0 – 0	30	70	100
IMCA – 603	Artificial Intelligence	4	4 – 0 – 0	30	70	100
IMCA – 604	Elective	4	4 – 0 – 0	30	70	100
	E-1 Big Data Analytics					
	E-2 Cyber Security & Cyber Crime					
IMCA – 605	Lab based on a) Computer Graphics b) Introduction to JAVA Programming	8	0 – 0 – 16	100	100	200 (100+100)
	Total Credit	24	Total Marks			600

Semester VII

Coding	Title	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
			L*	T*	P*			
IMCA 701	Information and Network Security System	4	4	0	0	30	70	100
IMCA 702	Programming with JAVA (Advanced)	4	4	0	0	30	70	100
IMCA 703	Theory of Computation	4	4	0	0	30	70	100
IMCA 704	Design and Analysis of Algorithms	4	4	0	0	30	70	100
IMCA 705	Lab on Advance JAVA & Design and Analysis of Algorithms	8	0	0	16	100	100	200 (100+100)
Total Credit		24	Total Marks					600

L* = Lecture

T* = Tutorial

P* = Practical

Semester VIII

Coding	Title	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
			L*	T*	P*			
IMCA 801	Machine Learning	4	4	0	0	30	70	100
IMCA 802	Advanced Operating System	4	4	0	0	30	70	100
IMCA 803	Software Engineering	4	4	0	0	30	70	100
IMCA 804	Advanced Artificial Intelligence	4	4	0	0	30	70	100
IMCA 805	Lab on .NET + Operating System + Seminar	8	0	0	16	100	100	200 (100+100)
Total Credit		24	Total Marks					600

L* = Lecture

T* = Tutorial

P* = Practical

Semester IX

Coding	Title	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
			L*	T*	P*			
IMCA 901	Modeling & Simulation	4	4	0	0	30	70	100
IMCA 902	Soft Computing	4	4	0	0	30	70	100
IMCA 903	Elective – I	4	4	0	0	30	70	100
IMCA 904	Elective – II	4	4	0	0	30	70	100
IMCA 905	Minor Project / Seminar	8	0	0	16	100	100	200 (100+100)
Total Credit		24	Total Marks					600

L* = Lecture

T* = Tutorial

P* = Practical

List of Elective - I

IMCA 903.1: Wireless Technology

IMCA 903.2: Image Analysis & Computer Vision

IMCA 903.3: Real Time System

IMCA 903.4: Embedded System Design

IMCA 903.5: Software Project Management

List of Elective - II

IMCA 904.1: Natural Language Processing

IMCA 904.2: Parallel Processing

IMCA 904.3: Compiler Design

IMCA 904.4: Artificial Neural Network

IMCA 904.5: Internet of Things (IOT)

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

Semester X

Coding	Title	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
			L*	T*	P*			
IMCA 1001	Major Project (Application based / Research oriented)	24	0	0	0	230	370	600
Total Credit		24	Total Marks					600

L* = Lecture

T* = Tutorial

P* = Practical

Internal Marks [30] Break-up

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

Seminar [50] Break-up

1.	Article Submission (Based on Latest developments in the field of Computer Science)	20
2.	Presentation (Based on Article submitted)	20
3.	Viva-Voce	10
	Total Marks	50

Major Project:

Internal and External Examination Marks for Major Project (of 230 marks) Break-up

SRS (Document + Presentation)	60
SDS (Document + Presentation)	60
Mid-term demo of Project	60
Mid-term Project Report	50
Total Marks	230

External Examination Marks (end Semester) for Major Project (of 370 marks) Break-up

Project Report	110
Executable Code / Execution of Project	110
Final Presentation of the Project	80
Viva-Voce	70
Total Marks	370

Important Notes:

1. Student who remain absent or fail or willing to improve the marks in the internal assessment will be permitted to appear in the desired paper(s) in the same semester with the permission of the concerned Head of Department, 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.

Passing Rules

2. Minimum Pass Marks and Rules regarding Determination of Result are Suggested as follows:
 - (i) The candidate shall be declared 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 forward 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 five years' course will be limited to seven years.

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

Description of Marks Obtained	Division / Result
<ul style="list-style-type: none">• 80% and above marks in a paper	Distinction in that paper
<ul style="list-style-type: none">• A candidate who has secured aggregate 60% and above marks	First Division
<ul style="list-style-type: none">• A candidate who has secured aggregate 50% and above but less than 60% marks	Second Division

Semester-I

IMCA – 101: Programming Fundamentals Using C

UNIT-I

Introduction: Concept of problem solving, Problem definition, Program design, Techniques of Problem Solving (Flowcharting, algorithms, pseudo code), Structured programming concepts Fundamentals: C character set, Tokens, identifiers and keywords, constants and variables, Data types, Structure of a C Program.

UNIT-II

Types of Statements: declarations, arithmetic statements and arithmetic operations, , Operators: Arithmetic, relational and equality, logical, assignment and compound assignment, Operators classification based on number of operands: Unary, Binary and Ternary (conditional, unary operations), operator's precedence & associativity, library functions, single character input and output, entering and writing data.

UNIT-III

Control Statements: Statement and blocks, Decision making structures: if else and its types, Looping structures: while, for, do while, Case control structures: switch, break and continue statements, nested control structures.

UNIT-IV

Arrays: Definition, types, initialization, processing an array, 2 Dimension Arrays, Sorting, Searching, Copy, Insertion, Deletion of elements in array. Functions and pointers: Functions definition, prototype, passing parameters, recursion, pointers, pointers and arrays, pointers and Functions.

UNIT-V

String: Operations on String, built in functions, string and functions User defined data types and Additional Features of C: Structures, Array of Structures, Array within Structures, Structures within Structures, Union, Enumerations, Pre-processor Directives, FILE handling basic.

Text/Reference Books:

1. The C Programming Language by Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall Software Series, 2nd Edition.
2. Let us C by Y.Kanetkar, BPB Publications.
3. Mastering C by Vijay Prasad, TMH.
4. Programing with C, Balaguruswamy, Tata McGraw-Hill.
5. Schaum's Outline of Theory and Problems of Programming with C: Gottfried B.S., TMH.
6. C Project by Kanetkar, BPB Publications,2006.

IMCA – 102: Discrete Structures

Unit - I

SETS: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.

Unit – II

RELATIONS AND FUNCTIONS: Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

Unit – III

PARTIAL ORDER RELATIONS AND LATTICES: Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, Glb, lub, Lattices & Algebraic Systems, Principle of Duality, Basic Properties, Sublattices, Distributed & Complemented Lattices.

Unit -IV

Graphs: types and operations(bipartite graph. Subgraph, distance of a graph, cut-edges & cut vertices, isomorphic and homomorphic graphs), degree of graphs, adjacent and incidence matrices, path circuit(Floyd's and Warshall algorithms), hamiltonian graph, graph colouring.

Unit – V

Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

Text/Reference Books:

1. Rosen, K.H., Discrete Mathematics and its Applications, McGraw Hill, (2006)
2. Kolman, Busby and Ross, "Discrete Mathematical Structure", PHI, 1996.
3. Babu Ram, "Discrete Mathematics", Pearson Education
4. S.K. Sarkar, "Discrete Maths"; S. Chand & Co., 2000.
5. Tremblay, J.P. and Manohar, R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, (2007).

IMCA -103: Digital Electronics

Unit-I

Number System and Codes: Decimal, Binary, Hexadecimal, Octal, BCD, Conversions, Complements (1's and 2's), Signed and Unsigned numbers, Addition and Subtraction, Multiplication, Gray and Hamming Codes.

Unit-II

Logic Gates and Boolean Algebra: Truth Tables, OR, AND, NOT, XOR, Universal (NOR and NAND) Gates, Boolean Theorems, DeMorgan's Theorems.

Unit-III

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques(Karnaugh Map Method: up to 4 variables). Multiplexers(2:1,4:1) and Demultiplexers (1:2,4:1), Adder (half and full) and their use as subtractor, Encoder (8-line-to-3-line) and Decoder (3-line-to-8-line) , Code Converters(Binary to BCD and vice versa).

Unit-IV

Sequential logic design: Latch, Flip flop, S-R FF , J-K FF, T and D type FFs, Clocked FFs, Registers, Counters (ripple, synchronous and asynchronous, ring, modulus), State Table, State Diagrams and Sequential Machines.

Unit- V

A/D and D/A converters: D/A conversions – Weighted-Register D/A converter, R-2R ladder D/A converter, A/D conversions-Counter type method using D/A, dual slope integrator method, successive approximation method, simultaneous method.

Text/Reference Books:

1. Digital Electronics, Principles and Applications, R.L. Tokheim, Tata McGraw-Hill.
2. Digital Principles, R.L. Tokheim, Schaum's Outline Series, Tata McGraw-Hill.
3. Digital Systems, Principles and Applications, R.J. Tocci and N.S. Widner, Pearson Education Asia.
4. Digital Principles and Applications, A.P. Malvino and D. Leach, Tata McGraw Hill.
5. Digital Design, M.M. Mano, Pearson Education Asia.
6. Digital Fundamentals, T.L. Floyd, Pearson Education Asia.
7. Solved Problems in Digital Electronics, S.P. Bali, Sigma Series, Tata McGraw-Hill.
8. Digital Electronics, W.H. Gothmann, Prentice Hall of India.
9. Modern Digital Electronics, R.P. Jain, Tata McGraw-Hill.

IMCA -104: Mathematics – I

UNIT-I

Differential Calculus: Partial Differentiation, asymptotes, concavity, convexity, point of inflexion, curvature, radius of curvature, curve tracing, envelopes and evolutes, change of variables, Jacobian, expansion of functions of several variables.

UNIT-II

Chain rule, mean value theorem, Taylor series with remainder term, maxima & minima, saddle point.

UNIT-III

Integral Calculus: Fundamental theorem of Integral calculus, reduction formulae, properties of definite integral, applications to length, area, volume, surface of revolution.

UNIT-IV

Matrices: Elementary row and column transformation, linear dependence, rank of a matrix, consistency of system of linear equations, solution of linear system of equations, characteristic equations.

UNIT-V

Cayley Hamilton theorem, eigen values and eigen vectors, diagonalization, complex matrices.

Text/Reference Books:

1. B.S. Grewal, "Elementary Engineering Mathematics", 34th Ed., 1998.
2. Shanti Narayan, "Integral Calculus", S. Chand & Company, 1999
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised Edition, 2001.
4. Shanti Narayan, "Differential Calculus", S.Chand & Company, 1998.

Semester-II

IMCA-201: Data Structures

Unit-1:

Introduction to programming methodologies and design of algorithms, Structured programming concepts, Study and implementation of basic data structures like: Arrays, multidimensional arrays and their organization, introduction to sparse arrays

Unit-2:

Linked list (singly, doubly and circular), Concept of linked list, Difference of link list & array, Single linked list, Representation, Operations, Traversing, Insertion(first node, last node, at a position, after a node value), Deletion(first node, last node, at a position, after a node value), Double linked list, Representation , Operations, traversing, Insertion (first node, last node, at a position, after a node value), Deletion (first node, last node, at a position, after a node value), Circular link list & header link list example

Unit-3:

Stacks, Queues, Operations on Stack, Array & Linked Representation, Programs on stack, Push & Pop operations, traversing. Operations on Queue, Array & Linked Representation, Programs on stack, Insert & Delete operations, Circular queue, representation, Priority Queue, Application of queue

Unit-4:

Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort

Unit-5 :

Tree terminology, Binary tree, Complete Binary Tree, Binary search tree, Tree Traversals, Creation of Binary Tree from traversal methods, Expression Tree & expression, Manipulation, Binary Search Tree, Insertion & deletion in BST(Program), Graph:, Graph terminology, Representation of graphs, Path matrix, Graph Traversal, BFS (breadth first search), DFS (depth first search).

Text/Reference Books:

1. Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Edu.
2. Y. Langsam, Tananbaum, et. al., "Data Structures using C and C++", PHI, 1999.
3. Schaum's outline series, "Data Structure", TMH, 2002
4. Yashwant Kanetkar, "Data Structures Through C",BPB Publications, 2008
5. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Booksource

IMCA -202: Computer Architecture

Unit-I

Basic Computer Organization and Design: Computer registers, bus system, instruction set, timing and control, instruction cycle (fetch and execute cycle), memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

Unit-II

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

Unit-III

Memory Organization: Cache memory-Cache hit and cache miss, hit ratio, Associative memory, mapping, Virtual memory organization.

Unit-IV

Input-output Organization: Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Unit- V

IC Digital Logic Families: Bipolar Transistor as current controlled switch, MOSFET as voltage controlled switch. RTL, DTL, TTL, ECL. MOSFET and CMOS.

Text/Reference Books:

1. M. Mano, Computer System Architecture, Prentice Hall of India Third edition / Pearson Education 1992.
2. A. J. Dos Reis, Assembly language and computer architecture using C++ and JAVA, Course Technology, 2004.
3. W. Stallings, Computer Organization and Architecture Designing for Performance 8th Edition 2009, Prentice Hall of India.

IMCA-203: Technical writing and Communication in English

Unit –I

Grammar and Reading Skills- Skills of effective reading, reader related material, memory and retention, Parts of speech, writing correctly transformation of sentences, incorrect to correct English, tenses and replacing single word for group of words.

Unit –II

Skills in Writing- letters, official/business correspondence. CV's, Tech. Reports/types, Precise, comprehension, Paragraph writing (200 word) on current topics, writing notices, agenda, circulars.

Unit –III

Secretarial Skills- Effective communication, listening and feedback skills, telephone handling, Attending meeting, preparing of agenda, writing of minutes, summaries. Handling problem situations. Control of voice and proper use of phonetics.

Unit –IV

Presentation and Discussion Skills- Types of communication. Barriers to Communication. Effective use of kinesics, Planning interviews and making presentations. Taking initiatives- especially in group discussions, overcoming nervousness, making audience analyses and establishing leadership.

Unit-V

Writing Manual and Proposals: Identify different types of manuals and describe their purpose. Differentiate between print manuals and e-manuals and detail issues related to manuals. Assess standard operating procedure and demonstrate how to follow the writing process to create manuals. Analyze the content and structure of proposals and compare the different proposal types. Discuss persuasive elements of proposals and the purpose of requests for proposals.

Text/Reference Books:

1. K.K. Sinha, "Business Communication".
2. Varinder Pal, "Business Communication".
3. T. M. Farhatullah, "Communication Skills for Technical Students".
4. Shiv K. Khera, "You can Win
5. Sharma, R.C. and Krishna Mohan. *Business Correspondence and Report Writing*, Tata McGraw- Hill publishing Company Limited.
6. Sen, leena. *Communication Skills*, Prentice Hall of india, New Delhi.
7. Pal Rajinder and Prem Lata. *English Grammar and Composition*, S. Chand Publication, new Delhi.
8. O, Connor, J.D. *Better English Pronunciation*, Cambridge University Press, Cambridge.
9. Hornby, A.S. *Oxford Advanced Learner's Dictionary*, Oxford University Press.

IMCA-204: Mathematics-II

Unit -I

Definition and examples of group, General properties of groups, Order of an element of a group, Permutations, Even and Odd permutations, Group of permutations, Cyclic group.

Unit -II

Subgroups, Cosets, Lagranges theorem, Morphism of groups, Kernel, Isomorphism, Cayle's theorem, Automorphism, Fundamental theorem of homomorphism.

Unit -III

Rings, Zero divisors, Integral domain and Fields, Characteristic of a ring and an integral domain, Subrings, Subfield, prime field, Ring homomorphism and isomorphism.

Unit -IV

FUNCTIONS OF SEVERAL VARIABLES Partial Differentiation, Change of Variables, Chain Rule, Euler's Theorem.

UNIT-V

Maxima and minima of functions of two and three independent variables, Lagranges method of undetermined multipliers.

Text/Reference Books:

1. Kolman, Busby and Ross, "Discrete Mathematical Structure", PHI, 1996.
2. S.K. Sarkar, "Discrete Maths"; S. Chand & Co., 2000.
3. Differential Calculus: Shanti Narayan, Shyam Lal Charitable Trust, Delhi, 1981.
4. Integral Calculus: Shanti Narayan, S. Chand, Delhi, 1982.

Semester-III

IMCA-301: Object Oriented Programming using C++

Unit I

Principles of Object Oriented Programming: - The Traditional Approach, Shortcoming of procedure oriented languages, Basic concepts of Object Oriented Programming, Benefits of OOP, Object Oriented Languages

Unit II

Overview of Programming Basics:- Input/Output using cin/cout, processor directives, basic and user defined data types, operators, loops, decision making, control statements, functions, pointers to functions

Unit III

Classes :Definition, Class objects, Class member functions, Static Class Members, Class Scope, Nested Classes, Local Classes, Composite class, Constructor, Destructor, Friends, this Pointer, Operator Overloading:-Overloading unary and binary operators, Special operators : Operator [], (), , ++ and --, << and >>, etc.

Unit IV

Inheritance and Polymorphism :- Class hierarchy : Definition, Identifying the members of the hierarchy, Base class member access, Base and derived class construction, Member wise initialization and assignment, virtual functions, multiple inheritance, class scope under inheritance, virtual classes

Unit V

Templates:- Class Templates, Function Templates, Exception Handling :- Throwing, The try.....catch block, Exception specifications

Text/Reference Books:

1. C++: The Complete Reference Herbert Schildt, TMH, 5 th Ed.
2. Let us C++ Kanetkar, BPB, 2 nd Ed
3. Object Oriented Programming with C++ E. Balagurusamy, TMH, 4 th Ed.
4. C++ Primer Stanley Lippman & Lajoi, Pearson, 3 rd Ed.
5. C++ Programming Language Bjarne Stroustrup, Pearson, 3 rd Ed.
6. C++ Programming Bible Al Stevens & Clayton Walnum, Wiley Pub.

IMCA-302: Systems Programming

Unit-I

Introduction to system software, Evolution of system software, General machine architecture (memory, register, data, instructions) The Simplified Instructional Computer (SIC), Traditional (CISC) Architectures, RISC Architectures.

Unit-II

Elements of assembly language programming,, Overview of assembly process, assembler features and functions, Load and Go assembler, One-pass and two pass assemblers, Brief description of different phases of a compiler. Introduction to Interpreters. Software tools for program entry and testing, line and screen editors, debug monitors.

Unit - III

Loaders and Linkers: Basic Loader functions and features: Compile & go, absolute, relocating, direct linking & subroutine linkage loader schemes, binders, linking loaders. Relocation, Program Linking, static and dynamic linking.

Unit -IV

Macro Processors - Basic Macro Processor Functions, Machine-Dependent Macro Processor Features, Machine-Independent Macro Processor Features, Macro Processor Design Options, Implementation Examples.

UNIT-V

Structured Programming, Applications of structured programming techniques to construction of system software tools.

Features of Higher level languages (HLL) Importance and features of HLL, Extensive data types and structures, Scope rules, Storage Allocation, Functional Modularity

Text/Reference Books:

1. Systems Programming - J.J.Donavan, Tata McGraw Hill.
2. System Software: An Introduction to Systems Programming, 3/E - Leland L. Beck - Addison-Wesley.
3. D.M. Dhamdhare Systems Programming and Operating Systems, Tata McGraw-Hill Publishing Company, Ltd; Second Revised Edition 1996
4. L. Beck, D. Manjula, System Software, An Introduction to Systems Programming, Pearson, 3rd Edition 1996.
5. Advanced MS-DOS Programming - Ray-Duncan. BPB Publication.
6. Writing DOS device drivers : Paniel A.Norton Addison-Wesley.
7. Hardware & Software of personal Computers : Sanjay K.Bose. Wesley Eastern Publication.

IMCA-303: Database Systems

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 multi-valued 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. R. Elmarsri and SB Navathe, "Fundamentals of Database Systems", Pearson, 5th Ed. [T2] Singh S.K., "Database System Concepts, design and application", Pearson Education [T3] Ramakrishnan and Gherke, "Database Management Systems", TMH.
2. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 4th Edition, McGraw Hill, 1997.
3. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.
4. A. K. Majumdar, P. Battacharya, "Data Base Management Systems", TMH, 1996. [R4] Bipin Desai, "An Introduction to database Systems", Galgotia Publications, 1991.

IMCA-304: Statistics and Probability

Unit-I

Probability: Sample Space, Axioms of Probability, Probability on Finite Sample Spaces, Conditional Probability, Bayes Theorem, and Independence of Events, Random Variables.

Unit II

Review of basic probability, Random variables, Probability Distribution, Mathematical Expectation and Variance of Probability distribution, Standard discrete distributions: Binomial, Poisson and Geometric distributions, Probability density function, Cumulative distribution function, Expectation and Variance, Standard continuous distributions – Uniform, Normal, Exponential, Joint distribution and Joint density functions

Unit III

Population and Sample, Statistical inference, Sampling with and without replacement, Random samples, Population parameters, Sample statistics, Sampling distributions, Sample mean, Sampling distribution of means, Sample variances, Sampling distribution of variances, Case where population variances is unknown, Unbiased estimates and efficient estimates, point estimate and Interval Estimates, Confidence Interval estimates of population parameters, Confidence intervals for variance of a Normal distribution, Maximum likelihood estimates.

Unit IV

Statistical hypothesis, Null and Alternate hypothesis, test of hypothesis and significance, Type I and Type II errors, Level of Significance, Tests involving the Normal distribution, One-Tailed and Two-Tailed tests, P value. Special tests of significance for Large samples and Small samples (F, chi-square, z, t- test), ANOVA.

Unit V

Correlation, Rank correlation, Regression Analysis, Linear and Non linear Regression, Multiple regression, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves.

Text/Reference Books:

1. V. Rohatgi, A. Saleh, Introduction to Probability Theory and Statistics, Second Edition, Wiley-Interscience, 2000.
2. W. Feller, An Introduction to Probability Theory and Its Applications, Vol.1, Third Edition, Wiley, 1968.
3. G. Casella, R. L. Berger, Statistical Inference, Second Edition, Duxbury Press, 2001.

Semester-IV

IMCA-401: Operating Systems

Unit – I

Introduction: What is an Operating System, Simple Batch Systems, Multi-programmed Batches systems, Time-Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems.

Processes: Process Concept, Process Scheduling, Operation on Processes, CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling,

Unit- II

Process Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit-III

Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing. Memory Management: Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation.

Unit-IV

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management Disk Reliability

Unit – V

Information Management: Introduction, A Simple File System, General Model of a File System, Types of File System File-System Interface: File Concept, Access Methods, Directory Structure, Protection: Goals of protection, Domain of protection, Access rights, Consistency Semantics Security: Authentication, Program threats, System threats, Encryption.

Text/Reference Books:

1. Silberschatz and Galvin, “Operating System Concepts”, John Wiley & Sons, 7th Ed. 2005
2. Haldar/Aravind, “Operating System”, Pearson Edu.
3. Madnick E., Donovan J., “Operating Systems”, Tata McGraw Hill, 2001
4. Tannenbaum, “Operating Systems”, PHI, 4th Edition, 2000

IMCA-402: Computer Networks

Unit-I

Introduction to Computer Networks: Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

Unit-II

Data Communication Fundamentals and Techniques: Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; guided and unguided transmission media.

Unit-III

Networks Switching Techniques and Access mechanisms: Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Unit-IV

Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go- back-n ARQ; Point to Point Protocol on Internet.

Multiple Access Protocol and Networks: CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networking devices- repeaters, hubs, switches, bridges, router and gateways.

Unit-V

Networks Layer Functions and Protocols: routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

Transport Layer Functions and Protocols: Transport services- error and flow control, Connection establishment and release- three way handshake;

Overview of Application layer protocol: Overview of DNS protocol; overview of WWW & HTTP protocol.

Text/Reference Books:

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM Publishing Company Ltd 2007.
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI Pvt. Ltd 2002.
3. W. Stallings: Data and Computer Communication, Tata McGraw Hill, latest Edition.

IMCA-403: Computer Oriented Numerical Methods

Unit-I

Computer Arithmetic and Solution of Non-Linear Equations : Introduction – Floating Point Arithmetic and Errors: Floating point represent of Numbers – Sources of Errors – Non-Associativity of Arithmetic – Propagated Errors – Pitfalls in Computation.

Unit-II

Solution of Non-Linear equations: Bisection – Fixed point – Regula falsi – Newton's Raphson – Secant method. Convergence criteria of Iterative methods. Solution of simultaneous Linear Algebraic Equations and ordinary differential equations :

Unit-III

Cramer's Rule - Gauss elimination method – Pivoting Strategies - Gauss Jordan method – Jacobi Iterative method – Gauss Seidal method –Comparison of Direct and Iterative methods. Interpolation and Curve Fitting : Problem of Interpolation - Langranges method of Interpolation – Inverse Interpolation – Newton's interpolation formulae.

Unit-IV

Error of the Interpolating Polynomial - Interpolation at equally spaced points : Forward and Backward differences – Newton's forward and backward difference formulas. Fitting of polynomials and other curve - Least square approximation of functions - linear and polynomial regressions.

Unit-V

Numerical differentiation and Integration : Differentiation based on polynomia fit - Numerical integration using Simpson,s rule and Gaussian quadratic formula - Numerical solution of differential equations of the form $dy/dx=f(x,y)$ using Euler,s method and Runge-Kutta methods.

Text/Reference Books:

1. Numerical methods for Scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.
2. Elementary Numerical Analysis by Samuel D.Conte and Cart de Boor, McGraw Hill International Edition.
3. Numerical methods for Science and Engineering, PHI by R.G.Stanton
4. Computer based numerical algorithms by E.V.Krishnamoorthy
5. Introduction to Numerical Analysis by E.Atkinson

IMCA-404: System Analysis & Design

Unit-I

System definition and concepts: Characteristics and types of system, Manual and automated Systems, Real-life Business sub-systems: Production, Marketing, Personal, Material, Finance
Systems models types of models: Systems environment and boundaries, Real-time and distributed systems, Basic principles of successful systems. Systems analyst: Role and need of systems analyst ,Qualifications and responsibilities ,Systems Analyst as and agent of change,

Unit-II

System Development Life Cycle: Various phases of development :Analysis, Design, Development, Implementation, Maintenance, Systems documentation considerations: Principles of systems documentation , Types of documentation and their importance, Enforcing documentation discipline in an organization. System Planning: Data and fact gathering techniques: Interviews, Group communication, Presentations, Site visits. Feasibility study and its importance Types of feasibility reports System Selection plan and proposal Prototyping Cost-Benefit and analysis: Tools and techniques.

Unit-III

Systems Design and modelling: Process modeling, Logical and physical design, Design representation, Systems, flowcharts and structured charts , Data flow diagrams , Common diagramming, conventions and guidelines using DFD and ERD diagrams. Data Modeling and systems analysis , Designing the internals: Program and Process design ,Designing Distributed Systems, Input and Output: Classification of forms: Input/output forms design, User-interface design, Graphical interfaces

Unit-IV

Modular and structured design: Module specifications ,Module coupling and cohesion , Top-down and bottom-up design, System Implementation and Maintenance: Planning considerations, Conversion methods, producers and controls, System acceptance Criteria, System evaluation and performance, Testing and validation, Systems qualify Control and assurance, Maintenance activities and issues.

Unit-V

System Audit and Security: Data and Strong media Procedures and norms for utilization of computer equipment, Audit of computer system usage, Audit trails, Types of threats to computer system and control measures: Threat to computer system and control measures, Disaster recovery and contingency planning, Object Oriented Analysis and design: Introduction to Object Oriented Analysis and design life cycle, object modeling: Class Diagrams, Dynamic modeling: state diagram, Dynamic modeling: sequence diagramming.

Text/Reference Books:

1. System Analysis and Design Methods, Whitten, Bentley and Barlow, Galgotia Publication.
2. System Analysis and Design Elias M. Awad, Galgotia Publication.
3. Modern System Analysis and Design, Jeffrey A. Hofer Joey F. George Joseph S. Valacich Addison Wesley.

Semester-V

IMCA-501: Python Programming

Unit I

Introduction to Python: Python variables, Python basic Operators, Understanding python blocks. Python Data Types, Declaring and using Numeric data types: int, float etc.

Unit II

Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.

Unit III

Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Python Functions, Organizing python codes using functions.

Unit IV

Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations. Database Programming: Connecting to a database, Creating Tables, INSERT, UPDATE, DELETE and READ operations, Transaction Control, Disconnecting from a database, Exception Handling in Databases.

Unit V

Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc. GUI Programming: Tkinter introduction, Tkinter and Python Programming, Tk Widgets, Tkinter examples. Python programming with IDE.

Text/Reference Books:

1. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition , Pearson Education, 2016
2. Charles Dierbach, "Introduction to Computer Science using Python", Wiley, 2015
3. Jeeva Jose & P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Publishers, New Delhi, 2016
4. Downey, A. et al., "How to think like a Computer Scientist: Learning with Python", John Wiley, 2015
5. Mark Lutz, "Learning Python", 5th edition, Orelly Publication, 2013, ISBN 978- 1449355739

IMCA-502: Data Science

UNIT-I

Develops all aspects of the machine learning pipeline: data acquisition and cleaning, handling missing data.

UNIT-II

Exploratory data analysis, visualization, feature engineering, modeling, interpretation, presentation in the context of real-world datasets.

UNIT-III

Fundamental considerations for data analysis are emphasized (the bias-variance tradeoff, training, validation, testing).

UNIT-IV

Classical models and techniques for classification and regression are included (linear and logistic regression with regularization, support vector machines, decision trees, random forests, XGBoost).

UNIT-V

Uses the Python data science ecosystem (e.g., sklearn, pandas, matplotlib).

Text/Reference Books:

Cathy O’Neil and Rachel Schutt. *Doing Data Science, Straight Talk From The Frontline*. O’Reilly. 2014.

References and books related to the course:

- 1 Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. *Mining of Massive Datasets*. v2.1, Cambridge University Press. 2014. (free online)
- 2 Kevin P. Murphy. *Machine Learning: A Probabilistic Perspective*. ISBN 0262018020. 2013.
- 3 Foster Provost and Tom Fawcett. *Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking*. ISBN 1449361323. 2013.
- 4 Trevor Hastie, Robert Tibshirani and Jerome Friedman. *Elements of Statistical Learning*, Second Edition. ISBN 0387952845. 2009. (free online)
- 5 Avrim Blum, John Hopcroft and Ravindran Kannan. *Foundations of Data Science for a modern theoretical course in computer science*.
- 6 Mohammed J. Zaki and Wagner Miera Jr. *Data Mining and Analysis: Fundamental Concepts and Algorithms*. Cambridge University Press. 2014.
- 7 Jiawei Han, Micheline Kamber and Jian Pei. *Data Mining: Concepts and Techniques*, Third Edition. ISBN 0123814790. 2011.

IMCA-503: Android Mobile Application Development

UNIT - I

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT - II

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT - III

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT - IV

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT -V

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

1. T1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)
2. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
3. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
4. Android Application Development All in one for Dummies by Barry Burd, Edition: I

IMCA-504: E-1 Pervasive Computing

Unit - I

INTRODUCTION: Pervasive Computing: Past, Present and Future - Pervasive Computing, Application

Unit -II

DEVICE TECHNOLOGY Hardware – Human Machine Interfaces – Biometrics – Operating Systems – Java for Pervasive devices.

Unit -III

DEVICE CONNECTIVITY & WEB APPLICATION CONCEPTS: Protocols – Security – Device Management - Web Application Concepts: WWW architecture – Protocols – Transcoding - Client Authentication via Internet.

Unit -IV

WAP & VOICE TECHNOLOGY: WAP and Beyond: Components of the WAP architecture – WAP infrastructure – WAP security issues – WML – WAP push – Products – i-Mode - Voice Technology: Basics of Speech recognition- Voice Standards – Speech applications – Speech and Pervasive Computing.

Unit -V:

PDA & PERVASIVE WEB APPLICATION ARCHITECTURE: Device Categories – PDA operation Systems – Device Characteristics – Software Components - Standards – Mobile Applications - PDA Browsers - Pervasive Web Application architecture: Background – Development of Pervasive Computing web applications - Pervasive application architecture.

Text/Reference Books:

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, “Pervasive Computing, Technology and Architecture of Mobile Internet Applications”, Pearson Education, 2012.
2. Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, “Fundamentals of Mobile and Pervasive Computing”, McGraw Hill edition, 2006.
3. Uwe Hansmann, L. Merk, Nicklous M., Stober T., Hansmann U., “Pervasive Computing (Springer Professional Computing)”, 2003, Springer Verlag, ISBN:3540002189.

IMCA-504: E-2 Cloud Computing

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.

Semester-VI

IMCA-601: Computer Graphics

Unit-I

Introduction to Graphics systems, Basic elements of Computer graphics, Applications of computer graphics. Graphics Hardware: Architecture of Raster and Random scan display devices, input/output devices.

Unit-II

Fundamental Techniques in Graphics: Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling

Unit-III

2D and 3D Geometric Transformations; translations, rotation, scaling, shearing, reflection, composite transformation

Unit-IV

Projections, Vanishing points. Geometric Modeling: Representing curves & Surfaces. Visible Surface determination: Hidden surface elimination. Surface rendering: Illumination and shading models.

Unit-V

Basic color models and Computer Animation, and a case study of a popular graphics software.

Text/Reference Books:

1. J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2 nd edition Publication Addison Wesley 1990.
2. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2 nd edition 1989.

IMCA-602: Introduction to JAVA Programming

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. Herbert Schildt: JAVA 2 The Complete Reference, TMH, Delhi
2. Deitel: How to Program JAVA, PHI
3. U.K. Chakraborty and D.G. Dastidar: Software and Systems An Introduction, Wheeler Publishing, Delhi.
4. Joseph O'Neil and Herb Schildt: Teach Yourself JAVA, TMH, Delhi

IMCA-603: Artificial Intelligence

Unit-I

Introduction: Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behavior and environment.

Unit-II

Problem Solving and Searching Techniques: Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

Unit-III

Knowledge Representation: Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs.

Unit-IV

Programming in Logic (PROLOG). Dealing with Uncertainty and Inconsistencies: Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.

Unit-V

Understanding Natural Languages: Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

Text/Reference Books:

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3 rd edition, 2001.
5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3 rd edition, 2000.

IMCA-604: E-1 Big Data Analytics

UNIT I :

INTRODUCTION TO BIG DATA AND HADOOP Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

UNIT II :

HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III :

Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV :

Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction

UNIT V :

Data Analytics with python Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with python.

Text/Reference 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

IMCA-604: E-2 Cyber Security and Cyber Crime

Unit-I

Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking.

Unit-II

CYBER OFFENSES: HOW CRIMINALS PLAN THEM Introduction, Categories of Cybercrime, How Criminals Plan the Attacks: Reconnaissance, Passive Attack, Active Attacks, Cybercafe and Cybercrimes Cybercrime and Cloud Computing .

Unit-III

CYBERCRIME: MOBILE AND WIRELESS DEVICES Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era: Types and Techniques of Credit Card Frauds, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Operating Guidelines for Implementing Mobile Device Security Policies, Organizational Policies for the Use of Mobile Hand-Held Devices, Laptops.

Unit-IV

TOOLS AND METHODS USED IN CYBERCRIME Introduction, Proxy Servers and Anonymizers, Phishing: How Phishing Works? Password Cracking: Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords, Keyloggers and Spywares Spywares, Virus and Worms: Types of Viruses, Trojan Horses and Backdoors, Attacks on Wireless Networks: Traditional Techniques of Attacks on Wireless Networks, Theft of Internet Hours and Wi-Fi-based Frauds and Misuses, How to Secure the Wireless Networks.

Unit-V

Cyber laws: The Indian Context, The Indian IT Act: Admissibility of Electronic Records: Amendments made in the Indian ITA 2000, Positive Aspects of the ITA 2000, The Weak Areas of the ITA 2000, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act Amendments to the Indian ITA 2008: Overview of Changes Made to the Indian IT Act, Cyberlaw, Technology and Students: Indian Scenario.

Text/Reference Books:

1. "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole, SUnit Belapur, Wiley India Publications, April, 2011.
2. "Cyberlaw: The Indian Perspective" by Pavan Duggal, Saakshar Law Publications, Delhi.
3. Indian Legislation On Cyber Crime, S.R. Sharma, Anmol Publications
4. Cyber Laws, Yatindra Singh, Universal Law Publishing Co.
5. The Information Technology Act, 200 – Universal Law Publishing Co.

Semester-VII

IMCA-701: Information and Network Security System

Unit-I

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

Unit-II

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-III

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-IV

Public Key Cryptography – Number Theory: Euclidean algorithm, Euler Theorem, Fermat theorem, Totient 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-V

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. Cryptography and Network Security by William Stallings, Pearson Education, 6th edition, 2013.
2. Cryptography and Network Security by Behrouz A. Forouzan, Tata McGraw Hill.
3. Cryptography and Network Security by atul Kahate, McGraw Hill Education India (Pvt. Ltd.) 2nd edition, 2009.
4. Handbook of Information Security Management, Micki Krause F tipton- Vol. – 3, CRC Press LLC, 2004.
5. Link: Dr, Gary C. Kersler's : An overview of Cryptography: "Pretty good Privacy (PGP)"(HTML).
6. www.Netsecurity.net.

IMCA-702: Programming with JAVA (Advance)

UNIT-I

A Collection of Useful Classes Utility Methods for Arrays ,Observable and Observer Objects , Date & Times ,Using Scanner Regular Expression, Input/Output Operation in Java(java.io Package),Streams and the new I/O Capabilities ,Understanding Streams, The Classes for Input and Output, The Standard Streams, Working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects .

UNIT-II

GUI Programming Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features Using Swing Components, Java Utilities (java.util Package) The Collection Framework : Collections of Objects , Collection Types, Sets , Sequence, Map, Understanding Hashing, Use of ArrayList & Vector.

UNIT-III

Event Handling Event-Driven Programming in Java, Event- Handling Process, Event Handling Mechanism, The Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.

UNIT-IV

Database Programming using JDBC Introduction to JDBC,JDBC Drivers & Architecture, CRUD operation Using JDBC, Connecting to non-conventional Databases.

UNIT-V

Java Server Technologies Servlet Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment , Descriptor (web.xml), Handling Request and Response.

Text/Reference Books:

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

IMCA-703: Theory of Computation

Unit - I :

Introduction Basic Concepts: Symbols, Strings, Language, Formal Language, Natural Language. Basic Machine and Finite State Machine. Finite Automata: Definition and Construction – Deterministic Finite Automata, Non Deterministic Finite Automata, NFA with Epsilon-Moves, Equivalence of NFA and DFA, Minimization of Finite Automata, Concept of Generalized non-deterministic finite automata.

Unit - II :

Regular Expressions, Regular Grammar and Languages Definition and Identities of Regular Expressions, Regular Grammar and Finite Automata: FA to RG and RG to FA, Left Linear and Right Linear Grammar and Inter-conversion between them. Closure Properties of Regular Languages, Non-regular languages and Pumping Lemma.

Unit - III :

Context Free Grammar and Languages Definition and Construction of CFG, Definition, Parse tree, derivation, ambiguity, Ambiguous Grammar and Removal of Ambiguity. Simplification of Grammar. Normal Forms of Grammar: Chomsky normal form and GNF. Non-Context Free Languages, pumping lemma.

Unit - IV :

Pushdown Automata Definition and Construction of Deterministic pushdown automata (DPDA) and Non-Deterministic pushdown automata (NPDA). Pushdown Automata - Examples and Relation with CFGs, Equivalence of PDAs and CFGs, Closure Properties of CFLs.

Unit - V :

Turing Machines & Decidability Definition and Construction of Turing Machines. Languages of TM. Types of TM. Time Complexity of TM, Halting Problem, Decidability/ undecidability

Text/Reference Books:

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

IMCA-704: Design and Analysis of Algorithms

Unit-I

Algorithms and structured programming, analysing algorithms, asymptotic behaviour of an algorithm, Order notations, time and space complexities (polynomial, logarithmic 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. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications, 1985.
2. Design & Analysis of Computer Algorithms, Aho, J.E. Hopcroft, & J.D. Ullman, Addison Wesley, 1974.
3. Algorithms - The Construction, Proof & Analysis of Programs, P. Berliions & P. Bizard, John Wiley & Sons, 1986.
4. Data Structures and Algorithms, K. Melhorn, Vol. I & II, Springer Verlag, 1984.
5. Introduction to Algorithms by A.L. Cormen, leiseron, rivest & Stain, 3rd Edition, PHI Learning pvt. Ltd.

Semester-VIII

IMCA-801: Machine Learning

Unit-I

Machine Learning: Introduction, Types of machine learning, supervised learning-Basics, Over fitting the training data. Nearest Neighbor Methods, Validation: Nearest neighbor prediction, K-nearest neighbor methods, Weighted neighbor methods, the curse of dimensionality, Computational considerations, Connection to density estimation.

Unit-II

Probability, Matrix, Random variable, Conditional probability, Bayes' theorem, Over fitting, linear classification: Characterizing a linear classifier, Training a linear classifier.

Unit-III

Logistic regression, Support vector machines (SVMs), Linear SVM, Lagrangian optimization and duality, The soft margin SVM, The kernel Trick.

Unit-IV

Decision Trees: Predictor form, Training Decision trees, Decision tree classifiers, Learning Decision trees.

Unit-V

Clustering: K-means, Agglomerative, Gaussian Mixtures and EM

Text/Reference Books:

1. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008.
2. Christopher Bishop. Pattern Recognition and Machine Learning. 2e.

IMCA-802: Advance Operating System

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. Operating System Concepts, Silberschatz, Galvin and Gagne, Wiley India Ltd., 6 edition.
2. Modern Operating Systems, Andrew S. Tanenbum, Pearson Edition, 2nd edition, 2004.
3. Operating Systems, Gary Nutt, Pearson Education, 3rd Edition, 2004.
4. Operating Systems, Harvey M. Dietal, Pearson Education, 3rd edition, 2004.
5. Fundamentals of Operating Systems, A.M. (1979).

IMCA-803: Software Engineering

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

IMCA-804: Advance Artificial Intelligence

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

Semester – IX

IMCA-901: Modeling and Simulation

Unit-I

Definition of System: Types of system-continuous and discrete, modelling process and definition of a model.

Unit-II

Computer work load and preparation of its models, verification and validation modelling procedures, comparing model data with real system. Differential and partial differential equation models.

Unit-III

Simulation Process: Use of simulation, advantages and disadvantages of simulation, discrete and continuous simulation procedures, Discrete system simulation: Monte Carlo method, Random Number Generation.

Unit-IV

Evaluation of simulation, length of simulation runs, variance reduction techniques. Project management : PERT/CPM techniques, simulation of PERT networks. Model as components of information systems, modelling for decision support.

Unit-V

Simulation languages: A brief introduction to important discrete and continuous simulation language; Simula,

Dyanamo, Stella, Powerism. Their application and Comparison.

Text/Reference Books:

1. Introduction to simulation,Payne, J.A: Mcgraw Hill.
2. Computer Aided Modelling and Simulation-Spriet, W. A: Academic Press.
3. Modelling and performance Measurement of Computer systems, Barnes,B:.
4. System Simulation, Gorden, G: Prentice Hall of India.
5. System Simulation, Deo Narsing, Mcgraw Hill.

IMCA-902: Soft computing

Unit-I

What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

Unit-II

What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons , Back Propagation networks, Architecture of Back-propagation(BP) Networks, Back-propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

Unit-III

Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

Unit-IV

History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

Unit-V

Evolutionary Computing, Simulated Annealing, Random Search, Downhill Simplex Search.

BOOKS

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, International Editions, Electrical Engineering Series, Singapore, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.
5. Stamatios V. Kartalopoulos "Understanding Neural Networks and Fuzzy Logic Basic concepts & Applications", IEEE Press, PHI, New Delhi, 2004.

IMCA-903.1: E – I Wireless Technology

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-III

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 Schiller. Mobile Communications, Pearson Education
2. Stojmenovic Ivan, HandBook 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. Wireless Communication and Networking – Willam Stallings, PHI, 2003.
6. Ad-hoc Wireless Networks- Architecture and Protocols by C. Siva ram Murthy, B.S. Manoj, Pearson Education, 2nd Edition, 2005.
7. Raj Kamal Oxford Univ. Press “Mobile Computing” 3rd Ed. In Print expected July 2015

IMCA-903.2: E – I Image Analysis & Computer Vision

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 smoothing, 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. Rafael 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

IMCA-903.3: E – I Real Time Systems

Unit-I

Introduction to Real-time computing: Characterizing Real-time system & tasks; Performance measures of real time systems, estimation of program run time.

Unit-II

Real-time system design: Hardware requirement, system-development cycle, data transfer techniques, synchronous & asynchronous data communication, standard interfaces.

Unit-III

Task Assignment and Scheduling: Priority scheduling, scheduling with fixed priority dynamic priority scheduling.

Unit-IV

Real-time programming languages & Tool: desired language characteristics, data typing, control structure, run time error handling, overloading & generics, run time support, Real-time databases, Real time communication algorithms.

Unit-V

Fault tolerance techniques: Causes of failure, fault types, fault detection, redundancy, integrated failure handling

Reliability Evaluation techniques: Parameter values, reliability model for hardware redundancy, software error model, Clock synchronization.

Text/ Reference Books:

1. C.M. Krishna & K.G. Shen, Real Time Systems, McGraw Hill, 1997.
2. P.D. Lawrence & K. Mauch, Real Time Microcomputer Design: An Introduction, McGraw Hill, 1988.
3. Mathai Joseph, Real Time systems : Specification, Verification & Analysis, Prentice Hall Inc., 1996.
4. Stuart Bennet, Real Time computer control, Prentice Hall Inc., 1988.
5. S. J. Young, Real time languages, John Willey & sons, 1982.

IMCA-903.4: E – I Embedded System Design

Unit- I

Overview: Overview of embedded systems, Design challenge, Processor technology, IC technology, Design Technology. Custom-Single purpose processors: Custom single purpose processor design, optimizing custom single processors. General-Purpose Processors: Basic architecture, operation, programmers view, development environment, selecting a microprocessor.

Unit- II

Application Specific Instruction Set Processor (ASIP) Design: ASIP Design methodologies, steps involved in ASIP design: application analysis, design space exploration, generation of software tools like compiler, debugger, instruction set simulator etc., synthesizing processor. Simulation based and scheduler based design space exploration techniques and their comparison.

Unit- III

Standard single-purpose processors: peripherals Timers, counters, watchdog timers, UART, Pulse width modulator, LCD controller, Keypad controller, ADC, Real time clocks.

Memory: Memory write ability and storage performance, Common memory types, composing memories, memory hierarchy and cache, advanced RAM: DRAM, FPM DRAM, EDO DRAM, SDRAM, RDRAM, Memory management Unit.

Unit- IV

Interfacing: Arbitration, Muti-level bus architectures, Serial protocols: I2C bus, CAN bus, Fire Wire bus, USB, Parallel protocols: PCI and ARM bus, Wireless Protocols: IrDA, Bluetooth, IEEE 802.11.

Unit- V

Digital Camera: Case study of embedded system. Control systems: Open loop and closed loop systems, General control systems and PID controllers, Practical issues related to computer based control, Benefits of computer based control implementations.

Text / Reference books:

1. Embedded system design: A unified hardware/software Introduction, Frank Vahid & Tony Givargis: John Wiley & Sons Inc. 2002.
2. Embedded System Design, Petor Marwedel, Springer- Verlog newyork Incorporated, 2005.
3. Embedded Systems by Rajkamal, TMH.
4. Embedded Systems- Architecture, Programming and Design by Rajkamal, TMH, 2007.
5. Computer Architecture and Parallel Processing by Kai Hwang, faye A.Brigs, McGraw Hill.

IMCA-903.5: E-I Software Project Management

Unit-I

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-II

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-III

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-IV

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-V

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', Addison-Wisley, England, 1988.
2. Paul Clements, et al., 'Documenting Software architectures: Views and beyond', Addison-Wisley, 2002.
3. Mark Norris, Peter Rigby, Malcolm Payne, 'The healthy Software Project-A Guide to Successful Development & Management', John Wiley & Sons, 1993.
4. 'Software Architecture : System Design, Development and maintenance', Edited by Jan Bosch, Morven Gentleman, Christine Hofmeister, Juha Kusela, 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.

IMCA-904.1: E – II Natural Language Processing

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. Speech and Language Processing by Jurafsky and Mrtin, Pretice Hall, 2000.

IMCA-904.2: E – II Parallel Processing

UNIT-I

Introduction to Parallel Processing: Flynn's classification, SIMD and MIMD operations, Shared Memory vs. message passing multiprocessors, Distributed shared memory, Hybrid multiprocessors

UNIT-II

Shared Memory Multiprocessors: SMP and CC-NUMA architectures, Cache coherence protocols, Consistency protocols, Data pre-fetching, CC-NUMA memory management, SGI 4700 multiprocessor, Network Processors.

UNIT-III

Interconnection Networks: Static and Dynamic networks, switching techniques, Routers, Internet techniques.

UNIT-IV

Message Passing Architectures: Message passing paradigms, Grid architecture, Workstation clusters, User level software.

UNIT-V

Scheduling: Multiprocessor Programming Technique, Scheduling and mapping, Internet web servers, P2P, Content aware load balancing.

Text / Reference books:

1. Advanced Computer Architecture parallel processing, HESHAM EL-REWINI, MOSTAFA ABD-EL-BARR, John Wiley & Sons INC publication.
2. Advanced Computer Architecture, Kai Hwang, Tata McGraw Hill Edition.
3. Computer System Architecture, M. Morris Mano, Prentice Hall.
4. Elements of Parallel Processing, V. Rajaraman, Prentice-Hall of India, 1990.
5. Designing Efficient Algorithms on Parallel Computers, McGraw Hill International, New York, 1987.
6. Parallel Algorithms, Dhall et. al., McGraw Hill Int.

IMCA-904.3: E – II Compiler Design

Unit-I

Introduction to translators, compilers, interpreters, compilation process. Programming language, grammars, derivations, reductions, regular expression, context free language and grammar. *Lexical analyzer*: input buffering, specification and recognition of tokens, introduction to finite automata, regular expressions to NFA, minimization of DFA, keywords and reserve word policies, LEX – the lexical analyzer generator. Error Handling.

Unit-II

Syntax analyzer: context free grammars, top down parsing, brute force parser, recursive descent parser, LL(1) parser, Bottom up parsing, operator precedence parsing, simple precedence parsing, LR parser, LALR parser, YACC – the parser generator.

Unit-III

Syntax directed translation schemes: implementation of syntax directed translators, synthesized attributes, inherited attributes, dependency graph, evaluation order, construction of syntax trees, directed acyclic graph of expression, bottom up evaluation of S- attributed definitions, L-attributed definitions, top down translation of L – attributed definitions. Errors, lexical phase errors, syntactic phase errors. Intermediate languages, postfix notation, syntax trees, parse trees, three address code, triples and indirect triples.

Unit-IV

Translation of assignment statements, Boolean expressions, statements that alter flow of control, array references, procedure calls, declarations, case statement, record structures. *Symbol tables*: operation on symbol tables, symbol table organization for non-block structured languages, symbol table organization for block – structured languages.

Unit-V

Run time storage management, storage allocation and referencing data in block structured language, storage allocation. *Code optimization*: sources of optimization, loop optimization, DAG and optimization of basic blocks. Code generation, a machine model, next use information register allocation and assignment, a simple code generator, code generation from DAG's, Peephole optimization.

Text/Reference Books:

1. Principles of Compiler Design , Aho, Ullman; Narosa Publishing House, 1989
2. Compilers : Principles, techniques and tools , Aho, Sethi, Ullman; Wesley 1988
3. Compiler Construction : Theory & Practice, Barrat, Eates, CoughtGalgotia 1988
4. Trembly & Sorenson Compiler Writing ; Mc-Graw Hill Book Co.
5. Gries Compiler Construction for Digital Computer ; John Willey & Sons, New York - 1987

IMCA-904.4: E – II Artificial Neural Network

Unit-I

Introduction to ANN Features , structure and working of Biological Neural Network ,Trends in Computing Comparison of BNN and ANN, History of neural network research, characteristics of neural networks terminology, models of neuron Mc Culloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture

Unit-II

Back Propagation networks : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input – hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.

Unit-III

Activation & Synaptic Dynamics : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. Basic functional units of ANN for pattern recognition tasks: Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks. a) Feed forward neural networks –

- Linear responsibility X-OR problem and solution.- Analysis of pattern mapping networks summary of basic gradient search methods) Feedback neural networks Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.

Unit-IV

Competitive learning neural networks : Components of CL network pattern clustering and feature mapping network, ART networks, Features of ART models, character recognition using ART network.

Unit-V

Applications of ANN :Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron – Recognition of handwritten characters.

NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.

Text/Reference books:

1. Artificial neural Networks, Yegnanarayana PHI.
2. Neural networks, Fuzzy logic and Genetic Algorithms, S. Raj Sekharan , Vijayalakshmi Pari, PHI

IMCA-904.5: E – II Internet of Things (IoT)

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
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