

# **MASTER OF COMPUTER APPLICATION (MCA)**

**Detailed syllabi for Students Admitted  
to  
KIIT Deemed to be University**

## **ACADEMIC CURRICULA 2025 - 2027**



**Kalinga Institute of Industrial Technology (KIIT)**  
Deemed to be University U/S 3 of UGC Act, 1956  
**SCHOOL OF COMPUTER APPLICATIONS**

# **COURSE STRUCTURES & SYLLABI**

**Master of Computer Application (MCA)  
(2025– 2027)**

**Kalinga Institute of Industrial Technology  
(Deemed to be University)**



**Kalinga Institute of Industrial Technology (KIIT)**  
Deemed to be University U/S 3 of UGC Act, 1956  
**SCHOOL OF COMPUTER APPLICATIONS**

## **PROGRAMME EDUCATIONAL OBJECTIVES**

They are expected to accomplish the following objectives in a few years after MCA graduation:

**PEO1:** Pursue a successful career in the field of computer applications, contribute significantly to their profession in industry, research and academia or undertake entrepreneurial endeavours.

**PEO2:** Continuously learn, engage and update them to carryout independent or collaborative research, and address constantly evolving technological and global challenges in their field of expertise.

**PEO3:** Develop leadership skills and demonstrate professional, social and ethical responsibilities as an individual.

## **PROGRAMME OUTCOMES**

Master of Computer Applications (MCA) programme is designed to ensure that each student acquires the desired competencies and on successful completion of the programme, the students are expected to:

**PO1:** Computational knowledge: Apply the knowledge of mathematics and computer fundamentals to solve real life problems.

**PO2:** Problem analysis: Identify, formulate, review research literature, and analyze complex problems in their program of study using knowledge of mathematics and computer science.

**PO3:** Design/development of solutions: Design solutions for complex problems and design software components that meet the specified needs with appropriate consideration for the public health and safety, cultural, societal, and environmental considerations.

**PO4:** Conduct investigations of complex problems: Use application-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5:** Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern IT tools to model complex solutions with an understanding of their limitations.

**PO6:** The professional and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.

**PO7:** Environment and sustainability: Understand the impact of the professional solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8:** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the software professional practices.

**PO9:** Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10:** Communication: Communicate effectively on complex technical activities with the community and with society at large, write and present substantial technical reports/ documents, and give and receive clear instructions.

**PO11:** Project management and finance: Demonstrate knowledge and understanding of the software and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12:** Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **PROGRAMME SPECIFIC OUTCOMES**

**PSO1:** Ability to demonstrate a degree of mastery in the area of computer applications through the advanced knowledge of data acquisition, data analytics, big data, pattern recognition and knowledge discovery.

**PSO2:** Ability to independently carry out research/investigation and developmental work to solve practical problems.

**PSO3:** Develop sound knowledge and skill sets to develop and expand professional careers in fields related to human-computer interaction and management of industrial processes for the design and implementation of intelligent systems.

### FIRST SEMESTER (AUTUMN)

<b>THEORY</b>						
<b>SL. NO.</b>	<b>COURSE CODE</b>	<b>COURSE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
01	MC4101	Programming and Data Structures	3	-	-	3
02	MC4103	Computer Organization and Architecture	3	-	-	3
03	MC4105	Discrete Mathematics	3	-	-	3
04	MC4107	Database Management System	3	-	-	3
05	MC4109	Operating Systems	3	-	-	3
<b>PRACTICAL</b>						
06	MC4191	Programming and Data Structures Lab	-	-	4	2
07	MC4193	Database Management System Lab	-	-	4	2
08	MC4195	Soft skills Lab	-	-	2	1
<b>SESSIONAL</b>						
09	SY18001	Sports and Yoga	-	-	2	1
<b>TOTAL</b>			-	-	-	21

### SECOND SEMESTER (SPRING)

<b>SL. NO.</b>	<b>COURSE CODE</b>	<b>COURSE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
01	MC4102	Computer Networks	3	-	-	3
02	MC4104	Design and Analysis of Algorithms	3	1	-	4
03	MC4106	Object Oriented Programming	3	-	-	3
04	MC4108	Software Engineering	3	-	-	3
05	MC4112	Artificial Intelligence	3	-	-	3
<b>PRACTICAL</b>						
06	MC4192	Java Lab	-	-	4	2
07	MC4194	Machine Learning Lab	-	-	4	2
08	MC4196	Professional Communication Lab	-	-	2	1
<b>TOTAL</b>			-	-	-	21

### THIRD SEMESTER (AUTUMN)

THEORY						
SL. NO.	COURSE CODE	COURSE	L	T	P	CREDITS
01	MC5101	Big Data Analytics	3	-	-	3
02	MC5103	Information and Cyber Security	3	1	-	4
03	MC5105	Cloud Computing	3	-	-	3
04		Elective -1	3	-	-	3
05		Elective - 2	3	-	-	3
PRACTICAL						
06	MC5191	Data Analytics Lab	-	-	4	2
07	MC5193	Advanced Java Lab	-	-	4	2
TOTAL			-	-	-	20

### FOURTH SEMESTER (SPRING)

The entire fourth semester is devoted to practice orientation and training. During the semester students have to undertake compulsory project-oriented training for 120 days and submit a project report based on the work done for evaluation.

SESSIONALS						
SL. NO.	COURSE CODE	COURSE	L	T	P	CREDITS
01	MC5182	Seminar	-	-	-	6
02	MC5184	Project Work	-	-	-	8
03	MC5186	Viva Voce	-	-	-	4
TOTAL			-	-	-	18

CREDIT DISTRIBUTION				
Semester 1	Semester 2	Semester 3	Semester 4	Total
21	21	20	18	80

## **ELECTIVES**

### **Elective - 1**

- MC5121 - Object Oriented Analysis and Design
- MC5123 - Web Technology
- MC5125 - Natural Language Processing
- MC5127 - Software Testing and Quality Assurance
- MC5129 - Management Support System
- MC5131 - Mobile Applications development

### **Elective - 2**

- MC5141 - Software Project Management
- MC5143 - Computer Graphics
- MC5145 - Soft Computing
- MC5147 - Mobile Computing
- MC5149 - Block Chain Architecture
- MC5151 - Compiler Design

# DETAILED SYLLABI

## FIRST SEMESTER

**MC4101      PROGRAMMING AND DATA STRUCTURES      CREDITS-3**

### UNIT - I

**C Language Fundamentals:** Character set, Identifiers, keywords, data types, Constants and variables, statements, expression, operators, precedence of operators, Input-output, control statements, control structures.

### UNIT - II

Arrays, functions, strings, recursion, Tower of Hanoi problem, storage classes, structures, Union, pointer and File Handling.

### UNIT - III

**Development of Algorithms:** Notations and Analysis. Storage representation of array, sparse matrix, Insertion and Deletion from an array, merging of two sorted arrays, Stacks and Queues, Application of stack: Infix to Postfix expression, Evaluation of Postfix expression.

**Sorting and Searching Techniques:** Selection sort, Bubble sort, Heap sort, Quick sort, linear search, Binary Search.

### UNIT - IV

**Linked Lists:** Singly linked lists, linked stacks and queues, Operations on Polynomials, Linked Dictionary, Doubly Linked Lists, Circular Linked Lists. Dynamic Storage Management.

**Binary Tress:** Binary search Tree, General Trees, Tree Traversing, Operations on Binary Trees, Expression Tree, Height Balanced Trees.

**Graphs:** Representation of Graphs - BFS, DFS, Hash Table Methods.

### **Reference Books:**

1. Reema Thareja, *Data Structures Using C*, 2nd edition, Oxford University Press, 2014.
2. E. Balagurusamy, *Data Structures Using C*, MGH, 2013
3. Forouzan, B.A. & Gilberg, R. : *C Programming and Data Structures*, 3<sup>rd</sup> Ed., Cengage, 2019
4. Horowitz, E. & Sahni, S. : *Fundamentals of Data Structures in C*, Universities Press
5. Ritika Mehera: *Data Structures Using C*, Pearson Education.
6. Chandan Banerjee & A. Das: *Data Structures and Algorithms in C and PYTHON*, Universities Press.
7. Amiya K. Rath & A.K. Jagadev: *Data Structures and Program Design Using C*, Scitech Pub.
8. Tenenbaum, A. M.: *Data Structures Using C*: Pearson Education.



**COURSE OUTCOMES:** The students will be able to

**CO1:** Design correct programs to solve problems.

**CO2:** Compare various programming, and apply the concept of decision structures, loops and functions.

**CO3:** Choose efficient data structures and apply them to solve problems.

**CO4:** Analyze the efficiency of programs based on time complexity.

**CO5:** Prove the correctness of a program using loop invariants, pre-conditions and post-conditions in programs

**CO6:** Design reusable ADTs.

## **MC4103 COMPUTER ORGANIZATION AND ARCHITECTURE CREDITS-3**

### **UNIT - I**

**Fundamentals of Digital Electronics:** Number systems, Floating Point Arithmetic, Error Detection and Correction, Boolean algebra, Minimization techniques, Sum of min terms, Product of max terms, Simplification using Karnaugh's Map (up to 4 variables), Combinational Circuits, Sequential Circuits, Shift Register, Counters, Design of Combinational and Sequential Circuits.

### **UNIT - II**

**Basic Computer Organization and Design:** Von Neumann Architecture, Instruction codes, Computer registers, Computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Design of Basic computer, Design of Accumulator Unit.

### **UNIT - III**

**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, Data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC), Pipeline Processing, Parallel Processing.

**Input-Output organization:** Peripheral Devices, I/O output interface, Asynchronous data transfer, Modes of transfer, Priority Interrupt, DMA, Input output Processor, Serial Communication.

**Memory Organization:** Memory Hierarchy, Main Memory, Cache Memory.

### **UNIT - IV**

**Programming the Basic Computer:** Introduction, Machine Language, Assembly Language, the

Assembler, Program loops, Programming Arithmetic and Logic Operations, Subroutines, I-O Programming, Ten Advanced Optimization of Cache Performance, Memory Technology and Optimization, Protection, Crosscutting Issues, Memory Hierarchies in the ARM Cortex-A8 and Intel Core i7.

#### **Reference Books:**

1. *Mano M Morris, Computer System Architecture, 3rd Edition (Updated), Pearson, 2020.*
2. *William Stallings, Computer Organization and Architecture: Designing for Performance, 10th Edition, Pearson Education.*
3. *Hamacher, C. : Computer Organization and Embedded Systems, 6<sup>th</sup> Edition, MGH, 2022*
4. *John P Hayes, Computer Architecture and Organization, 3rd Edition, MGH, 2017.*
5. *Alan Clements: Computer Organization and Architecture: Cengage : 1<sup>st</sup> Edn. : 2014*

## **COURSE OUTCOMES:**

The students will be able to

**CO1:** Illustrate the working of Computer Systems.

**CO2:** Classify and interpret the Instruction Set Architecture.

**CO3:** Solve problems related to the advanced pipelining techniques.

**CO4:** Analyze the system performance.

**CO5:** Prioritize the current state in memory system design.

**CO6:** Design alternate/ advanced architecture using data flow computing.

**MC4105**

**DISCRETE MATHEMATICS**

**CREDITS-3**

### **UNIT I**

#### **Sets and Proposition**

**Basics:** Finite and Infinite Sets, Combinations of Sets, Multisets, Venn Diagrams.

**Propositional Logic:** Propositions and Logical Operations, Functionally complete set of connectives, Well Formed Formulas, Laws of equivalence, Normal forms, Predicate calculus, Inference Theory.

**Notion of Proof:** Direct and Indirect Proof, Inductive proofs.

### **UNIT II**

#### **Relations and Functions, Counting Techniques**

**Relations:** Properties of Relations, Matrices of relations, Closure operations on relations, Equivalence Relations, Computer Representation of Relations, Partial Ordering Relations and Lattices, Properties of Lattices, Hasse Diagram of partially ordered set.

**Functions:** Introduction to functions and its types, Function for Computer Science, Discrete numeric Functions, Composition of Functions, Invertible Functions, Recursive Functions, Generating functions.

**Counting-** Basics of Counting Techniques, Pigeonhole Principle, Generalized Permutations and Combinations, Recurrences Relations.

### **UNIT III**

**Graph Theory-** Basic Concept of Graph Theory and Terminology, representation of Graphs, Bipartite, Regular, Planar and connected graphs, reachability and connectedness.

Matrix representation of graphs, Storage representation and manipulation of graphs, Euler graphs, Hamiltonian path and circuits, graph traversals, shortest path in weighted graphs, Graph Isomorphism and Homomorphism.

**Trees:** Introduction, Undirected Trees, Binary search trees, Spanning trees, Minimum spanning trees, Kruskal's Algorithm, Prim's Algorithm.

#### UNIT IV

**Algebraic Structures:** Definition, Properties, Types: Semi Groups, Monoid, Groups, Abelian group, Subgroup, cyclic groups, Factor group, Permutation groups, Normal subgroup, Cosets and Lagrange's Theorem, Homomorphism and Isomorphism of Groups.

**Boolean Algebra:** Boolean Functions, Representing Boolean Functions, Principal of Duality, Design and Implementation of Digital Networks, Karnaugh maps.

**Coding Theory:** Codes and Group-codes, Error detection and correction using Group codes, Hamming Code.

#### Reference Books:

1. K. H. Rosen, "Discrete Mathematics and its Applications", MGH, 8<sup>th</sup> Edition, 2021
2. T.Veerarajan," Discrete Mathematics ". MGH, 2012.
3. B. Kolman, R. C. Busby, S. Ross, "Discrete Mathematical Structures", PHI, 6<sup>th</sup>. Edition, 2010.
4. S. Lipschutz, Discrete Mathematics, MGH, 2<sup>nd</sup>. Edition, 2005
5. Richard Johnsonbough, "Discrete Mathematics", Pearson Education, 8<sup>th</sup>. Edition, 2018.
6. K. Viswanathan Iyer: Discrete Mathematics with Applications, 1<sup>st</sup> Edn. Cengage, 2022
7. Edgar G. Goodaire : Discrete Mathematics with Graph Theory : 3<sup>rd</sup> Edn. Pearson Education.

#### COURSE OUTCOMES:

The students will be able to

**CO1:** Describe fundamental mathematical concepts and terminology.

**CO2:** Understand circuit design using Boolean algebra concepts.

**CO3:** Apply counting principles of different types of discrete structures.

**CO4:** Analysis of recursive definitions.

**CO5:** Evaluates the techniques for constructing mathematical proofs using examples.

**CO6:** Design solutions based on Graph Theory, Coding Theory and Group Theory.

**MC4107**

**DATABASE MANAGEMENT SYSTEM**

**CREDITS-3**

#### UNIT - I

Database & Database users, Characteristic of the database, database systems, Concepts & Architecture, schemas & instances, Data independence, Database languages & interfaces. Relational Data models, Concepts & Relational database constraints, Database design using ER, EER to Relational mapping and Relational algebra.

#### UNIT - II

Functional Dependencies and its implication, closure rules, Normalization, Decomposition, synthesis approach, 3NF and BCNF, lossless join and dependency preserving decomposition, multi valued dependency & 4NF, Join dependency & 5NF.

### UNIT - III

Basics of query processing, Processing of joins, materialized vs. pipelined processing, DB transactions, ACID properties, interleaved executions, schedules, serialisability, concept of database recovery and backup.

### UNIT-IV

Concurrency control techniques, Locking and management of locks, 2PL, locking techniques deadlocks, Optimistic Concurrency control, Comparison of Concurrency control methods, XML and relational databases and big data concept.

#### **Reference Books:**

1. R. Elmasri and S. B. Navathe, *Fundamentals of Database Systems*, Pearson Education.
2. Silberschatz, A.; Korth, H. F. and S. Sudarshan, *Database System Concepts*, 7<sup>th</sup>, MGH, 2021
3. C. Coronel, S. Morris & P. Rob, *Database Principles Fundamentals of Design Implementation and Management*, 10th Edition, Cengage, 2013
4. Thomas Connolly & C. Begg : *Database Systems : A Practical Approach to Design, Implementation and Management* : 6<sup>th</sup> Edn. Pearson Education, 2019
5. Rajiv Chopra: *Database Management Systems: A Practical Approach*: 5<sup>th</sup> Edn. S. Chand, 2016
6. P.S. Gill : *Database Management Systems* : 2<sup>nd</sup> Edn. , Wiley.

#### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Define basic database concepts, role of a database management system including the structure and operation of the relational data model.

**CO2:** Compare simple and moderately advanced database queries using SQL and Relational Calculus.

**CO3:** Apply logical database design principles, including E-R diagrams and database normalization.

**CO4:** Analyze the concept of a database transaction and related database facilities, including concurrency control, journaling, backup and recovery, and data object locking and protocols.

**CO5:** Evaluate the performance of query processing in distributed database systems.

**CO6:** Design basic database storage structures & access techniques.

**MC4109**

**OPERATING SYSTEMS**

**CREDITS-3**

### UNIT-I

**Introduction:** Evolution of operating systems, Types of operating systems, Different views of the operating systems, Operating system concepts and structures.

**Processes:** The process concept, system programmer's view of processes. The operating system's view of processes, Operating system services for process management, scheduling algorithms, Performance evaluation.

## UNIT-II

**Inter-process Communication and Synchronization:** The need for inter-process synchronization, Mutual exclusion, Semaphores, Classical problems in concurrent programming, Critical region, Monitors.

**Deadlock:** Deadlock criteria, prevention, avoidance, detection and recovery algorithms.

## UNIT-III

**Memory Management:** Contiguous memory allocation, Swapping, paging and segmentation, virtual memory, Page replacement algorithms. Design issues for paging systems, Segmentation.

**File Systems:** File systems, Directories, File system implementation, Security & protection mechanisms.

## UNIT-IV

**Principles of I/O Hardware and software:** I/O devices, Device controllers, Principles of I/O Software, Interrupt handlers, Device drivers, Device independent I/O software, User space I/O software.

**Disks:** Disk hardware, scheduling algorithms, Error handling, track-at-a-time caching, RAM Disks.

**Clocks:** Clock hardware, Clock software.

**Terminals:** Terminal hardware & software, Memory-mapped terminals, I/O Software.

### Reference Books:

1. Silberschatz & Galvin, *Operating System Concepts*, 9th Edition, Wiley, 2020.
2. D. M. Dhamdhere, *Operating Systems a Concept Based Approach*, 3rd Edition, MGH, 2017
3. P. C. Bhatt, *An Introduction to Operating Systems: Concepts & Practice*, 4th Edn, PHI
4. Andrew S Tanenbaum and Albert S Woodhull, *Operating System Design & Implementation*, 3rd Edition, Pearson Education, 2015.
5. Godbole, A.S. : *Operating Systems : 3<sup>rd</sup> Edn.*, MGH, 2018
6. M.K. Singh : *Operating Systems: Concept Building & Problem Solving Approach* : Cengage
7. William Stallings : *Operating Systems: 9<sup>th</sup>*, Pearson Educations, 2018

### COURSE OUTCOMES:

The students will be able to

**CO1:** Define fundamentals of Operating System.

**CO2:** Compare processes scheduling algorithms.

**CO3:** Apply the concepts of memory management, paging and virtual memory.

**CO4:** Analyze and discuss the policies of synchronization.

**CO5:** Evaluate the uses of system call.

**CO6:** Develop interaction techniques among the various components of computing system.

## PRACTICALS

### MC4191      PROGRAMMING AND DATA STRUCTURES LAB      CREDITS-2

**C programming:** variables and expression assignment, Loop, if-else, Case statement, break, continue, Single & Multidimensional arrays, Functions, recursion, file handling in C, Pointers, address operator, declaring pointers and operations on pointers

**Stack:** Problems of stack, evaluation of Arithmetic expressions in infix, prefix, and postfix forms.

**Queue:** Problems on queues, circular queues, insertion and deletion on queues.

**Searching and sorting algorithm:** Problems on Binary Search, Quick sort, Bubble sort

**List:** Problems on single linked list, doubly linked list with list operations, circular list.

**Trees:** Creation of Binary tree, determination of depth of binary tree, counting nodes, tree traversals, BST.

**Graphs:** Problems on graphs, Breadth First Search, Depth First Search.

### MC4193      DATABASE MANAGEMENT SYSTEM LAB      CREDITS-2

Study features of a commercial RDBMS package such as Oracle and Structured Query Language (SQL).

Laboratory exercises should include defining schemes for the applications, creation of a database, writing SQL queries to retrieve and manipulate data from the database. Use of host language interface with embedded SQL.

### MC4195      SOFT SKILLS LAB      CREDIT-1

**Communication Skills:** LSRW (Listening, Speaking, Reading, Writing) Basics, Pronunciation (Do's and Don'ts). Major elements in grammar (Verbs and their types, Tenses, Punctuation and sentence formation) E-mail etiquette and Report writing.

**Personality Development:** A guide to healthy conversations, Art of Assertiveness, Emotional Intelligence and Critical, Thinking, Body Language, Grooming skills, Stress management

**Presentation Skills:** Elements of Effective presentation, Structure of presentation, Body language and Voice modulation Presentation tools: Applications, Audience Engagement.

**Public Speaking:** Speaking Basics, 7Ps of Public Speaking, Confidence Enhancement, Impression management, Feedback handling.

#### **Reference Books:**

1. John Seely, *Oxford Guide to Writing and Speaking*, Oxford University Press, 2005.
2. Pillai and Fernandez, *Soft Skills and employability skills*, Cambridge Publication.

## SESSIONAL

**SY18001**

**SPORTS AND YOGA**

**CREDITS: 1**

### UNIT-I

**Concept and significance of consciousness:** Modern and ancient approach of consciousness, Types of consciousness viz., Jagrata, Svapna, Susupti, Turya, and Turiyatita.

### UNIT-II

**Preparatory practices:** Breathing practices, Suksma vyayma (all 46 practices), and Sthoolavyayma (all 14)

### UNIT-III

**Dharana practices:** Principles and procedure of Antaranga&Bahrangatrataka, Jatrutrataka& Jyoti trataka; Principles and practices of Ajappajapa, Antarmouna, Chakra meditation, Cyclic meditation, and Transcendental meditation.

### UNIT-IV

**Concept and practice of Dhyana:** Concept of Jyoti and Bindu dhyana, principle and procedure of Vipassana meditation, Preksha meditation, Transcendental meditation, Brahma kumari Raja yoga meditation, and Yoga nidra.

### Reference Book:

Yogic Sukshma Vyayma by Dharendra Brahmachari, MDNIY publisher, Ashoka Road, New Delhi 2.  
Mandukya Upanishad by Swami Harsanandsa, R K Mission Publication, Belur math, Kolkata

## SECOND SEMESTER

**MC4102**

**COMPUTER NETWORKS**

**CREDITS-3**

### UNIT - I

**Introduction Concepts:** Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

### UNIT – II

**Medium Access Sub Layer:** Channel Allocations, LAN protocols, Overview of IEEE standards- FDDI. Data Link Layer - Elementary Data-Link Protocols, Sliding Window protocols, Error Handling.

### UNIT – III

**Network Layer:** Point-to-Point Networks, routing, Congestion control, Internetworking-TCP / IP, IP packet, IP address, IPv4 & IPv6.

**TCP/IP Protocol Stack:** TCP and UDP, Routing Protocols

**Transport and Session Layer:** Design issues, connection management, TCP - Window Management. remote procedure call.

**Presentation Layer:** Design issues, Data compression techniques, cryptography.

### UNIT – IV

**Application Layer:** File Transfer, Access and Management, Electronic mail, Virtual Terminals, DHCP.

#### **Reference Books:**

1. B. A. Forouzan, "Data Communication and Networking", 6<sup>th</sup> Edn., MGH, 2022
2. A.S. Tanenbaum, Computer Networks, 6<sup>th</sup> Edn., Pearson Education. 2022
3. W. Stallings, Data and Computer Communication, 8th Edition, Macmillan Press, 2017
4. Larry L. Peterson and Bruce S. Davie, Computer Networks: A System Approach, 5th Edition, Morgan Kaufmann Publishers, 2011
5. Mayank Dave: Computer Networks: 1<sup>st</sup> Edn. Cengage
6. Dhanashree K. Toradmalle: Computer Networks and Network Design : Wiley

### COURSE OUTCOMES:

The students will be able to

**CO1:** Define fundamental concepts of computer networking.

**CO2:** Classify the basic taxonomy and terminology of computer networking.

**CO3:** Apply advanced networking concepts.

**CO4:** Analyze specific areas of networking such as the design and maintenance of individual networks.

**CO5:** Evaluate routes to create interconnect of nodes.

**CO6:** Design and implement the protocols used in computer networks.

## **MC4104                      DESIGN AND ANALYSIS OF ALGORITHMS                      CREDITS-4**

### UNIT-I

Growth of Functions, Asymptotic notations, Analysis of Insertion sort, Divide and Conquer technique, Recurrences, Solving Recurrences: Substitution Method, Recurrence tree, Master's theorem, Generating function, Analysis of Merge sort.

### UNIT-II

Heap sort, Priority queue, Analysis of heap sort, Data structure for disjoint sets, Disjoint set operations, Greedy Technique: Huffman Codes, Knapsack problem.



### UNIT-III

Dynamic programming: Evaluation of Binomial Coefficient, Matrix chain multiplication, Longest Common Subsequence (LCS), Graph Algorithms: Minimum spanning tree (Algorithm of Kruskal & Prim), Single source shortest paths (Dijkstra's Algorithm), All pairs shortest paths (Floyd-Warshall algorithm).

### UNIT-IV

Concept of Backtracking: N Queen Problem, Branch and Bound, Approximation Algorithms: Polynomial Time, Polynomial-Time certification, NP-Completeness, NP Completeness and reducibility, NP-Complete problems: The circuit satisfiability problem, The clique problem, The vertex-cover problem, The subset sum problem, Algorithm for travelling-salesperson problem.

#### **Reference Books:**

1. S. Sridhar, *Design and Analysis of Algorithms*, 1<sup>st</sup> Edition, Oxford, 2015.
2. T.H Cormen C. E. Leiserson, R. L. Rivest, *Introduction to Algorithms*, 3<sup>rd</sup> Edition, MIT Press
3. E.Horwitz, S.Sahani, *Fundamentals of Computer Algorithms*, 2<sup>nd</sup> Edn., Universities Press, 2008.
4. Michael T. Goodrich, *Design and Analysis of Algorithms*, 1<sup>st</sup> Edition, Wiley, 2019.
5. Anany Levitin : *Introduction to the Design and Analysis of Algorithms*; Pearson Education, 2017

#### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Explain different computational models, order notation and various complexity measures.

**CO2:** Compare the complexities of problem-solving techniques.

**CO3:** Apply the fundamental graph theory algorithms and to solve related problems.

**CO4:** Analyze efficient algorithms in common engineering design situations.

**CO5:** Evaluate the criteria and specifications of algorithmic design techniques.

**CO6:** Design approximation algorithms.

**MC4106**

**OBJECT ORIENTED PROGRAMMING**

**CREDITS-3**

#### **UNIT - I**

**OOPS Concept and Introduction to Java:** OOP's concept, Programming Paradigm, Basics of Java, Data Types, Variables, Operators, Control Statements, Loops and Arrays.

**Classes and Objects:** Classes, Methods, Inner Classes, Packages, Strings, Inheritance & Polymorphism, Abstract class, Interfaces, Exception Handling, Java Collections.

#### **UNIT - II**

**Java I/O:** Input Stream, Output Stream, File Stream.

**Multithreaded Programming:** Multithreading concepts, Thread Life Cycle, Creating Multithreaded Application, Thread priorities, Thread synchronization.

**Networking with Java:** Networking basics, Sockets, port, java.net – networking classes and interfaces, Implementing TCP/IP based Server and Client, Datagrams – Datagram packet, Datagram server and client.

### UNIT-III

**Applets:** Applet Architecture, Applet Life Cycle, adding images and sound to an applet, passing parameters to an applet, Creating Applet Application, Requesting repainting.

**AWT & Event Handling:** Layout Managers, Border layout, Flow layout, Grid layout, Card layout, AWT all components, Event delegation Model, Event source and handler, Event categories, Listeners, interfaces, Anonymous classes.

### UNIT-IV

**Swings:** Model view Controller design pattern, Different layout, Menus, Dialog boxes, Text input etc.

**Database Connectivity with JDBC:** Java database connectivity, Types of JDBC drivers, writing first JDBC applications, Types of statement objects (Statement, Prepared Statement and Callable Statement), Types of Resultset, ResultSetmetadata, Inserting and updating records, JDBC and AWT, Connection pooling.

#### **Reference Books:**

1. PatricNaughton, Herbert Schildt, *Java 2 Complete Reference*, 9<sup>th</sup> Edn., MGH, 2017
2. R. Nageswara Rao, *Core Java: An Integrated Approach*, 1<sup>st</sup> Edition, Dreamtech Press, 2016
3. Ivor Horton, *Beginning Java*, 7thEdition, Wiley, 2011
4. *Core Java For Beginners*, 3<sup>rd</sup> Edition, Vikash Publication, 2013
5. Jim Keogh, *Complete Reference- J2EE*, 1<sup>st</sup> Edition, MGH, 2017
6. P Radha Krishna: *Object Oriented Programming through Java : Universities Press*, 2016
7. N B Venkateswarlu & Dr. E V Prasad: *Learn Object Oriented Programming Using Java: S.Chand*

### COURSE OUTCOMES:

The students will be able to

**CO1:** Describe the differences between object-oriented programming and procedural programming.

**CO2:** Understand the fundamental concepts of object oriented programming.

**CO3:** Apply the advanced concept of object-oriented programming such as inheritance and polymorphism.

**CO4:** Analyze the additional features of JAVA that are not available in function oriented programming languages such as exceptional handling, Interface, etc.

**CO5:** Evaluate the functionalities like Multithreading and Networking with JAVA.

**CO6:** Develop small scale projects using AWT, swings and JDBC.

**UNIT - I**

**Introduction to Software Engineering:** Emergence of software engineering, changes in software development practices, system engineering and role of system analyst.

**Software Life Cycle Models:** Need for a life cycle model, phase entry and exit criteria, classical waterfall model, iterative waterfall model, prototype model, evolutionary model, V model, Spiral model, selection criteria for the various models and Agile model development.

**Requirement Analysis and Specification:** Requirement gathering and analysis, functional requirements, organization of the SRS document, decision trees and decision tables, formal system specification, axiomatic specification, algebraic specification and 4GL.

**UNIT – II**

**Introduction to Design:** Importance of design, design activities and methodologies, good design characteristics, cohesion, coupling, layered modular design, fan-in and fan-out, approaches to design.

**Function Oriented Design Approach:** Structured analysis, data flow diagrams, structured design, transform analysis and transaction analysis, structure chart.

**Object Oriented Design with UML:** Overview of Object-Oriented Concepts, UML (Unified Modeling Language), UML Diagrams for Users View, Structural View, Behavioral View, Implementation View and Environmental View, Designing Use Case Diagram, Class Diagram, Sequence Diagram and State Charts.

**UNIT - III**

**Coding:** Coding standards, code walkthrough, code inspection, documentation – internal and external documentation and Gunning's Fog index.

**Testing:** Validation and verification, fault and failure, debugging, debugging approaches, unit testing, black box testing, equivalence class partitioning, boundary value analysis, white box testing, integration testing, system testing – alpha, beta and acceptance testing, stress testing and regression testing.

**Maintenance:** Characteristics of maintenance, types of maintenance, software reverse engineering, maintenance process model and maintenance cost estimation.

**UNIT – IV**

**Software Project Management:** Roles of a project manager, project planning, project size estimation, project estimation techniques - empirical, heuristic (COCOMO) and analytical, staffing estimation, scheduling, organization and team structure, risk management and SCM.

**Reliability and Quality Management:** Introduction to reliability, reliability metrics, reliability growth modelling, software quality, ISO 9001, SEI CMM and Six Sigma.

**Computer Aided Software Engineering:** Scope of CASE, benefit of CASE, CASE in software life cycle, second generation CASE tool and CASE environment architecture.

**Reference Books:**

1. *Rajib Mall: Fundamentals of Software Engineering, 4<sup>th</sup> Edition, Prentice Hall of India, 2014*
2. *I. Sommerville: Engineering Software Products: An Introduction to Modern Software Engineering, Pearson Education, 2017*
3. *Roger S. Pressman: Software Engineering A Practitioner's Approach, 8<sup>th</sup> Edition, MGH, 2019*
4. *Craig Larman: Applying UMI and Patterns An introduction OOAD and the Unified Process, 3<sup>rd</sup> Edition, Pearson Education, 2015*
5. *Ugrasen Suman : Software Engineering: Concepts and Practices, 2<sup>nd</sup> Edn. ; Cengage, 2022*
6. *Pankaj Jalote : Software Engineering: A Precise Approach; 1<sup>st</sup> Edn. ; Wiley; 2015*
7. *Sajan Mathew: Software Engineering :1<sup>st</sup> Edn., S.Chand; 2013*

**COURSE OUTCOMES:**

The students will be able to

**CO1:** Identify requirements of the software projects.

**CO2:** Understand the software requirements and translate them to Design and development process.

**CO3:** Apply and map various testing methods to the phases of SDLC.

**CO4:** Analyze the basic project management practices and tools in real life projects.

**CO5:** Evaluate various quality factors for software.

**CO6:** Develop small real-world project with the help of software engineering concepts.

**MC4112**

**ARTIFICIAL INTELLIGENCE**

**CREDITS-3**

**UNIT-I**

**Introduction:** The Foundations of Artificial Intelligence, the History of Artificial Intelligence and the State of the Art.

**Agents and Environments:** Introduction, Types of agents, Structure of Intelligent Agents and Rational Agents Environments.

**UNIT-II**

**Solving Problems by Searching:** Problem-solving Agents, Formulating Problems, Example Problems, and Searching for solutions, Search Strategies, Avoiding Repeated States.

**Uninformed Search Strategies:** (BFS, DFS, DLS, IDDFS, Bidirectional Search).

**Informed Search Methods:** Best-First Search, Heuristic Functions, A\* search and Iterative Improvement Algorithms.

**UNIT-III**

**Constraint Satisfaction Problems:** Constraint Satisfaction Problems; Backtracking search for CSPs; Local search for CSPs.

**Adversarial Search:** Games, Optimal Decisions in Games, Alpha-Beta pruning.

**Agents that Reason Logically:** A Knowledge-based Agent, The Wumpus World Environment, Representation, Reasoning and Logic, Propositional Logic: A very simple logic, an agent for the Wumpus World.

**First-Order Logic:** Syntax and Semantics, Extensions and Variations, Using First Order Logic, Logical Agents for the Wumpus World.

#### UNIT-IV

**Neural Network:** -Learning in Neural and Belief Networks, How the Brain Works, Neural Network Perceptions. Multi-layered feed forward Networks, Back Propagation algorithm, Applications of Neural Networks.

**Genetic Algorithms:** Introduction, encoding, fitness function, reproduction operators, genetic modelling, genetic operators, crossover, single site crossover. two-point crossover, multi point crossover, uniform crossover.

**Planning:** A simple planning agent from problem solving to planning, planning in situation calculus. Basic representations for planning. A partial-order planning example, A partial order planning algorithm.

#### **Reference Books:**

1. Lavika Goel, *Artificial Intelligence, Concepts and Applications*, Wiley, 1<sup>st</sup> Edition, 2021
2. S.J. Russell & P. Norvig, *Artificial Intelligence: A modern Approach*, Pearson, 2022.
3. P.H Winston, *Artificial Intelligence*, Addison Wesley, 2011.
4. Deepak Khemani, *A First Course in Artificial Intelligence*, MGH; 1<sup>st</sup> Edition, 2017.
5. Nils J. Nilsson, *Artificial Intelligence: A new Synthesis* –, 1<sup>st</sup> Edition, Elsevier, 1997.
6. A. Srinivasaraghavan & V. Joseph, *Machine Learning*, Wiley, 2019.
7. Saroj Kaushik: *Artificial Intelligence: 2<sup>nd</sup> Edn.*; Cengage, 2022
8. N.P. Padhy: *Artificial Intelligence & Intelligent Systems: Oxford University Press*

#### **COURSE OUTCOMES:**

The students will be able to

- CO1:** Describe the key components of the artificial intelligence (AI) field
- CO2:** Explain search strategies and solve problems by applying a suitable search method
- CO3:** Apply artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning
- CO4:** Analyse and apply probability theorem, Bayesian networks, knowledge representation.
- CO5:** Describe and list the key aspects of planning in artificial intelligence
- CO6:** Design and implement appropriate solutions for search problems and for planning problems

## PRACTICALS

**MC4192**

**JAVA LAB**

**CREDITS-2**

**Introduction:** An overview of JAVA program, data types, variable and arrays, operators, control statements.

**Classes& Objects:** The general form of a class, declaring objects, assigning object reference variables, methods, constructors.

**Inheritance:** Inheritance basics, member access and inheritance, using super to call super class constructors. Creating a multilevel hierarchy, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance.

**Packages:** Defining a package, finding packages and CLASSPATH, access protection, importing packages.

**Interfaces:** Defining an interface, implementing interfaces, applying interfaces, variables in interfaces, use static methods in an interface.

**Exception Handling:** Exception-Handling Fundamentals, Exception Types.

**I/O Basics:** Streams, reading console input, writing console output, reading and writing files.

**Multithreaded Programming:** The java thread model, creating a thread, creating multiple threads.

**Applet:** Applet fundamentals, the applet class, applet architecture, applet initialization and termination.

**AWT:** Introducing the AWT, working with windows, graphics, and text.

**JDBC:** Introduction to JDBC, Drivers Types, JDBC Objects, SQL query objects.

**MC4194**

**MACHINE LEARNING LAB**

**CREDITS-2**

Write program in Java or Python or R to implement the assignments

Introduce and implement different Supervised and Unsupervised learning technique

Optimization method implementation like Genetic Algorithm

Computational methods for Data Analysis, Non-linear Optimization, Problem-Solving by Soft Computing Techniques- Fuzzy Logic, Neural Networks

Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets for real life applications.

**MC4196**

**PROFESSIONAL COMMUNICATION LAB**

**CREDIT-1**

**UNIT-I**

**Resume Writing:** Resume Basics – Structure, Sections, Formatting, Drafting and Exclusions. Types of resumes – Chronological, Functional and Hybrid. Cover Letters

## UNIT-II

**Group Discussion:** GD basics – Structure, Motive, Seating, Format. GD Role-plays – Positive and Negative roles. Types – Topic based and Case study-based GD Strategies – Introduction, Discussion and Summarization.

## UNIT-III

**Interview skills:** Types of Interviews- Structured, Unstructured and Semi-structured Interview Strategies – Stress handling, Behavioral interview questions, Convincing skills. Interview preparation – Effective communication skills, Dress – code, Research about the company, Subject knowledge, Cognitive flexibility and adaptability.

### *Reference Books:*

1. Lehman, Dufrene, Sinha , BCOM, Cengage Learning, 2009
2. Bovee et al, Business Communication Today, 14<sup>th</sup> Edition Pearson, 2018.

## THIRD SEMESTER

**MC5101**

**BIG DATA ANALYTICS**

**CREDITS-3**

## UNIT-I

Data Representation- Data Objects and Attribute Types: Nominal, Binary, Ordinal, Numeric, Discrete and Continuous, Types of data: Record, Temporal, Spatial Temporal, Graph, Unstructured and Semi structured data, Basic Statistical Descriptions of Data.

## UNIT-II

Introduction to Data Analysis: Probability and Random Variables, Correlation, Regression. Data Analysis Pipeline: - Data pre-processing- Attribute values, Attribute transformation, Sampling, Dimensionality reduction: PCA, Eigenfaces, Multidimensional Scaling, Non-linear Methods, Graph-based Semi-supervised Learning, Representation Learning Feature subset selection, Distance and Similarity calculation.

## UNIT-III

Data Mining Techniques for Analysis: -Classification: Decision tree induction, Bayes classification, Rule-based classification, Support Vector Machines, Classification Using Frequent Patterns, k-Nearest-Neighbour, Fuzzy-set approach Classifier, Clustering: K-Means, k-Medoids, Agglomerative versus Divisive Hierarchical Clustering Distance Measures in Algorithmic Methods, Mean-shift Clustering.

## UNIT-IV

Visualization: -Traditional Visualization, Multivariate Data Visualization, Principles of Perception, Color, Design, and Evaluation, Text Data Visualization, Network Data Visualization, Temporal Data Visualization.

**Reference Books:**

1. *Intelligent Data Analysis*, M.Berthold and D.J.Hand, 2nd Edition, Springer, 2007
2. J Moreira , Andre Carvalho , T Horvath, *A General Introduction to Data Analytics*, Wiley, 2019
3. Jiawei Han, Micheline Kamber, Jian Pei , *Data Mining Concepts and Techniques*, 3<sup>rd</sup> Edition, Morgan Kaufmann Publishers, 2011
4. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "*Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses*", Wiley, 2013.
5. DT Editorial Services, *Big Data, Black Book*, Dreamtech Press (Wiley), 2015.
6. Raj Kamal, Preeti Saxena : *Big Data Analytics: MGH : 2019*
7. G. Sudha Sadasivam & R. Thirumahal : *Big Data Analytics: Oxford : 2020*
8. Thomas Erl: *Big Data Fundamentals: Pearson Education; 2016*

**COURSE OUTCOMES:**

The students will be able to

- CO1:** Understand the programming requirements viz., generic types and methods to perform data analysis.
- CO2:** Find a meaningful pattern in data.
- CO3:** Implement the analytic algorithms.
- CO4:** Handle large scale analytics projects from various domains.
- CO5:** Develop intelligent decision support systems.
- CO6:** Formulate an effective strategy to implement a successful Data analytics project.

**MC5103                      INFORMATION AND CYBER SECURITY                      CREDITS-4****UNIT - I**

**Introduction:** Goals of Information Security (CIA), Security Services, Basic Network Security Terminology, Security Threats and Attacks.

**Basic Encryption Techniques:** Cryptography, Classical Methods, Substitution Ciphers, Transposition Ciphers, Cryptanalysis, Steganography.

**UNIT - II**

**Modern Block Ciphers:** Feistel Ciphers, Data Encryption Standard (DES), DES Analysis, Block Cipher Modes of Operations, Triple DES.

**Stream Ciphers:** A5/1, RC4.

**Public Key Cryptosystems:** Public Key Cryptography, RSA, Elliptic Curve Cryptography.

**Key Management:** Key Distribution, Diffie–Hellman Key Exchange, Digital Signatures, X.509 Digital Certificate Standard.



## UNIT - III

**Authentication:** Message Digest, Secure Hash Algorithm, HMAC, Access Control-Passwords, Biometrics, Authorization- Firewalls, IDS.

**Security at Network Layer:** Secure Socket Layer (SSL) and Transport Layer Security (TLS), SSL vs IPSec, Kerberos, WEP.

## UNIT - IV

**Software Flaws and Malware:** Types of malware, Software-Based Attacks.

**Cyber Security:** Cyber Threats: - Cyber Warfare-Cyber Crime-Cyber Terrorism-Cyber Espionage, Cyberspace and the Law, Penalties & Offences under the Information Technology Act, 2000, Cyber Forensics.

### **Reference Books:**

1. M. Stamp: *Information Security: Principles and Practice*, 2<sup>nd</sup> Edition, Wiley
2. V. K. Pachghare: *Cryptography and Information Security*, 2<sup>nd</sup> Edition, PHI, 2015
3. Michael E. Whitman: *Principles of Information Security*, 5<sup>th</sup> Edition, Cengage, 2015
4. Forouzan: *Cryptography & Network Security*, 3<sup>rd</sup> Edition, MGH
5. William Stallings: *Cryptography and Network Security Principles and Practices*, 7<sup>th</sup> Edition, Pearson Education, 2017
6. Mark Rhodes-Ousley: *Information Security: The Complete Reference*, 2<sup>nd</sup> Edition, MGH; 2013
7. Atul Kahate: *Cryptography And Network Security: 4<sup>th</sup> Edn.*; MGH; 2019
8. Bernard L. Menezes; Ravinder Kumar : *Cryptography, Network Security, and Cyber Laws*; Cengage; 2018

## COURSE OUTCOMES:

The students will be able to

**CO1:** Evaluate the security threats in modern computer era.

**CO2:** Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography.

**CO3:** Define and identify firewall and network filtering.

**CO4:** List and recognize various VPN.

**CO5:** Identify different Software Flaws and Malwares.

**CO6:** Distinguish various ethical hacking and testing procedures.

**MC5105**

**CLOUD COMPUTING**

**CREDITS-3**

## UNIT-I

**Introduction to Cloud Computing:** Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

## UNIT-II

**Virtualization concepts:** Virtual Machines and Virtualization of Clusters and Data Centers, Levels of Virtualization, Virtualization Structures / tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

## UNIT-III

**Cloud computing architectures over Virtualized Data Centers:** Data–Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter-cloud Resource Management. Cloud Security and Trust Management, data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the cloud.

## UNIT-IV

**Common Standards in Cloud Computing:** The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

### **Reference Books:**

1. Raj KumarBuyya, James Broberg and Andrzej Goscinski , *Cloud Computing Principles and Paradigms*, 1<sup>st</sup> Edition, Wiley Publication, 2011
2. Judith Hurwitz, Robin Bloor, Marcia Kaufman and Fern Halper, *Cloud Computing for Dummies*, Wiley Publication, 2009
3. Divyakant Agrawal, K. G. SelcukCandan, Wen-Syan Li (Eds.), *New frontiers in information and software as a service*, Springer Proceedings, 2011
4. K. Jayaswal, *Cloud Computing Black Book*, Dreamtech Press (Wiley), 2014.
5. Raj Kumar Buyya, Christian Vecchiola, S. Thamarai Selvi: *Mastering Cloud Computing*; MGH
6. Arshdeep Bahga and Vijay Madisetti: *Cloud Computing: A Hands-on Approach*; Universities Press.
7. Thomas Erl; *Cloud Computing Design Patterns*; 1<sup>st</sup> Edn.; Pearson Education; 2016
8. Shailendra Singh: *Cloud Computing* : Oxford University Press; 2018

### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Elaborating the basic concepts of cloud computing and defining the basic terms.

**CO2:** Understanding the various cloud implementations and migration techniques.

**CO3:** To define the various industrial applications of cloud virtualization.

**CO4:** In depth learning of security challenges and preventive measures in cloud computing.

**CO5:** To Illustrate Virtualization for Data-Center Automation.

**CO6:** Practical implementation of cloud computing and live case studies.

## ELECTIVE-I

MC5121

OBJECT ORIENTED ANALYSIS AND DESIGN

CREDITS-3

### UNIT-I

**Introduction:** Importance of modeling, process model, analysis and design, methodology, UML, views, design models and code.

**Object Model:** UML and code, classes and objects, data redundancy, links and associations, assemblies and components.

### UNIT-II

**Business Modeling:** Terms, concepts, use-cases, actors, generalization of use-case, extend and include stereotypes, use-case packaging.

**Class and Object Diagrams:** Static and dynamic models, advanced classes, advanced relationships, generalization, aggregation, composition, reification, link classes, interfaces and packages.

### UNIT-III

**Interaction Diagrams:** Classifier roles, association roles, Sequence diagram, Communication diagram, Interaction Overview diagram, and Timing diagram.

**Advanced Behavioural Modelling:** States, events and transitions, semantics, non-determinism in a state chart diagram, actions and activities, composite states and timed event.

### UNIT-IV

**Component Diagram:** Components, artifacts, compilation dependency, generalization dependency and dependency graphs.

**Constraints:** UML constraints, 'xor' constraint, 'subset' constraints and introduction to OCL.

#### **Reference Books:**

1. Mark Priestley, *Practical Object-Oriented Design with UML*, 2<sup>nd</sup> Edition, MGH, 2003
2. Larman Craig, *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*, 3<sup>rd</sup> Edition, Pearson, 2015
3. Simon Bennett, Ray Farmer, Steve McRobb, *Object-Oriented Systems Analysis and Design Using UML*, 2<sup>nd</sup> Edition, MGH, 2010
4. Atul Kahate, *Object Oriented Analysis & Design*, MGH, 2007
5. Brahma Dathan and Sarnath Ramnath; *Object-Oriented Analysis, Design and Implementation: An Integrated Approach*; 2<sup>nd</sup> Edn.; Universities Press; 2014

## **COURSE OUTCOMES:**

The students will be able to

**CO1:** Define and differentiate the object-oriented design from procedure-oriented design.

**CO2:** Understand system requirements to determine the use cases and domain model of the problem domain.

**CO3:** Apply fundamentals of Class and Object modelling.

**CO4:** Analyze UML models to show the interaction between various objects and understand the limitations of the interaction diagram.

**CO5:** Evaluate the states of an objects and the importance of the object life cycle.

**CO6:** Design and implement real-life case studies.

**MC5123**

**WEB TECHNOLOGY**

**CREDITS-3**

### **UNIT – I**

**HTML Basics:** HTML Document, Basic Structure of HTML, Syntax, HTML Tags and Attributes, Types of HTML Tags, Rules of nesting, Basic Tags (HTML Tag, Head Tag, Title Tag, Body Tags).

**Page Formatting:** Adding a new Paragraph, Adding a line break, Inserting a blank space, changing page background, Div and Span tags

**Text Formatting:** Html Headings, Formatting elements (Bold text, Important text, Italic text, Emphasized text, Marked text, Small text, Deleted text, Inserted text, Subscript text, Superscript text), Comments, Horizontal Lines

**Creating Lists:** Ordered List, Unordered Lists, Definition Lists

**Advance HTML:** Images, Text Links, Image Links, opening a page in New Window or Tab, Linking to an area of same page, Introduction to Table Tags, Advantages and limitations of tables, Frames & IFrame, HTML Forms, XHTML.

### **UNIT – II**

**Cascading Style Sheets (CSS):** Introduction, Benefits of CSS, CSS Syntax, CSS Implementation (inline, internal and external), CSS Selectors (ID Selectors, Class Selectors, Grouping Selectors, Universal Selectors, CSS Pseudo-classes), CSS properties (background-color, background-image, border-style, height, width, color, text-align, font-family, font-style, font-size, fontweight), Box Model in CSS (margin, border, padding).

### **UNIT - III**

**JavaScript:** JavaScript Introduction, Language Syntax, Variable declaration, Operators, Control Statements, Error Handling, Understanding arrays, Function Declaration, Built in Functions, HTML Document object Model, Working with Objects, Call method in JavaScript, Inheritance in JavaScript using prototype, cookies.

**Server-Side Programming:** Java Servlets, Architecture Overview, Servlet- Generating Dynamic Content, Life Cycle, Parameter Data, Sessions, Cookies, URL Rewriting, Other Capabilities-Data Storage and Concurrency,JSP, Architecture of JSP, Life Cycle, Scripting Elements, Implicit Objects, Directive Tags, Action Tags, Custom Tags, JSTL.

## UNIT – IV

**XML Introduction-** Introduction of XML- Some current applications of XML, Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, Document Type Definition (DTD), types.

**AJAX :** Introduction to AJAX , Servlet and JSP with AJAX , Interacting with database

## COURSE OUTCOMES:

The students will be able to

**CO1:**Identify the concepts of the Web & Markup Languages.

**CO2:** Practice and develop web Applications using HTML, CSS & Frameworks.

**CO3:** Distinguish and practice on client-side and server-side Internet Programming.

**CO4:** Identify the concepts of JavaScript.

**CO5:** Working with AJAX, Servlet and JSP.

**CO6:** Design and implement fully operational websites.

## Reference Books:

1. Robert W Sebesta, *Programming the World Wide Web*, 8th Edition, Pearson, 2015.
2. Paul Deitel, Deitel & Associates, Inc., *Internet & World Wide Web: How to Program*, 4th Edition, Pearson, 2008.
3. Marty Hall and Larry Brown, "Core Web Programming", Second Edition, Volume I and II, Pearson Education, 2001.
4. Thomas Powell, Fritz Schneider, *JavaScript The Complete Reference*, 3rd Edition, MGH
5. DT Editorial Services: *Web Technologies, Black Book; dreamtech (Wiley); 2018*

**MC5125**

**NATURAL LANGUAGE PROCESSING**

**CREDITS-3**

## UNIT - I

**Introduction to NLP**, NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

## UNIT - II

**N-gram Language Models:** The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models, Lexical syntax.

**Hidden Markov Models & Tagging:** Markov Models, Hidden Markov Models (HMMs), Trellis Algorithm, Viterbi Algorithm. Estimating the Parameters of HMMs, The Forward-Backward Algorithm, Implementation Issues, Task of Tagging, Tag sets, Morphology, Lemmatization, Tagging Methods, Manually Designed Rules and Grammars, Statistical Methods, HMM Tagging (Supervised, Unsupervised), Evaluation Methodology (examples from tagging), Precision, Recall, Accuracy, Statistical Transformation Rule-Based Tagging, Maximum Entropy, Maximum Entropy Tagging, Feature Based Tagging, Results on Tagging, Various Natural Languages.

### UNIT - III

**Neural Networks in NLP:** Introduction to perceptron and back propagation, Pattern Recognition and Machine Learning, LSTM Recurrent Neural Networks, Understanding LSTM Networks.

**Syntactic parsing and Semantic Analysis:** Grammar formalisms and tree banks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs. Neural shift-reduce dependency parsing, Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labelling and Semantic Parsing.

### UNIT - IV

**Information Extraction (IE):** Named entity recognition and relation extraction. IE using sequence labelling, Machine Translation (MT): Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

#### **Reference Books:**

1. Daniel Jurafsky, James H. Martin, *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition*, 2 edition, Pearson, 2013.
2. Steven Bird, Ewan Klein, *Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit*, 1st edition, SPD, 2011.
3. Manning, C. D. and H. Schutze, *Foundations of Statistical Natural Language Processing*, The MIT Press, 1999
4. Allen, J., Benjamin's, *Natural Language Understanding*, Cummings Publishing Company Inc, 1994
5. U.S. Tiwary & Tanveer Siddiqui: *Natural Language Processing & Information Retrieval*; Oxford University Press.
6. Ela Kumar: *Natural Language Processing*; Wiley

### COURSE OUTCOMES:

The students will be able to

**CO1:** Demonstrate a given text with basic Language features.

**CO2:** Explain a rule-based system to tackle morphology/syntax of a language.

**CO3:** Distinguish different Models & Tagging.

**CO4:** Design a tag set to be used for statistical processing for real-time applications.

**CO5:** Compare and contrast the use of different statistical approaches for different types of NLP applications.

**CO6:** Design an innovative application using NLP components.

## MC5127 SOFTWARE TESTING AND QUALITY ASSURANCE CREDITS-3

### UNIT - I

**Fundamentals of testing:** Seven testing principles, the psychology of testing, Code of ethics, Verification and Validation, Test Team Organization and Management.

### UNIT-II

**Test processes:** Testing throughout the software life cycle, Software development models, Test levels, Test types, Dynamic Testing, Static techniques, Validation Activities, Regress in Testing, Comparison of Testing Techniques, Maintenance testing.

### UNIT-III

**Test management:** Software Metrics, Testing Metrics for Monitoring Controlling the Testing Process, Efficient Test Suite Management, Acceptance Testing.

### UNIT -IV

**Testing Software and tools:** Testing Object-oriented Software, Testing Web-based Systems, Testing Agile-based Software, Tool support for testing, Test **automation**. Effective use of tools.

**Test Quality:** Software Quality, Testing Process Maturity Models, **Tracking the Bug**, Case Studies.

### *Reference Books:*

1. Naresh Chauhan: *Software Testing Principles and Practices, Second Edition, Oxford University Press, 2016*
2. Rex Black, Erik van Veenendaal, Dorothy Graham: *Foundations of Software Testing, ISTQB Certification, Third Edition, Cengage Learning, 2015*
3. RenuRajani, Pradeep Oak: *Software Testing, Effective Methods, Tools and Techniques, Second Edition, MGH, 2017*
4. S. S Limaye: *Software Testing, First Edition, MGH, 2009*

### COURSE OUTCOMES:

The students will be able to

**CO1:** Solve the problems using Software Testing techniques and Approaches.

**CO2:** Apply various Software testing Techniques to find bugs in software.

**CO3:** Use open-source software Testing Tools.

**CO4:** Apply various Software Quality Assurance Techniques to ensure the quality in software.

**CO5:** Comparison of different testing tools with suitable cases.

**CO6:** Develop and deliver quality software with Software Reliability, and Software Quality Assurance.

**UNIT-I**

**An Overview:** Introduction of Management Support Systems, Business Intelligence, Analytics and Decision support, Foundations and Technology for Decision Making, Descriptive Analytics.

**UNIT-II**

**Descriptive Analytics:** Data Warehousing, Business Reporting, Visual Analytics, Business Performance Management, Geographic Information systems.

**UNIT-III**

**Predictive Analytics:** Data Mining, Techniques for Predictive Modelling, Text Analytics, Text Mining and Sentiment Analysis, Web Analytics, Web Mining and Social Analytics.

**UNIT-IV**

**Prescriptive Analytics:** Model-Based Decision Making, Modelling and Analysis, Automated Decision Systems and Expert Systems, knowledge management and Collaborative Systems.

**Big Data and Future Direction of Business Analytics:** Big Data and Analytics, Business Analytics, Impact of Management Support Systems.

**Reference Books:**

1. Ramesh Sharda, DursunDelen, EfraimTurban: *Business Intelligence and Analytics: Systems for Decision Support*, Tenth Edition, Pearson education, 2018
2. Efraim Turban, Jay E. Aronson, Ting-Peng Liang: *Decision Support Systems and Intelligent Systems*, 7th Edition, Pearson, 2005
3. Efreem G Mallach: *Decision Support systems and Data warehouse Systems*, Second Edition, McGraw Hill, 2002
4. Gregory S. Parnell, Patrick J. Driscoll, Dale L. Henderson: *Decision Making in Systems Engineering and Management*, 2nd Edition, Willy, 2010
5. Ciara Heavin, Daniel J. Powe: *Decision Support, Analytics, and Business Intelligence, Business Expert*, Third Edition, 2017
6. S. Christian Albright; *Business Analytics: Data Analysis and Decision Making*; Cengage; 2020

**COURSE OUTCOMES:**

The students will be able to

**CO1:** Identify the guidelines for designing a management support system and phases of the decision making process in a typical organization and the types of decisions that are made.

**CO2:** Understand the decision support system.

**CO3:** Apply geographic information system to design infrastructure solutions for organizations.

**CO4:** Analyze how enterprise systems and industrial networks create new efficiencies for businesses and evaluate the benefits and limitations of enterprise systems and industrial networks.

**CO5:** Evaluate decision support tools that can aid decision making and apply system development methodology to develop a decision support system.

**CO6:** Develop a functional prototype of a decision support system for a given case.



**UNIT-I**

**Introduction to Mobile Computing:** Introduction to Android Development Environment, Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

**UNIT-II**

**Intents on UIs, VUIs and Mobile Apps:** Text-to-Speech Techniques, Designing the Right UI, Multi-channel and Multimodal UIs and Services, Android Intents and Services, Characteristics of Mobile Applications, Successful Mobile Development, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider.

**UNIT-III**

**Communications Via Network and the Web:** State Machine, Correct Communications Model, Android Networking and Web, Telephony, Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony, Notifications and Alarms, Performance, Performance and Memory Management, Android Notifications and Alarms.

**UNIT - IV**

**Graphics, Performance and Multithreading:** Graphics and UI Performance, Android Graphics and Multimedia, Mobile Agents and Peer-to-Peer Architecture, Android Multimedia, Location, Mobility and Location Based Services, Android Putting It All Together (as time allows), Packaging and Deploying, Performance Best Practices, Android Field Service App, Security and Hacking (as time allows), Active Transactions, More on Security, Hacking Android, Platforms and Additional Issues (as time allows), Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing.

**Reference Books:**

1. John Horton, *Android Programming for Beginners, 2nd Edition*, Packt Publishing, 2018
2. Jeff Mcherter and Scott Gowell, *Professional Mobile Application Development*, Jeff Mcherter and Scott Gowell, Wrox (Wiley), 2012
3. Lorn Potter, *Hands-On Mobile and Embedded Development with Qt 5 Build apps for Android, iOS, and Raspberry Pi with C++ and Qt.*, Packt Publishing, 2019
4. PrajyotMainkar, Salvatore Giordano, *Google Flutter Mobile Development Quick Start*, Packt Publishing, 2019
5. Jochen Schiller; *Mobile Communications*; Pearson Education.
6. Upena Dalal & Manoj K. Shukla; *Wireless and Mobile Communication*; Oxford University Press.

## **COURSE OUTCOMES:**

The students will be able to

**CO1:** Identify the limitations of fixed networks.

**CO2:** Understand the network infrastructure requirements to support mobile devices and users.

**CO3:** Relate the different wireless technologies such as CDMA, GSM, GPRS, LTE, etc.

**CO4:** Compare the protocols and architectures employed in wireless local area networks and cellular networks.

**CO5:** Evaluate the techniques to design and develop a simple mobile application for smaller devices.

**CO6:** Design solutions using mobile computing techniques.

## **ELECTIVE-II**

**MC5141**

**SOFTWARE PROJECT MANAGEMENT**

**CREDITS-3**

### **UNIT - I**

**Introduction:** Project Management concepts, Process Framework, Project Planning Software Life Cycle, Software Development Process and models - SEI CMM, ISO.

**Project evaluation and Programme Management:** Importance of Software Project Management, Categorization of Software Projects, Management Control, Project Portfolio Management, Cost-benefit Evaluation, Risk evaluation, Stepwise Project Planning.

### **UNIT - II**

**Project Life Cycle and Software Effort Estimation:** Software process and Process Models, Selection of methodologies and technologies, Managing interactive processes, Basics of Software estimation, Software effort and Cost estimation techniques, Function points Mark II, COSMIC full function points COCOMO – a Parametric Productivity Model.

### **UNIT - III**

**Activity Planning and Risk Management:** Objectives of activity planning, Network planning model; Activity-on-arrow network, Precedence network, Forward and Backward pass; Critical path; Slack and float, Resource Allocation – Creation of critical paths – Cost schedules, The SEI CMM - Problems and Risks, Risk Managing framework, Risk Identification, Avoidance, Mitigation and Analysis, Monte Carlo simulation, Risk Estimation.

### **UNIT - IV**

**Project Management and Control:** Framework for Monitoring and control, Collecting the data, Visualizing progress, Cost monitoring, earned value analysis, prioritizing monitoring Getting the project back to target, Change control, Software Configuration Management.

**Staffing in Software Projects and Software Quality:** Managing people: Organizational behaviour – Best methods of staff selection, Motivation – The Oldham – Hack man job characteristic model – Stress

– Health and Safety – Ethical and Professional concerns, Working in teams, The importance of software quality, ISO 9126, Product versus process quality management, Process capability models, Quality plans.

**Reference Books:**

1. *Bob Hughes, Mike Cotterell, RajibMall:Software project Management, Sixth Edition, Mc Graw Hill, 2017.*
2. *Subramanian Chandramouli, SaikatDutt: Software Project Management, First Edition, Pearson Education, 2015.*
3. *Pankaj Jalote:Software project Management in Practice, First Edition, Pearson Education, 2015.*
4. *Sanjay Mohapatra: Software project Management, First Edition, Cengage India, 2011.*

**COURSE OUTCOMES:**

The students will be able to

**CO1:** Familiar with basic concepts of Software design and implementation.

**CO2:** Understanding of Development lifecycle models, matching lifecycles to projects, Project plans, Work Breakdown Structures.

**CO3:** Understanding of Estimation and Budgeting

**CO4:** Analyze the basic concept of Risk management, Change control,

**CO5:** Understand and apply various software metrics on software quality products and managing conflict and motivating

**CO6:** Design the Project Recovery, Documentation, Cutover/Migration, Post Project Reviews, Closing and project success.

**MC5143**

**COMPUTER GRAPHICS**

**CREDITS-3**

**UNIT-I**

**Introduction to Computer Graphics:** Image Processing and their applications, Raster-Scan System, Random-Scan Systems. Graphics Primitives: Points and Lines, Line-Drawing Algorithms: DDA and Bresenham's Line Algorithm. Circle-Generating Algorithms: Midpoint Circle Algorithm, Bresenham's Circle Algorithm. Ellipse-Generating Algorithm: Midpoint Ellipse Algorithm. Region Filling Algorithms: Seed Fill: Boundary-Fill Algorithm, Flood-fill Algorithm, Scan-Line Polygon Fill Algorithm.

**UNIT-II**

**Two-Dimensional Geometric Transformations:** Translation, Rotation, Scaling, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Inverse transformations, General Pivot-Point Rotation, General Fixed-Point Scaling, General Composite Transformations. Other Transformations: Reflection, Shear.

**Two-Dimensional Viewing and Clipping:** The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to viewport Coordinate transformation, Clipping Operations: Point Clipping, Line Clipping: Cohen-Sutherland Line Clipping, Liang-Barsky Line Clipping. Polygon Clipping: Sutherland-Hodgeman Polygon Clipping.

### UNIT-III

**Three-Dimensional Concepts and Object Representation:** Three-Dimensional Transformations: Translation, Rotation, Scaling and their Matrix Representations. Three-Dimensional Display Methods: Parallel Projection, Perspective Projection and their types. Polygon surfaces, quadric surfaces.

**Curves and Surfaces:** Parametric representation of curves: Bezier curves, B-spline curves. Parametric representation of surfaces; Interpolation method.

Basic Illumination models, polygon rendering methods. Basic Models, Displaying Light Intensities, halftone patterns and Dithering Techniques. Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area subdivision and octree methods. Rendering: Polygon Rendering Methods, Gouraud shading and Phong Shading.

### UNIT-IV

**Intuitive colour concepts:** RGB, YIQ, CMY, HSV and HLS colour model, Colour selection. Design of Animation Sequence, general computer animation functions, Raster Animation, computer animation languages, key frame systems, motion specifications.

#### **Reference Books:**

1. D. Hearn, M.P. Baker, *Computer Graphics C Version, 4<sup>th</sup> Edition*, Pearson Education, 2013
2. Hearn & Baker, *Computer Graphics with OpenGL, 4th Edition*, Pearson Education, 2014
3. Rajesh K. Maurya, *Computer Graphics with Virtual Reality Systems*, Wiley; Second edition, 2014
4. J.D.Foley, V.Dam, S.K.Feiner, J.F.Huges - *Computer Graphics Principles Practice, 2<sup>nd</sup> Edition*, Pearson Education, 2002
5. D. Rogers, *Mathematical Elements of Computer Graphics, 2<sup>nd</sup> Edition*, McGraw Hill Education, 2017
6. John F Hughes; *Computer Graphics: Principles and Practice; 3<sup>rd</sup> Edn.*, Pearson; 2019
7. Samit Bhattacharya; *Computer Graphics; 1<sup>st</sup> Edn.*, Oxford Universities Press; 2015

#### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Explain the core concepts of computer graphics.

**CO2:** Understand a typical graphics pipeline.

**CO3:** Apply various algorithms to scan convert the basic geometrical primitives, transformations, area filling, clipping.

**CO4:** Analyze the importance of viewing and projections in both 2D and 3D.

**CO5:** Evaluate the various factors of color and shading.

**CO6:** Design animations using related technologies.

**UNIT - I**

**Fuzzy logic:** Fuzzy set theory: crisp sets, fuzzy sets, crisp relations, fuzzy relations, Fuzzy Systems: Crisp logic predicate logic, fuzzy logic, Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations, fuzzy If – Then rules, fuzzy Rule based system, Defuzzification

**UNIT - II**

**Neural Networks:** Supervised Learning Neural Networks, Perceptron, Adaline, Back propagation Multilayer Perceptron, Radial Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Kohonen Self Organizing Networks, Learning Vector Quantization, Hebbian Learning, Hop-field networks.

**UNIT – III**

**Optimization:** Derivative-based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, Random Search, Downhill Simplex Search

**Genetic Algorithms:** Fundamentals of genetic algorithms: Encoding, Fitness functions, Reproduction. Genetic Modeling: cross cover, inversion and deletion, Mutation operator, Bit-wise operators, Bitwise operators used in GA. Convergence of Genetic algorithm.

**UNIT - IV**

**Hybrid Systems:** Hybrid system, neural Networks, fuzzy logic and Genetic algorithms hybrids. Genetic Algorithm based Back propagation Networks: GA based weight determination applications: Fuzzy Back Propagation Networks.

**Reference Books:**

1. S. Rajasekaran, G.A. VijayalakshmiPai, *Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications*; PHI Learning.
2. S N Sivanandam *Principles Of Soft Computing*, 2nd Edition, John Wiley, 2011.
3. Davis E.Goldberg, *Genetic Algorithms: Search, Optimization and Machine Learning*, Addison Wesley, N.Y.,1989
4. J.S.R.Jang, C.T.Sun and E.Mizutani, *Neuro-Fuzzy and Soft Computing*, , Pearson Education, 2015
5. N.P. Padhy & S. P. Simon; *Soft Computing with MATLAB Programming*; Oxford University

**COURSE OUTCOMES:**

The students will be able to

**CO1:** Ability to analyze the applications which can use fuzzy logic.

**CO2:** Design Fuzzy Inference Systems and Fuzzy Controller.

**CO3:** Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

**CO4:** Appreciate the importance of optimizations and its use in computer engineering fields and other domains.

- CO5:** Understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications.
- CO6:** Develop models by integrating various soft computing techniques.

**MC5147**

**MOBILE COMPUTING**

**CREDITS-3**

### **UNIT-I**

**Introduction** to Mobile Communications and Computing: Applications of Mobile Computing, Generations of Mobile Communication Technologies.

**(Wireless) Medium Access Control:** Motivation for a specialized MAC (Hidden and Exposed terminals, Near and Far terminals), SDMA, FDMA, TDMA, CDMA. Spreading Techniques.

### **UNIT-II**

**Cellular Systems:** GSM, Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security and new data services, General Packet Radio Service (GPRS), EDGE, Universal Mobile Telecommunication System (UMTS). Next Generation Networks – Orthogonal Frequency Division Multiplexing (OFDM), LTE – Architecture & Interface – LTE radio planning, 5G Architecture, MIMO Satellite Communications Systems.

### **UNIT-III**

**Wireless LAN:** IEEE 802.11 - Architecture – Services – MAC – Physical layer – IEEE 802.11a - 802.11b/g/n - 802.11AC/AD/AX standards – HIPERLAN – Bluetooth, ZigBee, RFID.

**Mobile Network Layer:** Mobile IP -Goals, assumptions, Entities and terminology, IP packet delivery, Agent Advertisement and Discovery, Registration, Tunnelling and Encapsulation.

**Mobile Ad hoc Networks (MANETs):** Properties of a MANET, Routing and various routing algorithms, Dynamic Source Routing (DSR), Vehicular Ad Hoc networks (VANET) – MANET Vs VANET.

### **UNIT-IV**

**Mobile Transport Layer:** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective Retransmission, Transaction oriented TCP.

**Protocols and Tools:** Wireless Application Protocol-WAP Architecture, Mobile Device Operating Systems: iOS, Android, BlackBerry, Security.

#### **Reference Books:**

1. Jochen Schiller, *Mobile Communications*, Pearson Education; Second edition, 2014
2. Upena Dalal, *Wireless communication & networks*, Oxford University Press, 2014
3. Kumkum Garg, *Mobile Computing*, Pearson Education India, 2010
4. Gottapu Sasibhushana Rao, *Cellular Mobile Communication*, Pearson Education India, 2012
5. Reza Behravanfar, *Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML*, Cambridge University Press, 2004
6. Uwe Hansmann, LotharMerk, Martin S, Nicklous, Thomas Stober, *Principles of Mobile Computing*, 2<sup>nd</sup> Edition, Springer, 2006

## **COURSE OUTCOMES:**

The students will be able to

**CO1:** Identify the limitations of fixed networks.

**CO2:** Understand the network infrastructure requirements to support mobile devices and users.

**CO3:** Relate the different wireless technologies such as CDMA, GSM, GPRS, LTE, etc.

**CO4:** Compare the protocols and architectures employed in wireless local area networks and cellular networks.

**CO5:** Evaluate the techniques to design and develop a simple mobile application for smaller devices.

**CO6:** Design solutions using mobile computing techniques.

**MC5149**

**BLOCK CHAIN ARCHITECTURE**

**CREDITS-3**

### **UNIT-I**

**Introduction to Block chain:** Block chain History, Digital Trust, Decentralization- Digital Money to Distributed Ledger Technology, Decentralized Economy, Design Primitives: Protocols, Security, Consensus.

Types of Block chain- Permissions Vs Permission-less Block chain and Privacy, Cryptography and Crypto Primitives Hash-Signature-PKI, Crypto currency and its requirements. Bit coin/ Ethereum Basics, Double Spending, Wallet.

### **UNIT-II**

**Consensus:** Overview of Block chain Technology, Lifecycle of Block chain- Transactions, Blocks, Hashes, Digital Signature, Consensus, Verify and confirm Blocks/Transactions, Smart Contract, Consensus Mechanisms- Proof of Work, Proof of Stake, Proof of Burn, Proof of Authority and Proof of Elapsed Time, Role of the Miners, Requirements for the Consensus Protocols, Scalability aspects of Block chain.

### **UNIT-III**

**Block chain Architecture:** Markle Root Tree, Block chain Platform, Mining and simulating Block chain, Competitive Mining, Incentives- mining and transaction fee, CPU and Energy Considerations,

Features of Hyper ledger, hyper ledger Model: Decomposing the consensus process, Hyper ledger components, IOTA, EOS, Multi chain, Corda and Solidity.

### **UNIT-IV**

**Block chain Use Cases:** – Design and Implementation of a Distributed Application (DAPP), Auto execution of contracts.

Block chain in Finance: Settlements, KYC, Capital Markets and Insurance, Block chain in trade/supply-chain: Provenance of goods, visibility, Invoice Management, Block chain in Government: Digital Identity, Land Records, Public Distribution System and Social Welfare Systems, Block chain Security, AI-Block chain-and-Big Data.

**Reference Books:**

1. Imran Bashir, *Mastering Block chain*, 2nd Edition, Packt Publishing, 2018.
2. Paul Laurence, *Block chain: Step-By- Step Guide to Understanding and Implementing Block chain Technology*, 2018.
3. Melanie Swan, *Block chain – Blueprint for a new Economy*, O'Reilly, 2018.
4. Alan Wright, *Block chain: Uncovering Block chain Technology, Crypto currencies, Bit coin and the Future of Money: Block chain and Crypto currency Exposed*, 2017.
5. A. Antonopoulos, *Mastering Bit coin: Unlocking Digital Crypto currencies*, O'Reilly
6. Kevin Werbach, *The Block chain and the new architecture of Trust*, MIT Press, 2018.
7. Joseph J. Bambara and Paul R. Allen, *Block chain – A practical guide to developing business, law, and technology solutions*, McGraw Hill, 2018.
8. Arjuna Sky Kok, *Hands-On Block chain for Python Developers: Gain block chain programming skills to build decentralized applications using Python*, Pockt, 2019
9. Chandramouli Subramanian; *Block chain Technology*; Universities Press; 2020
10. Kumar Saurabh, Ashutosh Saxena; *Block chain Technology: Concepts and Applications*; Wiley

**COURSE OUTCOMES:**

The students will be able to

**CO1:** Familiarized with Block chain Terminology.

**CO2:** Understand the concept of Block chain, Bit coin.

**CO3:** Understand de-centralization.

**CO4:** Gain knowledge about the domain of block chain in real time.

**CO5:** Basic knowledge of Bit coin, Ethereum and Hyper ledger fabric.

**CO6:** Design and Implementation of case study based Distributed Applications.

**MC5151**

**COMPILER DESIGN**

**CREDITS-3**

**UNIT - I**

**Introduction to Compilers:** Structure of a compiler, Lexical Analysis, Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, Lex, Finite Automata, Regular Expressions to Automata, Minimizing DFA.

**UNIT - II**

**Syntax Analysis:** Role of Parser, Grammars, Error Handling, Context-free grammars, Writing a grammar, Top Down Parsing, General Strategies Recursive Descent Parser Predictive Parser-LL(1), Parser-Shift Reduce Parser, LR Parser, LR (0), Item Construction of SLR Parsing Table, Introduction to LALR Parser, Error Handling and Recovery in Syntax Analyzer, YACC.



### UNIT - III

**Intermediate Code Generation:** Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

### UNIT - IV

**Run-Time Environment and Code Generation:** Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management, Issues in Code Generation, Design of a simple Code Generator.

**Code Optimization:** Principal Sources of Optimization, Peep-hole optimization, DAG- Optimization of Basic Blocks, Global Data Flow Analysis, Efficient Data Flow Algorithm.

#### **Reference Books:**

1. *Alfred Aho, Jeffrey O. Ullman, "Compilers: Principles Techniques and Tool", 2<sup>nd</sup> Edition, Pearson, 2013.*
2. *K. C. Loudon, "Compiler Construction- Principles and Practice", Thomson, 2003.*
3. *V. Raghavan, Principles of Compiler Design, Mc-Graw Hill, 2010.*
4. *Allen I. Holub "Compiler Design in C", Prentice Hall of India, 2006.*
5. *C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", 2<sup>nd</sup> Edition Benjamin Cummings, 2008.*
6. *J.P. Bennet, "Introduction to Compiler Techniques", 2<sup>nd</sup> Edition, McGraw-Hill, 2003.*
7. *ITL Education; Express Learning - Principles of Compiler Design; Pearson*

### COURSE OUTCOMES:

The students will be able to

**CO1:** Understanding of how the different phases of compiler work.

**CO2:** Study of lexical analysis, and various parsing techniques.

**CO3:** Understand the concept of intermediate code generation technique.

**CO4:** Analyze code optimization technique and fundamental of runtime environment.

**CO5:** Illustrate the concept of storage management.

**CO6:** Design and implement a simple compiler for a hypothetical machine using syntax directed translation.

# PRACTICALS

**MC5191**

**DATA ANALYTICS LAB**

**CREDITS-2**

Data Analysis and visualization using different tools, statistical analytics, Solving of use cases based on classification, clustering and regression analysis.

**MC5193**

**ADVANCE JAVA LAB**

**CREDITS-2**

**Introducing Swing:** JFC, Classes of the java x. swing Package

**Networking:** Network Programming using the java.net Package, Establishing the two-way Communication between Server and Client, Learning the Datagram Socket and Datagram Packet Classes, Understanding the Content and Protocol Handlers

**RMI:** Understanding RMI Architecture, RMI Registry, Creating a Distributed Application using RMI API, Using Naming Services.

**Introducing the Java EE Platform:** Introducing the Java EE 6 Platform, HTTP Protocol, Introducing Web and Application Servers.

**Servlet:** Exploring the Servlet API, Explaining the Servlet Life Cycle methods. Servlet Configuration. Creating a Sample Servlet. Creating application with HttpServletRequest and HttpServletResponse Interfaces, Describing a Session, Working with Session Tracking and exploring the Session Tracking Mechanisms, Using the Java Servlet API for Session Tracking.

**JSP:** The life cycle methods of a JSP Page, Working with JSP Basic Tags and Implicit Objects, Working with Action Tags in JSP, Exploring the JSP Unified EL, Using Functions with EL, JSP Tag Extensions and Standard Tag Library, Introducing JSTL.

**Struts 2:** Basics of Struts2, Struts2 Features, Steps to create Struts2 application

**Hibernate:** Introducing Hibernate, Exploring the Architecture of Hibernate, Steps to create Hibernate application.

Cover Designing by : KIIT Publication Cell



**Kalinga Institute of Industrial Technology**

**KIIT DEEMED TO BE UNIVERSITY**

KIIT, Bhubaneswar-751024

Ph:(0674)-2725481, 2725171, 2740326, Fax: 0674 2725481, E.mail: [kiit@kiit.ac.in](mailto:kiit@kiit.ac.in), Website:[www.kiit.ac.in](http://www.kiit.ac.in)