GURU KASHI UNIVERSITY

Master of Computer Application
Session: 2022-2023

Department of Computer Applications

PROGRAM LEARNING OUTCOMES

After completion the program the student will be able to:

- understand and apply mathematical foundation, computing knowledge for the conceptualization of computing models from defined problems.
- identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.
- Use the modern programming languages, tools, techniques, and skills necessary for designing, developing, and deploying software-based applications.
- apply ethical principles and commit to professional ethics and responsibilities and norms of the computer practice.
- Communicate effectively with different stakeholders using a variety of modes and techniques, including written reports, oral presentations, and visual aids.
- Adopt a research culture and implement policies to address pressing local and global concerns.

Programme Structure

Semester-I						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA101	Advanced Database Management System	Core	4	0	0	4
MCA102	Object Oriented Programming Using C++	Core	4	0	0	4
MCA103	Discrete Mathematics	Core	4	0	0	4
MCA104	Advanced Operating Systems	Technical Skill	3	0	0	3
MCA105	Interpersonal Skills	Compulsory foundation	1	0	0	1
MCA106	S/W Lab-I Advanced Database Management System	Technical Skill	0	0	6	3
MCA107	S/W Lab-II Object Oriented Programming Using C++	Technical Skill	0	0	6	3
MCA199		MOOC	-	-	-	-
Disciplinary Elective I (Any one of the following)						
MCA109	LINUX Administration	Disciplinary Elective I	3	0	0	3
MCA110	Data Communication & Computer Networks					
MCA111	Cloud Computing					
Total			**19**	**0**	**12**	**25**

Semester-II						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA201	Advanced Data Structures & Algorithms	Core	4	0	0	4
MCA202	Programming using Python	Core	4	0	0	4
MCA203	Research Methodology	Research Based Skills	4	0	0	4
MCA204	Community Based Field Project	Skill Based	0	0	6	3
MCA205	S/W Lab-III Data Structure & Algorithms	Technical Skill	0	0	8	4
Value added Course (For other Department also)						
MCA206	Ethical Hacking	VAC	0	0	4	2
Disciplinary Elective II (Any one of the following)						
MCA208	Advanced Web Application Development	Disciplinary Elective II	3	0	0	3
MCA209	Bio Informatics					
MCA210	Artificial Intelligence					
Total			**15**	**0**	**18**	**24**

Semester-III						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA301	Advanced Software Engineering	Core	4	0	0	4
MCA302	Theory of Computation	Core	4	0	0	4
MCA303	Java Programming with OOPs Concept	Technical Skill	3	0	0	3
MCA304	S/W Lab-IV Java Programming with OOPs Concept Lab	Technical Skill	0	0	6	3
Disciplinary Elective III (Any one of the following)						
MCA305	C#. NET	Disciplinary Elective III	3	0	0	3
MCA306	Data Mining and Ware Housing					
MCA307	Machine Learning					
Disciplinary Elective IV (Any one of the following)						
MCA308	Mobile Application Development	Disciplinary Elective IV	3	0	0	3
MCA309	Image Processing					
MCA310	Network Security and Cryptography					
Open Elective Course						
		OEC	2	0	0	2
MCA399		MOOC	-	-	-	-
Total			**19**	**0**	**6**	**22**
Open Electives Course (For other Departments)						
MCA311	Cyber Law	OEC	2	0	0	2

Semester-IV						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA401	Industrial Training/Internship (6 Months)	Research Based	NA	NA	NA	20
Total						**20**
Grand Total			**53**	**0**	**36**	**91**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

i. CE-I(10 Marks)
ii. CE-II(10 Marks)
iii. CE-III(5Marks)

(For each CE Conduct Surprise Test, Quiz, and Term Paper. Assignment etc.)

B. Attendance (5 marks)
C. Mid Semester Test-1: [30 Marks]
D. MST-2: [20Marks]
E. End-Term Exam: [20 Marks]

Evaluation Criteria for Practical Subjects

Total 20 Marks (Each Practical)

A. Performance of each practical (10 Marks)
B. Report (05 Marks)
C. Practical Viva (05 Marks)

Evaluation Criteria for Training/Internship/Survey Camp etc.

Total 25 Marks

A. Each Report(25 Marks) – Weekly/Monthly (25 Marks)

Evaluation Criteria for other courses has been given separately with the respective courses

Semester-I

Course Title: Advanced Database Management System
Course Code: MCA101

L	T	P	Credits
4	0	0	4

Total Hours: 60

Course Outcomes:
On completion of this course the students will able to

1. Interpret the basic concepts and explore the applications of database systems.
2. Describe the basics of SQL and construct queries using SQL.
3. Make familiar with a commercial relational database system (Oracle) by writing SQL using the system.
4. Analyze relational database theory, and be able to write relational algebra expressions for queries.
5. Grasp the design principles for logical design of databases, including the E-R method and normalization approach.

Course Content

UNIT I

12 Hours

1. Introduction: Overview of Database Management System: Components of DBMS, Application of DBMS, Advantages of DBMS over file processing systems, Types of DBMS, DBMS Architecture, DBMS Schema, Three Schema Architecture, and DBMS Languages. Responsibility of Database Administrator.
2. Database Design: E-R Diagram (Entity Relationship), Components of ER model, DBMS Generalization, Specialization and Aggregation.

UNIT II

18 Hours

1. DBMS Relational Model: Codd's rule of DBMS, Relational DBMS concepts, Relational Integrity constraints, DBMS Keys, Covert ER model to Relational Model, Difference between DBMS and RDBMS, Relational Algebra(set operations, select, project, join, division), DBMS joins.
2. Normalization: Functional dependencies & Normalization, 1st, 2nd, 3rd and BCNF.

UNIT III

10 Hours

1. DBMS Transaction: Overview of transactions in DBMS, ACID properties, concurrent execution and its problems, DBMS Schedule, DBMS Security.
2. Parallel and Distributed Databases and Client-Server Architecture: Architecture for parallel database; Distributed database concepts, Data fragmentation, Replication, and allocation techniques, Overview of

Client-Server Architecture.

UNIT IV

20 Hours

1. Enhanced Data Models for Advanced Applications: Active database concepts, temporal database concepts, Spatial databases, Deductive databases;
2. Emerging Database Technologies: Mobile databases, Multimedia Databases.
3. SQL: Introduction and Basic commands of SQL.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Ramez, E. (2007). *Fundamentals of Database Systems: For VTU*. Pearson Education India.
- Date, C. J. (1975). *An introduction to database systems*. Pearson Education India.
- Silberschatz, A., Korth, H. F., & Sudarshan, S. (2002). *Database system concepts* (Vol. 5). New York: McGraw-Hill.
- Date, C. J. (1975). *An introduction to database systems*. Pearson Education India.

Web Sources

- https://www.educba.com/types-of-dbms/
- https://www.geeksforgeeks.org/normal-forms-in-dbms/
- https://www.tutorialspoint.com/sql/sql-overview.htm
- https://www.tutorialspoint.com/dbms/dbms_transaction.htm

Course Title: Object Oriented Programming Using C++

Course Code: MCA102

L	T	P	Credits
4	0	0	4

Total Hours: 60

Course Outcomes:

On completion of this course the students will able to

1. Describe all the basic concepts of C++ and its features such as composition of objects, Operator overloading.
2. Implement the various access modifiers in C++ programs.
3. Analyze inheritance with the understanding of early binding and late binding.
4. Classify various object oriented concepts to solve different problems.

5. Analyze and explore various Stream classes, I/O operations and exception handling.

Course Content

UNIT I

17 Hours

1. Programming Basics: Introduction to Programming, Programming Paradigms, Programming Languages and Types. Introduction to C - Basic Program Structure, Execution flow of C Program, Directives, Basic Input /Output Introduction to Object Oriented Programming- OOP concepts, Advantages, Applications, Comparison of C and C++- Data Types, Control Structures, Operators and Expressions .
2. Introduction to C++: Structure of a C++ program, Execution flow, Classes and Objects, Access modifiers, Data Members, Member Functions, Inline Functions, Passing parameters to a Function(pass by Value, Pass by Address, Pass by Reference), Function with default arguments, Function Overloading, Object as a Parameter, Returning Object Static data members and functions, Constant Data members and functions Constructors- Default, Parameterized, Copy, Constructor Overloading, Destructors Arrays, Array as a Class Member, Array of Objects, Strings C style strings and String Class.

UNIT II

14 Hours

1. Operator Overloading and Pointers: Operator Functions-Member and Non Member Functions, Friend Functions Overloading Unary operators Overloading binary operators(Arithmetic, Relational, Arithmetic Assignment, equality), Overloading Subscript operator Type Conversion Operators- primitive to Object, Object to primitive, Object to Object Disadvantages of operator Overloading, Explicit and Mutable Pointers, Pointer and Address of Operator, Pointer to an Array and Array of Pointers, Pointer arithmetic, Pointer to a Constant and Constant Pointer, Pointer Initialization, Types of Pointers(void, null and dangling), Dynamic Memory Allocation, Advantages and Applications of pointers .

UNIT III

13 Hours

1. Inheritance and Polymorphism: Inheritance Concept, Protected modifier, Derivation of Inheritance- Public, Private and Protected,
2. Types of Inheritance-Simple, Multilevel, Hierarchical, Multiple, Hybrid, Constructors and Inheritance, Function Overriding and Member hiding Multiple Inheritance, Multipath inheritance – Ambiguities and solutions Polymorphism, Static and Dynamic Binding, Virtual Functions, Pure Virtual Functions, Virtual destructors, Abstract Classes, Interfaces.

UNIT IV

16 Hours

1. Streams and Exceptions: Files, Text and Binary Files, Stream Classes, File IO using Stream classes, File pointers, Error Streams, Random File Access, Manipulators, Overloading Insertion and extraction operators Error handling, Exceptions, Throwing and catching exceptions, Custom Exceptions, Built in exceptions
2. Advanced C++: Casting- Static casts, Const Casts, Dynamic Casts, and Reinterpret Casts. Creating Libraries and header files. Namespaces Generic Programming, Templates, Class Templates, Function Templates, Template arguments, STL Database Programming with MySQL.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Kamthane, A. (2012). *Programming in C++, 2/e*. Pearson Education India.
- Salaria, R. S. (2016). *Mastering Object-Oriented Programming With C++*. KHANNA PUBLISHING HOUSE.
- Balagurusamy, E. (2001). *Object-Oriented Programming with C++, 7e*. McGraw-Hill Education.

Web Sources

- https://www.tutorialspoint.com/basic-concepts-of-object-oriented-programming-using-cplusplus
- https://www.geeksforgeeks.org/operator-overloading-cpp/
- https://www.simplilearn.com/tutorials/cpp-tutorial/types-of-inheritance-in-cpp

Course Title: Discrete Mathematics

Course Code: MCA103

L	T	P	Credits
4	0	0	4

Total Hours: 60

Course Outcomes:

On completion of this course the students will able to

1. Attain all the basic principles of sets and operations in sets.
2. Implement an argument using logical notation and determine if the argument is or is not valid.
3. Discuss about all counting principles to determine probabilities.
4. Solve various methods of Recurrence relations.
5. Classify the various traversal methods for trees and graphs.

Course Content

UNIT I

16Hours

1. Set Theory: Introduction ,Sets and Elements, Subsets ,Venn Diagrams, Set Operations, Algebra of Sets, Duality , Finite Sets, Counting Principle ,Classes of Sets, Power Sets, Partitions ,Mathematical Induction.
2. Relations: Introduction , Product Sets , Relations ,Pictorial Representatives of Relations, Composition of Relations ,Types of Relations ,Closure Properties , Equivalence Relations, Partial Ordering Relations
3. Functions: Introduction, Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions, Exponential and Logarithmic Functions.

UNIT II

14 Hours

1. Logic and Propositional Calculus :Introduction ,Propositions and Compound Statements ,Basic Logical Operations ,Propositions and Truth Tables ,Tautologies and Contradictions ,Logical Equivalence ,Algebra of Propositions ,Conditional and Biconditional Statements ,Arguments ,Propositional Functions, Quantifiers ,Negation of Quantified Statements.
2. Techniques of Counting :Introduction ,Basic Counting Principles ,Mathematical Functions ,Permutations ,Combinations ,The Pigeonhole Principle ,The Inclusion–Exclusion Principle, Principle Recurrence relations and Generating Function.

UNIT III

14 Hours

1. Graph Theory: Introduction, Data Structures ,Graphs and Multigraphs ,Subgraphs, Isomorphic and Homeomorphic Graphs ,Paths, Connectivity , Traversable and Eulerian Graphs, Labeled and Weighted Graphs ,Complete, Regular, and Bipartite Graphs, Planar Graphs , Graph Colorings ,Representing Graphs in Computer Memory and Graph Algorithms. Directed Graphs, Sequential Representation of Directed Graphs, Warshall's Algorithm, and Shortest Paths.

UNIT IV

16 Hours

1. Trees: Introduction, Binary Trees, Complete and Extended Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Binary Search Trees, Priority Queues, Heaps, Path Lengths, Huffman's Algorithm, General (Ordered Rooted) Trees Revisited.
2. Ordered Sets and Lattices: Introduction, Ordered Sets, Hasse Diagrams of Partially Ordered Sets, Lattices, Bounded Lattices, Distributive Lattices, Complements, Complemented Lattices.

3. Algebraic Systems: Introduction, Operations, Semigroups, Groups, Subgroups, Normal Subgroups, and Homo-morphisms, Rings, Internal Domains, and Fields.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings:

- Lipschutz, S. (1976). Schaum's outline of theory and problems of discrete mathematics.
- Epp, S. S. (2010). *Discrete mathematics with applications*. Cengage learning.
- Kolman, B., Busby, R. C., & Ross, S. (1995). *Discrete mathematical structures*. Prentice-Hall, Inc.
- Doerr, A., & Levasseur, K. (1985). *Applied discrete structures for computer science*. SRA School Group.
- Rosen, K. H., &Krithivasan, K. (2012). *Discrete mathematics and its applications: with combinatorics and graph theory*. Tata McGraw-Hill Education.

Web Sources

- https://byjus.com/maths/basics-set-theory/
- https://discrete.openmathbooks.org/dmoi2/sec_intro-functions.html
- https://byjus.com/maths/graph-theory/

Course Name: Advanced Operating Systems
Course Code: MCA104

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will able to

1. Discuss the fundamentals of Operating System concepts.
2. Attain the mechanisms of OS to handle processes and threads.
3. Classify the role of paging, segmentation and virtual memory in operating systems.
4. Implement various Scheduling Algorithms.
5. Execute all the Deadlock Detection Algorithms.

Course Content

UNIT I

11 Hours

1. Introductory Concepts: Operating system functions and characteristics, Operating System classification, historical evolution of

operating system, Real time system, Distributed system, Methodologies for implementation of O/S service, system calls, system programs, Interrupt mechanisms.

2. Processes: Process Concept, Process model, Process scheduling, Process states, process hierarchies, Process Synchronization, implementation of Processes, data structures used such as Process table, PCB creation of processes, context switching, exit of Processes.

UNIT II

9 Hours

1. Inter-process communication: Race conditions, critical sections, problems of mutual exclusion, Peterson's solution, producer-customer problem, Reader Writer's Problem, Dining Philosophers Problem, semaphores, monitors, message passing, and Semaphores.
2. Process scheduling: objective, Scheduling Criteria, Scheduling Algorithms, preemptive vs. non-preemptive scheduling, comparative assessment of different algorithms such as round robin, priority bases scheduling. FCFS, SJF, multiple queues with feedback
3. Deadlocks: Deadlock Characteristics, Conditions, modeling, detection and recovery, deadlock avoidance, deadlock prevention, deadlock handling.

UNIT III

12 Hours

1. The Linux: Linux History, Design Principles, Kernel Modules, Process Management, Scheduling, File Systems, Input and Output, Inter process Communication, Security.
2. Memory Management: Memory Allocation, concepts of Virtual Memory, Logical Versus Physical addresses space, Multiprogramming with fixed partition, variable partitions, virtual memory, paging, demand paging, design and implementation issues in paging such as page tables, inverted page tables, page replacement algorithms, page fault handling, working set model, local vs. global allocation, page size, segmentation with paging, Frames.

UNIT IV

13 Hours

1. File systems: File type, attributes, access and security, file operations, directory structures, path names, directory operations, implementation of file systems, implementation of file and file operation calls, implementation of directories, sharing of files, Allocation methods: Contiguous, linked and index allocation, block allocation, disk space management, free space management, logical file system, physical file system, Efficiency and Performance.
2. Device management: Techniques for device management, dedicated devices, shared devices, virtual devices; device characteristics, hardware considerations: input & output devices,

3. Storage devices: independent device operation, buffering, multiple paths, device allocation considerations.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Tanenbaum, A. S. Andrew S. Tanenbaum. *Distributed computing*,
- Qureshi, I. (2014). Cpu scheduling algorithms: A survey. *International Journal of Advanced Networking and Applications*, *5*(4), 1968.
- Mohan, I. C. (2013). *Operating Systems*. PHI Learning Pvt. Ltd.
- Duffy, K. P., Davis Jr, M. H., & Sethi, V. (2010). Demonstrating operating system principles via computer forensics exercises. *Journal of Information Systems Education*, *21*(2), 195-202.
- Stalling, W. (2012). Operating system.

Web Sources

- https://www.studytonight.com/operating-system/operating-system-processes
- https://www.geeksforgeeks.org/file-systems-in-operating-system/
- https://www.shiksha.com/online-courses/articles/memory-management-techniques-in-operating-system/

Course Title: Interpersonal Skills
Course Code: MCA105

L	T	P	Credits
1	0	0	1

Total Hours: 15

Course Outcomes:

On completion of this course the students will able to

1. Take a course overview of prerequisites to Business Communication and awareness of appropriate communication strategies.
2. Formulate an outline for effective Organizational Communication.
3. Summarize the information, ideas, concepts and opinions from a variety of sources.
4. Attain the competence in oral, written, and visual communication.
5. Interpret correct practices about the strategies of Effective Business writing.

Course Content

UNIT I

3 Hours

1. Grammar: Sentence, Parts of speech, Tenses, Active passive voice, Direct/Indirect speech.
2. Adjectives & Prepositions: Through activities, adequate contextual examples Practice Recognize adjectives Transform adjectival forms (Word level) Compare prepositions & use them in context Use adjectives & prepositions productively in speech and writing.
3. Listening Activities: Rhyming sounds, Homophones, Identify and use appropriate pronunciation.

UNIT II

4 Hours

1. Functions of Communication: Internal & External Functions, Models- Shannon & Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7C's and other principles), Non-verbal Communication.

UNIT III

5 Hours

1. Basic Technical Writing: Paragraph writing (descriptive, Imaginative etc.), precise writing, reading and comprehension, Letters– Format &various types, resume writing.
2. Speaking & Writing: Activities: Pair work, individual Work Introduce themselves & describe friends using adjectives.
3. Reading Task based Factual; Inferential Vocabulary & Experiential questions Comprehend, interpret & analyze simple reading passages.

UNIT IV

3 Hours

1. Visual to Verbal: Paragraph (using linkers) Messages: Pre-writing (brainstorming), Clustering/grouping ideas, Rough draft, Revision/editing, Final draft, Activities/tasks Interpret visuals Brainstorm, organizes & writes paragraphs using linkers Write messages for given contexts, Presentation: Practice: use Presentation of rules.
2. Verbal Communication: Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences. Technical Communication: MS-Word, Adobe Frame maker.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Krizan, B. (2008). *Business communication*.

- Tongue, J. R., Epps, H. R., &Forese, L. L. (2005). Communication skills. *Instructional course lectures*, *54*, 3-9.
- Ellison, D. (2015). Communication skills. *Nursing Clinics*, *50*(1), 45-57.

Web Sources

- https://in.indeed.com/career-advice/career-development/types-of-communication
- https://www.englishclub.com/esl-articles/200108.php
- https://onlineaccentspokenenglish.com/why-is-grammar-important-for-communication/

Course Title: S/W Lab-I Advanced Database Management System
Course Code: MCA106

L	T	P	Credits
0	0	6	3

Total Hours: 90

Course Outcomes:

On completion of this course the students will able to

1. Apply the basic concepts of Database Systems and its Applications.
2. Design and implement a database schema for a given problem-domain
3. Solve queries using SQL in database creation and interaction.
4. Perform various types of SQL queries to retrieve data from multiple tables.
5. Analyze recovery techniques of database system.

Course Content

1. Data Definition Language Commands
2. Data Manipulation Language Commands
3. In Built Functions
4. Nested Queries And Join Queries
5. Set operators
6. Views
7. Control Structure
8. Procedure and Function
9. Trigger
10. Front End Tools
11. Form
12. Menu Design
13. Report Generation
14. Database Design and Implementation Payroll Processing
15. Data Control Language, Transfer Control Language Commands

Course Title: S/W Lab-II Object Oriented Programming Using C++
Course Code: MCA107

L	T	P	Credits
0	0	6	3

Total Hours: 90

Course Outcomes:

On completion of this course the students will able to:

1. Create and explain basic C++ Program using I/O variables and structures.
2. Apply object oriented programming concepts using class and objects.
3. Analyze and apply the generic classes' concepts in programming problem.
4. Interpret the concept of polymorphism and inheritance.
5. Illustrate and evaluate the file Input Output mechanisms.

Course Content

1. Program to show the of use cin, cout.
2. Program to implement the operators.
3. Program based on decision making statement (if else).
4. Program based on the loops (while,do while).
5. Program based on loops (for), switch statement.
6. Program based on structures and enumerated data types.
7. Program based functions, overloaded functions.
8. Program to show usage of storage classes.
9. Program to show usage of function overloading, default arguments.
10. Program to show usage of classes, objects.
11. Program to show usage of constructors, destructors.
12. Program to manipulate arrays and array of objects.
13. Program to manipulate strings.
14. Program to show usage of inheritance of various type (multiple, multilevel etc.).
15. Program to show usage of unary operator overloading.
16. Program to show usage of binary operator overloading.
17. Program to conversion from basic to user defined data type.
18. Program to conversion from user defined.
19. Program to show usage of basics of pointers.
20. Program to show usage of pointers and arrays.
21. Program to show usage of pointers, function arguments.
22. Program to show usage of new, delete, memory management.
23. Program to show usage of virtual function.
24. Program to show usage of friend, static function.
25. Program to show usage of overloaded assignment operator, this pointer.
26. Program to read & write contents of a text file.
27. Program to show usage of file pointers.

28. Program to show usage of command line arguments.
29. Program to show usage of overloading of right & left shift operators.
30. Program to show usage of exception handling mechanism.
31. Program to show usage of uncaught_exception (), the exception and bad exception classes.
32. Program to show usage of templates.
33. Program to show usage of generic classes.
34. Implementation of File handling.
35. Implementation of Wrapper classes.
36. Implementation of container class.

Course Title: LINUX Administration
Course Code: MCA109

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will able to

1. Work with various Linux command and understand file hierarchical structuring.
2. Administrate user, manage and configure packages in Linux.
3. Monitor system performance and network activities and configure the various internet services
4. Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.
5. Comprehend the technical documentation, prepare simple readable user documentation and adhere to style guidelines and collaborate in teams on system tasks.

Course Content

UNIT I

9 Hours

1. Introduction: Linux Distributions, Difference Between Linux and Windows, Separation of the GUI and the Kernel, Understanding Linux Kernel, Installing Linux in a Server Configuration, Booting and Shutting Down Process, Concept of Root, Basic commands, working with vi Editor.

UNIT II

11 Hours

1. Understanding files and File System: Understanding Files and Directories in Linux, File Structure and hierarchy, File Permissions, File Management and Manipulation, Managing File System
2. Managing Packages & Users: Installing and removing Software in Linux, Getting and Unpacking the Package, Configuring the Package, Compiling the Package, Installing the Package, Managing Users and Groups

UNIT III

12 Hours

1. DNS: Installing a DNS Server, Configuring a DNS Server, DNS Records Types, Setting Up BIND Database Files, the DNS Toolbox, Configuring DNS Clients.
2. Web Server: Understanding the HTTP Protocol, Installing the Apache HTTP Server, Starting Up and Shutting Down Apache, Configuring Apache

UNIT IV

13 Hours

1. E-Mail Server: Understanding SMTP, Installing the Postfix Server, Configuring the Postfix Server, Running the Server, POP and IMAP Basics, Installing the UW-IMAP and POP3 Server
2. Samba Server: The Mechanics of SMB, Samba Administration, Using SWAT, Creating a Share, Mounting Remote Samba Shares, Creating Samba Users, Using Samba to Authenticate Against a Windows Server.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Wale, S. (2008). *Linux Administration: A Beginner's Guide*. McGraw-Hill.
- Nemeth, E., Snyder, G., Hein, T. R., Whaley, B., &Mackin, D. (2018). UNIX and Linux system administration handbook. *USENIX Open Access Policy*, *59*.
- Petersen, R. (2007). *Linux: The Complete Reference (With Cd)*. Tata McGraw-Hill Education.
- Dulaney, E. (2018). *Linux All-in-one for Dummies*. John Wiley & Sons.

Web Sources

- https://www.geeksforgeeks.org/introduction-to-linux-operating-system/
- https://www.javatpoint.com/linux-file-system
- https://www.educba.com/dns-configuration-in-linux/
- https://cloud7.news/linux/7-best-linux-mail-servers/

Course Title: Data Communication & Computer Networks
Course Code: MCA110

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will able to

1. Describe about the network topologies.
2. Enumerate the layers of the OSI model and TCP/IP.
3. Explain the data link layer and network protocols.
4. Interpret the components, tools and techniques of communication systems.
5. Test the performance of a single link, logical process-to-process (end-to-end) channel, a network as a whole (latency, bandwidth and throughput).

Course Contents

UNIT I

9 Hours

1. Introduction to Computer Networks and its uses: Network categorization and Hardware: Broadcast and point-to-point networks, Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Internetworks, Topologies, Wireless networks.
2. Network Software: Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Comparison of OSI and TCP/IP Models. Introduction to Example Networks: Internet, Connection-Oriented Networks – X.25, Frame Relay, ATM.

UNIT II

12 Hours

1. Data Communication Model, Digital and Analog data and signals, bit rate, baud, bandwidth, NY Quist bit rate, Guided Transmission Media – Twisted Pair, Coaxial cable, Optical fiber; wireless transmission – Radio waves, microwaves, infrared waves; Satellite communication.
2. Switching: Circuit Switching, Packet Switching; Multiplexing: Frequency Division Multiplexing Time Division Multiplexity, Synchronous and Asynchronom TDM, Modems, Transmission Impairments, Manchester and Differential Manchester encoching, ADSL Versus Cable.

UNIT III

11 Hours

1. Data Link Layer Design issues: Framing, error control, Flow Control, Error Detection and correction; Elementary Data Link Protocols, Sliding Window Protocols;
2. Medium Access Control: Aloha, CSMA protocols, Collision free protocols, Limited Contention Protocols; Wavelength division Multiple access protocol, Digital Cellular,
3. Radio: Global System for Mobile Communication (GSM), Code Division Multiple Access (CDMA), Fiber Distributed Data Interface, Distributed Queue Dual Bus (DQDB)

UNIT IV

13 Hours

1. Network Layer Design issues : Virtual Circuit and Datagram Subnet, Routing Algorithms, Optimality principle, Shortest path Routing, Flooding , Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast and Multi Cast Routing, Routing for Mobile hosts, Routing in Adhoc Networks,, congestion Control Algorithms, General Principals Traffic Shaping, Leaky bucket token bucket, choke packets, Load Shedding.
2. Transport layer: design issues, elements of transport protocol, addressing establishing &releasing a connection, flow control & buffering, TCP/IP service model, TCP connection management.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning

Suggested Readings

- Tanenbaum, A. S. (1981). Network protocols. *ACM Computing Surveys (CSUR)*, *13*(4), 453-489.
- Forouzan, B., Coombs, C., &Fegan, S. C. (1997). *Introduction to data communications and networking*. McGraw-Hill, Inc.
- Stallings, W. (2007). *Data and computer communications*. Pearson Education India.

Web Sources

- https://www.tutorialspoint.com/what-are-the-uses-of-computer-network
- https://data-flair.training/blogs/switching-techniques-in-computer-network/
- https://digitalnoteshub.com/design-issues-of-data-link-layer/
- https://www.geeksforgeeks.org/transport-layer-responsibilities/

Course Title: Cloud Computing
Course Code: MCA111

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will be able to:

1. Recognize the fundamentals and essentials of Cloud Computing.
2. Outweigh the benefits Cloud Security.
3. Describe the Concept of Cloud Infrastructure Model.
4. Analyze the key technical and organizational challenges.
5. Interpret the importance of virtualization in distributed computing.

Course Contents

UNIT I

9 Hours

1. Introduction to Cloud Computing: Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of Cloud Computing, Cloud Computing Architecture, Basics of Cloud Infrastructure.

UNIT II

11 Hours

1. Cloud Computing Delivery Models: Introduction, Cloud Computing Delivery Models, Attributes of Cloud Computing, Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Comparison of Different Services, Combining Different Services, Obstacles for Cloud Technology, Cloud Vulnerabilities, Cloud Challenges, Practical Applications of Cloud Computing.
2. Migrating to the Cloud: Introduction, Broad Approaches to Migrating to the Cloud, The Seven-step Model of Migration to the Cloud, Service Level Agreements (SLA).Evaluating the Business Need, Cloud vs. Hosted Applications, Cloud vs. Licensed Software Vendors.

UNIT III

12 Hours

1. Selection of Cloud Provider: Introduction, A Brief about Leading Cloud Service Providers, Considerations for Selecting a Cloud Solution, Business Considerations, Data Safety and Security, Interoperability, Portability and Integration, Geographical Considerations, Contingency and Recovery Management, Ethical and Legal Considerations, Scalability and Flexibility

UNIT IV

13 Hours

1. Abstraction and Virtualization: Introduction to Virtualization Technologies, Understanding Hyper visors, Scheduling and Load Balancing.
2. Securing the Cloud: Securing the Cloud, Securing Data, Establishing Identity and Presence.
3. Case-Studies: Using Google Web Services, Using Amazon Web Services, Using Microsoft Cloud Services.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Collaborative Learning

Suggested Readings:

- Buyya, R., Broberg, J., &Goscinski, A. M. (Eds.). (2010). *Cloud computing: Principles and paradigms*. John Wiley & Sons.

- Sosinsky, B. (2010). *Cloud computing bible*. John Wiley & Sons.
- Miller, M. (2008). *Cloud computing: Web-based applications that change the way you work and collaborate online*. Que publishing.
- Kiswani, J. H., Dascalu, S. M., & Harris Jr, F. C. (2021). Cloud computing and its applications: A comprehensive survey. *International Journal of Computer Applications IJCA*, *28*.

Web Sources

- https://www.knowledgehut.com/blog/cloud-computing/what-is-cloud-computing
- https://www.exitcertified.com/blog/cloud-computing-service-delivery-models
- https://www.checkpoint.com/cyber-hub/cloud-security/what-is-cloud-security/
- https://www.tutorialspoint.com/difference-between-abstraction-and-virtualization

Semester-II

Course Title: Advanced Data Structure & Algorithms
Course Code: MCA201

L	T	P	Credits
4	0	0	4

Total Hours: 60

Course Outcomes:

On completion of this course the students will able to:

1. Restate the fundamentals of basic data structures.
2. Implement the basic algorithms for sorting and searching.
3. Experiment the details of stack, queue and linked list operation.
4. Interpret the knowledge of tree and graphs concepts.
5. Apply algorithms and data structures in various real-life software problems.

Course Content

UNIT I

12 Hours

1. Introduction to Data Structures & Algorithms Introduction of Data structures, Abstract Data Types, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations (Big O, Omega, Theta), Performance measurement, Divide and Conquer, Back Tracking Method, Dynamic programming.
2. Sorting and searching algorithms Bubble sort, Insertion sort, Radix Sort, Quick sort, Merge sort, Heap sort, Selection sort, shell Sort, Linear Search, Sequential search, Binary search .

UNIT II

10 Hours

1. Hashing Different Hashing Techniques, Address calculation Techniques, Common hashing functions, Collision resolution techniques: Linear probe, Quadratic probe, Key offset. Rehashing, Double hashing,, Link list addressing.

UNIT III

18 Hours

1. Linear Data Structures Stack Definition, Operations, Implementation of Stacks (Array and Linked list) and applications-Evaluation of postfix expression, Balancing of parenthesis
2. Queue: Definition, Operations, Implementation of simple queue (Array and Linked list) and applications of queue-BFS.
3. Types of queues: Circular, Double ended, Priority, Implementation using linked list Types of Linked List: Singly, Doubly and Circular Linked list Definition, Operations (Insert, delete, traverse, count, search)

UNIT IV

20 Hours

1. Non-linear Data Structures Tree Definition and concepts, General Tree- Definition, Insertion and Deletion into general tree,
2. Binary Tree- Definition, Insertion and Deletion into binary tree, Traversal of a binary tree, Reconstruction of a binary tree from traversal, Conversion of general tree into binary tree, Huffman tree, Expression tree, Binary threaded three Binary Search Tree- Definition, Operation, Implementation AVL tree- Definition, AVL tree rotation with examples, Heaps-Definition, Operations (insertion, delete, build) M way Tree- Introduction, B tree-definition and examples and B * 14
3. Graphs Definition, Types, Operations, Representation, Networks, Traversals of graph, Minimum spanning tree, Kruskal's Algorithm, Prim's Algorithm, Warshall's Algorithm, Shortest path algorithm- Dijsktra's algorithm

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Lipschutz, S. (2011). Data Structures with C (Schaum's Outline Series)
- Langsam, Y., Augenstein, M., & Tenenbaum, A. M. (1996). *Data Structures using C and C*++ (Vol. 2). New Jersey: Prentice Hall.
- Samanta, D. (2001). *Classic data structures* (Vol. 2). Prentice Hall India.
- Narahari, Y. (2000). Data structures and algorithms. *Retrieved November*, *15*.2019.

Web Sources

- https://msatechnosoft.in/blog/searching-sorting-data-structure-algorithms/
- https://www.knowledgehut.com/blog/programming/hashing-in-data-structure
- https://www.programiz.com/dsa/types-of-queue
- https://www.geeksforgeeks.org/graph-data-structure-and-algorithms/

Course Title: Programming Using Python
Course Code: MCA202

L	T	P	Credits
4	0	0	4

Total Hours: 60

Course Outcomes:

On completion of this course, the students will be able to:

1. Discuss the variable, expression and statements.
2. Apply conditional and looping constructs.
3. Design and import functions in python programming.
4. Attain the basics of Strings and Dictionaries.
5. Utilize basic operations on File.

Course Content

UNIT I

15 Hours

1. Introduction to python Getting Started: Introduction to Python- an interpreted high level language, interactive mode and script mode.
2. Variables, Expressions and Statements: Values, Variables and keywords;
3. Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements (Assignment statement); Taking input (using raw input () and input () and displaying output (print statement); Putting Comments.

UNIT II

16 Hours

1. Conditional constructs and looping: if else statement While, for (range function), break, continue, else, pass, Nested loops, use of compound expression in conditional constructs and looping
2. Functions: Importing Modules (entire module or selected objects), invoking built in functions, functions from math module, using random () and randint () functions of random module to generate random numbers, composition.
3. Defining functions, invoking functions, passing parameters, scope of variables, void functions and functions returning values, flow of execution

UNIT III

14 Hours

1. Strings: Creating, initializing and accessing the elements; String operators: +, *, in, not in, range slice [n:m]; Comparing strings using relational operators; String functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase, Pattern Matching
2. Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements;List operations (joining, list slices);

3. List functions & methods: len, insert, append, extend, sort, remove, reverse, pop.

UNIT IV

15 Hours

1. Dictionaries: Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, traversing, appending, updating and deleting elements. Dictionary functions & Methods: cmp, len, clear (), get (), has key (), items (), keys (), update (), values ()
2. Tuples: Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple()
3. Input and Output: Output Formatting, Reading and Writing Files
4. Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Predefined Clean-up Actions

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Dawson, M. (2008). Programing With Python.
- Harbour, J. S. (2012). *More python programming for the absolute beginner*. Course Technology, Cengage Learning.
- Beazley, D. M. (2009). *Python essential reference*. Addison-Wesley Professional.
- Van Rossum, G. (2007, June). Python Programming Language. In *USENIX annual technical conference* (Vol. 41, No. 1, pp. 1-36).

Web Sources

- https://www.w3schools.com/python/python_intro.asp
- https://www.tutorialspoint.com/python/python_basic_operators.htm
- https://www.programiz.com/python-programming/function
- https://www.geeksforgeeks.org/python-lists/

Course Title: Research Methodology
Course Code: MCA 203

L	T	P	Credits
4	0	0	4

Total Hours: 60

Course Outcomes:

On completion of this course the students will able to:

1. Recognize the role and importance of research in the Computer Applications.

2. Describe key research methodology concepts and issues
3. Identify the concepts and procedures of sampling, data collection, analysis and reporting.
4. Analyze appropriate research problem and parameters.
5. Implement the basic concepts of research and its methodologies.

Course Content

UNIT I

15 Hours

1. Objectives of Research, Research Types, Research Methodology, Research Process – Flow chart, description of various steps, Selection of research problem.
2. Research Design: Meaning, Objectives and Strategies of research, different research designs, important experimental designs, completely randomized, randomized block, Latin Square, Factorial Experimental Design.

UNIT II

16 Hours

1. Methods of Data Collection: Types of data collection and classification, Observation method, Interview Method, Collection of data through Questionnaires, Schedules.
2. Processing and Analysis of Data: Editing, Coding, Classification of data Statistical measures and their
3. Significance: Central tendencies, Variation, Skewness, Kurtosis. Correlation and Regression, Multiple Regression, Time Series Analysis, Parametric tests (t, z and F),ChiSquaretest. Analysis of Variance, One - way ANOVA Factor Analysis, Centroid Method, Computer simulations using MATLAB/SPSS.

UNIT III

12 Hours

1. Probability Distributions: Binomial, Poisson, Exponential, Normal distributions, Frequency distribution, Cumulative Frequency distribution, Relative Frequency distribution.
2. Sampling Methods: Different methods of Sampling: Probability Sampling methods, Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Non Probability Sampling methods, Sample size.

UNIT IV

17 Hours

1. Testing of Hypotheses: Testing of Hypotheses concerning Mean(s), Testing of Hypotheses concerning Proportion(s), Testing of Hypotheses concerning Variance(s)
2. Report Writing and Presentation: Types of reports, Report Format– Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.
- Krishnaswamy, K. N., Sivakumar, A. I., & Mathirajan, M. (2006). *Management research methodology: Integration of principles, methods and techniques*. Pearson Education India.
- Chawla, D., & Sodhi, N. (2011). *Research methodology: Concepts and cases*. Vikas Publishing House.
- Panneerselvam, R. (2014). *Research methodology*. PHI Learning Pvt. Ltd..

Web Sources

- https://www.questionpro.com/blog/research-design/
- https://www.simplilearn.com/what-is-data-collection-article
- https://www.scribbr.com/statistics/probability-distributions/
- https://www.analyticssteps.com/blogs/what-hypothesis-testing-types-and-methods

Course Title: Community Based Field Project
Course Code: MCA 204

L	T	P	Credits
0	0	6	3

Total Hours: 90

Course Outcomes:

On completion of this course the students will be able to:

1. Apply community development principles.
2. Demonstrate research skills.
3. Develop community engagement strategies.
4. Identify and analyze community needs.
5. Create and implement a community-based project.

Course Title: S/W Lab-III Advanced Data Structure & Algorithms
Course Code: MCA205

L	T	P	Credits
0	0	8	4

Total Hours: 120

Course Outcomes:

On completion of this course the students will be able to:

1. Create the applications of data structures.

2. Solve the algorithmic problems like insertion and deletion of data.
3. Interpret the programming code to implement the Link List Structure.
4. Analyze Singly, Doubly, Circular Singly linked lists and its operations.
5. Implement the insertion and deletion on BST and heap sort.

Course Content

6. Program to input 1-D Array
7. Program to perform insertion in Arrays
8. Program to perform deletion in Arrays
9. Program to input 2-D arrays (Matrices)
10. Program to find transpose of a matrix. Multiply 2 matrices.
11. Program to implement sparse matrices.
12. Program to perform linear search
13. Program to perform Binary search
14. Program to reverse array without using another variables.
15. Program to perform Bubble sort.
16. Program to perform sorting using Selection Sort.
17. Program to perform sorting using Insertion Sort.
18. Program to input and traverse N-nodes in a one way linked list.
19. Program to reverse a one way linked list.
20. Program to perform insertion/deletion in linked lists.
21. Program to input and traverse doubly linked list.
22. Program to implement stack operations.
23. Program to implement Queues.
24. Program to find factorial using recursion.
25. Program to print Fibonacci series using recursion.
26. Program to input a BST.
27. Program to perform insertion in a BST.
28. Program to perform deletion in a BST.
29. Program to implement min-heaps.
30. Program to implement max-heaps.
31. Program to implement AVL trees.
32. Program to perform rotations in AVL trees.
33. Program to perform rotations in AVL trees.
34. Program to input a graph.
35. Program to print adjacency list of a graph.
36. Program to perform traversal in graphs using DFS.
37. Program to perform traversal in graphs using BFS.
38. Program to implement shortest path methods.
39. Programs to perform Dynamic memory allocation.
40. Programs to perform sorting on data stored in a file.
41. Programs to delete duplicates in arrays and linked lists.

L	T	P	Credits

Course Title: Ethical Hacking
Course Code: MCA206

0	0	4	2

Total Hours: 60

Course Outcomes:
On completion of this course the students will be able to:
1. Evaluate the new Hacking Methodology.
2. Install hacking software on a closed network environment.
3. Identify the tools and techniques to carry out a penetration testing.
4. Exemplify security techniques used to protect system and user data.
5. Analyze report writing and mitigation.

Course Content

1. Setup a honey pot and monitor the honey pot on network.
2. Write a script or code to demonstrate SQL injection attacks.
3. Create a social networking website login page using phishing techniques.
4. Write a code to demonstrate DoS attacks.
5. Install rootkits and study variety of options.
6. Study of Techniques uses for Web Based Password Capturing.
7. Install jcrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security and Management.
8. Implement passive scanning, active scanning, session hijacking cookies extraction using Burp suit tool.

Course Title: Advanced Web Application Development
Course Code: MCA208

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:
On completion of this course the students will be able to:
1. Recognize the model-view-controller paradigm and its application to web application development.
2. Create and style basic web pages using HTML tags and inline styles.
3. Transform data with JavaScript and use computational abstractions.
4. Identify the strengths and disadvantages of a number of website technologies such as PHP, ASP.NET, Node.js, or Apache Struts.
5. Develop a database-backed, interactive website using PHP framework.

Course Content
UNIT I

10 Hours

1. Internet Basics: Protocols, Servers and their Functions, Internet Clients, Network Security, Internet Development, Design Functional Internet site & Business Concepts

2. HTML: Fundamentals/ Basic HTML, Text formatting on Web Pages, Incorporate images, Creating hyperlinks, complex image maps, tables and nested tables, Inserting web page, Setting & modifying field properties, Validating HTML.

UNIT II

9 Hours

1. Cascading Style Sheet – CSS: Introduction, Designing with Style Sheets, Style Sheet Syntax, ID, Class Contextual Selectors, Cascading Order, Properties, Absolute and Relative Positioning, Layering Elements using Z-Index, Animating objects
2. JavaScript & Document Object Model: Introduction to JavaScript, Variables and Objects, Decision Making Statement, Loops, Arrays, Functions & Prototypes, Core JavaScript Objects, DOM Introduction, Event Model, Function
3. JQuery: Introduction, Installing & Configuration, JQuery Syntax, Selectors, Events, JQuery Callback & Chaining.

UNIT III

12 Hours

1. Extensible Markup Language – XML: Introduction to XML, Benefits, Holding Data, Separates Structure from Formatting, Data Sharing XML.
2. Document Type Definition DTD: Introduction, DTD Building Blocks, Elements & Attributes, Entities, Validation
3. Dream Weaver: Interactivity, Application Development Environment, Site Management, Media Customizing & Extending, Page Authoring, Design & Management.
4. PHP Hypertext Pre Processor - PHP: Introduction, PHP Document, Language Fundamentals, Decision Making Statement, Loops, Statements, Operators, PHP functions, Arrays & Functions, String Functions, Server-Side Processing, Processing Forms via GET/POST, State and Persistence, Web Application Development, Introduction to PHP Frameworks & Basic OOPs.

UNIT IV

14 Hours

1. SQL & MySQL : Introduction to SQL & MySQL & its Versions, Administration & Query Browser, Creating Databases & Tables, Using keys, Types of Table in MySQL, Data Types, Deleting databases and tables, Inserting, Retrieving, Updating & Deleting data, User Accounts, Access Control & documentation.
2. Integrating PHP and MySQL: PHP interfacing with MySQL, Connecting to MySQL, Database Connecting, Executing SQL, Retrieving the data set & refining the fetch.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration,

Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Duckett, J. (2014). *Web design with HTML, CSS, JavaScript and j Query set* (Vol. 1). IN: Wiley.
- Flanagan, D., & Novak, G. M. (1998). Java-Script: The Definitive Guide.
- Nixon, R. (2014). *Learning PHP, MySQL & JavaScript: with j Query, CSS & HTML5*. "O'Reilly Media, Inc.".

Web Sources

- https://www.w3schools.com/css/
- https://html.com/
- https://www.one.com/en/hosting/what-is-php
- https://www.cloudways.com/blog/connect-mysql-with-php/

Course Title: Bioinformatics
Course Code: MCA209

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will be able to:

1. Introduced the basic concepts of Bioinformatics and its significance in Biological data analysis.
2. Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.
3. Classify different types of Biological Databases.
4. Explain about the methods to characterize and manage the different types of Biological data.
5. Overview about biological macromolecular structures and structure prediction methods

Course Content

UNIT I

9 Hours

1. Introduction to Genomic data and Data Organization: Sequence Data Banks –Introduction to sequence data banks – protein sequence data bank. NBFR-PIR, SWISSPORT. Signal peptide data bank, Nucleic acid sequence data bank – GenBank, EMBL nucleotide sequence data bank. AIDS virus sequence data bank. PRNA data bank,
2. Structural data banks- protein Data Bank (PDB). The Cambridge Structural Database
3. (CSD): Genome data bank – Metabolic pathway data; Microbial and Cellular Data Bank.

UNIT II

13 Hours

1. Introduction to MSDN (Microbial Strain Data Network): Numerical Coding Systems of Microbes, Hibridoma Data Bank Structure, Virus Information System Cell line, Information system; other important Data banks in the area of biotechnology/life Sciences/biodiversity.
2. Sequence analysis: Analysis Tools for Sequence Data Bank: Pair wise alignment –NEEDLEMAN and Wunsch algorithm, Smith Waterman, BLAST, FASTA algorithms to Analyze sequence data; Sequence patterns motifs and profiles.

UNIT III

10 Hours

1. Secondary Structure Predictions; prediction algorithms; Chao-Fasman algorithm. Hidden-Markov model, Neural Networking., Tertiary Structure predictions; prediction algorithms; Chao-Fasman algorithm. Hidden-Markov model, Neural Networking.

UNIT IV

12 Hours

1. Application in Biotechnology: Protein classifications, Fold libraries, Protein structure
2. Prediction: Fold recognitions (threading), protein structure predictions: Comparative Modeling (Homology),
3. Advanced topics: Protein folding, Protein-ligand interactions, Molecular Modeling & Dynamics, Drug Designing.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Lesk, A. (2019). *Introduction to bioinformatics*. Oxford university press. Marks, M., & Uni, I. A. DEGREE COURSE M. Sc. BIO INFORMATICS UNDER CBCS. *Cytogenetics*, *9*(5), 3.
- Gibas, C., Jambeck, P., & Fenton, J. (2001). *Developing bioinformatics computer skills*. " O'Reilly Media, Inc.".
- Rastogi, S. C., Rastogi, P., & Mendiratta, N. (2022). *Bioinformatics: Methods and Applications-Genomics, Proteomics and Drug Discovery*. PHI Learning Pvt. Ltd.

Web Sources

- https://byjus.com/biology/bioinformatics/
- https://biotecharticles.com/Bioinformatics-Article/Applications-of-Bioinformatics-in-Biotechnology-404.html

- https://pubmed.ncbi.nlm.nih.gov/12632698/

Course Title: Artificial Intelligence
Course Code: MCA210

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will able to:

1. Differentiate the various searching techniques, constraint satisfaction problem.
2. Classify the role of agents and the way of evaluating it.
3. Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.
4. Compare different machine learning techniques to design AI machine and enveloping applications for real world problems.
5. Acquire the knowledge of real world Knowledge representation.

Course Content

UNIT I

11 Hours

1. Introduction to Artificial Intelligence (AI) and Problem Space: Introduction AI technique, Turing test, History and developments in AI, applications of AI, State space representation, production systems, systematic control strategies: Breadth first search and Depth first search, problem characteristics, product system characteristics, issues in the design of search programs.
2. Heuristic Search Technologies: Introduction to heuristic search, Generate and test, Hill Climbing, Best First search, A*, Problem reduction, AO*, constraint satisfaction and Means-ends-analysis techniques.

UNIT II

9 Hours

1. Knowledge representation: Information and knowledge, Knowledge acquisition and manipulation, Issues in knowledge representation, Knowledge representation methods - Propositional logic and first order predicate logic, Resolution principle, Horn's clauses, Features of language PROLOG, Semantic networks, Partitioned semantic nets, Frames, Scripts and conceptual dependencies.
2. Game playing: MiniMax search procedure, reducing alternatives using Alpha-Beta pruning method examples.

UNIT III

10 Hours

1. Expert systems : Introduction, examples, characteristics architecture, people involved and their role in building an expert systems, case

studies of expert systems, MYCIN and DENDRAL; features of knowledge acquisition systems : MOLE and SALT.

2. Natural Language understanding and processing: Introduction, Complexity of the problem, Chompsky hierarchy of grammars, Techniques for Syntactic processing, Semantic Analysis, Discourse and pragmatic processing

UNIT IV

15 Hours

1. Tools and Technologies for AI: Introduction to AI language LISP : Symbolic expression, creating, appending and modifying lists, defining functions, Predicates, Conditionals, Recursion, Iteration, Printing and reading , Lambda expressions and higher order function, List storage.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Khemani, D. (2013). *A first course in artificial intelligence*. McGraw-Hill Education.
- Fu, L. M. (2003). *Neural networks in computer intelligence*. Tata McGraw-Hill Education.
- Kamruzzaman, A. M. Artificial Intelligence & Applications.
- Russell, S. J. (2010). *Artificial intelligence a modern approach*. Pearson Education, Inc.

Web Sources

- https://www.javatpoint.com/artificial-intelligence-ai
- https://www.edureka.co/blog/top-12-artificial-intelligence-tools/
- https://www.techtarget.com/searchenterpriseai/definition/natural-language-understanding-NLU
- https://www.techtarget.com/searchenterpriseai/definition/expert-system

Semester-III

L	T	P	Credits

Course Title: Advanced Software Engineering
Course Code: MCA301

4	**0**	**0**	**4**

Total Hours: 60

Learning Outcomes:

On the completion of this course the students will able to:

1. Decompose the given project in various phases of a life cycle
2. Checking appropriate process model depending on the user requirements.
3. Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
4. Analyze the various processes used in all the phases of the product.
5. Apply the knowledge, techniques, and skills in the development of a software product.

Course Contents

UNIT I

14 Hours

1. Overview Introduction: FAQs about Software Engineering; Professional and Ethical Responsibility;
2. Software Process: Models; Process Iteration, Specification, Software Design and Implementation; Verification & Validation; Software Evolution; Automated Process Support.
3. Software Project Management: Management: Activities, Project Pl Software Project Management and Requirements Project Management: Management Activities, Project Planning, Project Scheduling, Risk Management; Software Requirements: Functional and Non-Functional Requirements, User Requirements, System Requirements, Requirements Document;
4. Requirements Engineering Process: Feasibility Studies, Requirements Elicitation and Analysis, Requirements Validation, Requirements Management.

UNIT II

13 Hours

1. System Models, Software Prototyping and Specifications System models: Context, Behavioral, Data, and Object models, CASE Workbenches; Software Prototyping: Prototyping in the Software Process, Rapid Prototyping Techniques, User Interface Prototyping; Specifications: Formal Specification in the Software Process, Interface Specification, Behavioral Specification.
2. Introduction: System Structuring; Control Models: Modular Decomposition; Domain- Specific Architectures;
3. Distributed Systems Architectures: Multiprocessor Architectures; Client-Server Architectures, Distributed Object Architectures; CORBA

(Common Object Request Broker Architecture).

UNIT III

16 Hours

1. Object Oriented Design: Objects and Object Classes, Object-Oriented Design Process, Design Evolution; Real Time Software Design: Systems Design, Real-Time Executives, Monitoring and Control Systems, Data Acquisition Systems; Design with Reuse: Component-Based Development, Application Families, Design Patterns; User Interface Design: Principles, User Interaction, Information Presentation, User Support, and Interface Evaluation.
2. Verification and Validation (V & V): Static and Dynamic V & V, V & V Goals, V & V vs. Debugging, Software Inspections / Reviews, Clean-Room Software Development; Software Testing: Defect Testing, Integration Testing, Interface Testing, Object-Oriented Testing, Testing Workbenches
3. Managing People: Introduction; Limits to Thinking; Memory Organization; Knowledge Modeling; Motivation; Group Working; Choosing and Keeping People; the People Capability Maturity Model

UNIT IV

17 Hours

1. Software Cost Estimation: Productivity, Estimation Techniques, Algorithmic Cost Modeling, Project Duration and Staffing. Quality Management: Quality Assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics; Process Improvement: Process and Product Quality, Process Analysis and Modeling, Process Measurement, the SEI Process Maturity Model, and Process Classification
2. Evolution: Legacy Systems: Structures, Design, and Assessment; Software Change: Program Evolution Dynamics, Software Maintenance, Architectural Evolution; Software Re- Engineering: Source Code Translation, Reverse Engineering, Program Structure Improvement, Program Modularization, Data Re-Engineering; Configuration Management.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Pressman S Roger (1992). *Software Engineering, A Practitioner's Approach*, Third Edition. McGraw Hill.
- Fairley E.R (1985). *Software Engineering Concepts*. McGraw Hill.

- Jalota Pankaj (1992).*An Integrated Approach to Software Engineering*. Narosa Publishing House.

Web Sources

- https://www.javatpoint.com/software-processes
- https://www.geeksforgeeks.org/software-engineering-verification-and-validation/
- https://www.geeksforgeeks.org/cost-estimation-models-in-software-engineering/

Course Title: Theory of Computation
Course Code: MCA302

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes:

On the completion of this course the students will able to:

1. Recognize and comprehend formal reasoning languages.
2. Use the basic concepts of formal languages of finite automata techniques.
3. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
4. Design different types of Push down Automata as Simple Parser.
5. Analyze Context Free languages, Expression and Grammars.

Course Content

UNIT I

13 Hours

1. Introduction: Basic Terminology: Alphabet, Formal Language and operations on formal languages, Examples of formal languages.

2. Finite automata : Concept of Basic Machines, Properties and Limitations of Finite State Machines, Deterministic Finite Automata(DFA),Non-Deterministic Finite Automata(NFA), Equivalence of DFA and NDFA , Non-Deterministic Finite automata with Λ-Transitions.

UNIT II

14 Hours

1. Regular expression: Regular Languages and Regular Expressions, Kleen's Theorem. Arden's Method.
2. Properties of Regular sets: The Pumping Lemma for Regular sets, Application of the Pumping Lemma, Closure Properties of Regular Sets, Myhill- Nerode Theorem and Minimization of Finite Automata, Minimization Algorithm.
3. Finite Automata with output: Moore and Mealy Machines. Equivalence of Moore and Mealy Machines.

UNIT III

17 Hours

1. Context Free Grammars: Examples and Definitions, Derivation trees and ambiguity, An Unambiguous CFG for Algebraic Expressions. Regular Grammar, Simplified forms and Normal forms: Removal of useless symbols and UNIT production, Removal of Λ-moves, Chomsky Normal Form (CNF), Greenback Normal Form (GNF).
2. Pushdown Automata: Introduction and Definition of Push-Down Automaton, Applications of Push down Automata.

UNIT IV

16 Hours

1. Turing Machines: Definitions and Examples, Deterministic and Non-Deterministic Turing Machines, Unsolvable Problems: A Non recursive Language and an Unsolvable Problem, PCP Problem and MPCP Problem.
2. More General Languages and Grammars: Recursively Enumerable and Recursive Languages, Unrestricted grammars, Context sensitive Language and grammar. Relation between languages of classes, Chomsky hierarchies of grammars.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Sipser, M. (1996). Introduction to the Theory of Computation. *ACM Sigact News*, *27*(1), 27-29.
- Dai, H. Y. (2015). McCarthy's LISP and Basis for Theory of Computation. In *Third International Conference on the History and Philosophy of Computing* (p. 39).
- Kozen, D. C. (2006). *Theory of computation* (Vol. 121). Heidelberg: Springer.
- Core, A. (1998). Theory of Computation.

Web Sources

- https://www.elprocus.com/introduction-to-the-theory-of-computation-toc/
- https://www.javatpoint.com/finite-automata
- https://www.tutorialspoint.com/what-is-turing-machine-in-toc
- https://brilliant.org/wiki/pushdown-automata/

L	T	P	Credits

Course Name: Java Programming with OOPs Concept
Course Code: MCA303

3	**0**	**0**	**3**

Total Hours: 45

Learning Outcomes:

On completion of this course the students will be able to:

1. Describe the concepts of data types, variables, arrays of object oriented programming.
2. Analyze interfaces, class hierarchies and exception in programs.
3. Construct appropriate diagrams and textual descriptions to communicate the AWT and Applet for web applications.
4. Implement the concept of SQL package, multithreading and JDBC in java.
5. Solve specified problems by using the Java SDK environment to create, debug and run simple Java programs.

Course Content

UNIT I

11 Hours

1. Introduction to Java: Introduction to java , Java History, Java Features; How Java Differs from C and C++; Comments in java, Java Program Structure, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style, Java and Internet, Java and World Wide Web, Web Browsers; Hardware and Software Requirements; Java Support Systems, Java Environment, Java Tokens; Java Statements.
2. Constants, Variables and Data Types: Introduction; Constants, Variables, Data Types, Introduction to Operators, Expressions, Operator Precedence. Decision Making,
3. Branching and Looping: Decision making and branching Statements, Looping Statements, Labeled loops, Jumping Statements.

UNIT II

11 Hours

1. Classes, Objects and Methods: Introduction, Defining a Class, Data member, member function, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods. Arrays, Strings, Vectors: Arrays, Zagged Arrays, And Strings, String functions: Vectors, Wrapper Classes.
2. Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalizer Methods, Abstract Methods and Classes, Visibility Control.

UNIT III

11 Hours

1. Interfaces: Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables, Implementing Multiple Inheritance using Interfaces.
2. Packages: Introduction; System Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package, Hiding Classes.
3. Managing Errors and Exceptions: Introduction; Types of Errors; Exceptions, Exception Handling using Try, Catch and Finally block: Throwing Our Own Exceptions, Using Exceptions for Debugging.

UNIT IV

12 Hours

1. Multithreading: Creating Threads, Thread Life Cycle, Synchronization, Thread Communication, Thread Priorities.
2. Applet Programming: How Applets Differ from Applications, Applet Life Cycle; Creating an Executable Applet.
3. JAVA Database Connectivity (JDBC): Merging data from Multiple tablets, joining, Manipulation: Database with JDBC, Prepared Statements, Transaction processing.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Balaguruswamy, E. (2014). *Programming with Java-A Primer*. McGraw-Hill Professionals.
- Chhillar, R. S. (2011). Comparison of C++ and JAVA in the Context of Object-Oriented Metrics. *IUP Journal of Computer Sciences*, *5*(2).
- Sedgewick, R., & Wayne, K. (2017). *Introduction to programming in Java: an interdisciplinary approach*. Addison-Wesley Professional.
- Lewis, G., Barber, S., & Siegel, E. (1998). *Programming with Java IDL*. John Wiley & Sons, Inc.

Web Sources

- https://www.scaler.com/topics/java/introduction-to-java/
- https://javaproglang.blogspot.com/2014/03/constants-variables-data-types.html#.
- https://beginnersbook.com/2013/03/packages-in-java/
- https://www.programiz.com/java-programming/class-objects
- https://www.knowledgehut.com/tutorials/java-tutorial/java-applet

Course Title: S/W Lab-IV Java Programming with OOPs Concept
Course Code: MCA304

L	T	P	Credits
0	0	6	3

Total Hours: 90

Learning Outcomes:

On completion of this course the students will able to

1. Classify the structure and model of the Java programming language.
2. Implement the given problems in Java programming language.
3. Develop software in the Java programming language.
4. Evaluate user requirements for software functionality required to decide whether the Java Programming Language can meet user requirements.
5. Connect Java programs to database using JDBC.

Course Content

1. Write a java program to find the Fibonacci series using recursive and non recursive functions.
2. Write a java program to multiply two given matrices.
3. Write a java program that checks whether a given string is palindrome or not.
4. Write a java program for Method overloading and Constructor overloading.
5. Write a java program to represent Inheritance.
6. Write a java program to display the employee details using Scanner class.
7. Write a java program to represent Abstract class with example.
8. Write a java program to implement interface using extends keyword
9. Write a java program to create user defined package
10. Write a java program for creating multiple catch blocks.
11. Write an applet program that displays a simple message.
12. Write a Java program compute factorial value using Applet.
13. Write a java program for handling Mouse events and Key events.
14. Write a java program that connects to a database using JDBC.

Course Title: C#.NET
Course Code: MCA 305

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

On completion of this course the students will be able to

1. Classify the basic concepts in regard to C# programming language
2. Introduce the general programming concepts

3. Implement comprehend C# code and Analyze the code solutions and compile C# projects
4. Design and develop professional console and window based.
5. Demonstrate knowledge of object-oriented concepts and design user experience and functional requirements C#.NET application.

Course Content

UNIT I

15 Hours

1. Overview of C#: History, Structure of C# Program, Namespaces, Using Aliases, Multiple Main Methods; Literals, Variables,
2. Data Types: Value types, Reference types; Boxing and Unboxing; Operators and Expressions, Branching and Looping,
3. Methods: Declaration, Method Parameters, value, ref, out and variable argument lists, Method Overloading;
4. Arrays: Declaration, Initialisation, Overview of methods used in System. Array class; Strings: Creating mutable and immutable strings; Difference between C++ and C#, Difference between Java and C#.

UNIT II

10 Hours

1. Classes and Objects : Defining a class, Member Access Modifiers, Creating objects, Accessing class members and functions;
2. Types of Constructors: Default, Parameterized, Copy, Static, Private; Working of Destructors, Constant and read only members,
3. Overview of Properties : Read only and write only properties;

UNIT III

10 Hours

1. Inheritance : Defining a base class and sub class, visibility control, defining subclass constructors, Types of inheritance, Overriding methods, Abstract classes and methods, Usage of Sealed; Implementing Dynamic Polymorphism;
2. Interfaces: Defining interface, extending interface, implementing interface, explicit interface implementation;

UNIT IV

10 Hours

1. Delegates: Introduction, Steps for creating a delegate, Multicast Delegates, Covariance and Contra variance;
2. Errors and Exceptions : Introduction, Types of Errors, Exceptions, Syntax of exception handling code, multiple catch statements, Exception Hierarchy, general catch handler, using finally, Nested try block, throwing own exceptions, Checked and Unchecked operators;
3. I/O: System.IO Namespace, Streams, Text Writer, Text Reader, Binary Writer, Binary Reader, File Stream;

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Bai, Y. (2010). *Practical database programming with Visual C#. NET*. John Wiley & Sons.
- Price, M. J. (2019). *C# 8.0 and. NET Core 3.0–Modern Cross-Platform Development: Build applications with C#,. NET Core, Entity Framework Core, ASP. NET Core, and ML. NET using Visual Studio Code*. Packt Publishing Ltd.
- Price, J., & Gunderloy, M. (2006). *Mastering Visual C#. Net*. John Wiley & Sons.
- Robinson, 2002: *Professional C#,* 2nd Ed., Wrox Press.

Web Sources

- https://www.tutlane.com/tutorial/csharp/csharp-introduction
- https://www.dotnettricks.com/learn/csharp/understanding delegates-in-c sharp
- https://www.w3schools.com/cs/cs_interface.php

Course Title: Data Mining and Ware Housing
Course Code: MCA306

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On successful completion of this course the students will be able to:

1. Design a data mart or data warehouse for any organization
2. Develop skills to write queries using DMQL
3. Extract knowledge using data mining techniques
4. Adapt to new data mining tools.
5. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data

Course Content

UNIT I

15 Hours

1. Introduction To Data Mining: Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System With A Database or Data Warehouse System, Major Issues In Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.

2. Preprocessing: Data Quality, Major Tasks in Data Preprocessing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration.
3. Data Warehousing And On-Line Analytical Processing: Data Warehouse basic concepts, Data Warehouse Modeling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.
4. DATA CUBE TECHNOLOGY: Efficient Methods for Data Cube Computation, Exploration and Discovery in Multidimensional Databases.

UNIT II

10 Hours

1. Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations.
2. Frequent Pattern And Association Mining: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.

UNIT III

9 Hours

1. Classification: Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification, Bayesian Belief Department of Computer Science and Engineering MLR Institute of Technology- UG - Autonomous-Regulations & Syllabus – MLR - 17 Page | 105 Networks, Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods.

UNIT IV

11 Hours

1. Cluster Analysis: Basic Concepts of Cluster Analysis, Clustering structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method, Other Clustering Techniques, Clustering High-Dimensional Data, Constraint-Based and User-Guided Cluster Analysis, Link-Based Cluster Analysis, Semi-Supervised Clustering and Classification, Bi-Clustering, Collaborative Clustering.
2. OUTLIER ANALYSIS: Why outlier analysis, Identifying and handling of outliers.

3. Distribution Based Outlier Detection: A Statistics-Based Approach, Classification-Based Outlier Detection, Clustering-Based Outlier Detection, Deviation-Based Outlier Detection, and Isolation-Based Method: From Isolation Tree to Isolation Forest.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Bhatia, P. (2019). *Data mining and data warehousing: principles and practical techniques*. Cambridge University Press.
- Han, J., Pei, J., &Kamber, M. (2011). *Data mining: concepts and techniques*. Elsevier.
- Dunham, M. H. (2006). *Data mining: Introductory and advanced topics*. Pearson Education India.
- Prabhu, S. H. J. K. H. K., &Vēṅkaṭēcan̲, N. (2007). *Data mining and warehousing*. New Age International.

Web Sources

- https://webdocs.cs.ualberta.ca/~zaiane/courses/cmput690/notes/Chapter1/
- https://learn.microsoft.com/en-us/dotnet/machine learning /tutorials /image-classification
- https://byjus.com/maths/cluster-analysis/

Course Title: Machine Learning
Course Code: MCA307

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will be able to:

1. Describe the basic concepts of Bayesian Decision Theory.
2. Examine the Machine Intelligence and its applications
3. Implement the working of perceptron learning algorithm, criterion and Windrow-Hoff learning algorithm.
4. Depict the algorithms like Nearest Neighbor classification, K-nearest neighbor and their applications.
5. Evaluate the models generated from data.

Course Content

UNIT I

8 Hours

1. Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class

conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

UNIT II

14 Hours

1. Linear machines: General and linear discriminates, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer
2. Perceptron's: two-layers universal approximates, back propagation learning, on-line, off-line error surface, important parameters.

UNIT III

10 Hours

1. Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data
2. Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability.

UNIT IV

13 Hours

1. Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, Occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoffs.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Alpaydin, E. (2020). *Introduction to machine learning*. MIT press.
- Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. *Science*, *349*(6245), 255-260.
- Mitchell, T. M., & Mitchell, T. M. (1997). *Machine learning* (Vol. 1, No. 9). New York: McGraw-hill.
- Bishop, C. M., & Nasrabadi, N. M. (2006). *Pattern recognition and machine learning* (Vol. 4, No. 4, p. 738). New York: Springer.

Web Sources

- https://www.javatpoint.com/machine-learning-decision-tree-classification-algorithm
- https://data-flair.training/blogs/advantages-and-disadvantages-of-machine-learning/
- https://www.w3schools.com/ai/ai_perceptrons.asp

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Course Title: Mobile Application Development
Course Code: MCA308

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will be able to:

1. Identify the various concepts of mobile programming that make it unique from programming for other platforms.
2. Critique mobile applications on their design pros and cons.
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
4. Program mobile applications for the Android operating system that use basic and advanced phone features.
5. Deploy applications to the Android marketplace for distribution.

Course Contents

UNIT I

10 Hours

1. Android Application Development: Android Architecture, Getting started with Android,
2. Mastering Android Development tools: Using Android Documentation, Working with Android Emulator;
3. Building simple Android Applications: Using the Application Context, Working with Activities, Using callback methods, working with intents, Dialogs, Fragments, Logging application information.

UNIT II

13 Hours

1. Android Application Design Essentials: Managing Application Resources: Working with Simple Resource values, Drawable Resources, Layouts Files , Drawing and Working with Animation; Configuring the Android Manifest file and basic application Settings, registering activities, Designating the launch activity.

UNIT III

12 Hours

1. Managing Application permissions, designing an application framework. Testing Android Applications, Publishing Android Application, Using Android Programming Managing Application Resources in a Hierarchy, Working With Different Types of Resources.

UNIT IV

10 Hours

1. 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.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

1. Steele, J., To, N., & Conder, S. (2011). *The Android Developer's Collection (Collection)*. Addison-Wesley Professional.
2. Meier, R. (2012). *Professional Android 4 application development*. John Wiley & Sons.
3. Burd, B. (2015). *Android application development all-in-one for dummies*. John Wiley & Sons.
4. Charland, A., &Leroux, B. (2011). Mobile application development: web vs. native. *Communications of the ACM*, *54*(5), 49-53.

Web Sources

- https://www.tutorialspoint.com/android/index.htm
- https://www.solutionanalysts.com/blog/5-essential-material-design-guidelines-for-android-app-development/
- https://developer.android.com/reference

Course Title: Image Processing
Course Code: MCA309

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will be able to:

1. Explain the fundamentals of digital image and its processing
2. Perform image enhancement techniques in spatial and frequency domain.
3. Elucidate the mathematical modeling of image restoration and compression
4. Apply the concept of image segmentation.
5. Describe object detection and recognition techniques.

Course Content

UNIT I

10 Hours

1. Introduction of Digital Image Processing: Digital Image Representation, Digital Image Processing System, Visual Perception, Sampling and Quantization, relationship between Pixels, Fourier Transforms, Walsh, Hadamard and Discrete Cosine Transforms.

UNIT II

10 Hours

1. Frequency Domains: Spatial and Frequency domain methods, Enhancement by point Processing, Spatial Filtering, Enhancement in the Frequency Domain, Generation of Spatial Masks from Frequency Domain Specifications, Color Image Processing.

UNIT III

11 Hours

1. Image Restoration: Degradation Model, Diagonalization of Circulant and Block Circulant of Matrices. Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filter, Constrained Least squares restoration, Iterative Restoration, Restoration in the Spatial Domain.

UNIT IV

14 Hours

1. Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory, Error-Free, Compression, Image Compression Standards.
2. Image Segmentation: Detection of Discontinuity, Edge linking and Boundary Detection, Thresholding, Region-Oriented Segmentation, The use of Motion in Segmentation.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Petrou, M. M., &Petrou, C. (2010). *Image processing: the fundamentals*. John Wiley & Sons.
- Gonzalez, R. C., & Woods, R. E. (1992). Digital image processing addison-wesley. *Reading, Ma*.B.Channda & D.Dutta.*Digital Image Processing and Analysis*.
- Jain, A. K. (1989). *Fundamentals of digital image processing*. Prentice-Hall, Inc..
- Pitas, I. (2000). *Digital image processing algorithms and applications*. John Wiley & Sons.
- Cristóbal, G., Schelkens, P., &Thienpont, H. (Eds.). (2013). *Optical and digital image processing: fundamentals and applications*. John Wiley & Sons.

Web Sources

- https://sisu.ut.ee/imageprocessing/book/1
- https://datagen.tech/guides/image-annotation/image-segmentation/
- https://open-instruction.com/image-processing/image-restoration/
- https://www.javatpoint.com/dip-introduction-to-frequency-domain

Course Title: Network Security and Cryptography
Course Code: MCA310

L	T	P	Credits
3	0	0	3

Total Hours: 45

Course Outcomes:

On completion of this course the students will be able to:

1. Provide security of the data over the network.
2. Do research in the emerging areas of cryptography and network security.
3. Implement various networking protocols and Apply security principles to system design.
4. Protect any network from the threats in the world.
5. Analyze and design network security protocols.

Course Content

UNIT I

9 Hours

1. Introduction to Cryptography and Block Ciphers: Introduction to security attacks - services and mechanism - introduction to cryptography.
2. Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – Steganography - stream and block ciphers.
3. Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - fiesta structure - data encryption standard (DES) - strength of DES - differential and linear crypt analysis of DES - block cipher modes of operations - triple DES – AES.

UNIT II

10 Hours

1. Confidentiality and Modular Arithmetic: Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms.

UNIT III

12 Hours

1. Public key cryptography and Authentication requirements: Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption.
2. Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS.
3. Integrity checks and Authentication algorithms: MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.

UNIT IV

14 Hours

1. IP Security and Key Management IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management. Unit VI (Web and System Security)
2. Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) .
3. System Security: Intruders - Viruses and related threads - firewall design principals – trusted systems.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Forouzan, B. A., & Mukhopadhyay, D. (2015). *Cryptography and network security* (Vol. 12). New York, NY, USA: Mc Graw Hill Education (India) Private Limited.
- Stallings, W. (2006). *Cryptography and network security, 4/E*. Pearson Education India.
- Mao, W. (2003). *Modern cryptography: theory and practice*. Pearson Education India.
- Viega, J., Messier, M., & Chandra, P. (2002). *Network security with openSSL: cryptography for secure communications*. "O'Reilly Media, Inc.".

Web Sources

- http://www.faadooengineers.com/online-study/post/cse/network-management-and-securuty/588/conventional-encryption-principles
- https://www.tutorialspoint.com/internet_technologies/website_security.htm
- https://www.geeksforgeeks.org/system-security/

Open Electives Course (For other Departments)

Course Title: Cyber Law
Course Code: MCA

L	T	P	Credits
2	0	0	2

Total hours: 30

Course Outcomes:

On completion of this course the students will be able to:

1. Analyse the concept of cyber-crimes.
2. Knowledge about the regulation of cyber space at national and international level.
3. Describe the international legal regime related to cyber-crimes.
4. Discuss the offences and penalties under it act 2000.
5. Discuss the scope of consumer protection in e-commerce.

Course Contents

UNIT I

10 Hours

1. General introduction and Cyber space regulations: Cyber Space-Meaning and characteristics Need for regulation of cyber space, Cyber-libertarianism, Cyber-paternalism, Lessing's model of regulation, Regulators in cyberspace, Introduction to Internet, ACLU v Reno, Digitization and Society, Legal Challenges of the Information Society, Information Technology Act, 2000

UNIT II

6 Hours

1. Cyber law and IPR issues: Digital Copyrights, Open Source, Linking and caching, Digital Rights Management, DMCA, - Patents, Software Patents Trademarks and domain names, Brand identities, search engines and secondary market, ICANN, Database Right

UNIT III

7 Hours

1. Cyber law and privacy and taxations issues: Digitization, personal data and data industry, Data protection principles, Conditions for processing of personal data, CCTV, RFID tracking, Data retention and identity - Taxation issues of e-commerce

UNIT IV

7 Hours

1. Cyber Crimes: Computer misuse - identity theft, grooming and harassment, Hacking, Viruses, criminal damage and mail bombing, Denial of service attack, Obscenity, child abuse, Stalking. Morphing, web jacking, phishing etc., Cyber terrorism, Bandwidth theft, Convention on cyber crime

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Collaborative Learning**.**

Suggested Readings

- Senthil, Surya and Devi Lakshmi (2010). *Manual of Cyber Laws***.** New Delhi: Aditya Book Company.
- Singh, Ranbir and Singh Ghanshyam (2004). *Cyber Space and the Law: Issues and Challenges,*Hyderabad: Nalsar University.
- Karake-Shalhoub, Z., & Al Qasimi, L. (2010). *Cyber law and cyber security in developing and emerging economies*. Edward Elgar Publishing.

Web Sources

- https://www.vedantu.com/commerce/introduction-to-cyberspace
- https://enhelion.com/blogs/2022/09/01/role-of-intellectual-property-in-cyber-law/
- https://www.lawyersclubindia.com/articles/key-issues-on-cyberspace-taxation-3542.asp
- https://www.techtarget.com/searchsecurity/definition/cybercrime

Course Title: Industrial Training/Internship (6 Months)

L	T	P	Credits
0	0	0	20

Course Code: MCA401

Course Outcomes:

On completion of this course the students will able to:

1. Participate in the projects in industries during his or her industrial training.
2. Describe use of advanced tools and techniques encountered during industrial training and visit.
3. Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
4. Develop awareness about general workplace behavior and build interpersonal and team skills.
5. Prepare professional work reports and presentations.