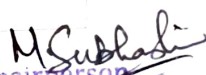## MCA SEMESTER-WISE PROGRAM STRUCTURE

| S No | Course Code | Title of the Course | Hours Per Week | | | Credits | Weightage for Examinations | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | CIE | SEE | |
| | | **I YEAR I SEMESTER** | | | | | | | |
| | BR1 | Bridge Course for JAVA | 2 | | 1 | | | | |
| | BR2 | Bridge Course for Discrete Mathematics | 2 | | | | | | |
| | | **THEORY COURSES** | | | | | | | |
| 1 | CC1 | Data Structures Using CPP | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 2 | CC2 | Advanced Java Programming | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 3 | CC3 | Operating Systems | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 4 | CC4 | Web Technologies | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | CC5 | Artificial Intelligence with Python | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 6 | CC6 | Probability & Statistics | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| | | **LAB COURSES** | | | | | | | |
| 7 | LCC1 | Data Structures Using CPP | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| 8 | LCC2 | Advanced Java Programming | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| 9 | LCC3 | Operating Systems | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| 10 | LCC4 | Web Technologies | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| | | **CREDITS FOR CORE PROGRAM** | 23 | 0 | 8 | 27 | 380 | 520 | 900 |
| | | **RESEARCH EDUCATION** | | | | | | | |
| 11 | RE1 | Hot House | 0 | 0 | 2 | 1 | | | |
| | | **EXTERNAL CERTIFICATIONS** | | | | | | | |
| 12 | LC1 | English Language Certification (CEFR - B1+) | 0 | 0 | 2 | 1 | | | |
| 13 | IC1 | IT Certification - 1 | 0 | 0 | 2 | 1 | | | |
| | | **TOTAL** | 0 | 0 | 6 | 3 | | | |
| | | **TOTAL SEMESTER I CREDITS** | 23 | 0 | 14 | 30 | | | |

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| S No | Course Code | Title of the Course | Hours Per Week | | | Credits | Weightage for Examinations | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | CIE | SEE | |
| | | **I YEAR II SEMESTER** | | | | | | | |
| | BR3 | **Bridge** Course for DBMS (Semester Recess) | 2 | | 1 | | | | |
| | | **THEORY COURSES** | | | | | | | |
| 1 | CC7 | Data Engineering with Python | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | CC8 | Computer Networks | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 3 | CC9 | Advanced Database Management Systems | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 4 | CC10 | Software Engineering | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 5 | CC11 | Design and Analysis of Algorithms | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 6 | CC12 | Distributed Systems | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| | | **LAB COURSES** | | | | | | | |
| 7 | LCC5 | Data Engineering with Python | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| 8 | LCC6 | Computer Networks | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| 9 | LCC7 | Advanced Database Management Systems | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| 10 | LCC8 | Software Engineering | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| | | **CREDITS FOR CORE PROGRAM** | 23 | 0 | 8 | 27 | 380 | 520 | 900 |
| | | **RESEARCH EDUCATION** | | | | | | | |
| 11 | RE2 | Research Methodology | 3 | 0 | 0 | 3 | | | |
| | | **EXTERNAL CERTIFICATIONS** | | | | | | | |
| 12 | LC2 | English Language Certification (CEFR - B2) | 0 | 0 | 2 | 1 | | | |
| 13 | IC2 | IT Certification - 2 | 0 | 0 | 2 | 1 | | | |
| | | **TOTAL** | 0 | 0 | 4 | 5 | | | |
| | | **TOTAL SEMESTER II CREDITS** | 26 | 0 | 16 | 32 | | | |
| | | **During Summer Vacation** | | | | | | | |
| 14 | PR1 | Industry Internship | | | | | | | |

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| S No | Course Code | Title of the Course | Hours Per Week | | | Credits | Weightage for Examinations | | Total Marks |
|------|-------------|---------------------|----|----|----|---------|-----|-----|------|
| | | | L | T | P | | CIE | SEE | |
| | | **II YEAR III SEMESTER** | | | | | | | |
| | | **THEORY COURSES** | | | | | | | |
| 1 | PE* | Stream 1 Professional Elective–I | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | PE* | Stream 1 Professional Elective–II | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | PE* | Stream 2 Professional Elective–I | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 4 | PE* | Stream 2 Professional Elective–II | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 5 | CC13 | Operations Research | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 6 | CC14 | Cyber Security | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | CC15 | Organizational Behaviour | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 8 | PR1 | Industry Internship | 0 | 0 | 0 | 2 | | | |
| | | **LAB COURSES** | | | | | | | |
| 9 | LCC9 | Stream 1 Professional Elective–I | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| 10 | LCC10 | Stream 2 Professional Elective–I | 0 | 0 | 2 | 1 | 35 | 40 | 75 |
| | | **CREDITS FOR CORE PROGRAM** | 23 | 1 | 4 | 28 | 350 | 500 | 850 |
| | | **RESEARCH EDUCATION** | | | | | | | |
| 11 | RE3 | Conference/seminar participation/presentation | 0 | 0 | 2 | 1 | | | |
| | | **EXTERNAL CERTIFICATIONS** | | | | | | | |
| 12 | LC3 | English Language Certification (CEFR - C1) | 0 | 0 | 4 | 2 | | | |
| 13 | PC1 | Stream 1 Professional Certification - 1 | 0 | 0 | 6 | 3 | | | |
| | | **TOTAL** | 0 | 0 | 12 | 6 | | | |
| | | **TOTAL SEMESTER III CREDITS** | 23 | 1 | 16 | 34 | | | |

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| S No | Course Code | Title of the Course | Hours Per Week | | | Credits | Weightage for Examinations | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | CIE | SEE | |
| | | **II YEAR IV SEMESTER** | | | | | | | |
| | | **THEORY COURSES** | | | | | | | |
| 1 | CC7 | Stream 1 Professional Elective–III | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | CC8 | Stream 2 Professional Elective–III | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | CC9 | Capstone Project | 0 | 0 | 24 | 12 | 40 | 60 | 100 |
| | | **CREDITS FOR CORE PROGRAM** | 6 | 0 | 24 | 18 | 120 | 180 | 300 |
| | | **RESEARCH EDUCATION** | | | | | | | |
| 4 | RE2 | Paper Publication in Conference/Seminar Proceedings/Journal | 0 | 0 | 2 | 1 | | | |
| | | **EXTERNAL CERTIFICATIONS** | | | | | | | |
| 5 | PC2 | Stream 2 Professional Certification 1 | 0 | 0 | 6 | 3 | | | |
| | | **TOTAL** | 0 | 0 | 8 | 4 | | | |
| | | **TOTAL SEMESTER IV CREDITS** | 6 | 0 | 32 | 22 | | | |
| | | **Total Credits for the Core Program** | | | | | | | 100 |
| | | **Total Credits for External Certifications** | | | | | | | 18 |
| | | **Total Credits for the Entire Program** | | | | | | | 118 |

1. CC-Core Course
2. LCC-Lab Core Course
3. PE-Professional Elective
4. LC-Language Certification
5. RE-Research education
6. PC-Professional Certification
7. PR-Project/ Internship
8. IC-IT Certification
9. L-Lecture
10. T-Tutorial
11. P-Practical
12. CIE-Continuous Internal Evaluation
13. SEE-Semester End Evaluation

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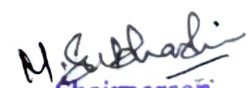M Subhashi
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# Professional Electives

| Stream | Course Code | Courses |
|---|---|---|
| Artificial Intelligence | PE1 | Machine Learning |
| | PE2 | Deep Learning |
| | PE3 | Natural Language Processing |
| Data Analytics | PE4 | Python Programming for Data Analytics |
| | PE5 | Data Base Systems in Big Data |
| | PE6 | Internet of Things |
| Software Engineering | PE7 | Software Quality Testing |
| | PE8 | Software Project Management |
| | PE9 | Agile Software Process |
| Compute Networks | PE10 | Network Security |
| | PE11 | Cloud Computing |
| | PE12 | Block Chain Technologies |

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# 1<sup>St</sup> Year - 1<sup>St</sup> Semester Syllabus

| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| CC1 | Data Structures Using C | 4 | - | - | 4 | 4 |

## Course Objectives

1. To learn the features of C
2. To learn the concepts and applications of linear data structures
3. To explore the concepts and applications of linear data structures
4. To learn to represent data using graph data structure
5. To learn the basic sorting and searching algorithms

## Learning Outcomes

CO1 Implement linear and non-linear data structure operations using C
CO2 Suggest appropriate linear / non-linear data structure for any given data set.
CO3 Apply hashing concepts for a given problem
CO4 Modify or suggest new data structure for an application
CO5 Appropriately choose the sorting algorithm for an application

## SYLLABUS

**Module 1:**
**C Programming Basics**: Structure of a C program – compilation and linking processes – Constants, Variables, Data Types, Expressions using Operators in C

**Module 2:**
Managing Input and Output operations, Control Statements and Looping statements

**Module 3:**
Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays.

**Module 4:**
**Strings**: String operations– String Arrays, Matrix operations.

**Module 5:**
**Functions, Pointers:** Functions – Pass by value – Pass by reference – Recursion- Pointers – Definition – Initialization – Pointer's arithmetic.

**Module 6:**
**Structures and Unions:** Structures and unions – definition – Structure within a structure – Union – Programs using structures and Unions, Exploring Storage classes.

**Module 7:**
**Linear Data Structures:** Arrays and its representations, Single Linked List

**Module 8:**
Circular Linked List, Doubly Linked List, Applications of Linked List

**Module 9:**
Stacks and Applications of Stacks

**Module 10:**
Queues, Circular Queues, Dequeues

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**Module 11:**
**Non-Linear Data Structures**: Trees, Binary Trees, Binary tree representation and traversals.

**Module 12:**
**Applications Of Tree**: Binary Search Trees, AVL trees.

**Module 13:**
**Graphs:** Graph and its representations, Graph Traversals – DFS, BFS

**Module 14:**
**Sorting Algorithms:** Selection Sort, Bubble Sort, Insertion sort, Merge sort, Quick Sort

**Module 15:**
Linear Search, Binary Search, Hashing, Types of Hashing. Collision resolution techniques

**Suggested Readings:**

1. C Programming & Data Structures- Behrouz A. Forouzan, Richard F. Gilberg
2. Data Structures Using C and C++ - Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum
3. Data Structure through C- Yashwant Kanetkar
4. Brian W. Kernighan / Dennis Ritchie ,The C Programming Language ,Second Edition , Pearson 2015
5. Pradip Dey and Manas Ghosh, ―Programming in C, Second Edition, Oxford University Press, 2011.
6. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

**Journal References:**

1. Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). Introduction to Algorithms (3rd ed.). The MIT Press. (ISBN-13: 978-0262033848)
2. Sedgewick, R., & Wayne, K. (2011). Algorithms (4th ed.). Addison-Wesley. (ISBN-13: 978-0321573513)
3. Brass, P., & Hildebrandt, A. (2008). Data Structures: A Pseudocode Approach with C. Thomson Learning. (ISBN-13: 978-1418836783)
4. Mehta, D., & Sahni, S. (2011). Handbook of Data Structures and Applications. Chapman and Hall/CRC. (ISBN-13: 978-1439826870)
5. Aho, A. V., Hopcroft, J. E., & Ullman, J. D. (1983). Data Structures and Algorithms. Addison-Wesley. (ISBN-13: 978-0201000238)
6. Gonnet, G. H., & Baeza-Yates, R. (1991). Handbook of Algorithms and Data Structures: In Pascal and C. Addison-Wesley. (ISBN-13: 978-0201416075)

**Website references:**

1. https://www.coursera.org/specializations/data-structures-algorithms
2. https://cslibrary.stanford.edu/
3. https://www.learn-c.org/
4. https://www.c4learn.com/data-structure/
5. https://www.programiz.com/dsa
6. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| CC2 | Advanced Java Programming | 4 | - | - | 4 | 4 |

## Course Objectives

1. To provide I/O fundamentals and essential classes for input/output operations.
2. Learn the basic data structure operation using Java Collection Framework and JDBC connectivity
3. Build rich client applications using Java FX and web applications using JSP and JSTL
4. Explaining the concept of Java Beans, their structure, and utilization within applications
5. Understand and apply Data Access using Spring Framework

## Learning Outcomes

CO1 Acquire proficiency in I/O basics, including stream and byte, character streams, and Implement String Handling, Exceptions Handling, and Multithreaded Programming.

CO2 Demonstrate use of data structure and data manipulation using Java Collection Framework.

CO3 Understand JavaFX concepts for modern and interactive user interface using UI controls, panes and JDBC connectivity

CO4 Create JSP using standard actions, custom tags, Introduction to JSP Standard Tag Library (JSTL) and JSTL Tags.

CO5 Understand Java Beans, their structure, and utilization within applications and develop applications using Spring Framework.

## SYLLABUS

**Module 1:**
I/O basics, Stream and Byte classes, Character Streams, Reading Console input and output, Print Writer Class.

**Module 2:**
String Handling, Exceptions Handling, Multithreaded Programming.

**Module 3:**
Collections Overview, Collections Interfaces, Collections Classes, Iterators, Random Access Interface, Maps.

**Module 4:**
Comparators, Arrays, String Tokenizer, BitSet, Date, Calendar.

**Module 5:**
JavaFX Basics, JavaFX vs Swing and AWT, Basic structure of JavaFX program, Panes UI Controls and Shapes, Property Binding.

**Module 6:**
Common Properties and methods for nodes, the color and font class, Image and ImageView classes, Layout panes and shapes.

**Module 7:**
Event Driven Programming and Animation: Event and event sources, registering handlers and handling events, inner classes, anonymous inner class handler.

**Module 8:**
Mouse Events, key events, listener for observable objects, animation.

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**Module 9:**
JavaFX UI Controls and Multimedia: Labeled and Lable, Button , CheckBox, RadioButton, TextFeild, TextArea.

**Module 10:**
ComboBox, ListView, ScrollBar, Slider

**Module 11:**
Java Database Programming: JDBC, PreparedStatements, CallableStatement, Retrieving Metadata.

**Module 12:**
Introduction Java EE, Programming JSP Architecture, JSP building blocks, Scripting Tags, implicit object.

**Module 13:**
Introduction to Bean, standard actions, session tracking types and methods. Custom Tags. Introduction to JSP Standard Tag Library (JSTL) and JSTL Tags.

**Module 14:**
Spring Frameworks: Introduction to Spring Framework, POJO Programming Model, Lightweight Containers.

**Module 15:**
Dependency Injection with Spring-Setter Injection, Constructor Injection, Circular Dependency, overriding bean, Auto Wiring Bean lookup, Spring Manage Beans.

**Suggested Readings:**

1. Herbert Schildt, The Complete Reference Java, 9th Edition, Tata McGraw Hill, 2005.
2. Bruce Eckel, Thinking in Java, 4th Edition, Pearson Education
3. Java 6 Programming Black Book, Wiley–Dreamtech.
4. Web Enabled Commercial Application Development using java 2.0, Ivan Byaross.
5. Java Server Programming java EE6, Black book, Dreamtechpress
6. Core Servlets and Java Server Pages :Vol I: Core Technologies 2/e , Marty Hall and Larry Brown, Pearson ,

**Journal References:**

1. Journal of ACM: Published by the Association for Computing Machinery, it covers field of computer science and information technology
2. IEEE transactions on Computers: This journal covers research in computer hardware, software, and theoretical computer science.
3. ACM Journal on Emerging Technologies in Computing Systems (JETC)
4. Future Generation of Computer Systems (FGCS): JETC publishes research on emerging technologies in computing systems, including topics like embedded systems, cyber-physical systems, and IoT.
5. Journal of Computer and System Sciences (JCSS)
6. IEEE Transactions on multimedia: : Institute of Electrical and Electronics Engineers (IEEE) focuses on multimedia computing, including topics related to image and video processing
7. Journal of Computer Science and Technology (JCST): published by Springer, it covers a broad range of topics in computer science and technology, including software engineering, artificial intelligence, and network security.

**Website references:**

1. https://docs.oracle.com/javase/8/docs/technotes/guides/language/index.html

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2. https://www.ibm.com/topics/java
3. https://www.w3schools.com/java/
4. https://www.programiz.com/java-programming
5. https://www.codecademy.com/learn/learn-java
6. https://www.geeksforgeeks.org/java/

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| CC3 | Operating Systems | 4 | - | - | 4 | 4 |

## Course Objectives

1. To gain the understanding of operating system and Unix operating system in specific
2. To comprehend the details of process.
3. To learn the types and architecture of computer memory
4. To study file system and its implementation
5. To realize the operating system concepts into case studies.

## Learning Outcomes

CO1 Explain operating systems and Unix OS, illustrate the workings of various OS components.
CO2 Analyze the process, its states and process scheduling algorithms.
CO3 Demonstrate paging, demand paging, page replacement and segmentation with illustrations.
CO4 Elaborate the file access and allocation methods and mass storage structures.
CO5 Describe concrete implementations of Linux system and Windows 7.

## SYLLABUS

**Module 1:**
**Basic Computer Organization and Design**: Instruction Codes, Computer Registers, Computer Instructions, Instruction Cycle, Memory reference instruction

**Module 2:**
Central Processing Unit: General Register Organization, Stack Organization, Instruction formats, Addressing modes

**Module 3:**
**Memory Organization**: Memory Hierarchy, Main Memory, RAM and ROM

**Module 4:**
Auxiliary memory, Associative memory, Cache memory

**Module 5:**
**Input-Output Organization**: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer. Pipeline Processing

**Module 6:**
**Introduction to Operating Systems**: OS structure and strategies, Process concepts, Process scheduling

**Module 7:**
Scheduling Algorithms: SJF, Round Robin, FCFS, SRTF, Preemptive, Non-Preemptive

**Module 8:**
Process synchronization: Critical Section problem – Semaphores-Classical problems of synchronization-critical Regions-Monitors

**Module 9:**
Deadlocks: Deadlock Handling-Deadlock PreventionDeadlock Avoidance-Deadlock Detection-Deadlock Recovery

**Module 10:**
Memory management strategies with example architectures: Swapping, Contiguous allocation

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**Module 11:**
Paging, Segmentation, Segmentation with paging

**Module 12:**
**Virtual memory management**: Demand paging, Page replacement, Thrashing

**Module 13:**
**File System Interface**: File concepts, Access methods and protection. File system
implementation: File system structure

**Module 14:**
Allocation methods, Directory, Implementation of file systems.

**Module 15:**
**System Protection**: Principles and Domain, Access Matrix and implementation, Access control
and access rights, Capability based systems, Language
based Protection

## Suggested Readings:

1. Morris Mano M, Computer System Architecture, Pearson Education India, 3rd, Edition, 2007.
2. William Stallings, Computer Organization and Architecture, PHI, 7th Edition, 2008.
3. Abraham Silberschatz, Peter B Galvin, Operating System Concepts, 9th edition, Wiley, 2016
4. William Stallings, Operating Systems-Internals and Design Principles, 8th edition, Pearson, 2014
5. Andrew S Tanenbaum, Modern Operating Systems, 4th edition, Pearson, 2016.
6. "Operating System Concepts" by Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne.
7. "Modern Operating Systems" by Andrew Tanenbaum.
8. "Design of the Unix Operating System" by Maurice J.
9. "Operating Systems: A Concept-Based Approach" by D M Dhamdhere
10. "Operating System: A Design-oriented Approach" by Charles Crowley
11. "Operating Systems" by Archer J Harris
12. "Design of the Unix Operating Systems" by Maurice Bach
13. "Operating Systems: A Modern Perspective" by Gary J Nutt
14. Operating Systems Three Easy Pieces Remzi Arpaci-Dusseau and Andrea Arpaci-Dussea
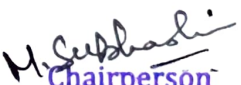
## Journal References:

1. OS Style and Reference Guide April 2021 - Sage Journals
2. Operating systems | IEEE Journals & Magazine
3. Comparative Study of Operating System Quality Attributes
4. Journal of Theoretical & Computational Science
5. Journal of Operating Systems Development & Trends
6. International journal of computer vision

## Website references:

1. https://www.tutorialspoint.com › operating-system
2. https://www.geeksforgeeks.org › operating-systems
3. https://www.javatpoint.com › operating-system
4. https://www.guru99.com › Operating System
5. https://www.scaler.com › topics › operating-system
6. https://www.w3schools.in › operating-system
7. https://prepinsta.com › operating-systems
8. https://studymuch.in › operating-systems

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| CC4 | Web Technologies | 3 | | | 3 | 3 |

## Course Objectives

1. Learn basics of HTML and DHTML,
2. Study the java scripting language
3. Understand the workings of event model
4. Proficient integration of XML in Web Applications
5. Manage web servers and comprehend the Active Server Pages

## Learning Outcomes

CO1  Write HTML and DHTML programs
CO2  Implement java script programs
CO3  Create programs on event models and ASP
CO4  Skills to develop responsive and feature rich web solutions
CO5  Proficiency in server-side technologies and web server management syllabus

## SYLLABUS

**Module – 1:**
**Introduction to HTML:** Web server, Web client/ Browser, All about HTML, Markup languages, common tags, header, test styling, linking images Formatting text, Unordered lists, nested and ordered list,

**Module – 2:**
Tables and formatting, Basic forms, Complex forms, Internal Linking, Meta Tags.

**Module – 3:**
**Dynamic HTML:** Cascading style sheets inline styles, style element, External Style sheet, text flow and Box model, user style sheets.

**Module – 4:**
**Introduction to scripting,** Java Script, Data types, Arithmetic's Equality relational, assignment increment, decrement operators

**Module – 5:**
Java Script Control Structures- if, if-else, while, Java Script Control Structures: For, Switch, Do/while, break.

**Module – 6:**
Programming modules, recursion, recursion vs. iteration global functions.

**Module – 7:**
Arrays, using arrays, Reference and reference parameters, passing arrays to functions, Multiple subscripted arrays, Objects-math, string, Boolean and number.

**Module – 8:**
**Object model and collections** Object referencing, collections all, children frames, navigator object.

**Module – 9:**
Event model- ONCLICK, ONLOAD, Error Handling, ONERRORS ONMOUSEMOVE, ONMOUSEOVER, ONMOUSEOUT, ONFOCUS, ONBLUR, ONSUBMIT.

**Module – 10:**
XML: Document Type Definition, XML Parsers, Using XML with HTML.

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**Module – 11:**
**Ajax-Enabled Rich Internet Applications with XML and JSON** : Introduction, Rich Internet Applications (RIAs) with Ajax, "Raw" Ajax Example Using the XMLHttpRequest Object

**Module – 12:** Using XML and the DOM, Creating a Full-Scale Ajax-Enabled Application

**Module – 13:**
**Web Servers**: Personal Web server, Internet information server, Apache Web Server, Installation of a Web Server.

**Module – 14:**
**Active Server Pages**, Client side Scripting vs Server side Scripting, Server side Active X Component, ADO, file system objects, Session tracking.

**Module – 15:**
**CGI and PERL5**, String Processing and Regular Expressions, Server side includes, Cookies and PERL.

**Suggested Readings:**

1. Deitel, Deitel& NIETO, "Internet & World Wide Web - How to Program", Pearson Education, Third Edition, 2004.
2. Steven Holzner, "HTML Black Book - Comprehensive Problem Server", Dream Tech Press, 2000
3. Ivan Bayross, "Web Enabled Commercial Application Development using...HTML, DHTML, JavaScript, Perl CGI " BPB Publications
4. Deitel & Deitel, "Internet & World Wide Web - How to Program", Pearson Education, Fourth Edition, 2008
5. Web Technologies, Uttam K Roy, Oxford University Press

**Journal References:**

1. **Journal of Web Engineering (JWE)**: This journal covers a broad range of topics related to web programming, web development, and web-based applications.
2. **International Journal of Web Services Research (JWSR)**: A journal that delves into the latest research in web services, web programming, and related areas.
3. **ACM Transactions on the Web (TWEB)**: A leading journal covering various aspects of web programming, web technologies, and web-based applications.
4. **Journal of Web Engineering & Technology (JWET)**: A journal that explores web engineering, technology, and web programming concepts.
5. **Journal of Web-Based Learning and Teaching Technologies (JWBLTT)**: This journal is focused on the use of web-based technologies in education and may include web programming aspects related to e-learning.
6. **Journal of Web Development and Web Designing**: This journal covers web development and design, including web programming techniques and practices.

**Website references:**

1. https://www.w3schools.com/
2. https://css-tricks.com/
3. https://htmldog.com/
4. https://www.smashingmagazine.com/
5. https://codepen.io/

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| CC5 | AI with Python | 4 | - | - | 4 | 4 |

## Course Objectives

1. To develop the foundational understanding of Python programming, data types, loop and Conditional statements.
2. To explore the various applications and domains where AI is employed.
3. To explain the architecture and working principles of neural networks, including feedforward neural networks, activation functions, and backpropagation.
4. To understand how to build AI models, train them on data, and evaluate model performance using appropriate metrics.
5. To discuss the ethical considerations in AI, including bias, fairness, and transparency, and emphasize the importance of responsible AI development.

## Learning Outcomes

CO1 Students will develop proficiency in AI programming languages, such as Python, and be able to write code to implement and experiment with AI algorithms.

CO2 Demonstrate proficiency in the foundational concepts of AI algorithms – both informed and unformed searching techniques

CO3 Understand the different methods of knowledge representation

CO4 Gain knowledge of how to apply Gaming and Planning techniques in real time expert Systems

CO5 Apply AI techniques to solve real-world problems in various domains, including healthcare, finance, and autonomous systems.

## SYLLABUS

**Module 1:**
Introduction to Python, Data Types, I/O Statements, Data types, conditional statements, control statements, Lists, Tuples

**Module 2:**
Dictionaries, Sets, Functions, Files, Modules, Packages

**Module3:**
History of AI, Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of AI, Applications.

**Module 4:**
**State-Space Search and Control Strategies:** Introduction, General Problem Solving. Characteristics of Problem, Exhaustive Searches

**Module 5:**
Heuristic Search Techniques -Best First Search, Iterative-Deepening, A*, Constraint Satisfaction.

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## Module 6:
AO*algorithm, Constraint Satisfaction, TSP Problem

## Module 7:
Knowledge representation issues, Using Predicate Logic, Representing Knowledge using Rules

## Module 8:
Weak Slots and Filler Structures, Semantic Nets, Frames

## Module 9:
Strong slots and filler structures, Conceptual Dependency, Scripts, CYC

## Module 10:
Game Playing, Mini-Max search algorithm, Alpha-Beta Pruning

## Module 11:
Planning-Definition, Algorithms of classical planning, Heuristics for planning, Hierarchical Planning

## Module 12:
Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems vs Traditional Systems, Rule Based Expert Systems, Applications of Expert Systems

## Module 13:
**Uncertainty Measure-Probability Theory**: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory.

## Module 14:
**Natural Language Processing**: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers

## Module 15:
Semantic Analysis, Universal Networking Knowledge.

## Suggested Readings:

1. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011
2. Russell, Norvig, Artificial Intelligence - A Modern Approach, Pearson Education, 2nd Edition, 2004
3. Rich, Knight, Nair, Artificial Intelligence, Tata McGraw Hill, 3rd Edition, 2009
4. "Artificial Intelligence: A Guide to Intelligent Systems" by Michael Negnevitsky
5. "Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth
6. "The Ethics of Artificial Intelligence" by Nick Bostrom and Eliezer Yudkowsky
7. "Artificial Intelligence and Ethics: A Systematic Introduction" by Vincent C. Müller

## Journal References:

1. Journal of Artificial Intelligence Research (JAIR): An open-access journal that covers a wide range of AI topics.
2. Artificial Intelligence (AI): A well-established journal featuring research in AI.
3. Machine Learning: Focusing on machine learning research, this journal is a key source for ML-related AI work.
4. Neural Networks: This journal specializes in neural networks, deep learning, and related topics.
5. Journal of Machine Learning Research (JMLR): An open-access journal dedicated to machine learning research.

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6.  Pattern Recognition: Focusing on pattern recognition and computer vision, this journal is essential for AI applications in vision.
7.  Cognitive Systems Research: This journal publishes interdisciplinary research at the intersection of cognitive science and AI.
8.  ACM Transactions on Intelligent Systems and Technology (TIST): It covers AI, intelligent systems, and their applications.
9.  Nature Machine Intelligence: A journal that publishes high-impact AI research and perspectives.
10. IEEE Transactions on Neural Networks and Learning Systems: Part of the IEEE Computational Intelligence Society, this journal covers neural networks, deep learning, and learning systems.

## Website references:

1.  https://openai.com/
2.  https://aiweekly.co/
3.  https://aiethicslab.com/
4.  https://arxiv.org/
5.  https://towardsdatascience.com
6.  https://allenai.org/
7.  https://aclweb.org/
8.  https://bair.berkeley.edu/
9.  https://machinelearningmastery.com/
10. Kaggle (kaggle.com): A platform for data science and machine learning competitions, hosting datasets, notebooks, and AI challenges.
11. GitHub (github.com): A platform where you can find AI-related open-source projects, code repositories, and collaboration opportunities.

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| CC6 | Probability & Statistics | 4 | - | - | 4 | 4 |

## Course Objectives

1. To understand the basic concepts of measures of central tendency and dispersion, skewness and kurtosis to assess the shape of data distributions
2. To learn the concepts of probability and concepts of discrete and continuous probability distributions
3. To gain understanding on sampling procedure with various kinds of estimate techniques
4. To learn the methods of hypotheses testing and acquiring knowledge of basic statistical Inference and its applications
5. To understand the concept of association between two variables and forecast future values by regression equations

## Learning Outcomes

CO1: Ability to demonstrate the concept of statistics and its importance in data analysis
CO2: Ability to calculate probabilities by applying probability laws and theoretical results, their inter relations with real time applications
CO3: Competency to understand the use of sample statistics to estimate unknown parameters
CO4: Demonstrate proficiency on Correlation Analysis in various real-world scenarios
CO5: Ability to compute and interpret regression lines and multiple regression analysis with applications

## SYLLABUS

**Module 1:**
Introduction to Statistics and data analysis, Measures of central tendency – Mean, Median and Mode

**Module 2:**
Measures of dispersion – Range, Quartile Deviation, Mean Deviation and Standard Deviation

**Module 3:**
Skewness – Karl Pearson's Coefficient of Skewness, Bowley's Coefficient of Skewness and Kurtosis.

**Module 4:**
Regression: Simple Regression, Estimation using regression line

**Module 5:**
Correlation: Introduction, Karl Pearson Correlation Analysis, Spearman's Rank Correlation

**Module 6:**
Multiple Regression and correlation analysis, finding multiple regression equations and making inferences about population parameters.

**Module 7:**
Probability - Basic terminology, Types of probability, Algebra of events. Conditional Probability

**Module 8:**
Multiplication theorem of Probability, Independent events, Baye's Theorem

**Module 9:**
Random Variable: Discrete random variable, Continuous random variable, Two dimensional random variable

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**Module 10:**
Joint probability distribution, stochastic independence, Moments, Expectation

**Module 11:**
**Probability Distributions:** Binomial distribution, Poisson distribution, Normal distribution

**Module 12:**
**Testing Hypothesis:** Introduction to Sample, different Sampling techniques, Sampling errors, Tests of significance - one sample tests – Student's t-distribution, Large Sample test (Z test)

**Module 13:**
**Testing Hypotheses:** Two sample tests -Student's t-distribution, Large Sample test (Z test)

**Module 14:**
**Chi-square Test:** Chi-square as a test of goodness of fit, Chi-square test for independence of attributes

**Module 15:**
**Analysis of Variance:** One way ANOVA, Two-way ANOVA

**Suggested Readings:**

1. Richard I Levin, David S Rubin - Statistics for Management, Seventh Edition, PHI - 1997
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics Sultan Chand & Sons, New Delhi.
3. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
4. Probability, Statistics and Random Processes T. Veerarajan Tata McGraw – Hill

**Journal References:**

1. Journal of the Indian Society for Probability and Statistics
2. Journal of the Royal Statistical Society. Series B: Statistical Methodology
3. Annual Review of Statistics and Its Application
4. Annals of Statistics
5. Journal of Statistical Software
6. Journal of Computational and Graphical Statistics
7. British Journal of Mathematical and Statistical Psychology
8. Electronic Journal of Probability
9. Journal of Multivariate Analysis
10. Electronic Journal of Statistics
11. Journal of Probability and Statistics

**Website references:**

1. https://stattrek.com
2. https://oli.cmu.edu/courses/probability-statistics-open-free
3. https://www.khanacademy.org/math/statistics-probability
4. https://www.statssolver.com
5. https://www.mathsisfun.com/data
6. https://www.math.net/probability-and-statistics
7. https://www.britannica.com/science/probability/Social-numbers

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| LCC1 | Data Structures Using C Lab | - | - | 2 | 2 | 1 |

## Course Objectives

1. To understand and implement basic data structures using C
2. To apply linear and non-linear data structures in problem solving.
3. To learn to implement functions and recursive functions by means of data structures
4. To implement searching and sorting algorithms

## Learning Outcomes:

CO1  Write basic and advanced programs in C
CO2  Implement functions and recursive functions in C
CO4  Implement data structures using C
CO5  Choose appropriate sorting algorithm for an application and implement it in a modularized way

## List of Programs

1. Implementation of Looping
2. Implementation of Arrays
3. Implementation of String Functions
4. Implementation of Switch Statement
5. Implementation of Binary Search
6. Implementation of Pointers
7. Implementation of Structures
8. Implementation of Recursive Functions
9. Implementation of Dynamic Memory Allocation
10. Implementation of Bubble sort using functions
11. Implementation of Linear List Using Arrays and using Linked List
12. Implementation of Stacks using Arrays and using Linked List
13. Infix to Postfix Expression
14. Evaluation of Postfix Expression
15. Implementation of Queues using Arrays and using Linked List
16. Implementation of Binary Tree Traversals in Recursive method
17. Implementation of Binary Search Trees
18. Implementation of Depth First Search Technique in Graph Traversal
19. Implementation of Breadth First Search Technique in Graph Traversal
20. Implementation of MST
21. Implementation of Selection Sort
22. Implementation of Insertion sort
23. Implementation of Quick Sort
24. Implementation of Merge Sort
25. Implementation of Heap sort

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| LCC2 | Advanced Java Programming Lab | - | - | 2 | 2 | 1 |

## Course Objectives

1. Write programs on creating and synchronizing threads.
2. Write programs based on Java Generics, Collection framework.
3. Build JDBC Connectivity with database.
4. Develop web applications using JSP and JSTL.
5. Demonstrate Data Access with Spring.

## Learning Outcomes

CO1 Demonstrate the implementation of thread Synchronization.
CO2 Demonstrate use of data structure and data manipulation concept using Java Collection Framework
CO3 Build JDBC connectivity with database.
CO4 Build JSP web application using standard actions, custom tags and JSTL Tags.
CO5 Develop application using Spring Framework.

### List of Programs

1. Write a program to demonstrate Byte and Character stream classes
2. Write a program to demonstrate mutual exclusion using thread synchronization.
3. Write a program to demonstrate Linked list class.
4. Write a program to demonstrate Hash set and Iterator classes.
5. Write a program to demonstrate Enumeration and Comparator interfaces.
6. Write a program to accept data and display output in key, value pair.
7. write a JavaFX program that display a simple window with a title,size and background color.
8. Design a JavaFX interface with a button implement an action event on the button click.
9. Write a program to create a registration form with different controls, menus and demonstrate JavaFX event handling.
10. Execute SQL operations like creating a table, inserting records, updating records, or retrieving records using JDBC connectivity.
11. Create a Telephone directory using JSP and store all the information within a database, so that later could be retrieved as per the requirement. Make your own assumptions.
12. Write a JSP page to display the Registration form (Make your own assumptions)
13. Write a JSP program to add, delete and display the records from StudentMaster (RollNo, Name, Semester, and Course) table.
14. Write a JSP program to add, delete and display the records from StudentMaster
15. Write a program to print "Hello World" using spring framework.

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| LCC3 | Operating Systems Lab | - | - | 2 | 2 | 1 |

## Course Objectives

1. Learn shell commands and scripting
2. Learn CPU scheduling algorithms
3. Learn memory management algorithms
4. Learn synchronization problems
5. Explore file allocation strategies and disk scheduling algorithms

## Learning Outcomes

CO1 Be able to execute shell commands and write shell scripts
CO2 Be able to write programs on CPU scheduling
CO3 Be able to create memory management algorithms
CO4 Be able to execute programs to demonstrate synchronization problems
CO5 Be able to implement file allocation methods and be able to create disk scheduling
algorithms programs

### List of Programs

1. Unix Shell Commands
   a) File handling commands       b) Directory handling commands       c) General purpose
       commands
2. Unix Shell Scripts
   a) Print Multiplication table of a give no. using all loops
   b) Perform all arithmetic operations
   c) Print the type of a file
   d) Rename all files whose names end with .c as .old
   e) Display the no. of lines in each text file in a given dir
3. Simulate FCFS Scheduling Algorithm
4. Simulate SJF Scheduling Algorithm
5. Simulate SRTF Scheduling Algorithm
6. Simulate Round robin Algorithm
7. Simulate Priority Non-Pre-emptive Algorithm
8. Simulate Priority Pre-emptive Algorithm
9. Simulate Producer Consumer Problem Using Semaphores
10. Simulate Dining Philosopher Problem Using Semaphores
11. Simulate Readers Writers Problem Using Semaphores
12. Banker's Algorithm Safety Sequence
13. Banker's Algorithm Resource Request
14. Simulate Worst Fit Contiguous Memory Allocation Technique
15. Simulate Best Fit Contiguous Memory Allocation Technique
16. Simulate First Fit Contiguous Memory Allocation Technique
17. Simulate MVT Technique
18. Simulate MFT Technique
19. Simulate Optimal Page Replacement Algorithm
20. Simulate LRU Page Replacement Algorithm
21. Simulate FIFO Page Replacement Algorithm
22. Simulate Sequential File Allocation Strategy
23. Simulate Indexed file Allocation Strategy
24. Simulate Linked File Allocation Strategy

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| Course Code | Course Title | L | T | P | HPW | Credits |
|---|---|---|---|---|---|---|
| LCC4 | Web Technologies Lab | - | - | 2 | 2 | 1 |

## Course Objectives

1. To develop an ability to design and implement static and dynamic website
2. Choose best technologies for solving web client/server problems
3. Create conforming web pages
4. Use JavaScript for dynamic effects
5. Understand, analyze and create XML documents and XML Schema

## Learning Outcomes

CO1 Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's

CO2 Create web pages using HTML and Cascading Styles sheets

CO3 Analyse a web page and identify its elements and attributes

CO4 Create dynamic web pages using JavaScript

CO5 Create XML documents and XML Schema

CO6 Understand, analyse and apply the role of languages like HTML, CSS, XML, JavaScript AJAX in the workings of the web and web applications

## List of Programs

1. Write a HTML Program to demonstrate Ordered and Unordered list tags.
2. Write a HTML program to display Time Table of MCA Course using all attributes of table tag.
3. Design a Home page of online Shopping web site that contains different products with images. Create image of the products as hyperlinks to display the Description of products.
4. Design the following static web pages required for Library Management System web site and link these pages to home page using hyperlinks in HTML. Home, About Us, List of Books.
5. Design the following web pages of college web site and link these pages to home page using frames in HTML.-Home, About Us, Courses Offered, Admissions
6. Develop and demonstrate the usage of inline, internal and external style sheet using CSS.
7. Write an HTML program that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
8. Create a student Registration form for Job Application and validate the form fields using JavaScript.
9. Develop and demonstrate a HTML file that includes Java script for the following problems: Input: A number n obtained using prompt Output: The first n Fibonacci numbers
10. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problem. Input: A number n obtained using prompt. Output: A multiplication table of numbers from 1 to 10 of n using alert
11. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problem. Input: A number n obtained using prompt. Output: Factorial of n number using alert
12. Develop and demonstrate a HTML file that includes Java script for the following problems: Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert
13. Write a HTML program to demonstrate ONCLICK and ONLOAD.
14. Write a HTML program to demonstrate MOUSE EVENTS.
15. Write a program to create blurred pictures and text with different direction and strength using Motion Blur filter in CSS.
16. Create an XML files with book-cover catalog and store the titles of the books in a title attribute of each cover node. Modify the example so that every time the mouse hovers over an image, the book's title is displayed below the image.

17. Write a program on "raw" AJAX implementation using the XMLHttpRequest object to fetch and display data from an XML file.
18. Create an Ajax-enabled version of the feedback form. As the user moves between form fields, ensure that each field is non-empty. For the e-mail field, ensure that the e-mail address has valid format.
19. Write step by step process to install IIS web server.
20. Write step by step process to install PWS web server.
21. Write a console application that obtains four integer values from the user and displays the product using ASP.NET.
22. Write a CGI script with string processing and regular expressions
23. Write a PERL script that can handle form data submitted via post request

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