INDEX

DEPARTMENT OF COMPUTER SCIENCE AND RESEARCH CENTRE

Vision

Empowering the students to adept with the modern technologies, moral values, leadership and entrepreneurial skills with latest pedagogy and research environment to compete at the global level

Mission

- Strengthening the core competency by using latest tools and technologies
- Imparting value based quality education to promote students as renowned professionals
- Strengthening the research to advocate global technology

Programme Educational Objectives (PEO)

PEO1: To create and strengthen women leaders through disciplinary knowledge, professional skills and ethical sensitivity

PEO2: To transform students as successful entrepreneurs to face the modern challenges

PEO3: To nurture the students to invent, innovate and create solutions for current moral, ecological and economic issues

Programme Outcomes (PO)

On completion of Post Graduate and Under Graduate programmes, student will be enabled with

PO1: Disciplinary Knowledge: Acquiring knowledge of different dimensions in the related areas of study and identifying the assumptions that frame thinking and actions

PO2: Effective Communication: Ability to share thoughts, ideas and applied ski11s of communications in its various perspectives through LSRW

PO3: Research Skill and Critical Thinking: Ability to plan, execute and report the results of an experiment and to draw conclusions from evidences and the capability to apply analytical thought by following scientific approach to knowledge development

PO4: Moral Ethical Awareness/ Reasoning: Ability to embrace moral/ethical values in conducting one's life, about an ethical issues from multiple perspectives, and use ethical practices in all works and appreciating environmental and sustainability issues; and adopting unbiased and truthful actions in all aspects of work

PO5: Information /Digital Literacy: Capability to use ICT in case of need and the ability to access, evaluate and use the relevant information

PO6: Problem Solving: Ability to apply their competence to solve non-familiar everyday problems in real life situations

PO7:Self-directed and Lifelong Learning: Acquire the ability to engage in independent and lifelong learning through self-paced and self-directed learning to meet out the change in life

MASTER OF COMPUTER APPLICATIONS (MCA)

(Two Years Regular Programme)

(For Students Admitted from 2025-26)

Program Outcomes (PO):

In completion of Master of Computer Applications (MCA) Degree programme, the students will be enabled with:

1. **Computational Knowledge:** Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the abstraction and conceptualisation of computing models from defined problems and requirements
2. **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines
3. **Design /Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
4. **Conduct investigations of complex computing problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5. **Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations
6. **Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices
7. **Life-long Learning:** Recognise the need, and have the ability, to engage in independent learning for continual development as a computing professional
8. **Project management and finance:** Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
9. **Communication Efficacy:** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions
10. **Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices
11. **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments
12. **Innovation and Entrepreneurship:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Program Specific Outcomes (PSO):

PSO1: Utilize strong technical aptitude and domain knowledge to develop smart software solutions for the upliftment of society

PSO2: Apply research and entrepreneurial skills augmented with a rich set of communication teamwork and leadership skills to excel in their profession

PSO3: Show continuous improvement in their professional career through life-long learning, appreciating human values and ethics

PSO4: Apply the knowledge of computer application areas in modelling software applications for the industries appropriately

PSO5: Apply the knowledge of latest computing techniques with mathematical foundation to compete with real world problems

PSO6: Ability to understand and align with the prevailing cross cultural, societal, professional, legal and ethical matters in industry

PSO7: Ability to face the changing trends and career opportunities in computer application

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core Papers

- Added Unit VI with Applications and Case Studies as self-study topics
- Java Programming and Java Programming Lab Courses moved from Semester I to Semester II
- Computer Organization and Web Designing courses shifted from Semester II to Semester I
- Artificial Intelligence Lab Course has been introduced in semester III instead of Data Mining Lab Course
- Data Mining and Warehousing and Datamining Lab courses have been converted as a special course in semester III and reduced syllabus

Discipline Specific Elective

- Cloud and Distributed Computing, Internet of things and Digital Image Processing courses syllabus have been reduced.

PROGRAMME STRUCTURE – PROGRAM CODE: PCA

Sem	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ REG| NAT| GLO	CIA	ESE	Total Marks
I	JMCAC11	Core I	Computer Organization	5	4	EMP	GLO	25	75	100
	JMCAC12	Core II	Data Structures and Algorithms	5	4	SD	GLO	25	75	100
	JMCAC13	Core III	RDBMS	5	4	SD	GLO	25	75	100
	JMCAC14	Core IV	Optimization Techniques	5	5	EMP	GLO	25	75	100
	JMCAC15P	Core V	# Web Designing Lab	5	4	SD	GLO	25	75	100
	JMCAC16P	Core VI	Data Structures and Algorithms with Python Lab	5	4	SD	GLO	25	75	100
	JMCAX1P/ JMCAX1O	Extra Credit I	RDBMS Lab / *Online Course	-	2	SD	GLO	-	100	100

			Total	**30**	**25+2**			**150**	**450 +10 0**	**600+ 100**
II	JMCAC21	Core VII	Cyber Security	6 (T-4, P-2)	5	SD	GLO	25	75	100
	JMCAC22	Core VIII	○ Java Programming	5	5	SD	GLO	25	75	100
	JMCAC23P	Core I X	Java Programming Lab	5	4	SD	GLO	25	75	100
	JMCAC24P	Core X	Data Analytics Lab	4	3	EMP	GLO	25	75	100
	JMCAE2A JMCAE2B JMCAE2C	DSE I	a. Cloud and Distributed Computing b. Probability and Applied Statistics c. Data Analytics	5	4	EMP	GLO	25	75	100
	JMCAE2D JMCAE2E JMCAE2F	DSE II	a. Operating Systems b. Digital Marketing c. Block chain Technologies	5	4	ENT	GLO	25	75	100
	JMCAX2I /JMCAX2O	Extra Credit II	#Internship / *Online Course	-	2	SD	GLO	-	100	100
			Total	**30**	**25+2**			**150**	**450 + 100**	**600+ 100**
III	JMCAC31	Core X I	Software Development Framework	5	4	EMP	GLO	25	75	100
	JMCAC32	Core XII	Machine Learning	6 (T-4, P-2)	5	SD	GLO	25	75	100
	JMCAC33P	Core XIII	Software Development Framework Lab	5	4	SD	GLO	25	75	100

	JMCAC34P	Core XIV	Artificial Intelligence Lab	4	3	SD	GLO	25	75	100
	JMCAE3A JMCAE3B JMCAE3C	DSE III	a. Artificial Intelligence and Expert Systems b. Digital Image Processing c. Organization Behaviour	5	4	EMP	GLO	25	75	100
	JMCAE3D JMCAE3E JMCAE3F	DSE IV	a. Theory of Computation b. Open Source Technologies c. Internet of Things	5	4	EMP	GLO	25	75	100
	JMESX3 / JMCAX3O	Extra Credit III	Employability Skills / *Online Course	-	2	EMP	GLO	100	-	100
			Total	**30**	**24+2**			**150 + 100**	**450**	**600+ 100**
IV	JMCAC41	Core XV	Software Project Management	5	5	EMP	GLO	25	75	100
	JMCAC42	Core XVI	○ Deep Learning	5	5	SD	GLO	25	75	100
	JMCAC43PW	Core XVII	Project	18 (P-12, Lib -6)	6	EMP	GLO	100	100	200
	JMCAX4P/ JMCAX4O	Extra Credit IV	Document Preparation Lab (LATEX) / *Online Course	-	2	SD	GLO	-	100	100
			Library/Browsing	1						
			Remedial/Games	1						
			Total	**30**	**16+2**			**150**	**350 + 100**	**400 + 100**

			Grand Total	**120**	**90 + 8**			**600 + 100**	**1700 + 300**	**2200+ 400**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.
# For internship course, refer www.internshala.com or any online internship course.
o For online course integration, syllabus will be taken from spoken tutorial
@ SD- Skill Development ENT-Entrepreneurship EMP-Employability
$ REG-Regional NAT-National GLO-Global

Core I - Computer Organization

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 5**
Subject Code: JMCAC11 **Credit: 4**

Course Objectives:
1. To understand the structure, function and characteristics of computer systems and understand the design of the various functional units and components of computers
2. To identify the elements of modern instructions sets and their impact on processor design

Unit I **(15 hours)**
Basic Computer Organization and Design: Instruction Codes-Computer Registers- Computer Instructions-Timing and Control-Instruction Cycle-Memory Reference Instructions -Input-Output and Interrupts.

Unit II **(15 hours)**
Micro programmed Control: Control Memory- Address Sequencing- Micro program Examples-Design of Control Unit.

Unit III **(15 hours)**
Central Processing Unit: Introduction- General Register Organization - Instruction Formats - Addressing Modes-Data Transfer and Manipulation-Program Control-**RISC Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic Pipeline-Instruction Pipeline-Vector Processing.

Unit IV **(15 hours)**
Input-Output Organization: Peripheral Devices- I/O interface-Asynchronous Data Transfer -Modes of Transfer -Direct Memory Access- Input Output Processor (Excluding IBM and Intel IOPs).

Unit V **(15 hours)**
Memory Organization: Memory-Main Memory- Auxiliary Memory -Associative Memory- Cache Memory -Virtual Memory-Memory Management Hardware.

Unit VI

Case Studies : Analyze and compare the instruction set architectures of two different processors - Design a microprogrammed control unit for a simple computer system - Design I/O processor for a specific system, managing I/O operations and improving system performance - Design a CPU for a specific application, such as a mobile device or a server - Design a memory management unit for a specific system, managing memory access and protection.

Course Outcomes:
After successful completion of this course, students will be able to
CO 1: Define the fundamental organization of a computer system
CO 2: Explain the concept of sequencing, designing, pipeline and vector processing methods
CO 3: Examine the function of input-output organization
CO 4: Compare various pipeline concepts
CO 5: Distinguish the organization of various parts of a system memory hierarchy

Text Book:
1. Morris Mano M, *Computer System Architecture,* Prentice Hall of India ,2011

Reference Books:
1. William Stallings, *Computer Organization and Architecture,* Pearson Publication, Eighth Edition, 2010
2. Morris Mano, *Digital Login and Computer Design*, Prentice Hall of India, 2001

Journal:
1. Journal of Information and Communication Technology (Scopus)

E-Resources:
1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	3	3	1	3	1	66
CO2	9	9	9	9	9	1	9	3	3	1	3	1	66
CO3	9	9	9	9	9	1	9	3	3	1	3	1	66
CO4	9	9	9	9	9	1	9	3	3	1	3	1	66
CO5	9	9	9	9	9	1	9	3	3	1	3	1	66
Total	45	45	45	45	45	5	45	15	15	5	15	5	330

Low-1 Medium-3 High-9

Core II - Data Structures and Algorithms

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 5**
Subject Code: JMCAC12 **Credit: 4**

Course Objectives:

1. To understand data structures and algorithms in computer science perspectives, algorithms analysis procedure, space and time complexity of various algorithms
2. To apply data structures and algorithms to solve real world problems

Unit I **(15 hours)**

Computational Complexity: Computer Architecture-Big oh Notation-other asymptotic notations for complexity of algorithms-More asymptotic notations. **Introduction:** History of Algorithm-Data structures and Algorithms-Data structure-Definition and Classification **Stacks:** Introduction-stack Operation-Application. **Queues:** Introduction-Operation-circular Queues-Other Types of Queues-Application.

Unit II **(15 hours)**

Linked Lists: Introduction-Singly Linked Lists-Circularly Linked List-Doubly Linked List-Application. **Linked Stacks and Linked Queues:** Introduction-Operation on Linked Stacks and Linked Queues-Dynamic Memory Management and Linked Stacks-Implementation of Linked Representations-Applications. **Trees and Binary Tress:** Introduction-Trees: Definition and Basic Terminologies-Representation of Trees-Binary Tree Traversals-Threaded Binary Trees-Applications.

Unit III **(15 hours)**

Graphs: Introduction-Definitions and Basic Terminologies-Representations of Graphs-Graph Traversals-Single-source & All pairs shortest paths problem- Minimum cost spanning trees. **Binary Search Trees and AVL Trees:** Introduction-Binary Search Trees: Definition and Operations-AVL Trees: Definition and Operations-Applications.

Unit IV **(15 hours)**

B Trees and Tries: Introduction to m-way search Trees: Definition and Operations-B Trees: Definition and Operations-Tries: Definition and Operations-Applications. **Red-Black Trees and Splay Trees:** Red-Black Trees-Splay Trees-Applications. **Hash Tables:** Introduction-Hash Table Structure-Hash Functions-Linear Open Addressing-Chaining-Applications.

Unit V **(15 hours)**

Searching: Introduction-Linear Search- Transpose Sequential Search-Interpolation Search- Binary Search-Fibonacci Search-Other Search Techniques. **Internal Sorting:** Introduction-Bubble Sort-Insertion Sort-Selection Sort0-Merge Sort-Shell Sort-Quick Sort-Heap Sort-Radix Sort. **External Sorting:** Introduction-External Storage Devices- Sorting with Tapes : Balanced Merge-Sorting with Disks :Balanced Merge-Polyphase Merge sort-Cascade Merge Sort.

Unit VI

Case Studies : Implement a Stack & Queue data structures using an array or linked list, and analyze its time and space complexity - Analyze the time and space complexity of different Tree & Graph traversal algorithms, such as inorder, preorder, and postorder traversal, DFS & BFS - Study the application of hash tables in web search engines, where data is organized in a hash table for efficient retrieval - Study the application of sorting algorithms in data analysis, where data is sorted for efficient processing and visualization.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Explain the concepts of data structures and its classification, Linked lists, Graphs and B Trees
CO2: Apply data structures and its algorithms in real time applications
CO3: Analyze the efficiency of graphs and searching algorithms
CO4: Compare different sorting algorithms
CO5: Develop different algorithm design techniques

Text Books:
1. G A Vijayalakshmi Pai, *Data structures and Algorithms, Concepts, Techniques and Application*,Tata McGraw Hill Education Private Limited, New Delhi, 2008
2. Kent D. Lee, Steve Hubbard, *Data Structures and Algorithms with Python*, Springer International Publishing Switzerland, 2015

Reference Books:
1. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Data Structures*, Galgotia Book Source, Second Edition, 2004
2. Alfred V.Aho Johne, Hopcroft, *Data Structures and Algorithm*, Addison-Wesley, Third Edition, 2012
3. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C++*, Pearson Education, Fourth Edition, 2014

Journal:
1. Journal of ICT Research and Applications (Scopus)

E-Resources:
1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
4. https://www.tutorialspoint.com/python_data_structure/python_data_structure_tutorial.pdf
5. https://nptel.ac.in/courses/106/106/106106145/

\Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	3	9	1	9	3	3	1	3	3	56
CO2	9	9	3	3	9	1	9	3	3	1	3	3	56
CO3	9	9	3	3	9	1	9	3	3	1	3	3	56
CO4	9	9	3	3	9	1	9	3	3	1	3	3	56
CO5	9	9	3	3	9	1	9	3	3	1	3	3	56
Total	45	45	15	15	45	5	45	15	15	5	15	15	280

Low-1 Medium-3 High-9

Core III - RDBMS

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 5**
Subject Code: JMCAC13 **Credit: 4**

Course Objectives:

1. To understand the basic concepts, applications of database systems, relational database design principles and SQL queries.
2. To understand the different issues involved in the design and implementation of a database system,security, integrity and concurrency.

Unit I **(15 hours)**

Introduction: Database System Applications-Purpose of Database System-View of Data-Database Design- **Data Storage and Querying**-Transaction Management-Database Architecture. **Relational Databases:** Introduction to the Relational Model-Introduction to SQL-Intermediate SQL: Join Expressions-Views- Transactions-Integrity constraints-Schemas-Authorization

Unit II **(15 hours)**

Database Design: Database design and E-R Model: Overview -ER-Model-Constraints- ER-Diagrams- Reduction to Relational Schemas – Design Issues-.Relational database model: Logical view of data- keys- integrity rules. **Relational Database design:** Features of good relational database design- Atomic domain and Normalization (1NF- 2NF- 3NF- BCNF).Database-Design Process-Modeling Temporal Data

Unit III **(15 hours)**

Data Storage and Querying: Storage and File Structure: Overview of Physical Storage -Magnetic Disk - RAID- Organization of Records in Files-**Indexing and Hashing:** Basic Concepts-Ordered Indices-Multiple Key Access-Static Hashing-Dynamic Hashing-Bit Map Indices. **Query Processing**: Overview-Selection Operation-Sorting-Join Operation.

Unit IV **(15 hours)**

Transaction Management: Transaction: Transaction Concept-Simple Transaction Model-Storage Structure-Transaction Atomicity and Durability-Transaction Isolation-Serializability-**Concurrency Control:** Lock- Based Protocols-Deadlock Handling. **Recovery System:** Failure Classification-Recovery and Atomicity-Recovery Algorithm-Failure Management.

Unit V **(15 hours)**

System Architecture: Database –System Architecture Centralized and Client-Server Architecture-Server System Architecture-Parallel System-Distributed System - Network Types. **Advanced Topics, Advanced Application Development:** Performance Tuning-Performance Benchmarks-Standardization.

Unit VI

Case Studies : Design a relational database for a university's student information system, including student records, course enrollment, and grade tracking - Develop an ER diagram for a banking system,

incorporating customer accounts, transactions, and branch information - Develop an indexing and hashing strategy for a database of customer transactions, ensuring efficient query processing - Develop a concurrency control mechanism for a database of airline reservations, preventing conflicts and ensuring data consistency - Develop a client-server architecture for a web-based application, optimizing data retrieval and storage efficiency.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Explore about DBMS architecture, database designs, database modeling

CO2: Extend about ER-Diagram and UML, Relational Algebra and Relational Calculus

CO3: Distinguish the normalization theory (1NF- 2NF- 3NF- BCNF)

CO4: Apply Structured query language (SQL) and Constraints

CO5: Evaluate various transaction processing, concurrency control mechanisms and database protection mechanisms

Text Book:

1. A Silberschatz , H Korth, S Sudarshan, *Database System and Concepts*, Mc Graw-Hill, Sixth Edition,2019

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems (3/e)*, McGraw Hill, 2003
2. Atul Kahate, *Introduction to Database Management Systems*, Pearson Education, Tenth Impression, 2012
3. C.J Date, *An Introduction to Database System*, Addison- Wesley Publishing, Third Edition, 1998

Journal:

1. Info Communication Journal (Scopus)

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	1	9	1	9	3	3	1	3	1	52
CO2	9	9	3	1	9	1	9	3	3	1	3	1	52
CO3	9	9	3	1	9	1	9	3	3	1	3	1	52
CO4	9	9	3	1	9	1	9	3	3	1	3	1	52
CO5	9	9	3	1	9	1	9	3	3	1	3	1	52
Total	45	45	15	5	45	5	45	15	15	5	15	5	260

Low-1 Medium-3 High-9

Core IV – Optimization Techniques

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 5**
Subject Code: JMCAC14 **Credit: 5**

Course Objectives:

1. To impart knowledge in concepts and tools of Operations Research(OR)
2. To apply OR techniques constructively to make effective business decisions

Unit I **(15 hours)**

Basics of Operations Research: Development of OR – Definition-Characteristics-Scientific Method-Necessity of OR-Scope-OR and Decision-Making-Scope of OR in Management, Financial management-Applications of various OR Techniques-Objectives –Phases-Models-Classification Schemes of Models-Role of Computers in OR – Difficulties in OR - Limitations of OR. **Linear Programing:** Introduction-Requirements for a Linear Programming Problem - Assumptions in Linear Programming Models – Applications of LP method- Formulation of LPP-Advantages – Limitations – Graphical Method of Solutions.

Unit II **(15 hours)**

General LPP-Canonical and standard Forms of LPP-Theory of Simplex Method – Some Important Definitions –Analytical Method or Trial and Error Method – Simplex Method – Artificial Variables Techniques – Special cases in Simplex Method Applications – Solution of Simultaneous Equations by Simplex Method – Some Additional Points – Computational Efficiency of the Simplex Technique.

Unit III **(15 hours)**

Transportation Model: Introduction to the Model – Assumptions in Transportation Model – Definition – Matrix Terminology – Formulation and Solution – Variants in Transportation Problems – Additional Problems –Least-Time Transportation Problems – Post Optimality Analysis in Transportations – Trans-Shipment Problem – Dual of the Transportation Problem.

Unit IV **(15 hours)**

Assignment Model: Definition of Assignment Model – Mathematical Representation – Comparison with the Transportation Model – Solution of Assignment Models – Hungarian Method for Solution of Assignment Problems – Formulation and Solution of Assignment Models – Variations – Additional Problems- Sensitivity Analysis in Assignment Problem – Travelling Salesman Problem.

Unit V **(15 hours)**

Advanced Topics in LP: Duality in LP – Dual Simplex Method – Revised Simplex Method – Bounded Variable Problem.

Unit VI

Case Study: Airline Scheduling and Crew Assignment- Network Traffic in Communication Systems- Cloud Resource Allocation–Puzzles and Games-Instruction Set Customization- Supply Chain Optimization Using Linear Programming- Energy Optimization in Smart Grids- Optimizing Marketing Campaigns Using A/B Testing and Multivariate Analysis

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Explain characteristics of Operational Research, Computational Efficiency of the Simplex Technique, Transportation Problems, Assignment problem and Duality
CO2: Apply Graphical, Simplex methods, Assignment Problem, Transportation Problem and Dual Simplex Method methods to get optimal solution for Linear Programming
CO3: Analyse the optimal solutions of different Linear Programming methods such as Graphical, Simplex method, Assignment Problem and Transportation Problem and Dual Simplex methods for making effective business decisions
CO4: Compare Solutions of as Graphical, Simplex and Dual Simplex method
CO5: Generate dual of LPP and dual of Transportation Problem

Text Book:
1. Er. Prem Kumar Gupta, Dr D S Hira, *Operations Research*, S Chand Publisher, Revised Edition, 2017

Reference Books:
1. V.K.Kapoor, *Operations Research*, Sultan Chand & Sons Publishers, Fourth Edition, 2001
2. Hamdy A.Taha, *Operations Research*, Prentice Hall of India, Seventh Edition, 2005
3. J K Sharma, *Operations Research Theory and Applications*, Macmillan Publishers India Limited, Fifth Edition, 2013
4. Kanti Swarup , P.K. Gupta and Man Mohan, *Operations Research*, Sultan Chand & Sons Publishers,Thirteenth Edition, 2004

Journal:
1. International Journal of Computing and Digital System (Scopus)

E-Resources:
1. https://nptel.ac.in/courses/110/106/110106062/
2. https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
3. https://www.bbau.ac.in/dept/UIET/EMER-601%20Operation%20Research%20Queuing%20theory.pdf

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	3	1	3	9	1	3	1	3	1	46
CO2	9	9	9	3	1	3	9	1	3	1	3	1	52
CO3	9	9	9	3	1	3	9	1	3	1	3	1	52
CO4	9	9	9	3	1	3	9	1	3	1	3	1	52
CO5	9	9	9	3	1	9	9	1	3	1	3	1	58
Total	45	45	39	15	5	21	45	5	15	5	15	5	260

Low-1 Medium-3 High-9

Core V - Web Designing Lab

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 5**
Subject Code: JMCAC15P **Credit: 4**

Course Objectives:

1. To analyze a web page and identify its elements and attributes and create web pages using XHTML and Cascading Style Sheets
2. To build dynamic web pages using JavaScript (Client side programming) and create XML documents and Schemas

List of Programs

HTML

1. Write a program to illustrate all basic tags
2. Write a program to display study time table for end semester examination
3. Write a program to display a menu list for bakery
4. Write a program to implement all style sheets
5. Write a program to demonstrate frame
6. Write a program to demonstrate hyperlinks for both text and image
7. Write a program to illustrate form tags

Java Script

8. Write a program to check the given year is Leap year or not.
9. Write a program to convert temperature from Fahrenheit to Celsius
10. Write a program to create login form
11. Write a program to create a HTML page to demonstrate validation for mail registration
12. Write a program to develop college website
13. Write a program to develop website for online shopping

Note: Questions for the internal examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the basics of all HTML tags to create the static web page
CO2: Apply the concepts of table and list in HTML
CO3: Examine the use of style sheets, frames and hyperlinks
CO4: Evaluate the concept of validation using JavaScript
CO5: Create a dynamic website

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	3	9	3	9	9	9	1	9	9	9	1	**80**
CO2	9	9	9	9	9	9	9	1	9	9	9	1	**92**

CO3	9	9	9	9	9	9	9	1	9	3	9	1	**86**
CO4	9	9	9	9	9	9	9	1	9	9	9	1	**92**
CO5	9	9	9	9	9	9	9	1	9	9	9	1	**92**
Total	**45**	**39**	**45**	**39**	**45**	**45**	**45**	**5**	**45**	**39**	**45**	**5**	**442**

Low-1 Medium-3 High-9

Core VI - Data Structures and Algorithms with Python Lab

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 5**
Subject Code: JMCAC16P **Credit: 4**

Course Objectives:

1. To identify and apply suitable data structure for the given real-world problems
2. To gain knowledge in practical applications of data structures using python

List of Programs

Basic Programs

1. Write a program to check given number is odd or even.
2. Write a program to check given year is leap year or not
3. Write a program to develop a simple calculator

Formula Substitution

4. Write a program to find the factorial of the given number
5. Write a program to display the Fibonacci series for n terms
6. Write a program to find the maximum of a list of numbers.
7. Write a program to generate first n prime numbers
8. Write a program to find Given Number is Armstrong Number or not

Algorithm substitution

9. Write a program to implement Selection sort
10. Write a Python program to perform Insertion sort
11. Write a program to implement Merge sort

Data structures

12. Write a program for implementation of Stacks Using Arrays
13. Write a program for implementation of Stacks Using Linked Lists
14. Write a program for implementation of Queue Using Arrays
15. Write a program for implementation of Queue Using Linked Lists
16. Write a program to search a key element in a list of elements using linear search
17. Write a program to search a key element in a list of elements using binary search
18. Write a program for iimplementation of Binary Search Tree
19. Write a program to create a singly linked list and perform the following operations:
    a. Delete an element from linked list
    b. Display the contents of the above list after deletion
20. Write a program to create a doubly linked list and perform the following operations:
    a. Delete an element from doubly linked list
    b. Display the contents of the above list after deletion

Note: - Questions for internal and external examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the Python language syntax including control statements, loops and functions to write programs for a wide variety problem in mathematics.

CO2: Examine the core data structures in python to store, process and sort the data.

CO3: Basic knowledge of condition checking

CO4: Implement the structure of algorithm

CO5: Examine the file and array concept

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO2	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO3	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO4	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO5	9	9	9	3	9	1	9	3	3	1	1	1	**58**
Total	**45**	**45**	**45**	**15**	**45**	**5**	**45**	**15**	**15**	**5**	**5**	**5**	**290**

Low-1 Medium-3 High-9

Extra Credit I - RDBMS Lab

(For Students Admitted from 2025-26)

Semester: I

Subject Code: JMCAX1P **Credit: 2**

Course Objectives:

1. To explain basic database concepts, applications, data models, schemas and instances and emphasize the importance of normalization in databases
2. To demonstrate the use of constraints and relational algebra operations and describe the basics of SQL and construct queries using SQL

SQL DDL

1. Create an address table with fields name, doorno , street & city
   - describe its structure
   - alter the table to include pincode
   - alter the table to modify street column
   - drop the table

DML

2. Create a student table with regno, name, age and dept.
   - insert records
   - delete the students with age above 20
   - truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - find out the no. of female employees
   - find out the employees with age ranging between 30 and 35
   - list out the employees who are working more than 5 years
4. Create a library file with fields accno,title,author,cost & no of copies
   - arrange the books according to accno
   - find out the TOTAL no. of books available in the library
   - find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - find out the eldest and youngest player
   - group players according to sports
   - list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno, clientname & phoneno. Illustrate the set operators union , unionall, minus & intersect
12. Create a student table with fields' regno, name, English, Tamil, Maths and TOTAL
    - insert records
    - arrange all records according to TOTAL
    - find the student who got first mark in Maths
    - list out the students whose name starts with 'S'
13. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    - insert records
    - update the qnty when it goes less than reorderlevel
    - list the items with price less than 100
14. Create an employee table with fields ecode, ename, age & salary and create a department table with fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

15. Create a vendormaster table with fields vencode,venname,place and phoneno
    Create an ordermaster table with fields item no, itemcode, vencode, qnty and orderdate. Illustrate the following constraints using the above tables
    - vencode as primary key in vendormaster
    - vencode as foreign key in ordermaster
    - phoneno as unique
    - place as notnull &
    - qnty > 100

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate DDL, DML and TCL Commands

CO2: Apply the basic concepts of Database Systems and Applications

CO3: Illustrate the use of implementing constraints in tables

CO4: Implement normalization queries using SQL in database creation and interaction

CO5: Design ER-models to represent simple database application scenarios

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	3	1	9	3	1	1	1	1	56
CO2	9	9	9	9	3	1	9	3	1	1	1	1	56
CO3	9	9	9	9	3	1	9	3	1	1	1	1	56
CO4	9	9	9	9	3	1	9	3	1	1	1	1	56
CO5	9	9	9	9	3	1	9	3	1	1	1	1	56
Total	45	45	45	45	15	5	45	15	5	5	5	5	280

Low- 1 Medium-3 High-9

Core VII – Cyber Security

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 6 (T-4 & P-2)**

Subject Code: JMCAC21 **Credit: 5**

Course Objective:

1. To practice with an expertise in academics to design and implement security solutions in Organizations.
2. To understand key terms and concepts in Cryptography, Rootkit, Cryptology

Unit I **(12 hours)**

Introduction to Cyber security: Computer security-threats-Harm-Vulnerabilities-Control-Authentication- Access Control-Cryptography-Malicious Code-Malware-Countermeasures-The web-User side-Browser Attacks-Email Attacks.

Unit II **(12 hours)**

Security In Operating System & Networks: Security in Operating Systems - Security in the Design of OperatingSystems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security -Denial of Service - Distributed Denial-of-Service.

Unit III **(12 hours)**

Database Security: Introduction of Databases-Security Requirements in Databases-Reliability and Integrity- Database Disclosure-Data Mining and Big Data-Cloud Computing: Cloud Computing Concepts-Cloud Securitytools and techniques-Securing IaaS.

Unit IV **(12 hours)**

Security Planning: Security Planning-Business Continuity Planning-Handling Incidents-Risk Analysis -Legal Issues and Ethics: Protecting Programs and Data-Information and the Law-Rights of Employees and Employers-Computer Crime-Ethical Issues in Computer Security.

Unit V **(12 hours)**

Cryptography: Cryptology-Symmetric Encryption Algorithms-Message Digests-Quantum Cryptography- Emerging Topics: The Internet of Things-Economics-E-Voting-Cyber Warfare.

Unit VI

Case Studies: Analyze WannaCry ransomware attack and discuss the vulnerabilities exploited, attack vectors, and countermeasures - Implementing Multi-Factor Authentication (MFA) in a web application to enhance security - Configuring a secure firewall for a small business network - Implementing data encryption and access controls in a relational database management system

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Classify the concept of threat, risks and security planning.
CO2: Apply theoretical concepts in different security phases
CO3: Analyze security concepts needs in cloud and database
CO4: Examine the concepts and do security in database and organization
CO5: Develop policies and procedures for database and cloud security and design security architecture for an organization.

Text Book:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, *Security in Computing*, Pearson Education, Fifth Edition, 2015

Reference Books:

1. Martti Lehto, Pekka Neittaanmäki, *Cyber Security: Analytics, Technology and Automation*, Springer International Publishing, 2015
2. Nelson Phillips, Enfinger Steuart, *Computer Forensics and Investigations*, Cengage Learning, 2009

Journal:

1. Info Communication Journal (Scopus)

E-Resources:

1. https://www.springboard.com/resources/learning-paths/cybersecurity-foundations/
2. https://www.edx.org/course/cyber-security-basics-a-hands-on-approach

Cyber Security (Lab)

Hours/Week: 2

List of Programs:

Console Application

1. Write a program to stop User from viewing certain URLs or Websites
2. Write a program to Protect Systems from Malicious Software

3. Write a program to implement Signature Based Detection
4. Write a program to implement Behavior-Based Detection
5. Write a program to prevent Threats from Getting on the Network using Sandboxing
6. Write a program to implement Web Application Firewall
7. Write a program to implement Website Scraper
8. Write a program to implement Log Analyzer

Note: Questions for the internal examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Build applications for cyber security solutions.
CO2: Perform Malware attacks.
CO3: Demonstrate corrective measures for computer security breaches.
CO4: Illustrate security threats and methodologies.
CO5: Develop firewall and web related issues.

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO2	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO3	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO4	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO5	9	9	9	9	9	1	9	9	9	1	9	9	**92**
Total	**45**	**45**	**45**	**21**	**21**	**5**	**45**	**45**	**21**	**5**	**45**	**21**	**364**

Low-1 Medium-3 High-9

Core VIII – Java Programming

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 5**
Subject Code: JMCAC22 **Credit: 5**

Course Objectives:
1. To learn the basic concepts of Java to increase the ability of students in web application development using AWT and Swing
2. To develop programming knowledge to create dynamic web applications using server side technology with Java database connectivity

Unit I **(15 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm –basic concepts of oops – benefits of oops – applications of OOPs. **Java Language Basics:** Java Program Structure – Basic Building Blocks – Variables - Data Types – Operators – Typecasting - Keyword

Final – **Control Structures** – **Loops – Functions:** Functions in Java – Recursive Functions – Parameter Passing – Method swap – In-built Methods or Library Methods .

Unit II **(15 hours)**

Arrays: Arrays in Java – Creating Array – Array Index Checking – Multi-Dimensional Arrays. **Introducing Classes:** Class Fundamentals – Declaring and Creating Objects – Accessing Members – Access Control Parameters: Public and Private – Introducing Methods – Methods with Parameter – Methods Returning a Value – Constructors – Default Constructor – Keyword this – The finalize () Method – Overloading Methods and Constructors – Using Objects as Parameters – Keyword static– **Inheritance:** Inheritance Basics – Member Access and Inheritance – Keyword super – Creating a Multi-Level Hierarchy – Method Overriding – Using final in Inheritance – Introducing Interface – Abstract Methods and Classes.

Unit III **(15 hours)**

Multi-Threaded Programming: Introduction of Threads – Reason for using Threads – Creating and Running a Thread – Creating Multiple Threads – Life Cycle of a Thread – Implementing Runnable Interface – Thread Priority and Thread Scheduling Policy – Synchronization – **Exception Handling:** Use of Exception Handling – Types of Exceptions – Checked and Unchecked Exceptions – Exception Handling Constructs – Keyword finally – Throw Statement – Multiple Catch Blocks.

Unit IV **(15 hours)**

Java Applets: Applet Basics – The Applet Class – Applet Architecture - Applet Life Cycle - Comparison of Applet and Applications – Setting Font and Changing Style, Size, Type, Foreground and Background Colour - Using Graphics Methods in Applets- Images and Sounds in Applets – Applet Tag - **Event Handling and AWT - Introduction to Swing:** JFrame – JOptionPane – Class JButton- Class JLabel- JCheckBox – Introduction to JRadioButton – Class JTextField – JTextArea- JMenu - JComboBox - **JDBC:** JDBC Architecture – SQL-Primer – Create DB in SQL – Creating JDBC Application – JDBC Driver – Connecting to the ODBC Data Source – Database Connections – Statements – The PreparedStatement Objects – The CallableStatement Objects – ResultSet.

Unit V **(15 hours)**

Servlets: Architecture – Life cycle – First program – Client HTTP request – Server HTTP response – HTTP status code – Writing filters – Exception handling – Cookies handling – Session tracking – Database access – File uploading – Handling date – Servlets-page redirection – Sample program – Servlets-packaging.

Unit VI

Case Studies: Creating a Simple Banking System- Library Management System- Student Management System- Library Management System - Bank Account System with Multi-threading - Online Shopping System with Exception Handling-Using Servlets in a Web Application- Simple Calculator Application using AWT and Event Handling

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concepts of Java Basics, Control Structures, Loops, Functions, Arrays, Classes, Inheritance, Thread, Applet, Swing, Servlet and JSP.

CO2: Utilize the techniques of AWT and Swing to create various fields.
CO3: Examine an implementation of Applet with Java for setting up fonts and its style.
CO4: Evaluate different types of JDBC drivers, connectivity and exceptions.
CO5: Design the web application using swing, servlet, and JDBC.

Text Books:

1. E. Balaguruswamy, Programming with JAVA - A Primer, McGraw Hill Professional, 2019.
2. Hortsmann & Cornell, "CORE JAVA 2 ADVANCED FEATURES, VOL II", Pearson Education, 2002.

Reference Books:

1. Paul Deitel, Harvey Deitel, *Java How to Program (Early Objects)*, Pearson Education, Tenth Edition, 2016.
2. DT Editorial Services, *Java 8 Programming Black Book*, Dreamtech Press, 2015.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E - Resources:

1. https://www.youtube.com/watch?v=Ae r8hsbPUo
2. https://www.learnvern.com/course/advanced-java-tutorial
3. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO2	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO3	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO4	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO5	9	9	9	9	9	1	9	9	9	1	9	9	**92**
Total	**45**	**45**	**45**	**21**	**21**	**5**	**45**	**45**	**21**	**5**	**45**	**21**	**364**

Low-1 Medium-3 High-9

Core IX – Java Programming Lab

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 5**
Subject Code: JMCAC23P **Credit: 4**

Course Objectives:

1. To apply the concepts of Abstract Windowing Toolkit (AWT) and swing to design and develop GUI application.
2. To create dynamic web applications using JSP, Servlet and Java Data Base Connectivity (JDBC)

List of Programs

Formula Substitution

1. Deveop a program to find binomial coefficient

Array

2. Deveop a program to arrange numbers and names in order
3. Deveop a program to perform Merging in two array
4. Deveop a program to perform Linear search and Binary search

OOPs Concept

5. Deveop a program to implement Inheritance
6. Deveop a program to implement Exception Handling
7. Deveop a program to implement multithreading

Applet

8. Deveop a program to handle Keyboard events
9. Deveop a program to handle Mouse events
10. Deveop a program to simulate a calculator (arithmetic operations) using GUI.
11. Deveop a program to implement Free hand drawing
12. Deveop a program to implement menus

Swing

13. Deveop a program to display current date & time in different format.
14. Deveop a program to set a foreground and background color for label

JDBC

15. Deveop a program to prepare a student's details with Roll-No, Name, Mark1, Mark2, Mark3, Total, Average and Grade to perform insert, update, delete and display of student information
16. Deveop a program to prepare an Electricity Bill to perform insert, update, delete and display Electricity bill of a particular user

Servlet

17. Deveop a program to display Simple Message
18. Deveop a program to use cookies to store the number of times a user has visited the servlet
19. Deveop a program to generate Random Numbers
20. Deveop a program to create a login page, if the username and password is correct then prints message "Hello username" else" login failed"
21. Deveop a program to create Student Information System to view the details of the students

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the concepts such as OOPs, Array to implement Java code
CO2: Apply an event handling using swing and AWT components
CO3: Illustrate the concept of Applets in Java program
CO4: Discover the database access through Java code using JDBC connectivity
CO5: Create dynamic web pages using Servlet and JSP

Course Outcomes	Programme Outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	3	1	3	1	**60**
CO2	9	9	9	3	3	1	9	9	3	1	3	1	**60**
CO3	9	9	9	3	3	1	9	9	3	1	3	1	**60**
CO4	9	9	9	3	3	1	9	9	9	1	9	1	**72**
CO5	9	9	9	3	9	1	9	9	9	1	9	1	**78**
Total	**45**	**45**	**45**	**15**	**21**	**5**	**45**	**45**	**27**	**5**	**27**	**5**	**330**

Low-1 Medium-3 High-9

Core X - Data Analytics Lab

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 4**
Subject Code: JMCAC24P **Credit: 3**

Course Objectives:

1. To know the modern quantitative tools to data analysis in a business context and identify datasets and explain how they are organized and manipulate data
2. To apply the tools to transform the data into useful information and use functions for data visualization.

List of Programs

Using Spreadsheet

1. Develop a program to Perform Basic Functions in Spread sheets
2. Develop a program to Perform Formatting and Proofing
3. Develop a program to Implement Date and Time Functions
4. Develop a program to Implement Sorting & Filtering Techniques
5. Develop a program to perform Data Validation
6. Develop a program to Display Pivot Tables
7. Develop a program to Display Charts and Slicers

Using R

8. Develop a program to Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
9. Develop a program to Get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
10. Develop a program to Perform K-Means clustering operation and visualize for iris dataset

Using SciLab

11. Develop a program to implement the basic matrix operations
12. Develop a program to find the Eigenvalues and eigenvectors

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Excel functions to solve mathematical, text, date and time operations, R functions for numerical operations and Scilab functions for matrix operations

CO2: Demonstrate the concepts of sorting, filtering using Excel

CO3: Illustrate statistical operations using R

CO4 Evaluate the Regression and Clustering

CO5: Develop programs to solve equations by Gauss elimination, Gauss Jordan Method and Gauss Seidel

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	9	3	3	3	1	74
CO2	9	9	9	9	9	1	9	9	3	3	3	1	74
CO3	9	9	9	9	9	1	9	9	3	3	3	1	74
CO4	9	9	9	9	9	1	9	9	3	3	3	1	74
CO5	9	9	9	9	9	1	9	9	3	3	3	1	74
Total	45	45	45	45	45	5	45	45	15	15	15	5	370

Low-1 Medium-3 High-9

DSE I - a) Cloud and Distributed Computing

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**

Subject code: JMCAE2A **Credit: 4**

Course Objectives:

1. To identify the technical foundations of cloud systems architectures and analyse the problems and solutions to cloud application problems
2. To apply principles of best practice in cloud application design and management and identify and define technical challenges for cloud applications and assess their importance

Unit I **(15 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration. **Network Virtualization and Geo-Distributed Clouds:** Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker - Software-Defined Network - Network Virtualization in Multi-Tenant Data Centers: VL2 - Network Virtualization in Multi-Tenant Data Centers: NVP - Geo-Distributed Cloud Data Centers.

Unit II **(15 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction - Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: Bully Election -

Industry Systems: Google Chubby and Apache ZooKeeper - Design of ZooKeeper. **Cloud-Native Computing:** Introduction – Micro services – Docker – Kubernetes - Introduction to Edge Computing - Classification of Edge Computing.

Unit III **(15 hours)**

Cloud Asset Management and Protection: Differences from Traditional IT - Types of Cloud Assets - Compute Assets - Storage Assets - Network Assets - Asset Management Pipeline - Procurement Leaks - Processing Leaks - Tooling Leaks - Findings Leaks - Tagging Cloud Assets. **Software-Defined Networking and Network Function Virtualization:** Introduction - Software-Defined Networking - Applications and Use Cases - Software-Defined NFV - Network Slicing.

Unit IV **(15 hours)**

Cloud Storage: Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase. **Identity and Access Management:** Differences from Traditional IT - Life Cycle for Identity and Access - Request - Approve - Create, Delete, Grant, or Revoke - Authentication - Cloud IAM Identities - Business-to-Consumer and Business-to-Employee - Multi-Factor Authentication - Passwords and API Keys - Shared IDs - Federated Identity - Single Sign-On - Instance Metadata and Identity Documents - Secrets Management - Authorization - Centralized Authorization - Roles.

Unit V **(15 hours)**

Classical Distributed Algorithms and the Industry Systems: Introduction - Time and Clock Synchronization in Cloud Data Center - Key Challenges - Clock Synchronization - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems. **Cloud Applications:** MapReduce, Spark, and Apache Kafka – MapReduce – Spark – Kafka.

Unit VI

Case Studies: Cloud Cost Optimization Strategies: A Case Study on IBM Cloud: Analyze how IBM Cloud optimizes its Cloud Costs Using Strategies Such as Resource Allocation- Rightsizing and Pricing Models – Global Tech's Leader Election Strategy in Cloud and Distributed Systems - Cloud Storage Platforms - Data Encryption-Implement Classical Distributed Algorithms - **Ensure scalability-Develop Cloud Based Platforms-Cost Efficiency – MapReduce Framework.**

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify the features of Cloud Computing and Virtualization

CO2 Demonstrate the leader election and cloud native computing

CO3: Classify types of cloud assets, Software-Defined Networking and Network Function Virtualization

CO4: Justify cloud storage, Identity and Access Management

CO5: Generate the Classical Distributed Algorithms, the Industry Systems and Cloud applications

Text Books:

1. Rajiv Misra and Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems*, Wiley Emerging Technology Series, 2020.
2. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*, O'Reilly Media, First Edition, 2019.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill, 2017
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms*, John Wiley & Sons Limited, 2011
3. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata
4. McGraw Hill, 2010

Journal:

1. Info Communication Journal (Scopus)

E - Resources:

1. https://nptel.ac.in/courses/106/104/106104182/
2. https://www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	3	1	1	1	9	9	9	9	3	9	3	9	**66**
CO2	9	1	3	9	3	3	3	9	9	3	3	3	**58**
CO3	3	9	3	1	9	9	9	9	9	9	9	9	**88**
CO4	1	1	9	3	3	3	9	9	9	9	9	9	**74**
CO5	9	3	9	9	9	9	9	9	9	9	9	9	**102**
Total	**25**	**15**	**25**	**23**	**33**	**33**	**39**	**45**	**39**	**39**	**33**	**39**	**388**

Low-1 Medium-3 High-9

DSE I – c) Data Analytics

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 5**
Subject Code: JMCAE2C **Credit: 4**

Course Objectives:

1. To understand the Big Data Platform and its Use cases and Map Reduce Jobs
2. To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and Apply analytics on Structured, Unstructured Data

Unit I **(15 hours)**

Introduction to Big Data: Classification of Digital Data, Structured and Unstructured Data - Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Data Warehouse and Hadoop Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments - Top Analytics Tools

Unit II **(15 hours)**

Technology Landscape: NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop -Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

Unit III **(15 hours)**

MongoDB and Mapreduce programming: MongoDB: Why MongoDB - Terms used in RDBMS and MongoDB - Data Types - MongoDB Query Language Map Reduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

Unit IV **(15 hours)**

Hive and Pig: Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements –Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having - Hive User Defined Function - Serialization and Deserialization. **Pig:** Introduction -Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig-Running Pig - Execution Modes of Pig Relational Operators - Eval Function -Complex Data Types - Piggy Bank - - Parameter Substitution – Diagnostic Operator

Unit V **(15 hours)**

Introduction to Data Analytics with R- Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Machine Learning Algorithms: Regression Model, Clustering, Collaborative Filtering, Associate Rule Making, Decision Tree, Big Data Analytics with BigR.

Unit VI

Case Studies: Analyse real-time processing using Hadoop and advanced analytics tools.-Traditional Business Intelligence versus Big Data-Compression to optimize real-time analytics- ETL workflows and enhance analytics efficiency- R for data analytics- Supervised learning for predictive Modelling and clustering

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Data sources, generations, data formats, Data Evolution, Data from various domains

CO2: Determine Big Data Characteristics, Frameworks, components and Limitation of traditional approaches and map Big Vs to Data Domains

CO3: Analyse various domains of Data Characteristics, Platform, Programming Model and Design Data Analytic ecosystem, and data processing framework

CO4: Evaluate the Concepts of Data Analytics Phases and Techniques

CO5: Formulate Data Analytics Techniques practically using R environment

Text Books:

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publications, First Edition,2015

2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman , *Big Data for Dummies*, Wiley India Private Limited, 2014

Reference Books:

1. Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley, India Private Limited, 2015
2. Chris Eaton, Dirk deroos, Understanding *Big data*, McGraw Hill, 2012
3. Tom White, *HADOOP: The definitive Guide*, O Reilly, 2012
4. Tom Plunkett, Brian Macdonald, Oracle *Big Data Handbook*, Oracle Press, 2014
5. JyLiebowitz, *Big Data and Business analytics*, CRC press, 2013
6. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013

Journal:

1. Info Communication Journal (Scopus)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://nptel.ac.in/courses/110/106/110106072/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	9	3	3	3	1	74
CO2	9	9	9	9	9	1	9	9	3	3	3	1	74
CO3	9	9	9	9	9	1	9	9	3	3	3	1	74
CO4	9	9	9	9	9	1	9	9	3	3	3	1	74
CO5	9	9	9	9	9	1	9	9	3	3	3	1	74
Total	45	45	45	45	45	5	45	45	15	15	15	5	370

Low-1 Medium-3 High-9

DSE II – a) Operating Systems

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 5**
Subject Code: JMCAE2D **Credit: 4**

Course Objectives:

1. To understand the services provided by and the design of an operating system.
2. To understand what a process is and how processes are synchronized and scheduled

Unit I **(15 hours)**

Introduction: What is an Operating System -Mainframe systems- desktop systems- Multiprocessor Systems-Distributed systems- Clustered Systems- Real time systems- Hand held systems. **Operating System Structure:** System components- Operating System services- System calls- System structure.

Unit II **(15 hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication**. CPU Scheduling**: Basic Concepts- Scheduling Criteria- Scheduling algorithms **Process Synchronization**: Background- The critical section problem- Mutex Locks-semaphores-Monitors.

Unit III **(15 hours)**

Deadlock: System Model-Deadlock Characterization- Methods of Handling Deadlock-Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock.**Memory management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(15 hours)**

Virtual memory: Background- Demand paging-Copy-on-Develop -Page replacement-Thrashing. **Filesystem interface**: File concepts- access methods- Directory structure.**Mass storage structure**: Overview of mass storage structure-HDD Scheduling-NVM Scheduling.

Unit V **(15 hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix- revocation of access rights. **Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities- Intrusion detection- Cryptography.

Unit VI

Case Studies : Compare and contrast the architecture, system components, and services of Windows and Linux operating systems - Analyze the CPU scheduling algorithms used in Windows, including their priorities and scheduling criteria. - Study how deadlock prevention techniques are used in a database system to prevent deadlocks and ensure data consistency - Design a file system for a distributed system, ensuring that files are accessed efficiently and consistently across different nodes - Design a secure authentication system for a web application, ensuring that user credentials are protected and access is granted only to authorized users.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the structure of operating system and scheduling algorithms
CO2: Apply the concept of process scheduling, deadlocks and its recovery
CO3: Analyze the background of memory with segmentation and paging
CO4: Evaluate file management with file organization, and disk scheduling
CO5: Create Securing systems and facilities

Text Book:

1. Abraham G Silberschatz, Operating System**,** Wiley Publisher, Tenth Edition, 2017.

Reference Books:

1. Milan Milenkovic, Operating System Concepts & Design, Tata, McGraw Hill, Second Edition,1997.
2. Peter Baer Galvin and Robert Neilson Boyd, Applied Operating system concepts, John Wiley

& Sons, First Edition, 2000.
3. Dhananjay M. Dhamdhere, Operating System A Concept-Based Approach, Tata McGraw Hill, Third Edition, 2012.
4. W. Stallings, Operating Systems, Internals & Design Principles, Prentice Hall of India, Fifth Edition, 2008.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://nptel.ac.in/courses/106/106/106106144/
3. https://onlinecourses.nptel.ac.in/noc21_cs44/preview
4. https://www.udacity.com/course/introduction-to-operating-systems--ud923
5. https://onlinecourses.nptel.ac.in/noc21_cs72/preview

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	3	3	1	9	3	9	9	9	1	9	9	74
CO2	9	3	3	1	9	3	9	9	9	1	9	9	74
CO3	9	3	3	1	9	3	9	9	9	1	9	9	74
CO4	9	3	3	1	9	3	9	9	9	1	9	9	74
CO5	9	3	3	1	9	3	9	9	9	1	9	9	74
Total	45	15	15	5	45	15	45	45	45	5	45	45	370

Low-1 Medium-3 High-9

DSE II – b) Digital Marketing

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 5**
Subject Code: JMCAE2E **Credit: 4**

Course Objective:

1.To understand internet, digital and social marketing
2.To analyse the social media strategy

Unit I **(15 hours)**

Introduction to Digital Marketing - Evolution of Digital Marketing from traditional to modern era- Role of Internet; Current trends - Info-graphics - implications for business & society - Emergence of digital marketing as a tool - Drivers of the new marketing environment - Digital marketing strategy; P.O.E.M. framework-Digital landscape- Digital marketing plan- Digital marketing models.

Unit II **(15 hours)**

Internet Marketing and Digital Marketing Mix: Internet Marketing - opportunities and challenges - Digital marketing framework - Digital Marketing mix - Impact of digital channels on IMC. **Search Engine Advertising:** Pay for Search Advertisements - Ad Placement - Ad Rank s- Creating Ad Campaigns - Campaign Report Generation Display marketing: Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

Unit III **(15 hours)**

Social Media Marketing : Understanding Social Media Marketing – Social Networking- Role of Influencer Marketing-Modes of Social Media Marketing- Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, Adverts-E mail Marketing plan- Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting Twitter Marketing: Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics.

Unit IV **(15 hours)**

Introduction to SEO : SEM - Web Analytics - Mobile Marketing - Trends in Digital Advertising - Introduction and need for SEO- How to use internet & search engines; search engine and its working pattern: On-page and off-page optimization, SEO Tactics - Introduction to SEM Web Analytics: Google Analytics & Google AdWords - data collection for web analytics- multichannel attribution- Universal analytics- Tracking code Trends in digital advertising.

Unit V **(15 hours)**

Social Media Channels : Introduction - Key terms and concepts - Traditional media vs Social media - Social networking - Content creation - Bookmarking & aggregating and Location & social media - Tracking social media campaigns **Social Media Strategy:** Introduction - Key terms and concepts - Using social media to solve business challenges - Step-by-step guide to creating a social media strategy - Documents and processes - Dealing with opportunities and threats - Step-by-step guide for recovering from an online brand attack - Social media risks and challenges

Unit VI

Case Studies: The Rise of Social Media Marketing: A Case Study on the Success of Instagram Ads for E-commerce Brands - Leveraging Search Engine Advertising and Display Marketing: A Case Study on the Success of a Digital Ad Campaign for an E-commerce Brand - Maximizing Brand Reach: A Case Study on Leveraging Social Media Platforms for Effective Marketing Campaigns - Boosting Online Visibility: A Case Study on the Impact of SEO and SEM Strategies for an E-commerce Website - Navigating Social Media Strategy: A Case Study on Overcoming Brand Challenges through Effective Social Media Campaigns.

Text Book:

1. Seema Gupta, *Digital Marketing*, Mc-Graw Hill 1st Edition, 2017.

Reference Books:

1. Ryan, D, *Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation*, Kogan Page Limited, 2014.
2. Puneet Singh Bhatia, *Fundamentals of Digital Marketing*, Pearson Education 1st Edition, 2017.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://onlinecourses.swayam2.ac.in/ugc19_hs26/preview
2. https://nptel.ac.in/courses/110104070
3. https://www.shiksha.com/online-courses/basics-of-digital-marketing-by-nptel-course-nptel43

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	3	1	9	3	68
CO2	9	9	9	3	3	1	9	9	3	1	9	3	68
CO3	9	9	9	3	3	1	9	9	3	1	9	3	68
CO4	9	9	9	3	3	1	9	9	3	1	9	3	68
CO5	9	9	9	9	9	1	9	9	9	1	9	9	92
Total	45	45	45	21	21	5	45	45	21	5	45	21	364

Low-1 Medium-3 High-9

DSE II – c) Blockchain Technologies

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 5**
Subject Code: JMCAE2F **Credits: 4**

Course Objectives:

1. To assess block chain applications in a structured manner and impart knowledge in block chain techniques and able to present the concepts clearly and structured
2. To get familiarity with future currencies and to create own crypto token

Unit I **(15 hours)**

Introduction of Block chain: Blockchain 101-Distributed Systems-Consensus-The history of blockchain-Introduction of blockchain-Features of blockchain-Applications of blockchain technology-Tiers of Blockchain technology-Consensus in blockchain-CAP theorem and block chain-Benefits and limitations of Blockchain. **Decentralization:** Introduction of Decentralization using blockchain-Methods of Decentralization-Routes of Decentralization-Blockchain and full ecosystem decentralization-Decentralization Organizations.

Unit II **(15 hours)**

Cryptography and Technical Foundations: Introduction- Mathematics- Cryptography- Confidentiality- Integrity - Authentication - Non repudiation -Accountability-Block Ciphers-DES-AES- Public and Private keys- RSA- hash Functions- Secure hash algorithms -Merkle trees- Patricia trees- DHT- ECDSA-Financial markets and trading-Trading-Exchanging.

Unit III **(15 hours)**

Bitcoin: Bitcoin-Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain-The genesis of Block-The bitcoin network-wallets. **Alternative coins:** Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin- Bitcoin- Prime coin-Zcash.

Unit IV **(15 hours)**

Ethereum101: Introduction-Ethereum Block chain-The consensus mechanism-The world state-the account state-Transactions-Contract creation transaction-Message call transaction-Elements of ethereum block chain-EVM-Execution Environment-Opcodes and their meaning-Accounts-Block-Block header-The genesis block-Transaction receipts-Transaction validation and execution-Block validation mechanism-Block finalization-Ether-Gas-Mining-Ethash-CPU Mining.

Unit V **(15 hours)**

BlockChain – Outside of Currencies: Internet of things-IoT Block chain experiment-Government-Health-Finance-Scalability and other Challenges: Scalability-Proof of Stake-Privacy-**Emerging Trends:** ABC's-Enterprise-grade bloc kchains-Private Block chains-startups-standardization-Enhancements-Real world Implementations-Consortia-Education in block chain technologies-Employment-Crypto Economics

Unit VI

Case Studies: Decentralized Trust: A Case Study on Blockchain Implementation in Financial Systems - Cryptographic Solutions for Data Protection - Securing Healthcare Data - Bitcoin as a Store of Value - The Legal and Ethical Challenges of Bitcoin - Ethereum's Smart Contracts - Ethereum and Supply Chain Transparency - Blockchain for Supply Chain Management - Blockchain for Intellectual Property - Blockchain for Intellectual Property Rights Management.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate the Fundamental Concepts of Block chain and uses of Bitcoin
CO2: Apply Cryptography Algorithms in block chain
CO3: Classify a transactions in Bitcoin
CO4: Explain the concept Decentralization, BitCoin, Ethereum in Block chain
CO5: Develop Private block chain environment and smart contracts in recent trends by using Ethereum

Text Book:

1. Imran Bashir, *Mastering Block chain: Deeper insights into Decentralization, Cryptography, Bitcoin and Popular Block chain Frameworks,* Packt Publishing, 2017.

Reference Books:

1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin*, O'Reilly, 2014.

2. Roger Wattenhofer, *The Science of the Block chain*, Create Space Independent Publishing, 2016.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction*, Princeton University Press, 2016.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	9	9	1	9	3	3	3	9	9	76
CO2	9	9	3	9	9	1	9	3	3	3	9	9	76
CO3	9	3	3	9	9	1	9	3	3	3	9	9	70
CO4	9	3	3	9	9	1	9	3	3	3	9	9	70
CO5	9	3	3	9	9	1	9	3	3	3	9	9	70
Total	45	27	15	45	45	5	45	15	15	15	45	45	362

Low-1 Medium-3 High-9

Extra Credit II - Internship

(For Students Admitted from 2025-26)

Semester: II
Subject Code: JMCAX2I **Credit: 2**

Course Objectives:

1. To articulate and apply principles learned in and outside of the classroom to a specific internship site experience
2. To get the practical knowledge to apply programming skills for developing a project

Students must undergo an internship in an industry and submit document prepared by them about the internship programme. It can be a group work with a group size of maximum two members. The Internship should be completed and submitted before the commencement of III Semester and viva will be conducted in the first week of III Semester.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand self-understanding, self-confidence, and interpersonal skills
CO2: Assess Strengths, Weaknesses, Opportunities and Threats (SWOT) and explore career options and gain general work experience

CO3: Examine any specific learning outcomes identified in supplemental documentation provided as part of the internship application process
CO4: Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization
CO5: Create the document which contains company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for organization of internship

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	9	1	1	9	1	76
CO2	9	9	9	9	9	1	9	9	1	1	9	1	76
CO3	9	9	9	9	9	1	9	9	1	1	9	1	76
CO4	9	9	9	9	9	1	9	9	1	1	9	1	76
CO5	9	9	9	9	9	1	9	9	1	1	9	1	76
Total	45	45	45	45	45	5	45	45	5	5	45	5	380

Low-1 Medium-3 High-9

Core XI - Software Development Framework

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 5**
Subject Code: JMCAC31 **Credit: 4**

Course Objectives:
1. To understand code solutions and compile C# projects within the .NET Framework
2. To design and develop professional console and window based .NET Application

Unit I **(15 hours)**

The .NET Framework: .Net programming Framework-VB.NET,C#.NET and the .NET Languages-The Common Language Runtime-The .NET Class Library-ASP.NET-Visual Studio.NET. **Learning the .NET Languages:** The .NET Languages-Data Types-Declaring Variables- Scope and Accessibility-Variable Operations-Object-Based Manipulation-Conditional Structures-Loop Structures-Functions and Subroutines.Types,

Unit II **(15 hours)**

ASP.NET Applications: ASP.NET Applications-Code-Behind-The Global.asax Application File-Understanding ASP.NET Classes-ASP.NET Configuration. **Web Form Fundamentals:** A Simple Page Applet-A Deeper Look at HTML Control Classes-The Page Class-Accessing HTML Server Controls. Web Controls: Stepping Up to Web Controls-Web control Classes- AutoPostBack and Web Control Events.

Unit III **(15 hours)**

Using Visual Studio .NET: The promise of Visual Studio.NET-Starting a Visual Studio.Net Project

– The Web form Designer-Writing Code-Visual Studio.NET Debugging-Working Without Visual Studio.NET. **Validation and Rich Controls:** Validation-A simple Validation Example-Understanding Regular Expressions-A Validated Customer Form

Unit IV **(15 hours)**

Tracing, Logging and Error Handling: Common Errors-The .NET Exception Object- Handling exceptions-Throwing Your Own Exceptions-Logging Exceptions-Error Pages-Page Tracing. **Overview of ADO.NET:** Introducing ADO.NET and Data Management- Characteristics of ADO.Net-The ADO.NET Object Model. ADO.NET Data Access: About the ADO.NET Examples-SQL Basics-The SQL Select Statement-Update-Insert-Delete-Accessing Data the Easy Way-Creating a connection-Defining a Select Command-Using a Command with a DataReader-Updating Data-Accessing Disconnected Data-Selecting Multiple Tables.

Unit V **(15 hours)**

Data Binding: Introduction-Single-Value Data Binding-Repeated-Value Data Binding-Data Binding with Databases. The DataList, DataGrid and Repeater: Introducing Templates-Using Templates with the DataList-Data Binding with Multiple Templates-Comparing the Template Controls-Selecting Items-Editing Items-Paging with the DataGrid- **Sorting with the DataGrid Using XML:** XML's Hidden Role in .NET-XML Explained- The XMLClasses-XML Validation-XML Display and Transforms-XML in ADO.NET.

Unit VI

Case Study: Adoption of .NET Framework for Enterprise Application Development. Developing a Financial Management System Using ASP.NET Web Forms. Implementing Validation Controls in an ASP.NET Web Application. Custom Error Pages with `web.config`. Configuring Application Settings Using XML

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Interpret the basic concepts of .NET, Problem of the state, data, Management Validation and Rich controls

CO2: Determine types, objects and namespaces, Enumerators and Iterators and Error Handling

CO3: Illustrate Table Controls, ASP.Net Applications and the Web Server, Interfaces and Structures

CO4: Evaluate on Exception Handling, Serializing objects, Direct Data Access

CO5: Develop XML classes and XML Validation, web forms and use web controls

Text Book:

1. Matthew MacDonald, *The Complete Reference ASP.NET*, Tata McGraw-Hill Publishing, 2017

Reference Books:

1. Dino Esposito, *Programming Microsoft ASP.NET*, Tata McGraw Hill, 2003
2. Chris Ullman , John Kauffman, Chris Hart, David Sussman, *Beginning ASP.Net 1.1 with VB.NET*, Wiley Publishing, First Edition, 2003
3. Elliotte Rusty Harold, *XML 1.1 Bible*, Wesley Publications, Third Edition, 2004

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	1	1	3	1	58
CO2	9	9	9	3	3	1	9	9	3	1	3	1	60
CO3	9	9	9	3	3	1	9	9	3	1	3	1	60
CO4	9	9	9	3	3	1	9	9	3	1	9	1	66
CO5	9	9	9	9	9	1	9	9	9	1	9	1	84
Total	45	45	45	21	21	5	45	45	19	5	27	5	328

Low-1 Medium-3 High-9

Core XII – Machine Learning

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 6 (T-4, P-2)**
Subject Code: JMCAC32 **Credit: 5**

Course Objectives:

1. To recognize the characteristics of machine learning that makes it useful to real-world problems
2. To understand the concept behind neural networks for learning non-linear functions

Unit I **(12 hours)**

Introduction: Well-Posed Learning Problems-Designing a Learning System-Perspectives and Issues in Machine Learning. Concept Learning: Introduction - A Concept Learning Task-Concept Learning as Search - Decision Tree Learning: Introduction-Decision Tree Representation-Appropriate Problems-Basic Decision Tree Learning Algorithm-Hypothesis Space Search-Inductive Bias-Issues.

Unit II **(12 hours)**

Artificial Neural Networks: Introduction-Neural Network Representations - Appropriate Problems - Perceptrons - Multilayer Networks and the Back Propagation Algorithm-An Illustrative Example: Face Recognition-Advanced Topics.

Unit III **(12 hours)**

Bayesian Learning: Introduction-Bayes Theorem-- Bayes Theorem and Concept Learning – Maximum Likelihood and Least-squared Error Hypotheses- Maximum Likelihood Hypothesis for Predicting Probabilities-Minimum Description Length Principle-Bayes Optimal Classifier-Gibbs

Algorithm-Naïve Bayes Classifier-An Example: Learning to Classify Text-Bayesian Belief Networks-The EM Algorithm.

Unit IV **(12 hours)**

Instance-Based Learning: Introduction-K-Nearest Neighbor Learning-Locally Weighted Regression-Radial Basis Functions-Case-based Reasoning - Genetic Algorithms: Genetic Algorithms-An Illustrative Example-Hypothesis Space Search-Genetic programming-Models of Evolution and Learning-Parallelizing Genetic Algorithms.

Unit V **(12 hours)**

Learning Sets of Rules: Introduction-Sequential Covering Algorithms-Learning Rule Sets: Summary-Learning First-Order Rules-Learning Sets of First-Order Rules: FOIL - Induction as Inverted Deduction-Inverting Resolution - Reinforcement Learning: Introduction- Learning Task-Q Learning-Nondeterministic Rewards and Actions-Temporal Difference Learning-Generalizing from Examples-Relationship to Dynamic Programming.

Unit V1

Case Studies: Google's DeepMind: Diabetic Retinopathy Detection- PayPal: Fraud Detection- Personalized Recommendations- Predictive Maintenance- Autonomous Driving- Viewing Predictions- Crop and Soil Health Monitoring- Anomaly Detection- Network Optimization- Load Forecasting- Real Estate Price Estimation- Music Recommendation Engine

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the need for machine learning for various problem solving

CO2: Demonstrate Decision Tree Learning Algorithm, Back propagation algorithm, Gibbs Algorithm, K-Nearest Neighbor Learning and Temporal Difference Learning with examples

CO3: Categorize the various supervised, semi-supervised and unsupervised learning algorithms in machine learning

CO4: Apply different classification techniques in real time examples

CO5: Design appropriate machine learning algorithms for different problems

Text Book:

1. Tom M. Mitchell, *Machine Learning*, Tata McGraw Hill, 2017.

Reference Books:

1. Jeremy Watt, Reza Borhani, Aggelos K Katsaggelos, *Machine Learning Refined Foundations, Algorithms & Applications*, Cambridge University Press, , 2016.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press Cambridge, 2010.
3. Andreas C. Muller and Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, First Edition, 2016.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E -Resources:

1. https://nptel.ac.in/courses/106/106/106106139/
2. https://onlinecourses.nptel.ac.in/noc22_cs58/preview

Machine Learning Lab

Hours/week: 2

Course Objectives:

1. To introduce the fundamental concepts and techniques of Machine Learning, emphasizing its necessity and applications
2. To apply Machine Learning to learn, predict and classify the real-world problems in the Supervised Learning paradigms

List of Programs:

1. Develop a python program to Implement k-nearest neighbors classification using python
2. Develop a python program to implement linear regression using python.
3. Extract the data from database using python
4. Implementation of Python Libraries for ML application such as Pandas and Matplotlib.
   a) Create a Series using pandas and display
   b) Access the index and the values of our Series
   c) Compare an array using Numpy with a series using pandas
5. Develop a Python program to implement Simple Linear Regression for iris using sklearn and plot the confusion matrix and graph.
6. Develop a python program to implement Support Vector Machine for a dataset and compare the accuracy by applying the following kernel functions:
   i. Linear
   ii. Polynomial
   iii. RBF
8. Develop a python program to implement Naïve Bayes theorem to classify the English text.
9. Develop a python program to implement Decision Tree for a recent application
10. Develop a python program to implement K-Means clustering Algorithm
11. Develop a python program to demonstrate the significance of genetic algorithm
12. Develop a python program to implement Ensemble models for a recent application
13. Develop a python program to implement Bayesian learning

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basic concepts and techniques of Machine Learning
CO2: Apply Machine Learning to learn, predict and classify the real-world problems
CO3: Illustrate the concept of Reinforcement Learning and Ensemble Methods
CO4: Evaluate modern notions in data analysis-oriented computing;
CO5: Outline predictions using machine learning algorithms

Note: Questions for the internal/external examination will be based on the concepts learnt

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	3	1	9	3	9	9	9	1	80
CO2	9	9	9	9	3	1	9	3	9	9	9	1	80
CO3	9	9	9	9	3	1	9	3	9	9	9	1	80
CO4	9	9	9	9	3	1	9	3	9	9	9	1	80
CO5	9	9	9	9	3	1	9	3	9	9	9	1	80
Total	45	45	45	45	15	5	45	15	45	45	45	5	400

Low-1 Medium-3 High-9

Core XIII - Software Development Framework Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 5**
Subject Code: JMCAC33P **Credit: 4**

Course Objectives:

1. To introduce to .Net IDE Component Framework and programming concepts in .Net Framework
2. To create website using ASP.Net Controls

List of Programs Console Application

1. Develop a program to calculate the area of a floor given its length and width
2. Develop a program to calculate the factorial of a number N, assuming the number is more than zero
3. Develop a program to check the given numbers (prime, perfect, Armstrong etc.)
4. Develop a program to generate the numbers (prime, perfect, Armstrong etc.)
5. Develop a program to calculate age for a person using properties
6. Develop a program to sort a given list of numbers and find out the average of a list of numbers.
7. Develop a program to display how many days are in a given month(check for leap years also)

Windows Application

8. Develop a program to build a simple calculator
9. Develop a program to calculate the arithmetic operations using functions
10. Develop a program to do String manipulation
11. Write a function that will return a approximate count of the number of words in a string

Web Application

12. Develop a program to design an E-mail application form using standard controls and store these details in SQL tables
13. Develop a program to create a login page and personal webpage. Enter the username and password in the login page. If the username and password are correct, the personal web page should be loaded otherwise the error page should be loaded.
14. Develop a program to create a student details form and validate the details using validation

controls

15. Develop a program to display employee details using data grid control
16. Develop a program to display an Electricity bill using data list control

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build console applications
CO2: Perform Windows and web Applications
CO3: Demonstrate validation controls in web form
CO4: Illustrate Data Grid control to database in Web application
CO5: Compose Datalist Controls to database in Web Application.

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	1	3	3	3	1	54
CO2	9	9	9	3	3	1	9	1	3	3	3	1	54
CO3	9	9	9	3	3	1	9	1	3	3	3	1	54
CO4	9	9	9	3	3	1	9	1	9	9	9	1	72
CO5	9	9	9	3	9	1	9	1	9	9	9	1	78
Total	45	45	45	15	21	5	45	5	27	27	27	5	312

Low-1 Medium-3 High-9

Core XIV - Artificial Intelligence Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 4**
Subject Code: JMCAC34P **Credit: 3**

Course Objectives:

1. To understand the basic concept and foundational knowledge of AI
2. To apply learned concepts to solve problems and analyze solutions

List of Programs:

1. Write a program for implementation of python basic libraries such as math, numpy and scipy
2. Write a program for implementation of python libraries for ml application such as pandas and matplotlib
3. Write a program for creating and loading different datasets in python.
4. Write a python program to compute mean, median, mode, variance and standard deviation using datasets
5. Write a program to implement simple linear regression and plot the graph
6. Write a program to implement breadth first search.
7. Write a program to implement depth first search
8. Implementation of find S algorithm
9. Implementation of Candidate Elimination algorithm

10. Write a program to implement hill climbing algorithm
11. Write a program to implement A* algorithm
12. Write a program to implement Tic-Tac-Toe game

Note: Questions for the internal examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Foundational knowledge, understanding basic concepts.
CO2: Applying learned concepts, solving problems, analyzing solutions.
CO3: Evaluating algorithms, proposing improvements, synthesizing knowledge for complex solutions.
CO4 : Optimizing and designing algorithms and solutions for real-world applications.
CO5 : Innovating, researching, and contributing new methods to the field.

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	3	9	3	9	9	9	1	9	9	9	1	**80**
CO2	9	9	9	9	9	9	9	1	9	9	9	1	**92**
CO3	9	9	9	9	9	9	9	1	9	3	9	1	**86**
CO4	9	9	9	9	9	9	9	1	9	9	9	1	**92**
CO5	9	9	9	9	9	9	9	1	9	9	9	1	**92**
Total	**45**	**39**	**45**	**39**	**45**	**45**	**45**	**5**	**45**	**39**	**45**	**5**	**442**

Low-1 Medium-3 High-9

DSE III - a) Artificial Intelligence and Expert Systems

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 5**
Subject Code: JMCAE3A **Credit: 4**

Course Objectives:
1. To describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions and AI techniques for knowledge representation, planning and uncertainty Management
2. To develop knowledge of decision making and learning methods and explain the concept of Knowledge Representation

Unit I **(15 hours)**
Introduction to Artificial Intelligence-Intelligent Agents, Approaches in Artificial Intelligence, Definitions of Artificial Intelligence, AI problems, Features of AI Programs, Importance of AI, Advantages and Disadvantages of AI.

Unit II **(15 hours)**

Applications of Artificial Intelligence- Finance, Hospitals and Medicine, Robotics, Expert systems, Diagnosis, Pattern Recognition, Natural Language Processing, Game Playing, Image Processing, Data mining, Big Data Mining. Introduction to the state space search- State space search, search techniques, Types of searching techniques.

Unit III **(15 hours)**

Heuristic Search Strategies-Types of Heuristic Search techniques, Hill Climbing Search, Simulated Annealing search, A* Algorithm, AND-OR Graphs, Properties of the Heuristic Search Algorithm, Adversary Search, The MINIMAX Algorithm.

Unit IV **(15 hours)**

Expert Systems-Definitions of Expert Systems, Features of Good Expert systems, Architecture and Components of Expert systems, Roles of the Individuals who interact with the system, Advantages of Expert systems, Disadvantages of Expert Systems.

Unit V **(15 hours)**

Knowledge Representation-Definitions of Knowledge Representation, Characteristics of Good Knowledge Representation, Basics of Knowledge representation, Properties of the Symbolic representation of knowledge, Properties of the Good knowledge representation systems, Categories of knowledge representation schemes, types of knowledge representation schemes.

UnitVI **Case**

Study: Approaches in Artificial Intelligence - Introduction to State Space Search & Search Techniques - Heuristic Search Strategies in Artificial Intelligence - Expert Systems in Real-World Applications - Knowledge Representation in Artificial Intelligence

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Illustrate knowledge on Artificial Knowledge concepts
CO2: Apply all searching algorithms and Hill-climbing procedures
CO3: Analyze their gaming skills and learn about Expert system
CO4: Evaluate the learners for aspiring careers in the field of Artificial Intelligence
CO5: Develop the game playing and planning of expert systems

Text Book:

1. I.Gupta, G.Nagpal, Artificial Intelligence and Expert Systems, Laxmi Publications, 2018.

Reference Books:

1. V.S. Jankiraman, Foundations of Artificial Intelligence and Expert Systems, Laxmi Publications, 2017.
2. Joseph C.Giarratano, Gary D.Riley, Expert Systems: Principles and Programming, Brooks/Cole Publications, Fourth Edition, 2018.
3. Lavika Goel, Artificial Intelligence: Concepts and Applications, Wiley India Private Limited, 2015.

Journals:

1. ICTACT Journal on Image and Video Processing (UGC)
2. Info Communication Journal (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://nptel.ac.in/courses/112/103/112103280/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	3	3	1	3	1	66
CO2	9	9	9	9	9	1	9	3	3	1	3	1	66
CO3	9	9	9	9	9	1	9	3	3	1	3	1	66
CO4	9	9	9	9	9	1	9	3	3	1	3	1	66
CO5	9	9	9	9	9	1	9	3	3	1	3	1	66
Total	45	45	45	45	45	5	45	15	15	5	15	5	330

Low-1 Medium-3 High-9

DSE III – b) Digital Image Processing

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 5**
Subject Code: JMCAE3B **Credit: 4**

Course Objectives:

1.To explain the fundamentals of digital image and its processing
2.To perform image enhancement techniques in spatial and frequency domain, apply the concept of image segmentation and describe object detection and recognition techniques

Unit I **(15 hours)**

Introduction: Digital Image Processing-The Origins of Digital Image Processing- Examples of Fields that Use Digital Image Processing- Fundamental Steps in Digital Image Processing - Components of an Image Processing System. **Digital Image Fundamentals:** Elements of Visual Perception- Image Sensing and Acquisition - Image Sampling and Quantization -Introduction to the Basic Mathematical Tools Used in Digital Image Processing.

Unit II **(15 hours)**

Intensity Transformations and Spatial Filtering: Background Filtering: Background - Some Basic Intensity Transformation Functions -Histogram Processing- Fundamentals of Spatial Filtering - Smoothing (Lowpass) Spatial Filters-Sharpening (Highpass) Spatial Filters-High Pass, Bandreject, and Bandpass Filters from Lowpass Filters -Combining Spatial Enhancement Methods.

Unit III **(15 hours)**

Filtering in the Frequency Domain: Background - Preliminary Concepts - Sampling and the Fourier Transform of Sampled Functions The Discrete Fourier Transform of One Variable - Extensions to Functions of Two Variables - Image Smoothing Using Low Pass Frequency Domain Filters - Image Sharpening Using High Pass Filters - Selective Filtering- The Fast Fourier Transform.

Unit IV **(15 hours)**

Image Restoration and Reconstruction: Noise Models - Wavelet and Other Image Transforms Matrix-based transforms- Fourier-Related Transforms- Wavelet Transforms. **Color Image Processing:** Color Models-Basics of Full-Color Image Processing-Color Transformations-Color Image Smoothing and Sharpening-Using Color in Image Segmentation-Noise in Color Images- Color Image Compression.

Unit V **(15 hours)**

Morphological Image Processing: Erosion and Dilation-Opening and Closing-The Hit-or-Miss Transform-Some Basic Morphological Algorithms. Image Segmentation: Edge Detection, Thresholding, and Region Detection: Thresholding - Segmentation by Region Growing and by Region Splitting and Merging-Region Segmentation Using Clustering and Super pixels-Region Segmentation Using Graph Cut. Image Pattern Classification: Optimum (Bayes) Statistical Classifiers-Neural Networks and Deep Learning

Unit VI

Case Studies: Image Enhancement Using Intensity Transformations and Spatial Filtering- Image Enhancement Using Frequency Domain Filtering- Image Restoration with Noise Removal- Color Image Processing for Object Recognition- Morphological Image Processing for Shape Analysis-Image Segmentation for Object Detection in Autonomous Vehicles.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the origins, components, elements of visual perception, basic intensity, transformation, discrete Fourier transform, color models, noise models and morphological algorithms of image processing.

CO2: Apply fundamental steps, smoothing, sharpening, segmentation and classification to the image.

CO3: Analyze relationship between pixels, mathematical tools, fuzzy techniques, filters, wavelet transforms, region grouping, splitting and merging.

CO4: Determine histogram, the color image compression.

CO5: Solve noise for color image**.**

Text Book:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson Education, Fourth Edition, 2018.

Reference Books:

1. B.Chanda, D.Dutta Majumder, Digital Image Processing and Analysis, Prentice Hall of India, 2003.
2. Nick Efford, Digital Image Processing a practical Introducing using Java, Pearson Education, 2004.

Journals:

1. ICTACT Journal on Image and Video Processing (UGC)
2. Info Communication Journal (Scopus)

E-Resources:

1. https://www.tutorialspoint.com/dip/index.htm
2. https://onlinecourses.nptel.ac.in/noc 19_ee55/preview
3. https://www.edx.org/learn/image-processing

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	3	3	1	3	1	66
CO2	9	9	9	9	9	1	9	3	3	1	3	1	66
CO3	9	9	9	9	9	1	9	3	3	1	3	1	66
CO4	9	9	9	9	9	1	9	3	3	1	3	1	66
CO5	9	9	9	9	9	1	9	3	3	1	3	1	66
Total	45	45	45	45	45	5	45	15	15	5	15	5	330

Low-1 Medium-3 High-9

DSE III – c) Organizational Behaviour

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 5**
Subject Code: JMCAE3C **Credit:4**

Course Objectives:

1. To identify the various leadership styles and the role of leaders in a decision-making process and processes used in developing communication and resolving conflicts.
2. To discuss the development of the field of organizational behaviour and explain the micro and macro approaches and development of the field of organizational behaviour and explain the micro and macro approaches.

Unit I **(15 hours)**

Organizational Behaviour: Introduction - Explaining organizational behaviour - Research and practice: evidence-based management - Human resource management **Environment:** Analysing the organization's environment - PESTLE - Ethical behaviour - Business ethics and corporate social responsibility.

Unit II **(15 hours)**

Individuals in the organization: **Learning**: The learning process - The behaviour rist approach to learning - The cognitive approach to learning - Behaviour modification versus socialization. **Communication:** Interpersonal communication - Verbal communication - Non-verbal

communication - Cultural differences in communication style - Impression management -Emotional intelligence - Organizational communication.

Unit III **(15 hours)**

Motivation: Nature and Importance - Content theories - Process theories - The social process of motivating others - Engagement and high performance. **Groups and teams in the organization: Group formation:** Groups in organizations - Definitions of groups - Types of group tasks - Group-oriented view of organizations - Formal and informal groups - Group formation - Group development - Groups and teams.

Unit IV **(15 hours)**

Foundation of Individual Behaviour: Introduction - The Individual and Individual Differences – Human Behaviour and its Causation – **Personality:** Concept of Personality – Determinants of Personality – Types of Personalities – Theories of Personality – Personality Development – Influences of Personality in Organisational Behaviour.

Unit V **(15 hours)**

Leadership: Leadership and management – Theories of leadership-Trait Theory-Behavioural Theory-Contingency Theory-**Decision-making:** Models of decision-making - Decision conditions: risk and programmability - Group decision-making - Problems with group decision making - Organizational decision making.

Unit VI

Case Studies: Navigating Organizational Change: A Global Tech Company's Approach to Evidence-Based Management, Ethics, and CSR- Enhancing Organizational Performance through Learning, Communication, and Emotional Intelligence- Boosting Motivation and Team Performance in a High-Growth Startup - Understanding the Impact of Personality on Employee Behavior and Organizational Dynamics in a Global Consulting Firm - Leadership and Decision-Making in a Fast-Paced Technology Firm: Navigating Complex Challenges and Opportunities.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the development of the field of organizational behaviour and explain the micro and macro approaches.

CO2: Demonstrate the applicability of analysing the complexities associated with management of individual behaviour in the organization and how the organizational behaviour can integrate in understanding the motivation (why) behind behaviour of people in the organization.

CO3: Analyse and compare different models used to explain individual behaviour related to motivation and rewards and the complexities associated with management of the group behaviour in the organization.

CO4: Evaluate the applicability of the concept of organizational behaviour to understand the behaviour of people in the organization.

CO5: Formulate the various leadership styles and the role of leaders in a decision-making process.

Text Books:

1. David A. Buchanan, Andrzej A. Huczynski, Organizational Behaviour, Pearson Education, Ninth Edition, 2017.
2. S. S. Khanka, Organisational Behaviour Text and Cases, S Chand Ltd, New Delhi 2021.

Reference Books:

1. Mustafa**,** Organisational Behaviour, Global Professional Publishing Ltd, Second Edition, 2013.
2. L M Prasad, Organizational Behavior, Sultan Chand & Sons, Fifth Edition, 2011.
3. K Aswathappa, Organizational Behavior**,** Himalaya Publishing House, Tenth Edition, 2012.
4. Mirza S Saiyadain, Organizational Behavior**,** Tata McGraw Hill, Ninth Edition, 2010.

Journal:

1. Journal of Organizations and Human Behavior

E - Resources:

1. https://nptel.ac.in/courses/110/106/110106145/
2. https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	3	1	9	3	9	9	9	1	80
CO2	9	9	9	9	3	1	9	3	9	9	9	1	80
CO3	9	9	9	9	3	1	9	3	9	9	9	1	80
CO4	9	9	9	9	3	1	9	3	9	9	9	1	80
CO5	9	9	9	9	3	1	9	3	9	9	9	1	80
Total	45	45	45	45	15	5	45	15	45	45	45	5	400

Low-1 Medium-3 High-9

DSE IV – a) Theory of Computation

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 5**
Subject Code: JMCAE4D **Credit: 4**

Course Objectives:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages and regular grammars, context frees grammar
2. To illustrate finite state machines to solve problems in computing and explain the hierarchy of problems arising in the computer sciences

Unit I **(15 hours)**

Automata Fundamentals: Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata withEpsilon Transitions.

Unit II **(15 hours)**

Regular expressions and languages: Regular Expressions – FA and Regular Expressions – Proving Languages notto be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

Unit III **(15 hours)**

Context Free Grammar and Languages: CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

Unit IV **(15 hours)**

Properties of Context Free Languages : Normal Forms for CFG – Pumping Lemma for CFL – ClosureProperties of CFL – Turing Machines – Programming Techniques for TM.

Unit V **(15 hours)**

Undecidability: Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

Unit VI

Case Studies: Text Processing: Finite Automata (FA) are used in text processing, pattern matching, and lexical analysis. Pattern Matching: Regular expressions are widely used in programming languages for string manipulation and pattern matching. Data Validation: Regular expressions help validate input data formats, such as email addresses or phone numbers. Syntax Analysis: Normal forms for CFGs and pumping lemmas help analyze the syntax of programming languages.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the language hierarchy, Turing machines and their capability and undecidable problems and NP class problems

CO2: Apply the theoretical foundations of computer science from the perspective of formal languages

CO3: Illustrate finite state machines to solve problems in computing and various problems of applying normal form techniques push down automata and Turing Machines

CO4: Evaluate automata for any given pattern and find its equivalent regular expressions and construct context free grammar for various languages

CO5: Design a context free grammar for any given language and design Finite Automata's fordifferent regular expressions and languages

Text Book:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, *Introduction to Automata TheoryLanguages and Computation,* Pearson Education, Third Edition, 2007.

Reference Books:

1. K. L. P Mishra, N. Chandrashekaran, *Theory of Computer Science-Automata Languages and Computation,* Second edition, 2003.
2. H.R.Lewis and C.H.Papadimitriou, *Elements of the theory of Computation,* Prentice Hall of India, Second Edition, 2003.

3. J.Martin, *Introduction to Languages and the Theory of Computation*, Tata McGraw Hill, Third Edition, 2003.
4. Micheal Sipser, *Introduction of the Theory and Computation*, Thomson Brokecole, 1997.

Journals:
1. ICTACT Journal on Soft Computing (UGC)
2. Intl. Journal of Internet of Things and Information Technology

E-Resources:
1. https://nptel.ac.in/courses/106/104/106104148/
2. https://nptel.ac.in/courses/106/104/106104028/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	9	9	1	9	3	9	3	9	3	76
CO2	9	9	3	9	9	1	9	3	9	3	9	3	76
CO3	9	9	3	9	9	1	9	3	9	3	9	3	76
CO4	9	9	3	9	9	1	9	3	9	3	9	3	76
CO5	9	9	3	9	9	1	9	3	9	3	9	3	76
Total	45	45	15	45	45	5	45	15	45	15	45	15	380

Low-1 Medium-3 High-9

DSE IV – b) Open Source Technologies

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 5**
Subject Code: JMCAE3E **Credit: 4**

Course Objectives:
1. To expose students to free open-source software environment and introduce them to use open source packages
2. Implement various applications using build systems and understand the installation of various packages in open source operating systems

Unit I **(15 hours)**

PHP- Introduction-What is PHP-Why use PHP and MYSQL-PHP strengths-Key features of PHP-**Using PHP**-Accessing PHP-Creating sample application- Embedding PHP in HML -Accessing form variables-Understanding identifiers- Examining Variable types- Using Operators-Making Decisions with conditionals-Repeating actions through iteration.

Unit II **(15 hours)**

Storing and Retrieving- Data-Processing files-Opening a file-Writing to a file-Closing a file-Reading from a file-Using other file functions-**Using arrays**-What is an array-Numerically indexed arrays-Arrays with different indices-array operators-multidimensional array-sorting array-String

manipulation and regular expressions.

Unit III **(15 hours)**

MYSQL- SQL-Inserting Data into the Database-Retrieving Data from the Database-Updating Records in the Database-Altering Tables after creation-Deleting Records from the Database-Dropping Tables-Dropping a Whole Database-Accessing your MYSQL database from the web with PHP-Querying a database from the web-putting new information in the database-Using other PHP database interfaces..

Unit IV **(15 hours)**

PYTHON-Introduction-Algebra with Variables-variables, complex quantities, common functions with numbers, logical operators, strings and printing. Simple programs-basic program structure, flowchart, conditional operations, iterative routines. Functions and Modules-Functions-Recursion, Nested functions, Nested scope, Modules-Built-in modules, math's module.

Unit V **(15 hours)**

Sequences and Operations with Sequences-String, tuple, list, dictionary, set, operators with sequences, iterator, iterator functions, input. Classes and Objects- classes, functions with attributes, overloading, inheritance, execution from command line.

Unit VI

Case Studies: Dynamic Web Application Development- PHP File Handling and Array Management- Data Processing and Automation in python- Advanced MySQL Database Interaction with PHP- Python Object-Oriented Programming and Web Scraping- Real-Time Data with PHP and Python- Database Optimization and Security

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Demonstrate install and run Linux operating system
CO2: Apply the MYSQL database concepts
CO3: Develop website and control using PHP and MYSQL
CO4: Explain Install open source web technologies MySQL and PHP
CO5: Illustrate the Python software making process

Text Book:

1. Luke Welling, Laura Thomson, PHP and MYSQL Web Development, Pearson Education, Fifth Edition, 2017.
2. T.R. Padmanabhan, Programming with Python, Springer Nature, 2016.

Reference Books:

1. James Lee and Brent Ware, Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, Dorling Kindersley Private Limited, 2008.
2. Eric S. Raymond, Michael Tiemann, Open Sources: Voices from the Open Source Revolution, O'Reilly, 1999.
3. Steve Holzner, PHP: The Complete Reference, Tata McGraw Hill, Second Edition, 2009

Journals:

1. ICTACT Journal on Soft Computing (UGC)
2. Intl. Journal of Internet of Things and Information Technology

E-Resources:

1. http://www.openresources.com/documents/open-resources/
2. http://www.alexsoft.com/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	1	3	9	3	9	3	9	9	3	9	**76**
CO2	9	9	3	9	3	9	9	9	3	9	9	3	**84**
CO3	9	9	9	3	9	3	3	9	9	1	3	9	**76**
CO4	9	1	3	9	3	9	1	3	9	3	9	9	**68**
CO5	3	9	3	9	9	3	3	3	9	9	9	3	**72**
Total	**39**	**37**	**19**	**33**	**33**	**27**	**25**	**27**	**39**	**31**	**33**	**33**	**376**

Low-1 Medium-3 High-9

DSE IV – c) Internet of Things

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 5**
Subject Code: JMCAE3F **Credit: 4**

Course Objectives:

1. To understand the application areas of IoT, building blocks of Internet of Things and characteristics
2. To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

Unit I **(15 hours)**

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT Reference Architecture - IoT Functional Architecture - IoT levels and deployment templates – **Application domains of IoT**: Home automation – Cities – Energy – Industry – Agriculture – Transportation - Health care & Lifestyle.

Unit II **(15 hours)**

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT- IoT System Management with NETCONF-YANG- Need for IoT Systems Management- SNMP- Network Operator Requirements-NETCONF- YANG- IoT Systems Management with NETCONF-YANG.

Unit III **(15 hours)**

IOT Platforms Design Methodology: Step 1 to Step 10- Case Study on IoT System for Weather Monitoring- Motivation for Using Python- IoT Systems Logical Design using Python- Introduction-

Installing Python- Python Data Types and Data Structures-Control Flow-Functions- Modules-Packages-File Handling-Date/Time Operations- Classes- Python Packages of Internet for IoT.

Unit IV **(15 hours)**

IoT Physical Devices and Endpoints: What is an IoT Device- Exemplary Device: Raspberry Pi-About the board-Linux and Raspberry Pi- Raspberry Pi Interfaces- Programming Raspberry Pi with Python- Other IoT Devices.

Unit V **(15 hours)**

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API – WAMP-AutoBahn for IoT-Xively Cloud for IoT-Python Web Application Framework-Django-Designing a RESTful Web API-Amazon Web Services for IoT-Home Automation-Cities-Environment.

Unit VI

Case Studies: IoT for Disaster Management & Early Warning Systems - IoT for Sustainable Water Use - M2M-Enabled Remote Surgeries & Smart Hospitals - IoT-Enabled Satellite Communication - IoT Platform for Metaverse and Digital Twins - Cyber-Resilient IoT Platform for Critical Defense & Military Applications - Next-Gen IoT Smart Locks with Quantum Cryptography

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the importance of smart objects and smart environment

CO2: Define IoT and M2M

CO3: Create IoT platforms using design methodology

CO4: Perform Wi-Fi data communications, remote data storage in cloud, and handle the data using web applications

CO5: Develop potential problems and solutions using IoT

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

Reference Books:

1. Charles Platt, *Make Electronics – Learning by Discovery*, O'Reilly Media, 2015.
2. Michael Miller, *The Internet of Things*, Pearson Education, 2015.

Journals:

1. ICTACT Journal on Soft Computing (UGC)
2. Intl. Journal of Internet of Things and Information Technology

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://www.classcentral.com/course/swayam-introduction-to-internet-of-things-10093

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	1	3	1	1	58
CO2	9	9	9	3	3	1	9	9	3	3	1	1	60
CO3	9	9	9	3	3	1	9	9	3	3	1	1	60
CO4	9	9	9	3	3	1	9	9	3	9	1	1	66
CO5	9	9	9	9	9	1	9	9	9	9	1	1	84
Total	45	45	45	21	21	5	45	45	19	27	5	5	328

Low-1 Medium-3 High-9

Core XV - Software Project Management

(For Students Admitted from 2025-26)

Semester: IV **Hours/Week: 5**
Subject Code: JMCAC41 **Credit: 5**

Course Objectives:

1. To identify the different project contexts and suggest an appropriate management strategy and key phases of project management.
2. To determine an appropriate project management approach through an evaluation of the business context and scope of the project and role of professional ethics in successful software development.

Unit I **(15 hours)**

Introduction to Software Project Management: Introduction – Plans, Methods and Methodologies – Setting Objectives – Project Success and Failure – Management Control – Traditional versus Modern Project Management Practices. **Project Evaluation and Programme Management:** Project portfolio Management – Evaluation of Individual Projects – Programme Management.

Unit II **(15 hours)**

An overview of Project Planning: Stepwise Project Planning - **Selection of an Appropriate Project Approach:** Software Processes and Process Models - Choice of Process models - Structure versus speed of Delivery - Waterfall Model - The Spiral Model - Software Prototyping.

Unit III **(15 hours)**

Activity Planning: Objectives of Activity planning - Project schedules - Sequencing and Scheduling Activities - Network Planning models. **Risk Management:** Risk - Categories of Risk – Risk identification – Risk Planning – Evaluating Risks to the Schedule – Applying the PERT technique.

Unit IV **(15 hours)**

Monitoring and Control: Creating the Framework – Collecting the Data – Review – Project Termination Review - Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Change control - Software Configuration Management.

Unit V **(15 hours)**

Agile Technique: The Agile Business Case-Objectives-Adding Value with the Business Case-Business Value Models-Models for the Business Case-Project Balance Sheet-Communicating with the Project Balance Sheet Tool.

Unit VI

Case Studies : Developing a Project Plan for a Real-World Software Development Project - Implementing Agile Methodologies for a Real-World Project - Creating a Risk Management Plan for a Real-World IT Infrastructure Project - Creating a Project Schedule and Budget for a Construction Project - Developing an Agile Project Plan for a Mobile App.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize Software Process Models

CO2: Illustrate the steps involved in Software Project Management and activity planning, Risk Management using case studies.

CO3: Apply Software effort Estimation Methods

CO4: Evaluate Software Project Management Tools

CO5: Design the Agile techniques in Software Project Management

Text Books:

1. Bob Hughes, Mike Cotterell, Rajib Mall, *Software Project Management*, Tata McGraw Hill, Fifth Edition, 2012.
2. John C.Goodpasture, PMP, *Project Management the Agile Way*, Second Edition, 2016.

Reference Books:

1. Robert K.Wysocki, *Effective Software Project Management*, Wiley Publication, 2011.
2. Walker Royce, *Software Project Management*, Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, *Managing Global Software Projects*, McGraw Hill Education, Fourteenth Reprint, 2013.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105218/
2. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	3	9	9	9	1	9	3	88
CO2	9	9	9	9	9	3	9	9	9	1	9	3	88
CO3	9	9	9	9	9	3	9	9	9	1	9	3	88
CO4	9	9	9	9	9	3	9	9	9	1	9	3	88

CO5	9	9	9	9	9	3	9	9	9	1	9	3	**88**
Total	**45**	**45**	**45**	**45**	**45**	**15**	**45**	**45**	**45**	**5**	**45**	**15**	**440**

Low-1 Medium-3 High-9

Core XVI – Deep Learning

(For Students Admitted from 2025-26)

Semester: IV **Hours/Week: 5**
Subject Code: JMCAC42 **Credit: 5**

Course Objectives:

1. To understand about the Deep learning, its principles and approaches
2. To learn about the Deep Learning algorithms and approaches.

Unit I **(15 hours)**

Neural Networks: Neural Networks Introduction to Neural Networks - Training a neural network: loss functions, backpropagation and stochastic gradient descent - Neural networks as universal function approximates

Unit II **(15 hours)**

Deep Neural Networks: Introduction to Deep Learning- A Probabilistic Theory of Deep Learning- Deep Forward Networks - Backpropagation and regularization, batch normalizationVC Dimension and Neural Nets-Deep Vs Shallow Networks.

Unit III **(15 hours)**

Convolutional Neural Networks: Introduction to Convolutional Neural Network - Architectures - AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

Unit IV **(15 hours)**

Recurrent Neural Networks and Deep unsupervised Learning : Recurrent networks, LSTM, GRU - Architectures, Autoencoders. Adversarial Generative Networks, DBM - Deep Reinforcement Learning.

Unit V **(15 hours)**

Sequence Analysis: Analyzing Variable-Length Inputs- tackling seq2seq with Neural N-Grams- Implementing Part-of- Speech Tagger- Unfolding Computation Graphs - Echo-State Networks- Long Short-Term Memory- Tensor flow Primitives for RNN models - Implementing Sentiment Analysis Model. **Applications of Deep Learning:** Deep Reinforcement Learning- Markov Decision Processes- Versus Exploit- Policy versus Value learning- Open AI Gym- Q-Learning and Deep Q-Networks-

Unit VI

Case Studies : Computer Vision- ImageNet- Detection- Face Recognition- Scene Understanding- Gathering Image Captions - Audio Wave Net - Natural Language Processing Word2Vec - Sentiment Analysis - Recent research.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Deep Learning algorithms and approaches

CO2: Implement Deep Learning algorithms to solve problems, which are almost impossible to handle via Traditional Approaches

CO3: Illustrate different types of Deep Neural Networks like CNN

CO4: Apply deep learning algorithms in real time problems

CO5: Develop applications such as NLP using Deep Learning Algorithms

Text Book:

1. Josh Patterson and Adam Gibson, *Deep Learning: A Practitioner's Approach*. O'Reilly, 2018.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, *Deep Learning*, MIT Press, 2016.

Reference Books:

1. Francois Chollet, *Deep Learning with Python*. O'Reilly. 2018.
2. Sandro Skansi, *Introduction to Deep Learning: From Logical Calculus to Artificial Intelligence*. Springer, 2018.
3. Antonio Gulli and Sujit Pal, *Deep Learning with Keras.* Packt, 2017.
4. Nikhil Buduma, *Fundamentals of Deep Learning*. O'Reilly, 2017.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2. https://nptel.ac.in/courses/106106184

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	3	3	3	9	1	1	3	1	1	46
CO2	9	9	3	3	3	3	9	1	1	3	1	1	46
CO3	9	9	3	3	3	3	9	1	1	3	1	3	48
CO4	9	9	9	9	3	3	9	1	1	3	1	3	90
CO5	9	9	9	9	3	9	9	1	3	3	1	9	74
Total	45	45	27	27	15	21	45	5	7	15	5	17	274

Low-1 Medium-3 High-9

Core XVII - Project

(For Students Admitted from 2025-26)

Semester: IV **Hours/Week: 18 (P-12, Lib -6)**

Subject Code: JMCAC43PW **Credit: 6**

Course Objectives:

1. To understand the fundamental principles of Project management and be familiar with the different methods and techniques used for project development
2. To get good knowledge of the issues and challenges faced while doing the project and to do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques

Students have to undergo an individual project work either on campus or in an industry and appear for the viva-voce examination with the software developed and document prepared by her

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders

CO2: Implement the plan by executing the code

CO3: Integrate the various aspects of software development for the total project

CO4: Construct the entire software project according to the specific problem

CO5: Check the software project by executing with the various data

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	9	9	9	9	9	9	9	108
CO2	9	3	9	3	9	9	3	3	9	3	9	9	78
CO3	9	9	9	9	9	3	9	3	9	3	9	9	90
CO4	9	9	3	9	9	3	3	9	9	9	9	9	90
CO5	9	9	3	3	9	9	9	9	9	9	9	9	96
Total	45	39	33	33	45	33	33	33	45	33	45	45	462

Low-1 Medium-3 High-9

Extra Credit IV – Document Preparation Lab (LATEX)

(For Students Admitted from 2025-26)

Semester: IV

Subject Code: JMCAX4P **Credit: 2**

Course Objectives:

1. To get practical knowledge on preparing documents containing mathematical formulas
2. To prepare a technical and scientific documentation

List of Programs

1. Create a document using an input file
2. Create a document using special symbols, dashes, line breaks & footnotes
3. Create a document using the sectioning command

4. Create a document using quotations, typestyle, commands & environments
5. Create a document using the mathematical symbol
6. Create a document using arrays and table
7. Create a document using a bibliography
8. Create a document using clauses and page style
9. Create a document using pictures and colors
10. Create a document using basics of the math index
11. Create a document using fine print and bibliography database
12. Create a document using math mode, tabbing environment, and files

Note: - Questions for the External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify bibliography database
CO2: Relate math mode, and fine print
CO3: Apply mathematical symbol to create the document
CO4: Select clauses, typestyle, commands, and page style
CO5: Create Latex documents

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	3	1	9	3	1	1	1	1	56
CO2	9	9	9	9	3	1	9	3	1	1	1	1	56
CO3	9	9	9	9	3	1	9	3	1	1	1	1	56
CO4	9	9	9	9	3	1	9	3	1	1	1	1	56
CO5	9	9	9	9	3	1	9	3	1	1	1	1	56
Total	45	45	45	45	15	5	45	15	5	5	5	5	280

Low- 1 Medium-3 High-9

M Sc INFORMATION TECHNOLOGY

(Two Years Regular Programme)
(For Students Admitted from 2025-26)

Program Specific Outcomes (PSO):

On Completion of this programme, the student will be able to

PSO1: Enrich the knowledge in the areas like Artificial Intelligence, Cloud Computing, Software Project Management, Machine Learning and core computing subjects

PSO2: Apply programming and technical skills to solve real life complex problems and hence enhance employability

PSO3: Design solutions for complex problems and design processes that meet the specific needs of the society

PSO4: Apply the knowledge of latest trends to carryout research & development in modern computing environment

PSO5: Apply learned skills to build optimized solution to latest technologies

PSO6: Function effectively as a team member or a leader to accomplish a common goal in a multidisciplinary team

PSO7: Engage in life-long learning, to remain up-to-date in their profession and obtain additional qualifications to enhance their career positions in IT industries

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core courses

- Added Unit VI with Applications and Case Studies topics as self-studies.
- Artificial Intelligence and Expert Systems course has been changed from Elective to Core paper from Semester I to Semester II and converted as a special course and reduced syllabus.
- Cryptography and Network Security course has been changed from Core to Elective paper and shifted from Semester II to Semester I.

Discipline Specific Elective

- Cloud and Distributed Computing and Internet of Things courses syllabus have been reduced.
- Compiler Design course has been changed from Semester III to Semester I.
- Internet of Things course has been changed from Semester I to Semester III.

PROGRAMME STRUCTURE – PROGRAM CODE: PIT

Sem	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ REG| NAT| GLO	CIA	ESE	Total Marks
I	JMITC11	Core I	# Data Analytics	6	5	EMP	GLO	25	75	100
	JMITC12	Core II	Open Source Technologies	6 (T-4 P-2)	5	SD	GLO	25 (T-15 P-10)	75	100
	JMITC13	Core III	Optimization Techniques	6	5	EMP	GLO	25	75	100
	JMITC14P	Core IV	Data Analytics Lab	6	5	SD	GLO	25	75	100
	JMITE1A JMITE1B	DSE I	a. Theory of Computation b. Cryptography and Network Security	6	5	EMP	GLO	25	75	100

	JMITX1/ JMITX1O	Extra Credit I	RDBMS Lab / * Online Course	-	2	SD	GLO	-	100	100
			Total	**30**	**25+2**			**125**	**375+ 100**	**500+ 100**
II	JMITC21	Core V	○ Advanced Java	6	5	SD	GLO	25	75	100
	JMITC22	Core VI	Data Structures and Algorithms	6	5	SD	GLO	25	75	100
	JMITC23	Core VII	Artificial Intelligence and Expert Systems	6 (T-4 P-2)	5	EMP	GLO	25 (T-15 P-10)	75	100
	JMITC24P	Core VIII	Advanced Java Lab	6	5	SD	GLO	25	75	100
	JMITE2A/ JMITE2B	DSE II	a. Probability and Applied Statistics b. Mobile Communications	6	5	EMP	GLO	25	75	100
	JMITX2I/ JMITX2O	Extra Credit II	#Internship / *Online Course	-	2	SD	GLO	-	100	100
			Total	**30**	**25+2**			**125**	**375+ 100**	**500+ 100**
III	JMITC31	Core IX	Software Project Management	6	5	EMP	GLO	25	75	100
	JMITC32	Core X	Software Development Framework	6	5	SD	GLO	25	75	100
	JMITC33	Core XI	Machine Learning	6 (T-4 P-2)	5	SD	GLO	25 (T-15 P-10)	75	100
	JMITC34P	Core XII	Software Development Framework Lab	6	5	SD	GLO	25	75	100
	JMITE3A/ JMITE3B	DSE III	a. Human Resource Management	6	4	EMP	GLO	25	75	100

			b. Internet of Things							
	JMESX3/ JMITX3O	Extra Credit III	Employability Skills / * Online Course	-	2	EMP	GLO	100	-	100
			Total	**30**	**24+2**			**125 +100**	**375**	**500+ 100**
IV	JMITC41	Core XIII	Cloud and Distributed Computing	6	5	EMP	GLO	25	75	100
	JMITC42	Core XIV	○Deep Learning	6	5	SD	GLO	25	75	100
	JMITC43PW	Core XV	Project	18 (P-12, Lib - 6)	6	EMP| SD	GLO	100	100	200
	JMITX4P/ JMITX4O	Extra Credit IV	Document Preparation Lab (LATEX) / *Online Course	-	2	SD	GLO	-	100	100
			Total	**30**	**16+2**			**150**	**250+ 100**	**400+ 100**
			Grand Total	**120**	**90+8**			**525+ 100**	**1375 + 300**	**1900 + 400**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX,
Spoken Tutorial, NPTEL or Coursera etc.
#For internship course, refer www.internshala.com or any online internship course.
- For online course integration, syllabus will be taken from spoken tutorial

@SD- Skill Development ENT-Entrepreneurship EMP-Employability
$ REG-Regional NAT-National GLO-Global

Core I - Data Analytics

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6**
Subject Code: JMITC11 **Credit:5**

Course Objectives:

1.To understand the Big Data Platform and its Use cases and Map Reduce Jobs

2.To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and Apply analytics on Structured, Unstructured Data

Unit I **(18 hours)**

Introduction to Big Data: Classification of Digital Data, Structured and Unstructured Data - Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Data Warehouse and Hadoop Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments - Top Analytics Tools

Unit II **(18 hours)**

Technology Landscape: NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop -Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem.

Unit III **(18 hours)**

MongoDB and Mapreduce programming: MongoDB: Why MongoDB - Terms used in RDBMS and MongoDB - Data Types - MongoDB Query Language Map Reduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

Unit IV **(18 hours)**

Hive and Pig : Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements –Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having - Hive User Defined Function - Serialization and Deserialization. **Pig:** Introduction -Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - PigRunning Pig - Execution Modes of Pig Relational Operators - Eval Function -Complex Data Types - Piggy Bank - - Parameter Substitution – Diagnostic Operator

Unit V **(18 hours)**

Introduction to Data Analytics with R- Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Machine Learning Algorithms: Regression Model, Clustering, Collaborative Filtering, Associate Rule Making, Decision Tree, Big Data Analytics with BigR.

Unit VI

Case Studies: Analyse real-time processing using Hadoop and advanced analytics tools.Traditional Business Intelligence versus Big Data-Compression to optimize real-time analytics- ETL workflows and enhance analytics efficiency- R for data analytics- Supervised learning for predictive Modelling and clustering.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Data sources, generations, data formats, Data Evolution, Data from various domains

CO2: Determine Big Data Characteristics, Frameworks, components and Limitation of traditional approaches and map Big Vs to Data Domains
CO3: Analyse various domains of Data Characteristics, Platform, Programming Model and Design Data Analytic ecosystem, and data processing framework
CO4: Evaluate the Concepts of Data Analytics Phases and Techniques
CO5: Formulate Data Analytics Techniques practically using R environment

Text Books:

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition,2015
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman , *Big Data for Dummies*, Wiley India Private Limited, 2014

Reference Books:

1. Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley, India Private Limited, 2015
2. Chris Eaton, Dirk deroos, Understanding *Big data*, McGraw Hill, 2012
3. Tom White, *HADOOP: The definitive Guide*, O Reilly, 2012
4. Tom Plunkett, Brian Macdonald, Oracle *Big Data Handbook*, Oracle Press, 2014
5. JyLiebowitz, *Big Data and Business analytics*, CRC press, 2013
6. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://nptel.ac.in/courses/110/106/110106072/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	3	9	**49**
CO2	9	9	9	1	9	3	9	**49**
CO3	9	9	9	1	9	3	9	**49**
CO4	9	9	9	1	9	3	9	**49**
CO5	9	9	9	1	9	3	9	**49**
Total	**45**	**45**	**45**	**5**	**45**	**15**	**45**	**245**

Low-1 Medium-3 High-9

Core II - Open Source Technologies

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6 (T: 4 P: 2)**

Subject Code: JMITC12 **Credit: 5**

Course Objectives:

1. To expose students to free open source software environment and introduce them to use open source packages
2. To implement various applications using build systems and understand the installation of various packages in open source operating systems

Unit I **(12 hours)**

PHP: Introduction-What is PHP-Why use PHP and MYSQL-PHP strengths-Key features of PHP-**Using PHP**-Accessing PHP-Creating sample application- Embedding PHP in HTMLAccessing form variables-Understanding identifiers- Examining Variable types- Using Operators-Making Decisions with conditionals-Repeating actions through iteration**.**

Unit II **(12 hours)**

Storing and Retrieving Data-Processing files-Opening a file-Writing to a file-Closing a fileReading from a file-Using other file functions-**Using arrays**-What is an array-Numerically indexed arrays-Arrays with different indices-array operators-multidimensional array-sorting array-String manipulation and regular expressions.

Unit III **(12 hours)**

Mysql: What is SQL-Inserting Data into the Database-Retrieving Data from the DatabaseUpdating Records in the Database-Altering Tables after creation-Deleting Records from the Database-Dropping Tables-Dropping a Whole Database-Accessing your MYSQL database from the web with PHP-Querying a database from the web-putting new information in the database-Using other PHP database interfaces.

Unit IV **(12 hours)**

Python: Introduction-Algebra with Variables-variables, complex quantities, common functions with numbers, logical operators, strings and printing. Simple programs-basic program structure, flowchart, conditional operations, iterative routines. Functions and Modules-Functions-Recursion, Nested functions, Nested scope, Modules-Built-in modules, maths module.

Unit V **(12 hours)**

Sequences and Operations with Sequences: String, tuple, list, dictionary, set, operators with sequences, iterator, iterator functions, input. Classes and Objects- classes, functions with attributes, overloading, inheritance, execution from command line.

Unit VI

Case Studies: Dynamic Web Application Development- PHP File Handling and Array Management-Data Processing and Automation in python- Advanced MySQL Database Interaction with PHP-Python Object-Oriented Programming and Web Scraping- Real-Time Data with PHP and Python-Database Optimization and Security.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate install and run Linux operating system
CO2: Apply the MYSQL database concepts
CO3: Develop website and control using PHP and MYSQL
CO4: Explain Install open source web technologies MySQL and PHP
CO5: Illustrate the Python software making process

Text Books:

1. Luke Welling, Laura Thomson, *PHP and MYSQL Web Development*, Pearson Education, Fifth Edition, 2016.
2. T.R. Padmanabhan, *Programming with Python*, Springer Nature, 2016.

Reference Books:

1. James Lee and Brent Ware, *Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP*, Dorling Kindersley, 2008.
2. Eric S. Raymond, Michael Tiemann, *Open Sources: Voices from the Open Source Revolution* , O'Reilly, 1999.
3. Martin C, *Brown, Perl: The Complete Reference*, Tata McGraw Hill, Second Edition, 2009.
4. Steve Holzner, *PHP: The Complete Reference*, Tata McGraw Hill, Second Edition, 2009.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/106/106106182/
2. https://nptel.ac.in/courses/106/105/106105182/

Open Source Technologies (Lab)

Hours/Week:2

Python:

Display Text

1. To display any given text message
2. To display Fibonacci series

Array

3. To count the number of vowel in the string

Function

4. To convert a date read from the user, given in DD/MM/YYYY format into written format. For example, Enter a date in DD/MM/YYYY Format: 16/7/2003 Output: 16 July, 2003
5. To print the contents of a file in uppercase using function

MySQL:

6. Create student database and display the data using Python
7. Create Employee database and display the employee salary data using Python

PHP:

8. To find Sum of digits of given number
9. To find factorial of a number
10. To display count, from 10 to 20 using loop
11. To check given number is prime number or not

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	1	3	9	3	9	43
CO2	9	9	3	9	3	9	9	51
CO3	9	9	9	3	9	3	3	45
CO4	9	1	3	9	3	9	1	35
CO5	3	9	3	9	9	3	3	39
Total	39	37	19	33	33	27	25	213

Low-1 Medium-3 High-9

Core III - Optimization Techniques

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6**
Subject Code: JMITC13 **Credit: 5**

Course Objectives:

1. To impart knowledge in concepts and tools of Operations Research and to understand mathematical models used in Operations Research
2. To apply these techniques constructively to make effective business decisions

Unit I **(18 hours)**

Basics of Operations Research: Development of OR – Definition-Characteristics-Scientific Method-Necessity of OR-Scope-OR and Decision-Making-Scope of OR in Management, Financial management-Applications of various OR Techniques-Objectives –Phases-ModelsClassification Schemes of Models-Role of Computers in OR – Difficulties in OR - Limitations of OR.

Linear Programing: Introduction-Requirements for a Linear Programming Problem - Assumptions in Linear Programming Models – Applications of LP method- Formulation of LPP-Advantages – Limitations – Graphical Method of Solutions .

Unit II **(18 hours)**

General LPP-Canonical and standard Forms of LPP-Theory of Simplex Method – Some Important Definitions –Analytical Method or Trial and Error Method – Simplex Method – Artificial Variables Techniques – Special cases in Simplex Method Applications – Solution of Simultaneous Equations by Simplex Method – Some Additional Points – Computational Efficiency of the Simplex Technique.

Unit III **(18 hours)**

Transportation Model: Introduction to the Model – Assumptions in Transportation Model Definition-Matrix Terminology- Formulation and Solution- Variants in Transportation Problems-Additional Problems-Least-Time Transportation Problems-Post Optimality Analysis in Transportations – Trans-Shipment Problem- Dual of the Transportation Problem.

Unit IV **(18 hours)**

Assignment Model: Definition of Assignment Model- Mathematical Representation- Comparison with the Transportation Model-Solution of Assignment Models -Hungarian Method for Solution of Assignment Problems- Formulation and Solution of Assignment Models -Variations -Additional Problems- Sensitivity Analysis in Assignment Problem- Travelling Salesman Problem.

Unit V **(18 hours)**

Advanced Topics in LP: Duality in LP - Dual Simplex Method -Revised Simplex Method Bounded Variable Problem.

Unit VI

Case Studies: Airline Scheduling and Crew Assignment- Network Traffic in Communication Systems- Cloud Resource Allocation–Puzzles and Games-Instruction Set Customization- Supply Chain Optimization Using Linear Programming- Energy Optimization in Smart Grids- Optimizing Marketing Campaigns Using A/B Testing and Multivariate Analysis

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain characteristics of Operational Research, Computational Efficiency of the Simplex Technique, Transportation Problems, Assignment problem and Duality

CO2: Apply Graphical, Simplex methods, Assignment Problem, Transportation Problem and Dual Simplex Method methods to get optimal solution for Linear Programming

CO3: Analyse the optimal solutions of different Linear Programming methods such as Graphical, Simplex method, Assignment Problem and Transportation Problem and Dual Simplex methods for making effective business decisions

CO4: Compare Solutions of as Graphical, Simplex and Dual Simplex method **CO5:**Generate dual of LPP and dual of Transportation Problem

Text Book:

1. Er. Prem Kumar Gupta, Dr D S Hira, *Operations Research*, S Chand Company, 2017.

Reference Books:

1. V.K.Kapoor, *Operations Research*, Sultan Chand & Sons Publishers, Fourth Edition, 2001.
2. Hamdy A.Taha, *Operations Research*, Prentice Hall of India Pvt Ltd, Seventh Edition, 2005.
3. J. K. Sharma, *Operations Research Theory and Applications*, Fifth Edition, Macmillan Publishers, 2013.
4. Kanti Swarup , P.K. Gupta and Man Mohan, *Operations Research*, Sultan Chand & Sons Publishers, Thirteenth Edition, 2004.

Journal:

1. Intl. Journal of Internet of Things and Information Technology

E-Resources:

1. https://nptel.ac.in/courses/110/106/110106062/
2. https://onlinecourses.swayam2.ac.in/cec20_ma10/preview

3. https://www.bbau.ac.in/dept/UIET/EMER601%20Operation%20Research%20Queuing%20theory.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	1	9	9	**49**
CO2	9	3	9	9	1	9	9	**49**
CO3	9	3	9	9	1	9	9	**49**
CO4	9	1	9	9	1	9	9	**47**
CO5	9	1	9	9	3	9	9	**49**
Total	**45**	**11**	**45**	**45**	**7**	**45**	**45**	**243**

Low-1 Medium-3 High-9

Core IV - Data Analytics Lab

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6**
Subject Code: JMITC14P **Credit: 5**

Course Objectives:

1. Able to identify datasets and explain how they are organized and manipulate data
2. Able to know how to transform the data into useful information and use functions for data

List of Programs

Using Spreadsheet

1. Perform Basic Functions in Spread sheets
2. Perform Formatting and Proofing
3. Implement Date and Time Functions
4. Implement Sorting & Filtering Techniques
5. To perform Data Validation
6. Display Pivot Tables
7. Display Charts and Slicers

Using R

8. Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
9. Get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
10. Perform K-Means clustering operation and visualize for iris data set **Using SciLab**
11. Develop a program to implement the basic matrix operations
12. Develop a program to find the Eigenvalues and eigenvectors

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Outline Excel functions to solve mathematical, text, date and time operations, R functions for numerical operations and Scilab functions for matrix operations
CO2: Demonstrate the concepts of sorting, filtering using Excel
CO3: Illustrate statistical operations using R
CO4 Evaluate the Regression and Clustering
CO5: Develop programs to solve equations by Gauss elimination, Gauss Jordan Method and Gauss Seidel

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	**45**	**9**	**45**	**15**	**5**	**45**	**45**	**209**

Low-1 Medium-3 High-9

DSE I - a) Theory of Computation

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6**
Subject Code: JMITE1A **Credit: 5**
Course Objectives:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages and regular grammars, context frees grammar
2. To illustrate finite state machines to solve problems in computing and explain the hierarchy of problems arising in the computer sciences

Unit I **(18 hours)**
Automata Fundamentals: Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata withEpsilon Transitions.

Unit II **(18 hours)**
Regular expressions and languages: Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

Unit III **(18 hours)**

Context Free Grammar and Languages: CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

Unit IV **(18 hours)**

Properties of Context Free Languages : Normal Forms for CFG – Pumping Lemma for CFL – ClosureProperties of CFL – Turing Machines – Programming Techniques for TM.

Unit V **(18 hours)**

Undecidability: Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

Unit VI

Case Studies: Text Processing: Finite Automata (FA) are used in text processing, pattern matching, and lexical analysis. Pattern Matching: Regular expressions are widely used in programming languages for string manipulation and pattern matching. Data Validation: Regular expressions help validate input data formats, such as email addresses or phone numbers. Syntax Analysis: Normal forms for CFGs and pumping lemmas help analyze the syntax of programming languages.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the language hierarchy, Turing machines and their capability and undecidable problems and NP class problems

CO2: Apply the theoretical foundations of computer science from the perspective of formal languages

CO3: Illustrate finite state machines to solve problems in computing and various problems of applying normal form techniques push down automata and Turing Machines

CO4: Evaluate automata for any given pattern, find its equivalent regular expressions, and construct context free grammar for various languages

CO5: Design a context free grammar for any given language and design Finite Automata's fordifferent regular expressions and languages

Text Book:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, *Introduction to Automata TheoryLanguages and Computation*, Pearson Education, Third Edition, 2007.

Reference Books:

1. K. L. P. Mishra, N. Chandrashekaran, *Theory of Computer Science-Automata Languages and Computation*, Second edition, 2003.
2. H.R.Lewis and C.H.Papadimitriou, *Elements of the theory of Computation*, Prentice Hall of India, Second Edition, 2003.
3. J.Martin, *Introduction to Languages and the Theory of Computation*, Tata McGraw Hill, Third Edition, 2003.
4. Micheal Sipser, *Introduction of the Theory and Computation*, Thomson Brokecole, 1997.

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104148/
2. https://nptel.ac.in/courses/106/104/106104028/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	9	9	9	9	**57**
CO2	9	3	3	3	3	3	3	**27**
CO3	9	9	3	3	3	9	3	**39**
CO4	9	3	3	3	3	9	3	**33**
CO5	3	3	3	3	3	3	3	**21**
Total	**39**	**27**	**15**	**21**	**21**	**33**	**21**	**177**

Low-1 Medium-3 High-9

DSE I - b) Cryptography and Network Security

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6**
Subject Code: JMITE1B **Credit: 5**

Course Objectives:

1. To understand the basics of Cryptography and Network Security and secure a message over insecure channel by various means
2. To learn about how to maintain the Confidentiality, Integrity and Availability of data and various protocols for network security to protect against the threats in the networks

Unit I **(18 hours)**

Computer and Network Security concept: Computer security concepts-The OSI security Architecture-Security Attacks- Security Services-Security Mechanisms. **Number Theory:** The Euclidean Algorithm-Modular Arithmetic - Fermat's Euler's Theorem.

Unit II **(18 hours)**

Symmetric Ciphers: Classical Encryption Techniques: Symmetric Chippers Model- Substitution Techniques-Transposition Techniques-Traditional Block Cipher Structure. **Finite Fields:** Groups-Rings-Fields-Finite Fields of the FormGF.

Unit III **(18 hours)**

Advanced Encryption Standard: Finite Field Arithmetic-AES Structure -AES Key Expansion.
Asymmetric Ciphers: The RSA Algorithm.

Unit IV

Other Public-Key Cryptosystem: Diffie-Hellman Key Exchange-Elgamal cryptographic system-Elliptic curve Cryptography. **Digital Signature:** Digital signature - Elgamal Digital Signature Scheme-Schnorr Digital Scheme-NIST Digital signature algorithm.

Unit V **(18 hours)**

Wireless Network Security: Wireless Security-Mobile Device Security- IEEE802.11 Wireless LAN Security. **Electronic Mail Security:** Internet Mail Architecture-Email FormatsEmail Threats and compressive Email Security-S/MIME -Domain Keys Identify Mail.

Unit VI

Case Studies : Analyze the security measures implemented by a major online banking system to protect against common security attacks - Design a secure login system for a web application using modular arithmetic and Fermat's Little Theorem - Investigate the security flaws in the Caesar Cipher and propose improvements using substitution and transposition techniques. Investigate the use of RSA in securing email communications, such as those used in Pretty Good Privacy (PGP) - Implement a digital signature scheme using the ElGamal algorithm and analyze its security.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Define various Cryptographic Techniques
CO2: Demonstrate various data encryption techniques
CO3: Explain the encryption standard and asymmetric ciphers
CO4: Analyze Hashing and Digital Signature techniques
CO5: Discuss various Security Applications

Text Book:

1. William Stallings, *Cryptography and Network Security Principles and Practice*, Pearson Education, Seventh Edition, 2017.

Reference Books:

1. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with Coding Theory*, Pearson Education, Second Edition, 2007.
2. William Stallings, *Cryptography and Network security Principles and Practices*, Pearson Education, Fourth Edition, 2006.
3. W.Mao, *Modern Cryptography – Theory and Practice*, Pearson Education, Second Edition, 2007.

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E- Resource:

1. https://nptel.ac.in/courses/106/105/106105162/

Course Outcomes	Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	3	9	**51**
CO3	3	9	3	9	9	3	9	**45**
CO4	9	9	3	3	9	3	9	**45**
CO5	9	9	3	9	9	3	9	**51**
Total	**39**	**45**	**15**	**33**	**45**	**15**	**45**	**237**

Low-1 Medium-3 High-9

Extra Credit I– RDBMS Lab

(For Students Admitted from 2025-26)

Semester: I
Subject Code: JMITX1 **Credit: 2**

Course Objectives:

1. The Students get practical knowledge on designing and creating Relational Database Management
2. To understand various advanced queries such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL

SQL DDL

1. Create an address table with fields name , doorno , street & city
   - Describe its structure
   - Alter the table to include pincode
   - Alter the table to modify street column
   - Drop the table

DML

2. Create a student table with regno, name, age and dept.
   - Insert records
   - Delete the students with age above 20
   - Truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - Find out the no. Of female employees
   - Find out the employees with age ranging between 30 and 35
   - List out the employees who are working more than 5 years
4. Create a library file with fields accno,title,author,cost & no of copies
   - Arrange the books according to accno
   - Find out the total no. Of books available in the library
   - Find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - Find out the eldest and youngest player
   - Group players according to sports

- List out the Indian players

6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno , clientname & phoneno Illustrate the set operators union , unionall, minus & intersect
12. Create a student table with fields' regno, name, English, Tamil, Maths and TOTAL
    - Insert records
    - Arrange all records according to total
    - Find the student who got first mark in maths
    - List out the students whose name starts with 'S'
13. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    - Insert records
    - Update the qnty when it goes less than reorderlevel
    - List the items with price less than 100
14. Create an employee table with fields ecode,ename,age & salary and create a department table with fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables

Constraints

15. Create a vendormaster table with fields vencode,venname,place and phoneno
16. Create an ordermaster table with fields item no, itemcode,vencode,qnty and orderdate . Illustrate the following constraints using the above tables
    - Vencode as primary key in vendormaster
    - Vencode as foreign key in ordermaster
    - Phoneno as unique
    - Place as notnull
    - Qnty > 100

Note: Questions for the external examinations will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build DDL, DML and TCL Commands
CO2: Make use of implementing constraints in tables
CO3: Apply to create block structure programming language
CO4: Create the concepts of functions
CO5: Develop the procedures, exceptions, triggers in PL/SQL block

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	9	9	3	9	**49**
CO2	9	9	3	9	3	9	1	**43**

CO3	3	9	9	3	9	3	3	**39**
CO4	9	1	3	9	3	9	1	**35**
CO5	9	9	9	9	9	3	3	**51**
Total	**39**	**37**	**25**	**39**	**33**	**27**	**17**	**217**

Low-1 Medium-3 High-9

Core V - Advanced Java

(For Students Admitted from 2025-26)

Semester: II **Hours/ Week: 6**
Subject code: JMITC21 **Credit: 5**

Course Objectives:

1. Learn networking and remote method invocation using Java API and Java Bean to increase the ability of students in web application development
2. Ability to develop programming knowledge to create dynamic web applications using server side technology with Java database connectivity

Unit I **(18 hours)**

JSP- JEEE- JSF- J2ME- Struts. **Networking with Java:** Basics of Networking - Sockets in Java - Client-Server in Networking - Proxy Servers - Internet Addressing - Domain Naming Service(DNS) - Inet4 Addresses and Inet6 Addresses - The URL Class - The URI Class - TCP/IP and Datagram - Java Net APIs – InetAddresses - InetAddress Caching - Creating and Using Sockets - Creating TCP Clients and Servers - A Whois Example - Submitting an HTML Form from Java - Handling URL- Using URLConnection Objects - Working With Datagrams - Datagram Server and Client.**Swing:** The Java Foundation Classes - Swing- Heavyweight versus Lightweight Components- Swing Features- Graphics Programming Using Panes- Model View Controller Architecture- Working With Swing- Preparing to Create a Swing Applet- Understanding Root Panes, Layered Pane and Content Panes- Creating a Swing Applet and Application – Closing JFrame Windows.

Unit II **(18 hours)**

Understanding RMI: Remote Method Invocation (RMI) - Client/Server Architecture - Implementing RMI - Limitation of RMI, A Model RMI Transaction -Writing an RMI Server - Designing a Remote Interface- Implementing a Remote Interface- Passing Object in RMI- Implementing the Server's Main Method- Creating a Client Program- Compiling and Running the Example – Exporting with Unicast Remote Object **Working with Java Beans:** What is Java Bean - Understanding Java Beans - Designing programs Using Java Beans - Creating Applets that Use Java Beans - Creating a Java Bean - Creating a Bean Manifest File and JAR File - Using a New Bean - Adding Controls to Beans - Giving a Bean Properties- Design Patterns for Properties- Simple Properties - Design Patterns for Events - Methods and Design Patterns - Giving a Bean Methods - Giving a Bean an Icon - The JavaBeans API.

Unit III **(18 hours)**

Talking to Database: JDBC- JDBC versus ODBC and Other APIs - Two- Tier and Three - Tier Models - Introducing SQL - The JDBC Package - Types of JDBC Drivers - Javasoft Framework-

Driver Interface and Driver Manager Class - The Essential JDBC Program- Using a Prepared Statement Object- The Interactive SQL Tool- Using Tables- Defining a Table Model **JDBC in Action:** Data Types and JDBC – Scrollable Result Sets - Batch Updates - Mapping Relational Data into Java Objects - Basic JDBC Types - Advanced JDBC data types.

Unit IV **(18 hours)**

Servlets: Architecture – Life cycle – First program – Client HTTP request – Server HTTP response – HTTP status code – Writing filters – Exception handling – Cookies handling – Session tracking – Database access – File uploading – Handling date – Servlets-page redirection – Sample program – Servlets-packaging.

Unit V **(18 hours)**

Java Server Pages: An Overview – Advantages of JSP – Architecture – JSP life cycle – JSP comments – JSP syntax – Implicit objects – Control-flow statements – Client-Server JSP – Database access – Custom tags – Exception handling – JSP standard tag library.

Unit VI

Case Studies: Creating a Simple Banking System- Library Management System- Student Management System- Library Management System - Bank Account System with Multithreading - Online Shopping System with Exception Handling-Using Servlets in a Web Application- Simple Calculator Application using AWT and Event Handling

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Explain the concepts of JSP, JEEE, JSF, J2ME, Struts, Swing, RMI, Java Bean and Servlet

CO2: Utilize the technique of swing and RMI to create various fields and invoke client/ server communication

CO3: Examine an implementation of networking with Java, RMI and Java Bean

CO4: Evaluate different types of JDBC drivers and connectivity

CO5: Design the web application using swing, servlet, JSP and database

Text Books:

1. DT Editorial Services, *Java 8 Programming Black Book*, Dreamtech Press, 2015.
2. B Prasanalakshmi *Advanced Java Programming*, CBS Publishers & Distributors d, 2015.

Reference Books:

1. Steven Holzner et al, *Java 2(JDK 5 Edition) Programming Black Book*, Dreamtech press, 2006.
2. Herbert Schildt, *Java: The Complete Reference*, Eleventh Edition, McGraw Hill, 2020.
3. James Gosling, David Holmes, Ken Arnold, *The Java Programming Language*, AddisonWesley Professional, Fourth Edition, 2005.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E - Resources:

1. Advanced Java, https://www.youtube.com/watch?v=Ae-r8hsbPUo

2. Java Programming, https://www.learnvern.com/course/advanced-java-tutorial

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

Core VI- Data Structures and Algorithms

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 6**
Subject Code: JMITC22 **Credit: 5**

Course Objectives:

1. To understand data structures and algorithms in computer science perspectives, algorithms analysis procedure, space and time complexity of various algorithms
2. To apply data structures and algorithms to solve real world problems

Unit I **(18 hours)**

Computational Complexity: Computer Architecture-Big oh Notation-other asymptotic notations for complexity of algorithms-More asymptotic notations. **Introduction:** History of Algorithm-Data structures and Algorithms-Data structure-Definition and Classification. **Stacks:** Introduction-stack Operation-Application. **Queues:** Introduction-Operation-circular Queues-Other Types of Queues-Application

Unit II **(18 hours)**

Linked Lists: Introduction-Singly Linked Lists-Circularly Linked List-Doubly Linked ListMultiply Linked List-Application. **Linked Stacks and Linked Queues:** IntroductionOperation on Linked Stacks and Linked Queues-Dynamic Memory Management and Linked Stacks-Implementation of Linked Representations-Applications. **Trees and Binary Tress:** Introduction-Trees: Definition and Basic Terminologies-Representation of Trees-Binary Tree Traversals-Threaded Binary Trees-Applications.

Unit III **(18 hours)**

Graphs: Introduction-Definitions and Basic Terminologies-Representations of Graphs-Graph Traversals-Single-source & All pairs shortest paths problem- Minimum cost spanning trees. **Binary Search Trees and AVL Trees:** introduction-Binary Search Trees: Definition and Operations-AVL Trees: Definition and Operations-Applications.

Unit IV **(18 hours)**

B Trees and Tries: Introduction to m-way search Trees: Definition and Operations-B Trees: Definition and Operations-Tries: Definition and Operations-Applications. **Red-Black Trees and Splay Trees:** Red-Black Trees-Splay Trees-Applications. **Hash Tables:** IntroductionHash Table Structure-Hash Functions-Linear Open Addressing-Chaining-Applications.

Unit V **(18 hours)**

Searching : Introduction-Linear Search- Transpose Sequential Search-Interpolation Search- Binary Search-Fibonacci Search-Other Search Techniques. **Internal Sorting:** IntroductionBubble Sort-Insertion Sort-Selection Sort0-Merge Sort-Shell Sort-Quick Sort-Heap Sort-Radix Sort. **External Sorting :** Introduction-External Storage Devices- Sorting with Tapes :Balanced Merge-Sorting with Disks :Balanced Merge-Polyphase Merge sort-Cascade Merge Sort.

Unit VI

Case Studies : Implement a Stack & Queue data structures using an array or linked list, and analyze its time and space complexity - Analyze the time and space complexity of different Tree & Graph traversal algorithms, such as inorder, preorder, and postorder traversal, DFS & BFS - Study the application of hash tables in web search engines, where data is organized in a hash table for efficient retrieval - Study the application of sorting algorithms in data analysis, where data is sorted for efficient processing and visualization.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concepts of data structures and its classification, Linked lists, Graphs and B Trees
CO2: Apply data structures and its algorithms in real time applications
CO3: Analyze the efficiency of graphs and searching algorithms
CO4: Compare different sorting algorithms
CO5: Develop different algorithm design techniques

Text Books:

1. Kent D. Lee, Steve Hubbard, *Data Structures and Algorithms with Python*, Springer International
2. Publishing Switzerland, 2015.
3. G A Vijayalakshmi Pai, *Data structures and Algorithms, Concepts, Techniques and Application,*Tata McGraw Hill Education Private Limited,New Delhi, 2008.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Data Structures*, Galgotia Book Source, Second Edition, 2004
2. Alfred V.Aho Johne, Hopcroft, *Data Structures and Algorithm*, Addison-Wesley, Third Edition,2012
3. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C++*, Pearson Education, Fourth Edition, 2014.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
4. https://www.tutorialspoint.com/python_data_structure/python_data_structure_tutorial.pdf
5. https://nptel.ac.in/courses/106/106/106106145/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

Core VII - Artificial Intelligence and Expert Systems

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 6 (T-4, P-2)**
Subject Code: JMITC23 **Credit: 5**

Course Objectives:

1. To describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions and AI techniques for knowledge representation, planning and uncertainty Management
2. To develop knowledge of decision making and learning methods and explain the concept of Knowledge Representation

Unit I **(18 hours)**

Introduction to Artificial Intelligence-Intelligent Agents, Approaches in Artificial Intelligence, Definitions of Artificial Intelligence, AI problems, Features of AI Programs, Importance of AI, Advantages and Disadvantages of AI.

Unit II **(18 hours)**

Applications of Artificial Intelligence- Finance, Hospitals and Medicine, Robotics, Expert systems, Diagnosis, Pattern Recognition, Natural Language Processing, Game Playing, Image Processing, Data mining, Big Data Mining. Introduction to the state space search- State space search, search techniques, Types of searching techniques.

Unit III **(18 hours)**

Heuristic Search Strategies-Types of Heuristic Search techniques, Hill Climbing Search, Simulated Annealing search, A* Algorithm, AND-OR Graphs, Properties of the Heuristic Search Algorithm, Adversary Search, The MINIMAX Algorithm.

Unit IV **(18 hours)**

Expert Systems-Definitions of Expert Systems, Features of Good Expert systems, Architecture and Components of Expert systems, Roles of the Individuals who interact with the system, Advantages of Expert systems, Disadvantages of Expert Systems.

Unit V **(18 hours)**

Knowledge Representation - Definitions of Knowledge Representation, Characteristics of Good Knowledge Representation, Basics of Knowledge representation, Properties of the Symbolic representation of knowledge, Properties of the Good knowledge representation systems, Categories of knowledge representation schemes, types of knowledge representation schemes.

Unit VI

Case Studies: Approaches in Artificial Intelligence - Introduction to State Space Search & Search Techniques - Heuristic Search Strategies in Artificial Intelligence - Expert Systems in Real-World Applications - Knowledge Representation in Artificial Intelligence

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate knowledge on Artificial Knowledge concepts
CO2: Apply all searching algorithms and Hill-climbing procedures
CO3: Analyse their gaming skills and learn about Expert system
CO4: Evaluate the learners for aspiring careers in the field of Artificial Intelligence.
CO5: Develop the game playing and planning of expert systems

Text Book:

1. I.Gupta, G.Nagpal, Artificial *Intelligence and Expert Systems*, Laxmi Publications, 2018.

Reference Books:

1. V.S. Jankiraman, *Foundations of Artificial Intelligence and Expert Systems*, Laxmi Publications, 2017.
2. Joseph C.Giarratano, Gary D.Riley, *Expert Systems: Principles and Programming*, Fourth Edition, 2018.
3. Lavika Goel, *Artificial Intelligence: Concepts and Applications*, Wiley India Private Limited, 2018.

Journal:

1. IAES International Journal of Artificial Intelligence (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://nptel.ac.in/courses/112/103/112103280/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	9	9	3	9	**49**
CO2	9	9	3	9	3	9	1	**43**
CO3	3	9	9	3	9	3	3	**39**
CO4	9	1	3	9	3	9	1	**35**
CO5	9	9	9	9	9	3	3	**51**
Total	**39**	**37**	**25**	**39**	**33**	**27**	**17**	**217**

Low-1 Medium-3 High-9

Artificial Intelligence Lab

Hours/week: 2

Course Objectives:

1. To understand the basic concept and foundational knowledge of AI
2. To apply learned concepts to solve problems and analyze solutions

List of Programs:

1. Write a program for implementation of python basic libraries such as math, numpy and scipy
2. Write a program for implementation of python libraries for ml application such as pandas and matplotlib
3. Write a program for creating and loading different datasets in python.
4. Write a python program to compute mean, median, mode, variance and standard deviation using datasets
5. Write a program to implement simple linear regression and plot the graph
6. Write a program to implement breadth first search.
7. Write a program to implement depth first search
8. Implementation of find S algorithm
9. Implementation of Candidate Elimination algorithm
10. Write a program to implement hill climbing algorithm
11. Write a program to implement A* algorithm
12. Write a program to implement Tic-Tac-Toe game

Note: Questions for the internal examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to :

CO1: Foundational knowledge, understanding basic concepts.

CO2: Applying learned concepts, solving problems, analyzing solutions.

CO3: Evaluating algorithms, proposing improvements, synthesizing knowledge for complex solutions.

CO4: Optimizing and designing algorithms and solutions for real-world applications

CO5: Innovating, researching, and contributing new methods to the field.

Course Outcomes	Programme Outcomes							
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	9	9	9	9	9	9	**63**
CO3	9	9	9	9	9	9	9	**63**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**39**	**45**	**39**	**45**	**45**	**45**	**303**

Low-1 Medium-3 High-9

Core VIII - Advanced Java Lab

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 6**
Subject Code: JMITC24P **Credit: 5**

Course Objectives:

1. To apply the concept of RMI to invoke Client/Server Communication and AWT, Swing to design and develop GUI applications
2. To build dynamic web applications using JSP, Servlet and Java Data Base Connectivity (JDBC)

List of Programs

Networking

1. Develop a program to do one and two way communication(s)
2. Develop a program to implement TCP Socket

Swing

3. Develop a program to display current date & time in different format
4. Develop a program to set a foreground and background color for label
5. Develop a program to create simple calculator

Bean

6. Develop a program to create a button
7. Develop a program to create text box which accepts only characters
8. Develop a program to create text box which accepts only integer value

JDBC

9. Develop a program to prepare a student's details with Roll-No, Name, Mark1, Mark2, Mark3, Total, Average and Grade to perform insert, update, delete and display of student information
10. Develop a program to prepare an Electricity Bill to perform insert, update, delete and display Electricity bill of a particular user

RMI

11. Develop a program to display a string message
12. Develop a program to perform arithmetic operations

13. Develop a program to find factorial value of a number
14. Develop a program to generate Fibonacci series

SERVLET

15. Develop a program to create a Servlet to display Simple Message
16. Develop a program to create a Servlet that uses cookies to store the number of times a user has visited the servlet
17. Develop a program to create a Servlet to generate Random Numbers
18. Develop a program to create a Servlet that prints today's date
19. Develop a program to create Servlet for login page, if the username and password is correct then prints message "Hello username" else "login failed"
20. Develop a program to create Student Information System to view the details of the Students

JSP

21. Develop a program to create a JSP that prints hello world
22. Develop a program to create a JSP that prints current date and time 23. Develop a program to create a JSP that add and subtract two numbers.
24. Develop a program to design a JSP Program to implement verification of a particular user login and display a welcome page
25. Develop a program to design and implement a JAVA JSP Program to get student information and display the same information through Servlet

Note: - Questions for the internal / external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the concepts such as client/ server, socket and RMI to implementJava code
CO2: Apply an event handling using swing components
CO3: Illustrate the concept of Java bean in Java program
CO4: Discover the database access through Java code using JDBC connectivity
CO5: Create dynamic web pages using Servlet and JSP

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

DSE II - b) Mobile Communications

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 6**
Subject Code: JMITE2B **Credit: 5**

Course Objectives:

1. To define mobile technologies in terms of hardware, software, and communications and describe existing mobile computing frameworks and architectures
2. To evaluate the effectiveness of different mobile computing frameworks and describe how mobile technology functions to enable other computing technologies

Unit I **(18 hours)**

Introduction: Mobile Computing- Middleware and Gateways-Developing Mobile Computing Applications- Security in Mobile Computing – Architecture of Mobile Computing-Three-Tier Architecture-Design Consideration for Mobile Computing-Mobile Computing through Internet-Mobile Computing through Telephone-Developing an IVR Applications.

Unit II **(18 hours)**

Bluetooth and GSM: Bluetooth- Features and working of RFID -Wireless Broadband (WiMAX) - Mobile IP – IPV6- IPV4 Vs IPV6 –Global System for Mobile Communications – GSM Architecture – Call Routing in GSM – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation – Authentication and Security- Mobile Computing Over SMS – SMS-Value Added Services through SMS**.**

Unit III **(18 hours)**

GPRS, 3G and 4G Networks: GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS- Applications for GPRS – Limitations of GPRS- Spread Spectrum Technology- CDMA Versus GSM – Features of 3G Networks – Architecture of 3G- Applications of 3G - Features of 4G- Architecture of 4G - Wireless Technologies Used in 4G- Merits and Demerits of 4G.

Unit IV **(18 hours)**

Mobile Ad-hoc Networks: Mobile Ad-Hoc Basic Concepts-Characteristics- Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc Networks (VANET) – MANET Vs VANET – Security of VANET and MANET - **Open Source Tools for Mobile Testing:** Appium **-** Katalon Studio – Monkey Talk – IOS Driver – Robotium – Calabash.

Unit V **(18 hours)**

Overview of Kotlin- Installation of Android Studio – Getting started with Hello World app- Creating a Registration form- Adding Radio Buttons- Adding spinner and Image- Creating a search App-URL request-Display Search Result-Playing video using YouTube API.

Unit VI

Case Studies: Analyze the architecture and design considerations of a popular mobile application, such as Instagram or Facebook - Design and develop a simple mobile application for a specific use case, such as a to-do list or a weather app - Design and develop a mobile application that utilizes SMS or MMS for communication, such as a messaging app or a mobile banking system - Design

and develop a mobile application that utilizes 4G networks for highbandwidth applications, such as video streaming or online gaming.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the principles of mobile technologies like GPRS, GSM, CDMA and TDMA and the concepts of Bluetooth and GSM, Mobile Ad-hoc networks

CO2: Apply the features of Android programming for developing Android Applications

CO3: Analyze technology of 1G, 2G, 3G and 4G for gaining the working knowledge of four generation Wireless technologies and Analyze the architecture, merits and demerits of Wireless technologies like Infra-Red, blue tooth, Wi-Fi, RFID and Wi-Max

CO4: Compare the characteristics and techniques MANET with VANET

CO5: Derive wireless communication systems with 3G and 4G technologies.

Text Books:

1. Asoke K. Talukder, Hasan Ahmed, Roopa R Yavagal. *Mobile Computing: Technology, Applications, And Service Creation*, Tata McGraw Hill, 2017.
2. Stefano Basagni , Marco Conti , Silvia Giordano , Ivan IvanStojmenovic, *Mobile AdHoc Networking, Cutting Edge Directions*, Wiley Publications, 2015.

Reference Books:

1. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, *Wireless and Mobile Networks, Concepts and Protocols*, Wiley Publications, 2016.
2. James C.Sheusi, *Android Application Development for Java programmers*, Cengage Learning, 2013.
3. Peter Spath, *Learn Kotlin for Android Development*, APress Publications, 2019.
4. Charles E.Perkins, *Ad Hoc Networking*, Addison-Wesley Publications, 2008.

Journal

1. IAES International Journal of Artificial Intelligence (Scopus)

E-Resources:

1. www.cse.iitk.ac.in/users/rkg/Talks/mobile_main.pdf
2. pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf
3. SWAYAM: https://swayam.gov.in/nd1_noc19_ee48/preview
4. SWAYAM: https://onlinecourses.swayam2.ac.in/aic20_sp02/preview
5. http://172.16.25.76/course/view.php?id=2224

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**

CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Extra Credit II - Internship

(For Students Admitted from 2025-26)

Semester: II
Subject Code: JMITX2I **Credit: 2**

Course Objectives:

1. To articulate and apply principles learned in and outside of the classroom to a specific internship site experience
2. To get the practical knowledge to apply programming skills for developing a project

Students have to undergo an internship in an industry and submit document prepared by them about the internship programme. It can be a group work with a group size of maximum two members. The Internship should be completed and submitted before the commencement of III Semester and viva will be conducted in the first week of III Semester.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand self-understanding, self-confidence, and interpersonal skills

CO2: Assess Strengths, Weaknesses, Opportunities and Threats (SWOT) and explore career options and gain general work experience

CO3: Examine any specific learning outcomes identified in supplemental documentation provided as part of the internship application process

CO4: Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization

CO5: Create the document which contains company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for organization of internship

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

Core IX - Software Project Management

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 6**
Subject Code: JMITC31 **Credit: 5**

Course Objectives:

1. To identify the different project contexts and suggest an appropriate management strategy and key phases of project management
2. To determine an appropriate project management approach through an evaluation of the business context and scope of the project and role of professional ethics in successful software development

Unit I **(18 hours)**

Introduction to Software Project Management: Introduction – Plans, Methods and Methodologies – Setting Objectives – Project Success and Failure – Management Control – Traditional versus Modern Project Management Practices. **Project Evaluation and Programme Management:** Project portfolio Management – Evaluation of Individual Projects – Programme Management.

Unit II **(18 hours)**

An overview of Project Planning: Stepwise Project Planning - **Selection of an Appropriate Project Approach:** Software Processes and Process Models - Choice of Process models - Structure versus speed of Delivery - Waterfall Model - The Spiral Model - Software Prototyping.

Unit III **(18 hours)**

Activity Planning: Objectives of Activity planning - Project schedules - Sequencing and Scheduling Activities - Network Planning models. **Risk Management:** Risk - Categories of Risk – Risk identification – Risk Planning – Evaluating Risks to the Schedule – Applying the PERT technique.

Unit IV **(18 hours)**

Monitoring and Control: Creating the Framework – Collecting the Data – Review – Project Termination Review - Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Change control - Software Configuration Management.

Unit V **(18 hours)**

Agile Technique: The Agile Business Case-Objectives-Adding Value with the Business CaseBusiness Value Models-Models for the Business Case-Project Balance Sheet-Communicating with the Project Balance Sheet Tool.

Unit VI

Case Studies : Developing a Project Plan for a Real-World Software Development Project - Implementing Agile Methodologies for a Real-World Project - Creating a Risk Management Plan

for a Real-World IT Infrastructure Project - Creating a Project Schedule and Budget for a Construction Project - Developing an Agile Project Plan for a Mobile A

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize Software Process Models

CO2: Illustrate the steps involved in Software Project Management and activity planning Risk Management using case studies.

CO3: Apply Software effort Estimation Methods

CO4: Evaluate Software Project Management Tools

CO5: Design the Agile techniques in Software Project Management

Text Books:

1. Bob Hughes, Mike Cotterell, Rajib Mall, *Software Project Management*, Tata McGraw Hill, Fifth Edition, 2012.
2. John C.Goodpasture, PMP, *Project Management the Agile Way*, Second Edition, 2016.

Reference Books:

1. Robert K.Wysocki, *Effective Software Project Management*, Wiley Publication, 2011.
2. Walker Royce, *Software Project Management*, Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, *Managing Global Software Projects*, McGraw Hill Education, Fourteenth Reprint, 2013.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105218/
2. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Core X - Software Development Framework

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 6**
Subject Code: JMITC32 **Credit: 5**

Course Objectives:

1. To understand the code solutions and compile C# projects within the .NET Framework
2. To design and develop professional console and window based .NET Application

Unit I **(18 hours)**

The .NET Framework: .Net programming Framework-VB.NET,C#.NET and the .NET Languages-The Common Language Runtime-The .NET Class Library-ASP.NET-Visual Studio.NET. **Learning the .NET Languages:** The .NET Languages-Data Types-Declaring Variables- Scope and Accessibility-Variable Operations-Object-BaseManipulationConditional Structures-Loop Structures-Functions and Subroutines.Types,

Unit II **(18 hours)**

ASP.NET Applications: ASP.NET Applications-Code-Behind-The Global.asax Application File-Understanding ASP.NET Classes-ASP.NET Configuration. **Web Form Fundamentals:** A Simple Page Applet-A Deeper Look at HTML Control Classes-The Page Class-Accessing HTML Server Controls. Web Controls: Stepping Up to Web Controls-Web control Classes- AutoPostBack and Web Control Events.

Unit III **(18 hours)**

Using Visual Studio .NET: The promise of Visual Studio.NET-Starting a Visual Studio.Net Project – The Web form Designer-Writing Code-Visual Studio.NET Debugging-Working Without Visual Studio.NET. **Validation and Rich Controls:** Validation-A simple Validation Example-Understanding Regular Expressions-A Validated Customer Form

Unit IV **(18 hours)**

Tracing, Logging and Error Handling: Common Errors-The .NET Exception Object- Handling exceptions-Throwing Your Own Exceptions-Logging Exceptions-Error Pages-Page Tracing. **Overview of ADO.NET:** Introducing ADO.NET and Data Management-Characteristics of ADO.Net-The ADO.NET Object Model. ADO.NET Data Access: About the
ADO.NET Examples-SQL Basics-The SQL Select Statement-Update-Insert-DeleteAccessing Data the Easy Way-Creating a connection-Defining a Select Command-Using a Command with a DataReader-Updating Data-Accessing Disconnected Data-Selecting Multiple Tables.

Unit V **(18 hours)**

Data Binding: Introduction-Single-Value Data Binding-Repeated-Value Data Binding-Data Binding with Databases. The DataList, DataGrid and Repeater: Introducing Templates-Using Templates with the DataList-Data Binding with Multiple Templates-Comparing the Template Controls-Selecting Items-Editing Items-Paging with the DataGrid- **Sorting with the DataGrid Using XML:** XML's Hidden Role in .NET-XML Explained- The XMLClassesXML Validation-XML Display and Transforms-XML in ADO.NET.

Unit VI

Case Studies: Adoption of .NET Framework for Enterprise Application Development. Developing a Financial Management System Using ASP.NET Web Forms. Implementing Validation Controls in an ASP.NET Web Application. Custom Error Pages with web.config. Configuring Application Settings Using XML

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Interpret the basic concepts of .NET, Problem of the state, data, Management Validation and Rich controls

CO2: Determine types, objects and namespaces, Enumerators and Iterators and Error Handling

CO3: Illustrate Table Controls, ASP.Net Applications and the Web Server, Interfaces and Structures

CO4: Evaluate on Exception Handling, Serializing objects, Direct Data Access

CO5: Develop XML classes and XML Validation, web forms and use web controls

Text Book:

1. Matthew MacDonald, *The Complete Reference ASP.NET*, Tata McGraw-Hill Publishing, 2017

Reference Books:

1. Dino Esposito, *Programming Microsoft ASP.NET*, Tata McGraw Hill, 2003
2. Chris Ullman , John Kauffman, Chris Hart, David Sussman, *Beginning ASP.Net 1.1 with VB.NET*, Wiley Publishing, First Edition, 2003
3. Elliotte Rusty Harold, *XML 1.1 Bible*, Wesley Publications, Third Edition, 2004

Journal:

1. Journal of ICT Research and Applications (Scopus)
2.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	9	3	3	9	39
CO2	9	3	3	9	1	1	9	35
CO3	3	3	3	9	1	1	9	29
CO4	9	1	3	9	1	1	9	33
CO5	9	3	1	9	1	3	9	35
Total	39	13	13	45	7	9	45	171

Low-1 Medium-3 High-9

Core XI – Machine Learning

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 6 (T: 4 P: 2)**
Subject Code: JMITC33 **Credit: 5**

Course Objectives:

1. To recognize the characteristics of machine learning that makes it useful to real-world problems
2. To understand the concept behind neural networks for learning non-linear functions

Unit I **(12 hours)**

Introduction: Well-Posed Learning Problems-Designing a Learning System-Perspectives and Issues in Machine Learning. Concept Learning: Introduction - A Concept Learning Task-Concept Learning as Search - Decision Tree Learning: Introduction-Decision Tree Representation-Appropriate Problems-Basic Decision Tree Learning Algorithm-Hypothesis Space Search-Inductive Bias-Issues.

Unit II **(12 hours)**

Artificial Neural Networks: Introduction-Neural Network Representations - Appropriate Problems - Perceptrons - Multilayer Networks and the Back Propagation Algorithm-An Illustrative Example: Face Recognition-Advanced Topics.

Unit III **(12 hours)**

Bayesian Learning: Introduction-Bayes Theorem-- Bayes Theorem and Concept Learning – Maximum Likelihood and Least-squared Error Hypotheses- Maximum Likelihood Hypothesis for Predicting Probabilities-Minimum Description Length Principle-Bayes Optimal Classifier-Gibbs Algorithm-Naïve Bayes Classifier-An Example: Learning to Classify Text-Bayesian Belief Networks-The EM Algorithm.

Unit IV **(12 hours)**

Instance-Based Learning: Introduction-K-Nearest Neighbor Learning-Locally Weighted Regression-Radial Basis Functions-Case-based Reasoning - Genetic Algorithms: Genetic Algorithms-An Illustrative Example-Hypothesis Space Search-Genetic programming-Models of Evolution and Learning-Parallelizing Genetic Algorithms.

Unit V **(12 hours)**

Learning Sets of Rules: Introduction-Sequential Covering Algorithms-Learning Rule Sets: Summary-Learning First-Order Rules-Learning Sets of First-Order Rules: FOIL - Induction as Inverted Deduction-Inverting Resolution - Reinforcement Learning: Introduction- Learning Task-Q Learning-Nondeterministic Rewards and Actions-Temporal Difference Learning-Generalizing from Examples-Relationship to Dynamic Programming.

Unit V1

Case Studies: Google's DeepMind: Diabetic Retinopathy Detection- PayPal: Fraud Detection-Personalized Recommendations- Predictive Maintenance- Autonomous Driving- Viewing Predictions- Crop and Soil Health Monitoring- Anomaly Detection- Network Optimization- Load Forecasting- Real Estate Price Estimation- Music Recommendation Engine

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Understand the need for machine learning for various problem solving
CO2: Demonstrate Decision Tree Learning Algorithm, Back propagation algorithm, Gibbs Algorithm, K-Nearest Neighbor Learning and Temporal Difference Learning with examples
CO3: Categorize the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
CO4: Apply different classification techniques in real time examples
CO5: Design appropriate machine learning algorithms for different problems

Text Book:
1. Tom M. Mitchell, *Machine Learning*, Tata McGraw Hill, 2017.

Reference Books:
1. Jeremy Watt, Reza Borhani, Aggelos K Katsaggelos, *Machine Learning Refined Foundations, Algorithms & Applications*, Cambridge University Press, , 2016.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press Cambridge, 2010.
3. Andreas C. Muller and Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, First Edition, 2016.

Journal:
1. IAES International Journal of Artificial Intelligence (Scopus)

E -Resources:
1. https://nptel.ac.in/courses/106/106/106106139/
2. https://onlinecourses.nptel.ac.in/noc22_cs58/preview

Machine Learning Lab

Hours/Week: 2

Course Objectives:
1. To introduce the fundamental concepts and techniques of Machine Learning, emphasizing its necessity and applications
2. To apply Machine Learning to learn, predict and classify the real-world problems in the Supervised Learning paradigms

List of Programs:
1. Develop a python program to Implement k-nearest neighbors classification using python
2. Develop a python program to implement linear regression using python.
3. Extract the data from database using python
4. Implementation of Python Libraries for ML application such as Pandas and Matplotlib.
   a) Create a Series using pandas and display
   b) Access the index and the values of our Series
   c) Compare an array using Numpy with a series using pandas
5. Develop a Python program to implement Simple Linear Regression for iris using sklearn

and plot the confusion matrix and graph.

6. Develop a python program to implement Support Vector Machine for a dataset and compare the accuracy by applying the following kernel functions:
   i. Linear
   ii. Polynomial
   iii. RBF
7. Develop a python program to implement Naïve Bayes theorem to classify the English text.
8. Develop a python program to implement Decision Tree for a recent application
9. Develop a python program to implement K-Means clustering Algorithm
10. Develop a python program to demonstrate the significance of genetic algorithm
11. Develop a python program to implement Ensemble models for a recent application
12. Develop a python program to implement Bayesian learning

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basic concepts and techniques of Machine Learning
CO2: Apply Machine Learning to learn, predict and classify the real-world problems
CO3: Illustrate the concept of Reinforcement Learning and Ensemble Methods
CO4: Evaluate modern notions in data analysis-oriented computing;
CO5: Outline predictions using machine learning algorithms

Note: Questions for the internal/external examination will be based on the concepts learnt

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	9	1	1	**27**
CO2	9	3	3	9	3	9	3	**39**
CO3	9	3	9	3	3	1	1	**29**
CO4	9	1	9	9	9	1	3	**41**
CO5	9	3	9	9	1	9	9	**49**
Total	**45**	**11**	**33**	**33**	**25**	**21**	**17**	**185**

Low-1 Medium-3 High-9

Core XII - Software Development Framework Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 6**
Subject Code: JMITC34P **Credit: 5**

Course Objectives:

1. To know about .Net IDE Component Framework
2. To know Programming concepts in .Net Framework and create website using ASP.Net Controls

List of Programs

Console Application

1. Develop a program to calculate the area of a floor given its length and width
2. Develop a program to calculate the factorial of a number N, assuming the number is more than zero
3. Develop a program to check the given numbers (prime, perfect, Armstrong etc.)
4. Develop a program to generate the numbers (prime, perfect, Armstrong etc.)
5. Develop a program to calculate age for a person using properties
6. Develop a program to sort a given list of numbers and find out the average of a list of numbers.
7. Develop a program to display how many days are in a given month(check for leap years also)

Windows Application

8. Develop a program to build a simple calculator
9. Develop a program to calculate the arithmetic operations using functions
10. Develop a program to do String manipulation
11. Write a function that will return a approximate count of the number of words in a string

Web Application

12. Develop a program to design an E-mail application form using standard controls and store these details in SQL tables
13. Develop a program to create a login page and personal webpage. Enter the username and password in the login page. If the username and password are correct, the personal web page should be loaded otherwise the error page should be loaded.
14. Develop a program to create a student details form and validate the details using validation controls
15. Develop a program to display employee details using data grid control
16. Develop a program to display an Electricity bill using data list control

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build console applications
CO2: Perform Windows and web Applications
CO3: Demonstrate validation controls in web form
CO4: Illustrate Data Grid control to database in Web application
CO5: Compose Data Repeater and Datalist Controls.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**

CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

DSE III - b) Internet of Things

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 6**
Subject Code: JMITE3B **Credit: 5**
Course Objectives:

1. To understand the fundamentals of Internet of Things and its building blocks
2. To understand the recent application domains of IoT in everyday life and the protocols with standards designed for IoT and the current research on it

Unit I **(18 hours)**

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT levels and deployment templates– **Application domains of IoT:** Home automation – Cities – Environment – Agriculture – Transportation - Health care & Lifestyle.

Unit II **(18 hours)**

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT- SNMP- NETCONF- YANG- IoT Systems Management with NETCONF- YANG.

Unit III **(18 hours)**

IoT Platforms Design Methodology: Step 1 to Step 10-Case Study on IoT System for Weather Monitoring- IoT Systems Logical Design using Python- Python Data Types and Data Structures-Control Flow-Functions-Modules- Packages-File Handling-Date/Time-Operations- Classes.

Unit IV **(18 hours)**

IoT Physical Devices and Endpoints: What is an IoT Device- Exemplary Device: Raspberry Pi-Linux and Raspberry Pi- Raspberry Pi Interfaces- Programming Raspberry Pi with Python- Other IoT Devices.

Unit V **(18 hours)**

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API – WAMP-AutoBahn for IoT-Xively Cloud for IoT-Python Web Application Framework-Django-Designing a RESTful Web API-Amazon Web Services for IoT-Home Automation-Cities-Environment.

Unit VI

Case Studies: IoT for Disaster Management & Early Warning Systems - IoT for Sustainable Water Use - M2M-Enabled Remote Surgeries & Smart Hospitals - IoT-Enabled Satellite Communication

- IoT Platform for Metaverse and Digital Twins - Cyber-Resilient IoT Platform for Critical Defense & Military Applications - Next-Gen IoT Smart Locks with Quantum Cryptography

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the importance of smart objects and smart environment
CO2: Define IoT and M2M
CO3: Create IoT platforms using design methodology
CO4: Perform WiFi data communications, remote data storage in cloud, andhandle the data using web applications
CO5: Develop potential problems and solutions using IoT

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

Reference Books:

1. Charles Platt, *Make Electronics – Learning by discovery*, O'Reilly Media, 2015.
2. Michael Miller, *The Internet of Things*, Pearson Education, 2015.

Journal:

1. Intl. Journal of Internet of Things and Information Technology

E-Resources:

1. NPTEL:https://nptel.ac.in/courses/106/105/106105166/
2. Classcentral:https://www.classcentral.com/course/swayam-introduction-to-internet-of- things-10093

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	3	1	3	**25**
CO2	1	3	9	9	3	1	9	**35**
CO3	3	3	3	1	1	9	9	**29**
CO4	1	3	9	1	3	3	9	**29**
CO5	3	3	3	3	1	3	9	**25**
Total	**11**	**15**	**27**	**23**	**11**	**17**	**39**	**143**

Low-1 Medium-3 High-9

Core XIII – Cloud and Distributed Computing

(For Students Admitted from 2025-26)

Semester: IV **Hours/Week: 6**
Subject code: JMITC41 **Credit: 5**

Course Objectives:

1. To impart the complete understanding of cloud, virtualization and distributed clouds
2. To enhance the students to understand the significance of cloud storage, identity and access management

Unit I **(18 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration **Network Virtualization and Geo-Distributed Clouds:** Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker - Software-Defined Network - Network Virtualization in Multi-Tenant Data Centers: VL2 - Network Virtualization in Multi-Tenant Data Centers: NVP - Geo-Distributed Cloud Data Centers.

Unit II **(18 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction - Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: Bully Election - Industry Systems: Google Chubby and Apache ZooKeeper - Design of ZooKeeper **Cloud-Native Computing:** Introduction – Micro services – Docker – Kubernetes - Introduction to Edge Computing - Classification of Edge Computing.

Unit III **(18 hours)**

Cloud Asset Management and Protection: Differences from Traditional IT - Types of Cloud Assets - Compute Assets - Storage Assets - Network Assets - Asset Management Pipeline - Procurement Leaks - Processing Leaks - Tooling Leaks - Findings Leaks - Tagging Cloud Assets **Software-Defined Networking and Network Function Virtualization:** Introduction - Software-Defined Networking - Applications and Use Cases - Software-Defined NFV - Network Slicing - Ongoing Research Opportunities.

Unit IV **(18 hours)**

Cloud Storage: Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase-**Identity and Access Management:** Differences from Traditional IT - Life Cycle for Identity and Access-Request -Approve - Create, Delete, Grant, or Revoke - Authentication - Cloud IAM Identities-Business-to-Consumer and Business -to-EmployeeMulti-Factor Authentication - Passwords and API Keys - Shared IDs - Federated Identity - Single Sign-On -Instance Metadata and Identity Documents-Secrets ManagementAuthorization- Centralized Authorization - Roles - Revalidate - Putting It All Together in the Sample Application.

Unit V **(18 hours)**

Classical Distributed Algorithms and the Industry Systems: Introduction - Time and Clock Synchronization in Cloud Data Center - Key Challenges - Clock Synchronization - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems- **Cloud Applications:** MapReduce, Spark, and Apache Kafka -MapReduce -Spark- Kafka.

Unit VI

Case Studies : Cloud Cost Optimization Strategies: A Case Study on IBM Cloud: Analyze how IBM Cloud optimizes its Cloud Costs Using Strategies Such as Resource Allocation-Rightsizing and Pricing Models – Global Tech's Leader Election Strategy in Cloud and Distributed Systems - Cloud Storage Platforms - Data Encryption-Implement Classical Distributed Algorithms.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Identify the features of Cloud Computing and Virtualization

CO2: Demonstrate the leader election and cloud native computing

CO3: Classify types of cloud assets, software-defined networking and network function virtualization

CO4: Justify cloud storage, Identity and Access Management

CO5: Generate the Classical Distributed Algorithms, the Industry Systems and Cloud applications

Text Books:

1. Rajiv Misra, Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems*, Wiley Emerging Technology Series, Wiley India Private Limited, 2020.
2. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*, O'Reilly Media, First Edition, 2019.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill, 2017.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms***,** John Wiley & Sons Limited ,2011.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata McGraw Hill, 2010.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E - Resources:

1. https://nptel.ac.in/courses/106/104/106104182/
2. https://www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	9	3	1	33	**35**
CO3	9	3	3	9	3	1	9	**37**
CO4	3	9	9	9	9	3	9	**51**

CO5	3	9	9	9	9	3	9	**51**
Total	**33**	**23**	**33**	**45**	**27**	**9**	**39**	**209**

Low-1 Medium-3 High-9

Core XIV – Deep Learning

(For Students Admitted from 2025-26)

Semester: IV **Hours/Week: 6**
Subject Code: JMITC42 **Credit: 5**

Course Objectives:

1. To understand about the Deep learning, its principles and approaches
2. To learn about the Deep Learning algorithms and approaches.

Unit I **(18 hours)**

Neural Networks: Neural Networks Introduction to Neural Networks - Training a neural network: loss functions, backpropagation and stochastic gradient descent - Neural networks as universal function approximates

Unit II **(18 hours)**

Deep Neural Networks: Introduction to Deep Learning- A Probabilistic Theory of Deep Learning- Deep Forward Networks - Backpropagation and regularization, batch normalizationVC Dimension and Neural Nets-Deep Vs Shallow Networks.

Unit III **(18 hours)**

Convolutional Neural Networks: Introduction to Convolutional Neural Network - Architectures - AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

Unit IV **(18 hours)**

Recurrent Neural Networks and Deep unsupervised Learning : Recurrent networks, LSTM, GRU - Architectures, Autoencoders. Adversarial Generative Networks, DBM - Deep Reinforcement Learning.

Unit V **(18 hours)**

Sequence Analysis: Analyzing Variable-Length Inputs- tackling seq2seq with Neural N-Grams- Implementing Part-of- Speech Tagger- Unfolding Computation Graphs - Echo-State Networks- Long Short-Term Memory- Tensor flow Primitives for RNN models - Implementing Sentiment Analysis Model. **Applications of Deep Learning:** Deep Reinforcement Learning- Markov Decision Processes- Versus Exploit- Policy versus Value learning- Open AI Gym- Q-Learning and Deep Q-Networks-

Unit VI

Case Studies : Computer Vision- ImageNet- Detection- Face Recognition- Scene Understanding- Gathering Image Captions - Audio Wave Net - Natural Language Processing Word2Vec - Sentiment

Analysis - Recent research.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Deep Learning algorithms and approaches

CO2: Implement Deep Learning algorithms to solve problems which are almost impossible to handle via Traditional Approaches

CO3: Illustrate different types of Deep Neural Networks like CNN

CO4: Apply deep learning algorithms in real time problems

CO5: Develop applications such as NLP using Deep Learning Algorithms

Text Book:

1. Josh Patterson and Adam Gibson, *Deep Learning: A Practitioner's Approach*. O'Reilly, 2018.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, *Deep Learning*, MIT Press, 2016.

Reference Books:

1. Francois Chollet, *Deep Learning with Python*. O'Reilly. 2018.
2. Sandro Skansi, *Introduction to Deep Learning: From Logical Calculus to Artificial Intelligence*. Springer, 2018.
3. Antonio Gulli and Sujit Pal, *Deep Learning with Keras*. Packt, 2017.
4. Nikhil Buduma, *Fundamentals of Deep Learning*. O'Reilly, 2017.

Journal:

1. IAES International Journal of Artificial Intelligence (Scopus)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2. https://nptel.ac.in/courses/106106184

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	**45**	**9**	**45**	**15**	**5**	**45**	**45**	**209**

Low-1 Medium-3 High-9

Core XV - Project

(For Students Admitted from 2025-26)

Semester: IV **Hours/Week: 18 (PROJECT – 12, l-6)**

Subject Code: JMITC43PW **Credits: 5**

Course Objectives:

1. To understand the fundamental principles of Project management and be familiar with the different methods and techniques used for project development
2. To get good knowledge of the issues and challenges faced while doing the project and to do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques

Students have to undergo an individual project work either on campus or in an industry and appear for the viva voce examination with the software developed and document prepared by them

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders
CO2: Implement the plan by executing the code
CO3: Integrate the various aspects of software development for the total project
CO4: Construct the entire software project according to the specific problem
CO5: Check the software project by executing with the various data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	3	9	**57**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	9	9	9	9	9	9	**45**
Total	**45**	**27**	**45**	**39**	**45**	**39**	**45**	**285**

Low-1 Medium-3 High-9

Extra Credit IV – Document Preparation Lab (LATEX)

(For Students Admitted from 2025-26)

Semester: IV
Subject Code: JMITX4P **Credit: 2**

Course Objectives:

1. To get practical knowledge on preparing documents containing mathematical formulas
2. To prepare a technical and scientific documentation

List of Programs

1. Create a document using an input file

2. Create a document using special symbols, dashes, line breaks & footnotes
3. Create a document using the sectioning command
4. Create a document using quotations, typestyle, commands & environments
5. Create a document using the mathematical symbol
6. Create a document using arrays and table
7. Create a document using a bibliography
8. Create a document using clauses and page style
9. Create a document using pictures and colors
10. Create a document using basics of the math index
11. Create a document using fine print and bibliography database
12. Create a document using math mode, tabbing environment, and files

Note: - Questions for the External examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Identify bibliography database
CO2: Relate math mode, and fine print
CO3: Apply mathematical symbol to create the document
CO4: Select clauses, typestyle, commands, and page style
CO5: Create latex documents

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

B Sc Information Technology

Three Years Regular Programme
(For Students Admitted from 2025-26)

Programme Specific Outcomes:
On completion of this programme, student will be able to gain
PSO 1: Demonstrate the aptitude of Computer Programming and Computer based problem solving skills
PSO 2: Display the knowledge of appropriate theory, practices and tools for the specification, design, and implementation

PSO 3: Apply the knowledge of Statistics and Operations Research in the development of computational solutions
PSO 4: Ability to link knowledge of Computer Science and Mathematics.
PSO 5: Ability to formulate, to model, to design solutions, to appreciate emerging technologies and to use software tools
PSO 6: Ability to design, develop and implement computer programs to solve real world problems in various domains
PSO 7: Ability to pursue higher studies of specialization and to take up technical employment

PREAMBLE
The Board of Studies in Computer Science has undertaken a comprehensive review of the curriculum, resulting in the following changes:

Core Papers

- Principles of Information Technology syllabus has been revised
- RDBMS and RDBMS Lab have been renamed as Database Management System and Database Management System Lab. Textbook and syllabi of theory has been revised
- The textbook and syllabi for Programming in C, and Computer Networks have been updated
- The Data Structure Lab, Theory of Computation and Bioinformatics syllabus have been introduced
- The Software Engineering syllabus has been revised
- Data Analytics and Data Analytics & Visualization Lab have been introduced
- The syllabi of Digital Electronics, Programming in C++ and Programming in C++ Lab courses have been removed

Multi-Disciplinary Courses

- PC Package Lab course has been revised
- Blockchain Technology Lab, Internet of Things Lab, Digital Marketing and Intellectual Property Rights have been introduced
- The Internet of Things course has been modified

Skill Enhancement Courses (SEC)

- The Office Automation Lab course has been reduced
- Web Development Lab, Cyber Security Lab, Bioinformatics Lab and Mobile Application Development Lab courses have been introduced
- Designing Lab, Web Designing Lab (HTML and Scripting Language) Lab, Programming in PHP Lab and Open Technology Lab courses have been removed

Discipline-Specific Electives

- Computer System Architecture, Cloud and Distributed Computing and Artificial Intelligence and Expert System courses have been removed

Value-Added Courses

- The Digital and Technology Solution course has been introduced

PROGRAMME STRUCTURE – PROGRAM CODE: UIT

Sem	Part	Subject Code	Course	Subject Title	Hours /Week	Credit	@ SD| ENT| EMP	$ REG| NAT| GLO	CIA	ESE	Total Marks
I	I	JBLT11/ JBLA11/ JBLHB11/ JBLHA11	Language I	Tamil I/ Arabic I/ Hindi I a (or) b	5	3			25	75	100
	II	JBLEB12/ JBLEA12	Language II	English I a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBITC11	Core I	Principles of Information Technology	6	5	SD	GLO	25	75	100
		JBITC12	Core II	○ Programming in C	6	6	EMP	GLO	25	75	100
		JBITA13P	AECC I	Programming in C Lab	4	3	EMP	GLO	25	75	100
	IV	JBITS14P	SEC I	Office Automation Lab	2	1	SD	GLO	-	50	50
				Library/Browsing	1	-			-	-	-
				Remedial/Games	1	-			-	-	-
		TOTAL			**30**	**21**			**125**	**425**	**550**
II	I	JBLT21/ JBLA21/ JBLHB21/ JBLHA21	Language I	Tamil II/ Arabic II/ Hindi II a (or) b	5	3			25	75	100
	II	JBLEB22/ JBLEA22	Language II	English II a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBITC21	Core III	Data Structures and Algorithms	5	5	SD| EMP	GLO	25	75	100
		JBITC22P	Core IV	Data Structures Lab	5	4	SD| EMP	GLO	25	75	100
		JBITA23	AECC II	Statistics	4	4	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBITS24P	SEC II	Web Development Lab	2	1	EMP	GLO	-	50	50

		JBUI2V	CVAC I	Understanding India	2	2			-	50	50
				Library/Browsing	1	-			-	-	-
				Remedial/Games	1	-			-	-	-
	V	JBITX2P/ JBITX2O	Extra Credit I	UI and UX Design Lab / * Online Course	-	2	ENT| EMP	GLO	-	100	100
				TOTAL	**30**	**22 + 2**			**125**	**475+ 100**	**600+ 100**
III	I	JBLT31/ JBLA31/ JBLHB31/ JBLHA31	Language I	Tamil III/ Arabic III/ Hindi III a (or) b	5	3			25	75	100
	II	JBLEB32/ JBLEA32	Language II	English III a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBITC31	Core V	Database Management Systems	4	4	SD| EMP	GLO	25	75	100
		JBITC32P	Core VI	Database Management Systems Lab	4	3	SD| EMP	GLO	25	75	100
		JBITA33	AECC III	Cost Accounting	4	4			25	75	100
	IV	JBITS34P	SEC III	Cyber Security Lab	2	1	SD	GLO	-	50	50
		JBMD31ITP	MD I	PC Package Lab	2	1	SD	GLO	-	50	50
		JBES3V	CVAC II	Environmental Science for Sustainable Development	2	2			-	50	50
		JBXTN3	Extension	NSS / CSS	2	2			100	-	100
	V	JBITX3P/ JBITX3O	Extra Credit II	NoSQL Lab / *Online Course	-	2	EMP	GLO	-	100	100
				TOTAL	**30**	**23+ 2**			**225**	**525+ 100**	**750+ 100**
	I	JBLT41/ JBLA41/ JBLHB41/ JBLHA41	LanguageI	Tamil IV /Arabic IV /Hindi IV a (or) b	5	3			25	75	100

IV	II	JBLEB42/ JBLEA42	LanguageII	English IV a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBITC41	Core VII	Operating Systems	5	5	SD| EMP	GLO	25	75	100
		JBITC42	Core VIII	# Programming in Java	4	4	ENT| EMP	GLO	25	75	100
		JBITA43P	AECC IV	Programming in Java Lab	4	3	ENT| EMP	GLO	25	75	100
	IV	JBMD41ITP	MD II	Web Designing Lab	3	2	ENT| EMP	GLO	-	50	50
		JBITS44P	SEC IV	Linux and Shell Programming Lab	2	1	SD	GLO	-	50	50
		JBDT4V	CVAC III	Digital and Technology solution	2	2	SD	GLO	-	50	50
	V	JBITX4P/ JBITX4O	Extra Credit III	R Tool Lab/ *Online Course	-	2	ENT| EMP	GLO	-	100	100
				TOTAL	**30**	**23+ 2**			**125**	**525+ 100**	**650+ 100**
V	III	JBITC51	Core IX	Software Engineering	6	5	SD	GLO	25	75	100
		JBITC52	Core X	Theory of Computation	6	6	SD	GLO	25	75	100
		JBITC53	Core XI	Bioinformatics	6	5	SD	GLO	25	75	100
	IV	JBMD51ITA/ JBMD51ITB	MD III	a) Internet of Things b) Blockchain technology	4	3	SD| EMP	GLO	25	75	100
		JBMD52ITAP/ JBMD52ITBP	MD IV	a) IoT Lab b) Blockchain technology Lab	4	3	SD| EMP	GLO	25	75	100
		JBITS54P	SEC V	Bioinformatics Lab	2	1	SD	GLO	-	50	50
		JBHW5V	CVAC IV	Health and wellness	2	2			-	50	50
	V	JBESX5	Extra Credit IV	Employability Skills	-	2			100	-	100
				TOTAL	**30**	**25 + 2**			**125+ 100**	**475**	**600+ 100**
	III	JBITC61	Core XII	Computer Networks	6	6	SD	GLO	25	75	100
		JBITC62	Core XIII	# Data Analytics	6	6	ENT| EMP	GLO	25	75	100

VI		JBITC63P	Core XIV	Data Analytics & Visualization Lab	5	4	ENT| EMP	GLO	25	75	100
		JBITC64PW	Core XV	Project	6	6	SD| ENT| EMP	GLO	25	75	100
	IV	JBMD61ITA/ JBMD61ITB	MD V	a) Digital Marketing b) Intellectual Property Rights	4	3	SD| EMP	GLO	25	75	100
		JBITS65P	SEC VI	Mobile Application Development Lab	2	1	SD| EMP	GLO	-	50	50
	V	JBITX6P/ JBITX6O	Extra Credit V	Data Mining Lab / * Online Course	-	2	ENT| EMP	GLO	-	100	100
				Library / Browsing	1	-			-	-	-
				TOTAL	**30**	**26+ 2**			**125**	**425 + 100**	**550+ 100**
				Grand Total	**180**	**140 +10**			**850+ 100**	**285 0 + 400**	**3700+ 500**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.
# For internship course, refer www.internshala.com or any online internship course.
○ For online course integration, syllabus will be taken from spoken tutorial

@SD- Skill Development ENT-Entrepreneurship EMP-Employability
$ REG-Regional NAT-National GLO-Global

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course
MD - Multi Disciplinary
CVAC - Common Value Added Course

CORE I - Principles of Information Technology

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6**
Subject Code: JBITC11 **Credit: 5**

Course objectives:
1. To understand the basics of computers.
2. To understand the design of various functional units, components of computers and concepts ofcombinational circuits.

Unit I **(18 Hours)**

Computer Basics: Algorithms – Simple Model of a Computer – Characteristics of Computers – Problem Solving Using Computers. **Input/Output Units:** Traditional Computer Input/output devices. **Computer Memory:** Memory Cell – Memory Organization – Read Only Memory. **Computer Generations and Classification:** First Generation of Computers- Second generation – Third Generation – Fourth Generation – Fifth Generation –Classification of Computers.

Unit II **(18 Hours)**

Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system-decimal to binary, octal to binary, hexadecimal to binary - hexadecimal to octal conversions and vice versa-binary arithmetic-1s and 2s complement representations-BCD addition and subtraction.

Unit III **(18 Hours)**

Basic Boolean functions: canonical sum of products and product of sum simplifications-minimization of logical expressions using K-map-logic gates-AND, OR, NOT, EX- OR, NAND, NOR gate**. Introduction to combinational logic circuits**: arithmetic circuits –half adder, full adder, half subtractor, full subtractor- multiplier and divider.

Unit IV **(18 Hours)**

Basic Computer Organization and Design: Instruction Codes-Computer Registers- Computer Instructions- Timing and Control-Instruction Cycle-Memory Reference Instructions -Input-Output andInterrupts.

Unit V **(18 Hours)**

Micro programmed Control: Control Memory- Address Sequencing- **Central Processing Unit:** Introduction- General Register Organization - Instruction Formats - Addressing Modes- Data Transfer and Manipulation-Program Control-RISC **Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic

Course Outcomes:

After successful completion of this course, students will be able to**CO1:** Summarize the basics of computers and its generations **CO2:** Illustrate number systems and its conversions
CO3: Analyze the operations of various logical circuits
CO4: Define the fundamental organization of a computer system
CO5: Examine the function of input-output organization

Text Book:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers*, PHI Learning PrivateLimited, Sixth Edition, 2018.
2. S. Salivahanan, S. Arivazhagan, *Digital Circuits and Design*, Oxford University Press, 2018.
3. Morris Mano M, *Computer System Architecture*, Prentice Hall of India, 2011.

Reference Books:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers*, PHI Learning PrivateLimited, Sixth Edition, 2018.

2. M. Morris Mano, Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014
3. William Stallings, *Computer Organization and Architecture*, PearsonPublication, Eighth Edition, 2010.

Journal:
1. Info Communication Journal (Scopus)

E-Resources:
1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/
2. https://www.coursera.org/courses?query=computer%20fundamentals
3. https://nptel.ac.in/courses/108/105/108105113/
4. https://www.classcentral.com/course/swayam-digital-electronic- circuits-12953
5. NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	1	3	**13**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**13**	**5**	**15**	**13**	**15**	**81**

Low-1 Medium-3 High-9

CORE II - Programming in C

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 6**
Subject Code: JBITC12 **Credit: 6**

Course Objectives:
1. To acquire a comprehensive understanding of C programming concepts includes data types, operators, control structures, functions, arrays, and strings.
2. To develop skills in applying C programming techniques to solve real-world problems using pointers, structures, and file handling.

Unit I **(18 Hours)**

Introduction: History of C –Importance of C – Basic structure of C programs - Constants, Variables and data types – Operators and expressions – Input and Output operations – Decision making and branching – Decision making and looping

Unit II **(18 Hours)**

Arrays: One and two dimensional arrays - Initializing two dimensional arrays – Multidimensional arrays.

Arrays: One and two dimensional arrays - Initializing two-dimensional arrays – Multidimensional arrays - **Character Arrays and Strings:** Declaring and initializing string variables- Reading strings from terminal- Writing strings to screen – String handling functions – Other features of strings.

Unit III **(18 Hours)**

User defined functions : Introduction – Need for user defined functions – A multi-function program – Elements of user defined functions – Definition of functions - Return values and their types - Calling a function – Function declarations - Functions that return multiple values – Nesting of functions - Recursion - Passing arrays to functions - Passing strings to functions - The scope and lifetime of variables

Unit IV **(18 Hours)**

Structures and Unions: Introduction – Defining and declaring structure – Accessing structure members – Structure initialization – Arrays of structures – Arrays within structures - Structures within structures – Structures and functions – Unions - **Pointers :** Introduction - Understanding pointers - Accessing the address of a variable -Declaring and initializing pointers – Accessing a variable through its pointer - Pointer expressions – Pointers and arrays – Pointers and character strings – Array of pointers - Pointers and functions – Pointers and structures

Unit V **(18 Hours)**

File Handling: Defining and opening a file – Closing a file – I/O operations on files - Error handling during I/O operations - Random access to files – Command line arguments - **Preprocessor:** Introduction - Macro substitution - File inclusion - Compiler control directives.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Recall and comprehend the basic structure of C programs

CO2: Apply knowledge of C programming to solve problems and develop programs

CO3: Analyze and design C programs using control structures, functions, arrays, and strings to develop algorithms

CO4: Implement file handling operations and use preprocessor directives to develop efficient C programs

CO5: Develop problem-solving skills using C programming concepts to design, implement, and testprograms to solve real-world problems

Text Book:

1. E Balagurusamy, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company Ltd, NewDelhi, IX Edition, 2012

Reference Books:

1. K R Venugopal, Sudeep R Prasad, *Programming with C*, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008

2. Mullish Cooper, *The Spirit of C - An Introduction to Modern Programming*, Jaico PublishingHouse , Mumbai, 2006

3. Byron S. Gottfried, Jitender Kumar Chhabra, *Programming with C*, Tata McGraw Hill Publishing Company Ltd , NewDelhi, 2006

Journal:
1. Journal of Information and Communication Technology (Scopus)

E - Resources:
1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview
4. https://spoken-tutorial.org/tutorialsearch/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

AECC I - Programming in C Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 4**
Subject Code: JBITA13P **Credit: 3**

Course Objectives
1. To introduce the basic concepts of programming using C language
2. To enhance the analyzing and problem solving skills in C

List of Programs:
Formula substitution
1. Develop a C Program to find sum of the digits and reverse the digits
2. Develop a C Program to generate the Fibonacci series
3. Develop a C Program to generate Prime number within range
4. Develop a C Program to find whether a given number is Armstrong or not
5. Develop a C Program to count the number of positive, negative and zero in the list
6. Develop a C Program to find the area of various shapes using switch case

Array
7. Develop a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of amatrix using switch case
8. Develop a C Program to Check whether the element is present in the given list or not
9. Develop a C Program to sort numbers in ascending and descending order
10. Develop a C Program to sort names in Alphabetical order

Functions & Structures

11. Develop a C Program to find the factorial of a given number using recursion function
12. Develop a C Program to Prepare student mark list using structure

String Manipulation

13. Develop a C Program to count the vowels in the given string
14. Develop a C Program to perform string functions

Pointers

15. Develop a C Program to find average of two numbers using pointers

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Understand C programming basics
CO2: Implement array operations and string manipulation
CO3: Design programs using functions, structures, and recursion
CO4: Analyze and implement pointer operations
CO5: Develop and debug C programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

SEC I - Office Automation Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 2**
Subject Code: JBITS14P **Credit: 1**

Course Objectives:

1. To acquire hands-on experience with office automation tools, including word processing, spreadsheet, presentation, and database management.
2. To learn to analyze and solve real-world problems using office automation tools.

List of Programs:

Word Processing

1. Create a word processing document consists two pages in a Book named “XX” and then do the following:
    a. Formatting Text, Alignment and Font Style using Word Art
    b. Perform Find and Replace

c. Add Header and Footer option to specify name of the Book Chapter Heading and Pagenumber of total pages
d. Display lists using bullet and number

2. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
3. Create a Newsletter Article (using Columns, Drop cap)

Spread Sheet

4. Create a spreadsheet consists of Student details and then do the following:
   a. Calculate student wise total and subject wise total
   b. Find the Maximum and Minimum marks of the subject
   c. Grade is calculated as
      i. If %>=90, then grade A
      ii. If %>=80 and <90, then grade B
      iii. If %>=70 and <80, then grade C
      iv. If %>=60 and <70, then grade D
      v. If %<60, then grade F
5. Create a spreadsheet having Employee details to calculate Net Pay and Gross Pay

Presentation

6. Create a presentation showing your various activities of the department a Perform slide translation and Setting background designs
7. Create a presentation showing various aspect of your college and perform custom animationand import sound.

Database:

8. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and AveragePerform to findtotal and average and check data entered.
9. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation toretrieve data.

Note: Questions for internal and external examination will be based on concept learnt Course Outcomes:

After successful completion of this course, student will be able to
CO1: Recall and understand various options of office application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Evaluated and compare options of different Microsoft office applications
CO5: Build a presentations, advertisements, reports for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**

CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE III - Data Structures and Algorithms

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**
Subject Code: JBITC21 **Credit: 5**

Course Objectives:

1. To design, implement, and analyze basic data structures such as arrays, linked lists, stacks, and queues
2. To develop and apply algorithmic techniques such as sorting, searching, and graph traversal tosolve real-world problems efficiently and effectively

Unit I **(15 hours)**

Introduction: History of Algorithms - Data structures and Algorithms - Data structure - Definition and Classification. **Stacks:** Introduction - stack Operation - Application. **Queues:** Introduction - Operation - circular Queues - Other Types of Queues - Application.

Unit II **(15 hours)**

Linked Lists: Introduction - Singly Linked Lists - Circularly Linked List - Doubly Linked List - Multiply Linked List - Application. **Trees and Binary Trees:** Introduction -Trees**:** Definition and Basic Terminologies - Representation of Trees -Binary Tree Traversals - Threaded Binary Trees - Applications.

Unit III **(15 hours)**

Graphs: Introduction-Definitions and Basic Terminologies - Representations of Graphs - Graph Traversals – Single source & all pairs shortest paths problem - Minimum cost spanning trees. **Binary Search Trees and AVL Trees:** Introduction - **Binary Search Trees:** Definition and Operations - AVL Trees: Definition and Operations - Applications.

Unit IV **(15 hours)**

Red-Black Trees and Splay Trees: Red-Black Trees - Applications. **Hash Tables:** Introduction-Hash Table Structure - Hash Functions - Linear Open Addressing - Chaining - Applications. **Searching:** Introduction-Linear Search-Transpose Sequential Search- Interpolation Search - Binary Search - Fibonacci Search - Other Search Techniques.

Unit V **(15 hours)**

Internal Sorting: Introduction - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort - Shell Sort - Quick Sort - Heap Sort - Radix Sort. **Algorithms:** Algorithm Specification - Performance analysis - Asymptotic notation.

Course Outcomes:
After successful completion of the course, the students will be able to
CO1: Recall and explain the fundamental concepts of basic data structures
CO2: Apply algorithmic techniques to solve problems efficiently and effectively
CO3: Analyze the time and space complexity of algorithms and evaluate their performance
CO4: Design and implement advanced data structures to solve complex problems
CO5: Evaluate and create solutions using algorithms

Text Books:
1. Vijayalakshmi Pai G A, *Data structures and Algorithms, Concepts, Techniques and Application*, Tata McGraw-Hill Education Private Limited, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms*, Universities Press, Second Edition, 2008.

Reference Books:
1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms*, Dorling Kindersley Private Limited, 2013.
2. Patel R B, *Expert Data Structures with C*, Khanna Book Publishing, Third Edition, 2000.

Journal:
1. Journal of ICT Research and Applications (Scopus)

E-Resources:
1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs26/preview
4. NPTEL: https://nptel.ac.in/courses/106/106/106106127/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	3	3	3	3	**19**
CO2	3	1	3	3	3	3	3	**19**
CO3	3	1	3	3	3	3	3	**19**
CO4	3	1	3	3	3	3	3	**19**
CO5	3	1	3	3	3	3	3	**19**
Total	**15**	**5**	**15**	**15**	**15**	**15**	**15**	**95**

Low-1 Medium-3 High-9

CORE IV - Data Structures Lab

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**

Subject Code: JBITC22P **Credit: 4**

Course Objectives:
1. To introduce the concepts of data structure and its operation
2. To implement data structures for problem solving in C/ C++/python

List of programs:
1. Develop a program to implement the stack using array
2. Develop a program to implement the queue using linked lists
3. Develop a program to implement the in-order tree traversal methods
4. Develop a program to search a key element in a list of elements using linear search
5. Develop a program to search a key element in a list of elements using binary search
6. Develop a program to implement insertion sort algorithm
7. Develop a program to implement selection sort algorithm
8. Develop a program to implement merge sort algorithm
9. Develop a program to implement binary search tree
10. Develop a program to create a singly linked list and delete an element from linked list
11. Develop a program to create a doubly linked list and display the contents in the list

Note: - Questions for the internal and external examination will be based on the concepts learnt
Course Outcomes:
After successful completion of the course, the students will be able to
CO 1: Understand the basics of data structures and its systematic approaches
CO 2: Implement the data structure and its operations in C or C++
CO 3: Compare the difference between various searching & sorting techniques
CO 4: Demonstrate Tree and linked list algorithm
CO 5: Develop simple applications using data structure

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

SEC II – Web Development Lab

(For Students Admitted from 2025-26)

Semester: II **Hours/Week: 2**
Subject Code: JBITS24P **Credit: 1**

Course Objectives:

1. To understand .Net IDE Framework
2. To create website using ASP.Net Controls

List of programs:

Console Application

1. Develop a program to calculate the factorial of a number N, assuming the number is more than zero
2. Develop a program to check a given numbers prime or not
3. Develop a program to calculate age for a person
4. Develop a program to sort a given list of numbers and find out the average of a list of numbers.
5. Develop a program to display how many days are in a given month (check for leap years also)

Windows Application

6. Develop a program to build a simple calculator
7. Develop a program to calculate the arithmetic operations using functions
8. Develop a program to perform String manipulation
9. Develop a program to create notepad

Web Application

10. Develop a program to create a login webpage using database connectivity
11. Develop a program to create a student details form and validate the details
12. Display employee details using data grid control

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Understand the basic concepts of ASP. Net framework
CO 2: Implement console, windows and web applications using ASP.Net controls
CO 3: Demonstrate database connectivity with applications
CO 4: Create console, windows and web applications
CO 5: Design dynamic webpages

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

CORE V - Database Management Systems

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 4**
Subject Code: JBITC31 **Credit: 4**

Course Objectives:

1. To understand the basic concepts of database systems, relational model, database design principles and SQL queries
2. To understand the design and implementation of a database security, Transaction concepts and advanced topics in DBMS

Unit I **(12 hours)**

Introduction to Database Systems: Introduction - File Management Systems (FMS) - Database Management Systems (DBMS) - FMS versus DBMS - An Overview of Database Management - Brief introduction to SQL - Embedded SQL - Dynamic SQL - DBMS Models - Database System Architecture **The Relational Model:** Relational Databases Primer - Relational Database Characteristics - Relational Algebra - Relational Calculus - Database Integrity – Keys - Entity and Referential Integrity
-Views.

Unit II **(12 hours)**

Database Design: Design Considerations - Functional Dependency - Normalization and NormalForms - Entity/Relationship (E/R) Modelling **Transaction Processing and Management:** Transaction – Recovery - Transaction Models - Two-Phase Commit - Concurrency Problems – Locking - Concurrency Problems Revisited – Deadlocks - Transaction Serialisability - Two-Phase Locking - Isolation Levels.

Unit III **(12 hours)**

Database Security: Data Classification - Threats and Risks – Cryptography - Digital Signature - Database Control - Users and Database Privileges - Types of Privileges - Object Privileges - Taking Away Privileges - Filtering Table Privileges - Statistical Databases.**Query Execution and Optimisation:** Query Processing - Using Indexes - Optimiser Functionality - Implementing SELECT - Optimisation Recommendations - Database Statistics.

Unit IV **(12 hours)**

Distributed Databases: Distributed Database Concepts - Distributed Database Architectures - Advantages of Distributed Databases - Distributed Database Requirements - Distributed Database Techniques - Distributed Query Processing - Distributed Concurrency Control and Recovery - Distributed Deadlocks - Client/Server Computing and DDBMS - Date's 12 Rules. **Decision Support Systems, Data Warehousing and Data Mining:** Information and Decision Making - Data warehouse - Data Warehousing Concepts - Data Warehousing Approaches - Online Analytical Processing (OLAP).

Unit V **(12 hours)**

Object Technology and DBMS: An Introduction to Object Technology – Abstraction – Encapsulation – Inheritance - Object Technology and RDBMS - Object Oriented Database Management Systems(OODBMS) **Advanced Topics in DBMS:** Deductive Databases - Internet and DBMS - Multimedia Databases - Digital Libraries - Mobile Databases.

Course Outcomes:
After successful completion of this course, students will be able to
CO1: Design, implement, and manage databases
CO2: Ensure data security and integrity
CO3: Optimize database performance
CO4: Apply database concepts to real-world scenarios
CO5: Demonstrate an understanding of advanced database topics

Text Book:
1. Atul kahate, *Introduction to Database Management Systems*, Pearson Education (Singapore) Pvt Ltd, 2004.

Reference Books:
1. Abraham Silberschatz, Henry Forth, S.Sudarshan, *Database System Concepts*, Mc Graw Hill publishers, 5th Edition, 1997.
2. C.J.Date, *An Introduction to Database System*, Addison Wesley Publishers, 3rd Edition, 1998.

Journal:
1. ICTACT Journal on Communication Technology (UGC)

E-Resources:
1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE VI - Database Management Systems Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 4**
Subject Code: JBITC32P **Credit: 3**

Course Objectives:

1. To get practical knowledge on designing and creating tables
2. To understand various queries such as relational constraints, joins, set operations, aggregate functions and views

List of Programs:

DDL

1. Create an address table with fields name , doorno , street & city
    a. Describe its structure
    b. Alter the table to include pincode
    c. Alter the table to modify street column
    d. Drop the table

DML

2. Create a student table with regno, name, age and dept.
    a. Insert records
    b. Delete the students with age above 20
    c. Truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
    a. Find out the no. of female employees
    b. Find out the employees with age ranging between 30 and 35
    c. List out the employees who are working more than 5 years
4. Create a library table with fields accno, title, author, cost & no of copies
    a. Arrange the books according to accno
    b. Find out the total no. of books available in the library
    c. Find out the book of minimum cost
5. Create a player table with fields name, sports(cricket, hockey, etc.), age & country
    a. Find out the eldest and youngest player
    b. Group players according to sports
    c. List out the Indian players
6. Develop the SQL queries to illustrate all number functions
7. Develop the SQL queries to illustrate date functions
8. Develop the SQL queries to illustrate all string functions
9. Create an item table with field's item no, item name, quantity & price and insert records. Illustrate the comparison operators (between, like, in & isnull)
10. Create a table with the fields client no , client name & phone no Illustrate the set operators Union, union all, minus & intersect
11. Create a student table with fields' regno, name, English, Tamil, Maths and Total & insert records
    a. Arrange all records according to Total
    b. Find the student who got first mark in Maths
    c. List out the students whose name starts with "S"
12. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    a. Insert records
    b. Update the qnty when it goes less than reorderlevel

c. List the items with price less than 100

13. Create an employee table with fields ecode, ename, age & salary and create a department table withfields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

14. Create a vendormaster table with fields vencode,venname,place and phoneno
15. Create an ordermaster table with fields itemno, itemcode, vencode, qnty and orderdate. Illstrate the following constraints using the above tables
    a. vencode as primary key in vendormaster
    b. vencode as foreign key in ordermaster
    c. phoneno as unique
    d. place as notnull &
    e. qnty > 100

TCL

16. Develop the SQL queries to illustrate TCL commands (savepoint, rollback and commit)

Triggers

17. Develop the SQL queries to create and execute triggers

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall and explain database concepts and structures using DDL commands

CO2: Manipulate and manage data using DML commands and functions

CO3: Analyze and solve problems using SQL queries, including aggregate functions, joins, and subqueries

CO4: Implement data integrity constraints and triggers to manage data consistency

CO5: Develop and execute complex SQL queries to solve real-world problems

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

SEC III – Cyber Security Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/Week: 2**

Subject Code: JBITS34P **Credit: 1**

Course Objectives:

1. To implement various cyber security measures to protect computer systems and networks
2. To analyze and detect various types of cyber threats using signature-based and behavior-based detection techniques, and develop skills to prevent and mitigate these threats

List of Programs:

1. Develop a program to stop user from viewing certain URLs or Websites
2. Develop a program to protect Systems from Malicious Software
3. Develop a program to perform signature based detection
4. Develop a program to behavior-based detection
5. Develop a program to Prevent threats from getting on the network using sandboxing
6. Develop a program to perform web Application firewall
7. Develop a program to perform website scraper
8. Develop a program to perform log analyzer

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build applications for cyber security solutions.
CO2: Perform Malware attacks.
CO3: Demonstrate corrective measures for computer security breaches.
CO4: Illustrate security threats and methodologies.
CO5: Develop firewall and web related issues.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	3	9	9	**45**
CO2	9	3	9	3	3	9	9	**45**
CO3	9	3	9	3	3	9	9	**45**
CO4	9	3	9	3	3	9	9	**45**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**15**	**45**	**15**	**15**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE VII - Operating Systems

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 5**
Subject Code: JBITC41 **Credit: 5**

Course Objectives:

1. To design and implement operating system components, including process schedulers, memory managers, and file systems, using appropriate algorithms and data structures.
2. To evaluate and compare different operating system design alternatives, including process synchronization mechanisms, memory management strategies, and security protocols.

Unit I **(15 hours)**

Introduction: Operating System - Mainframe systems- desktop systems- Multiprocessor Systems- Distributed systems- Clustered Systems- Real time systems- **Operating System Structure:** System components- Operating System services- System calls- - System structure.

Unit II **(15 hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication**. CPU Scheduling**: Basic Concepts- Scheduling Criteria **Process Synchronization**: Background- The critical section problem--semaphores- Monitors.

Unit III **(15 hours)**

Deadlock: System Model-Deadlock Characterization- Methods of Handling Deadlock-Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock-**Memory Management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(15 hours)**

Virtual Memory: Background- Demand paging-Copy-on-Develop -Page replacement-Thrashing. **File system Interface**: File concepts- access methods- Directory structure. **Mass Storage Structure**: Overview of mass storage structure

Unit V **(15 hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix. **Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Design and implement operating system components
CO2: Evaluate and compare different operating system design alternatives
CO3: Implement process management and synchronization techniques
CO4: Manage memory and file systems
CO5: Ensure system protection and security

Text Book:

1. Abraham G Silberschatz, *Operating System***,** Wiley Publisher, Tenth Edition, 2017

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design*, Tata McGraw Hill, Second Edition,1997

2. Peter Baer Galvin and Robert Neilson Boyd, *Applied Operating system concepts*, John Wiley & Sons, First Edition, 2000
3. Dhananjay M. Dhamdhere, *Operating System A Concept-Based Approach*, Tata McGraw Hill, Third Edition, 2012
4. W. Stallings, *Operating Systems, Internals & Design Principles*, Prentice Hall of India, Fifth Edition, 2008

Journal:
1. Journal of Information and Communication Technology (Scopus)

E-Resources:
1. https://nptel.ac.in/courses/106/105/106105214/
2. https://nptel.ac.in/courses/106/106/106106144/
3. https://onlinecourses.nptel.ac.in/noc21_cs44/preview
4. https://www.udacity.com/course/introduction-to-operating-systems--ud923
5. https://onlinecourses.nptel.ac.in/noc21_cs72/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	3	1	3	3	**15**
CO2	3	1	1	3	1	3	3	**15**
CO3	3	1	1	3	1	3	3	**15**
CO4	3	1	1	3	1	3	3	**15**
CO5	3	1	1	3	1	3	3	**15**
Total	**15**	**5**	**5**	**15**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE VIII - Programming in Java

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**
Subject Code: JBITC42 **Credit: 4**

Course Objectives:
1. To develop proficiency in Java programming fundamentals, including data types, operators, control structures, functions, and object-oriented programming concepts.
2. To design, implement, and test Java programs using advanced concepts, including inheritance, polymorphism, exception handling, multithreading, and applet programming

Unit I **(12 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm – basic concepts of oops – benefits of oops – applications of OOPs**. Java Evolution:** java features – java Versus C and C++ -java and internet – java and WWW – web browsers **Overview of Java**

Language:simple java program - more of java – application with two classes –java program structure – java tokens – java statements-implementing a java program - java virtual machine - command line arguments.

Unit II **(12 hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables – scope of variables – symbolic constants – type casting – getting values of variables – standard default values – **Operators and Expressions**: Arithmetic operators – Relational operators- logical operators – assignment operators – increment and decrement operators – conditional operator – bitwise operator – special operators –arithmetic expressions – evaluation of expressions– precedence of arithmetic operators-type conversion in expression –operator precedence and associativity – mathematical functions.- **Decision making and Branching:** if statement – switch - ? : Operator –**Decision Making and Looping:** while statement – do statement – for statement – jumps in loops - labeled loops.

Unit III **(12 hours)**

Classes, Objects and Methods: Introduction – defining a class, field declaration – methods declaration – creating objects– accessing class members – constructors – methods overloading – static members – nesting of methods – inheritance – overriding methods – final variables and methods – final classes– finalizer methods – abstract methods and classes – visibility control **- Arrays Strings and Vectors** :one dimensional array – creating an array –two dimensional arrays – strings –vectors – wrapper classes. **Interfaces, Multiple Inheritance:** defining interfaces – extending interfaces – implementing interfaces accessing interface variables.

Unit IV **(12 hours)**

Packages, Putting classes together : Introduction - java API packages : using system packages– naming conventions–creating packages –accessing a package –using a package – adding a class to a package– hiding classes – **Multi-threaded Programming** : creating threads – extending the thread class – stopping and blocking a thread - life cycle of a thread – using thread methods – thread exceptions – thread priority–synchronization –implementing the runnable interface.

Unit V **(12 hours)**

Managing Errors and Exception: Introduction – types of errors –exceptions -syntax of exception handling code – multiple catch statements –using finally statement –throwing our own exceptions – using exceptions for debugging- **Applet Programming:** introduction – how applets differ from applications –building applet code–applet life cycle – creating an executable applet – designing a web page - applet tag – adding applet to html file –running the applet – more about applet tags –passing parameters to Applets –aligning the display.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember and understand Java programming basics

CO2: Apply object-oriented programming principle to solve problems

CO3: Analyze the advanced Java concepts and techniques

CO4: Manage data and exception handling mechanisms

CO5: Design and develop Java applications

Text Books:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill, 2015
2. Hortsmann & Cornell, "CORE JAVA 2 ADVANCED FEATURES, VOL II", Pearson Education, 2002

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference,* McGraw Hill, 2017.
2. Robert Sedgewick, Kevin Wayne, *Introduction to Programming in Java,* Addison Wesley,2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Brief Version Pearson Education, 2017.

Journal:

1. Journal of ICT Research and Applications (Scopus

E-Resources:

1. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English
2. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

AECC IV - Programming in Java Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**
Subject Code: JBITA43P **Credit: 3**

Course Objectives:

1. To develop programming skills in Java, applying fundamental concepts, data structures, and object-oriented programming principles to solve problems.
2. To design, implement, and test Java programs to perform various tasks, including numerical computations, data sorting and searching, string manipulation, and graphical user interface (GUI) development.

List of Programs:

Formula Substitution

1. Develop a program to find the factorial and binomial coefficient value
2. Develop a program to calculate mean, variance and standard deviation
3. Develop a program for number conversions

Checking

4. Develop a program for number checking (prime, perfect, etc.)

Generation

5. Develop a program for number generation (prime, perfect, etc.)

Array

6. Develop a program to arrange numbers and names in order
7. Develop a program to perform matrix addition, subtraction, multiplication & transpose

Searching

8. Develop a program to implement linear search and binary search

String

9. Develop the program to perform string manipulation (case conversion, reversing, etc.)

OOP Concepts

10. Develop a program to implement inheritance concepts
11. Develop a program to implement exception handling
12. Develop a program to implement multithreading

Applet

13. Develop a program to handle Keyboard events
14. Develop a program to simulate a calculator (arithmetic operations) using GUI components

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple Mathematical problems, number checking and number generation

CO2: Demonstrate the concepts of String Manipulation, Linear Search and Binary Search

CO3: Illustrate OOP in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling and GUI components

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	9	9	3	9	9	**49**
CO2	9	1	9	9	3	9	9	**49**
CO3	9	1	9	9	3	9	9	**49**
CO4	9	1	9	9	3	9	9	**49**
CO5	9	1	9	9	3	9	9	**49**
Total	**45**	**5**	**45**	**45**	**15**	**45**	**45**	**245**

Low-1 Medium-3 High-9

SEC IV - Linux and Shell Programming Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 2**
Subject Code: JBITS44P **Credit: 1**

Course Objectives:

1. To understand and make effective use of Linux utilities and shell scripting language to solve problems
2. To develop the skills necessary for systems programming including file system programming, process and signal management and inter-process communication

List of Programs:

Built-in Commands

1. Develop a shell program to use who commands
2. Develop a shell program to use list commands
3. Develop a shell program to use sort commands
4. Develop a shell program to use wc commands
5. Develop a shell program to use cat commands

Formula Substitution

6. Develop a shell program to find odd or even number
7. Develop a shell program to find smallest among three numbers
8. Develop a shell program to find the factorial value
9. Develop a shell program to display multiplication table

Switch case

10. Develop a shell program to use case statement

Functions

11. Develop a shell program to display username and password
12. Develop a shell program to calculate the age of a person

Checking

13. Develop a shell program to check the given file is in directory or not

String Manipulation

14. Develop a shell program to perform string manipulations

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and apply Linux built-in commands to perform basic operations
CO2: Apply shell programming constructs to solve problems
CO3: Create shell programs to perform system administration tasks
CO4: Perform string manipulation operations using shell programming

CO5: Design and implement complex shell scripts to solve real-world problems

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	1	1	3	9	3	**27**
CO2	9	1	1	1	3	9	3	**27**
CO3	9	1	1	1	3	9	3	**27**
CO4	9	1	1	1	3	9	3	**27**
CO5	9	1	1	1	3	9	3	**27**
Total	**45**	**5**	**5**	**5**	**15**	**45**	**15**	**135**

Low-1 Medium-3 High-9

CORE IX - Software Engineering

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 6**
Subject Code: JBITC51 **Credit: 5**

Course Objectives:

1. To analyze software engineering problems and develop solutions using appropriate process models, such as waterfall, incremental, and evolutionary models.
2. To apply software engineering principles and practices to design, develop, test, and maintain software systems, ensuring quality, reliability, and maintainability.

Unit I **(18 hours)**

Introduction: Software engineering: A layered technology – A process framework – Process models – The waterfall model – Incremental process models – Evolutionary process models.
Software Engineering practice: Communication practices – Planning practices – Modeling practices – Construction practice.

Unit II **(18 hours)**

Agile Development: Agility -Agility and the cost of change -Agile process -Extreme Programming - Other agile process models-A tool set for the agile process. **Requirements Engineering:**Requirements engineering tasks – Initiating the requirements engineering process – Eliciting requirements – Developing use-cases – Negotiating requirements – Validating requirements.

Unit III **(18 hours)**

Design Engineering: Design process and design quality – Design concepts – The design model. **Testing Strategies:** A strategic approach to software testing – Test strategies for conventional software – Validation testing – System testing – The art of debugging.

Unit IV **(18 hours)**

Testing Tactics: Software testing fundamentals – White-box testing – Basis path testing – Control structure testing – Black-box testing. **Project Management:** The management spectrum – The people – The product – The process – The project.

Unit V **(18 hours)**

Risk Management: Reactive vs proactive risk strategies – Software risks – Risk identification – Risk projection – Risk refinement. **Quality Management:** Quality concepts – Software quality assurance – Software reviews – Formal technical reviews – The ISO 9000 quality standards – The SQA plan.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain a process model for a software project development

CO2: Apply project management and requirement analysis, principles to software project development

CO3: Analyze the cost estimate and problem complexity using various estimation techniques

CO4: Compare the SRS, design document, project plan of given software system

CO5: Generate test cases using the techniques involved in selecting: (a) White Box testing (b) Block Box testing

Text Book:

1. Roger S. Pressman, *Software Engineering A Practitioner's Approach*, Tata McGraw Hill, Eighth Edition, 2015

Reference Books:

1. Ian Sommerville, *Software Engineering*, Pearson Education, Seventh Edition, 2004
2. Samarjeet kaur, Sandhir Sharma, P.P Singh, *Software Engineering – Complete Course Book*, Deep &Deep Publications, 2006
3. Waman S Jawadekar, *Software Engineering -Principles and Practice*, Tata McGraw Hill, 2004

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://www.coursera.org/courses?query=software%20engineering

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE X -Theory of Computation

(For Students Admitted from 2025-26)

Semester: V **Hours/Week: 6**
Subject Code: JBITC52 **Credit: 6**

Course Objectives:

1. To give an overview of the theoretical foundations of computer science from formal languages and regular grammars, context free grammar.
2. To illustrate finite state machines to solve problems in computing and explain in hierarchy of problems arising in the computer sciences.

Unit I **(18 hours)**

Finite Automata (FA): Introduction, Deterministic Finite Automata (DFA) – Formal definition – Simpler notations (state transition diagram, transition table) – Language of a DF**. Nondeterministic Finite Automata (NFA):** Definition of NFA – Language of an NFA

Unit II **(18 hours)**

Regular Expressions (RE): Introduction - Identities of Regular Expressions - Finite Automata and Regular Expressions - Converting from DFA's to Regular Expressions - Converting Regular Expressions to Automata - Applications of Regular Expressions.

Unit III **(18 hours)**

Regular Grammars: Definition - Regular grammars and FA-FA for regular grammar -Regular grammar for FA-Applications - Closure properties of regular languages.

Unit IV **(18 hours)**

Context free Grammar (CFG): Derivation Trees - Sentential Forms - Rightmost and Leftmost derivations of Strings. Ambiguity GNF-Pumping Lemma for CFL's, CFG's Minimization of CFG's, CNF, GNF – Pumping Lemma for CFL's.

Unit V **(18 hours)**

Pushdown automata: Definition Model - Acceptance of CFL - Equivalence of CFG and PDA. Turing machines (TM): Formal definition and behavior - Languages of a TM-Types of TMs.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the hierarchy of languages, Turing machines, undecidable problems, and NP problems.
CO2: Apply formal language theory to design automata and grammars for different languages.
CO3: Use finite state machines, pushdown automata, and Turing machines to solve computing problems.
CO4: Convert automata to regular expressions and design context-free grammars for languages.

CO5: Design context-free grammars and finite automata for given languages and patterns.

Text Book:

John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata, Theory Languages and Computation, Pearson Education, Third Edition, 2007.

Reference Books:

1. K. L. P Mishra, N. Chandrashekaran, *Theory of Computer Science - Automata Languages and Computation*, Second edition, 2003.
2. H.R.Lewis and C.H.Papadimitriou, *Elements of the theory of Computation*, Prentice Hall of India, Second Edition, 2003.
3. J.Martin, *Introduction to Languages and the Theory of Computation*, Tata McGraw Hill, Third Edition, 2003.
4. Micheal Sipser, *Introduction of the Theory and Computation*, Thomson Brokecole, 1997.

Journal:

1. Info Communication Journal (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104148/
2. https://nptel.ac.in/courses/106/104/106104028

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XI - Bioinformatics

(For Students Admitted from 2025-26)

Semester: V **Hours/Week: 6**
Subject Code: JBITC53 **Credits: 5**

Course objective:

1. To apply biology of bio informatics techniques for genomics and genetics
2. To understand the concept behind bio informatics and molecular biology

Unit I **(18 hours)**

Introduction to Bioinformatics-Basics of Bioinformatics -applications-Molecular biology essentials - DNA,-RNA-proteins, and enzymes-Overview of genome, proteome, and systems biology-Database and data management in bioinformatics-**Biology for Bioinformatics:** Cell structure and function-Central Dogma of molecular biology -DNA replication-transcription, translation

Unit II **(18 hours)**

Mathematics for Bioinformatics: Basic statistics –mean-median-variance-probability-Linear algebra - matrix operations-Fundamentals of calculus -differential equations applied to modeling biological systems-**Computer Science Basics**: Introduction to programming (Python, R, or C++)Algorithms and data structures

Unit III **(18 hours)**

Molecular Biology and Informatics Techniques: Molecular Biology Techniques-Gene cloning, sequencing methods (Sanger, NGS)-PCR, gel electrophoresis, and Western blotting-Protein expression and purification techniques-Sequencing technologies and bioinformatics tools

Unit IV **(18 hours)**

Biological Databases and Tools-Introduction to biological databases– GenBank- EMBL, UniProt,-Sequence retrieval and data mining-Gene Ontology (GO), KEGG- other functional databases-Use ofbioinformatics tools like BLAST, FASTA, etc.-**Computational Biology:**Biological sequence analysis
–alignment-homology search-Sequence similarity and scoring matrices

Unit V **(18 hours)**

Programming for Bioinformatics: Introduction to programming in Python or R for biological data analysis-Data manipulation, visualization, and statistical analysis-Writing bioinformatics scripts for processing DNA, RNA, and protein sequences

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Understand and Explain the Basics of Bioinformatics
CO2: Apply Bioinformatics Tools for Sequence Analysis
CO3: Conduct Genomic and Proteomic Data Analysis
CO4: Interpret and Visualize Biological Data Using Computational Models
CO5: Understand and Implement Machine Learning in Bioinformatics

Text Books:

1. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins by Andreas D. Baxevanis & B. F. Francis Ouellette
2. Molecular Genetics of Bacteria by Larry Snyder and Wendy Champness
3. R Programming for Bioinformatics by Robert J. Gentleman

Reference Book:

1. Bioinformatics : Methods And Applications ,Dev Bukhsh Singh,Rajesh Kumar Pathak

Journal:

1. ICTACT Journal on Soft Computing (UGC)

E-Resources:
1. EMBL-EBI (European Bioinformatics Institute) – https://www.ebi.ac.uk/
2. Bioinformatics.org – http://www.bioinformatics.org/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

SEC V - Bioinformatics Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/Week: 2**
Subject Code: JBITS54P **Credit: 1**

Course Objectives:
1. To interpret genomic and transcriptomic data
2. To apply computational biology techniques

List of Programs:
Sequence From GenBank
1. Develop a program to retrieve nucleotide sequence from GenBank 4
2. Develop a program to retrieve protein sequence from GenBank 8
3. Develop a program to implement sequence similarity search using BLASTN 14
4. Develop a program to implement sequence similarity search using BLASTP 22

Protein Structure
5. Develop a program to access structural database and download the protein structure 28
6. Develop a program to work with Ensemble 32
7. Develop a program to implement multiple sequence alignment 36
8. Develop a program to predict physiochemical properties of protein sequence 42
9. Develop a program to predict peptide mass of protein sequence 48
10. Develop a program to predict cleavage site of protein sequence 54

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Develop proficiency in bioinformatics tools and software

CO2: Analyze biological sequence data using bioinformatics techniques

CO3: Interpret and analyze genomic and transcriptomic data

CO4: Construct and interpret phylogenetic trees and networks

CO5: Apply machine learning techniques to bioinformatics data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**15**	**45**	**15**	**45**	**45**	**45**	**255**

Low-1 Medium-3 High-9

Core XII - Computer Networks

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 6**

Subject Code: JBITC61 **Credit: 6**

Course Objectives:

1. To understand the fundamental concepts of computer networking, including network models, protocols, and layers of the OSI and TCP/IP models.
2. To analyze and explain the functioning of different network layers, including physical, data link, network, transport, and application layers, and identify the protocols and technologies used in each layer.

Unit I **(18 hours)**

Introduction: Data communications - Networks - The Internet - **Network Models**: Layered Tasks - The OSI model- Layers in the OSI model - TCP/IP Protocol suite – Addressing

Unit II **(18 hours)**

Physical Layer: Transmission Media: Guided media - Unguided media **Switching:** Circuit switched networks- Datagram networks - Virtual circuit networks - **Using Telephone and cable networks for data transmission:**Telephone network - Cable TV networks

Unit III **(18 hours)**

Data Link Layer: Error Detection and Correction: Introduction - Block coding - Linear block codes – Cyclic Codes – Checksum - **Data Link Control:** Framing - Flow and Error control - Protocols-

Noiseless channels - Nosy channels - Point-to-point protocol - **Ethernet:** IEEE Standards - Standard Ethernet -Faster Ethernet - Gigabit Ethernet

Unit IV **(18 hours)**

Network Layer: Network Layer: IPV4 Addresses - IPV6 Addresses - **Internet Protocol:** Internetworking -IPV4 - IPV6 - **Address Mapping, Error Reporting, and Multicasting:** Address Mapping - ICMP – IGMP

Unit V **(18 hours)**

Transport Layer: Process - To Process Delivery: UDP, TCP: User Datagram Protocol (UDP) - TCP**Congestion Control and Quality of Service:** Data traffic - Congestion - Congestion Control - Quality ofService - Technique to improve QoS - **Application Layer: Domain Name System:** Name space - Domain namespace - DNS in the Internet - DNS messages - **Remote Logging, Electronic Mail, and File Transfer:** Remote Logging - Electronic Mail - File Transfer - **WWW and HTTP:** Architecture- Web Document – HTTP

Text Book

1. Behrouz A Forouzan, *Data Communications & Networking,* Tata McGraw Hill, New Delhi, Fourth Edition, 2003

Reference Books:

1. Andrew S Tanenboum, *Computer Networks,* Prentice Hall of India Pvt. Ltd., New Delhi, Fourth Edition, 2007
2. Douglas E Comer, *Computer Networks and Internets*, Pearson Education, New Delhi, Fourth Edition, 2004

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview
2. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
3. https://nptel.ac.in/courses/106/105/106105081

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XIII - Data Analytics

(For Students Admitted from 2025-26)

Semester: VI **Hours/Week: 6**
Subject Code: JBITC62 **Credit: 6**

Course Objectives:

1. To understand the Big Data Platform and its Use cases and Map Reduce Jobs
2. To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and Apply analytics on Structured, Unstructured Data

Unit I **(18 hours)**

Introduction to Big Data: Introduction – understanding Big data-capturing bigdata-Volume-velocity- varietyveracity-Benefiting Big Data –Management of big data- organizing big data-Technology challenges**.**

Unit II **(18 hours)**

Big data Sources and Architecture: Big data sources-people to people communication-m2m- big data applications- Examining big data types- structured data – unstructured data- semi structured data-integrating data type into big data environment-Big data Architecture.

Unit III **(18 hours)**

Hadoop: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization- Hadoop Architecture, Hadoop Storage. Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers-: HDFS- Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts,
Joins & Subqueries, HBase.

Unit IV **(18 hours)**

Analytics and Big Data: Basic analytics-Advanced analytics-operationalized analytics-Monetizing analyticsmodifying
business intelligence products to handle big data- big data analytics solution- understanding text analytics-tools for Big data

Unit V **(18 hours)**

Data Visualization & R: Introduction-excellence in visualization- types of chart-Business Intelligence: Toolsskills applications – Health care- Education-retail - E- Governance -Working with R- Import a dataset in RPlotting a histogram-Big data mining.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Describe Data sources, generations, data formats, Data Evolution, Data from various domains
CO2: Determine Big Data Characteristics, Frameworks, components and Limitation of traditional approaches and map Big Vs to Data Domains

CO3: Analyse various domains of Data Characteristics, Platform, Programming Model and Design Data
Analytic ecosystem, and data processing framework
CO4: Evaluate the Concepts of Data Analytics Phases and Techniques
CO5: Formulate Data Analytics Techniques practically using R environment

Text Books:
1. Anil Maheshwari, *Data Analytics Made Accessible*, Kindle Edition, 2017.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman , *Big Data for Dummies*, Wiley India Private Limited, 2014.

Reference Books:
1. Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley, India Private Limited, 2015.
2. Chris Eaton, Dirk deroos, Understanding *Big data*, McGraw Hill, 2012.
3. Tom White, *HADOOP: The definitive Guide*, O Reilly, 2012.
4. Tom Plunkett, Brian Macdonald, Oracle *Big Data Handbook*, Oracle Press, 2014.
5. JyLiebowitz, *Big Data and Business analytics*, CRC press, 2013.
6. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013.

Journal:
1. ICTACT Journal on Soft Computing (UGC)

E-Resources:
1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://nptel.ac.in/courses/110/106/110106072

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE XIV - Data Analytics & Visualization Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours/week: 5**
Subject Code: JBITC63P **Credit: 4**

Course Objectives:

1. To identify datasets and explain how they are organized and manipulate data
2. To use functions for data visualization

List of Programs:

Spread Sheet:
1. To perform Basic Functions in Spread sheets
2. To perform Formatting and Proofing
3. To perform Mathematical & Text Functions
4. To Implement Date and Time Functions
5. To Implement Sorting
6. To Implement Filtering Techniques
7. To perform Logical Functions
8. To perform Data Validation
9. To display Pivot Tables
10. To display Charts and Slicers
11. To perform Lookup Functions

R Tool:
12. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT,ROUND)
13. To perform data import (.CSV, .XLS, .TXT) operations
14. To perform data export (.CSV, .XLS, .TXT) operations
15. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
16. To create data frames and performs operations on it
17. To perform data pre-processing operations -Handling Missing data
18. To perform data pre-processing operations - Min-Max normalization
19. To perform statistical operations (Mean, Median, Mode and Standard deviation)
20. To perform Simple Linear Regression
21. To perform K-Means clustering operation and visualize for iris data set

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Outline R functions to perform numerical operations
CO2: Demonstrate the concepts of import/export operations
CO3: Illustratedata pre-processing operations
CO4: Evaluate Statistical operations
CO5: Develop an application using K-Means algorithm with visualization

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**

CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE XV- Project

(For Students Admitted from 2025-26)

Semester: VI **Hours/Week: 6**
Subject Code: JBITC64PW **Credit: 6**

Course Objectives:
1. To impart the students to implement the project by data collection, tool selection
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Identifygoals, constraints, deliverables, performance criteria and resource requirements inconsultation with stakeholders
CO2: Apply the plan by executing the code
CO3: Illustrate the various aspects of software development for the total project
CO4: Evaluate the entire software project according to the specific problem
CO5: Develop thesoftware project by executing with the various data.

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

SEC VI - Mobile Application Development Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours/Week: 2**
Subject Code: JBITS65P **Credit: 1**

Course Objectives:

1. To facilitate students to understand android SDK and to help students to gain a basic understanding of Android application development
2. To inculcate working knowledge of Android Studio development tool

List of Programs:

1. Develop a program to simulate mobile application to send “hello” message from one to another
2. Develop a program to simulate mobile application to Addition of two numbers
3. Develop a program to simulate mobile application to create login form
4. Develop a program to simulate mobile application to send image from one to another
5. Develop a program to simulate mobile application to chatting
6. Develop a program to simulate mobile application to create any games
7. Develop a program to simulate mobile application to display device information
8. Develop an application that uses GUI components, Font and Colors
9. Develop a native application that uses GPS location information
10. Develop a mobile application to send an email.
11. Develop a mobile application for simple needs (Mini Project)

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Understand the basics of Android SDK and application development
CO2: Develop mobile applications using Android Studio
CO3: Implement various mobile application features, including login forms, image sharing, chatting, and device information display
CO4: Integrate location-based services using GPS and email functionality in mobile applications
CO5: Design and develop a mobile application

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

B Sc Computer Science

Three Years Regular Programme
(For Students Admitted from 2025-26)

Programme Specific Outcomes:

On completion of this programme, student will be able to gain

PSO 1: Demonstrate the aptitude of Computer Programming and Computer based problem solving skills

PSO 2: Display the knowledge of appropriate theory, practices and tools for the specification, design, and implementation

PSO 3: Apply the knowledge of Statistics and Operations Research in the development of computational solutions

PSO 4: Ability to link knowledge of Computer Science and Mathematics.

PSO 5: Ability to formulate, to model, to design solutions, to appreciate emerging technologies and to use software tools

PSO 6: Ability to design, develop and implement computer programs to solve real world problems in various domains

PSO 7: Ability to pursue higher studies of specialization and to take up technical employment

PREAMBLE

The Board of Studies in Computer Science has undertaken a comprehensive review of the curriculum, resulting in the following changes:

Core Papers

- The Fundamentals of Computer syllabus has been revised to include basics
- of computer, digital electronics and computer organization
- The textbook and syllabi for Programming in C, Database management systems,
- and Computer Networks have been updated
- The Data Structure Lab syllabus has been modified
- The Software Engineering syllabus has been revised
- Data Analytics and Data Analytics & Visualization Lab have been introduced
- The syllabi of Computer Organization, .NET Programming, and .NET Programming Lab courses have been removed

Multi-Disciplinary Courses

- PC Package Lab course has been revised
- Blockchain Technology Lab, Internet of Things Lab and Intellectual Property Rights have been introduced
- The Internet of Things course has been modified

Skill Enhancement Courses (SEC)

3. The Office Automation Lab course has been reduced
4. Python Lab, Cyber Security Lab, Bioinformatics Lab, and Mobile Application Development Lab courses have been introduced
5. Multimedia Lab - I , Multimedia Lab - II ,Web Designing Lab (HTML and Scripting Language) Lab courses have been removed

Ability Enhancement Compulsory Courses

6. Digital Electronics course has been removed

Discipline-Specific Electives

- Big Data Analytics and Mobile Application Development courses have been removed

Value-Added Courses

- The Digital and Technology Solution course has been introduced

PROGRAMME STRUCTURE – PROGRAM CODE: UCS

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
I	I	JBLT11/ JBLA11/ JBLHB11/ JBLHA11	Language I	Tamil I/ Arabic I/ Hindi I a (or) b	5	3			25	75	100
	II	JBLEB12/ JBLEA12	Language II	English I a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCSC11	Core I	Fundamentals of Computer	6	5	SD	GLO	25	75	100
		JBCSC12	Core II	○ Programming in C	6	6	EMP	GLO	25	75	100
		JBCSA13P	AECC I	Programming in C Lab	4	3	EMP	GLO	25	75	100
	IV	JBCSS14P	SEC I	Office Automation Lab	2	1	SD	GLO	-	50	50
				Library/ Browsing	1	-			-	-	-
				Remedial/ Games	1	-			-	-	-
				TOTAL	**30**	**21**			**125**	**425**	**550**
II	I	JBLT21/ JBLA21/ JBLHB21/ JBLHA21	Language I	Tamil II/ Arabic II/ Hindi II a (or) b	5	3			25	75	100
	II	JBLEB22/ JBLEA22	Language II	English II a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCSC21	Core III	Data Structures and Algorithms	5	5	SD | EMP	GLO	25	75	100
		JBCSC22P	Core IV	Data Structures Lab	5	4	SD | EMP	GLO	25	75	100
		JBCSA23	AECC II	Statistics	4	4	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBCSS24P	SEC II	Python Lab	2	1	EMP	GLO	-	50	50
		JBUI2V	CVAC I	Understanding India	2	2			-	50	50
				Library/ Browsing	1	-			-	-	-

				Remedial/ Games	1	-			-	-	-
	V	JBCSX2P/ JBCSX2O	Extra Credit I	UI and UX Design Lab / *Online Course	-	2	ENT| EMP	GLO	-	100	100
				TOTAL	**30**	**22 + 2**			**125**	**475+ 100**	**600+ 100**
III	I	JBLT31/ JBLA31/ JBLHB31/ JBLHA31	Language I	Tamil III/ Arabic III/ Hindi III a (or) b	5	3			25	75	100
	II	JBLEB32/ JBLEA32	Language II	English III a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCSC31	Core V	Database Management Systems	4	4	SD | EMP	GLO	25	75	100
		JBCSC32P	Core VI	Database Management Systems Lab	4	3	SD | EMP	GLO	25	75	100
		JBCSA33	AECC III	Operations Research	4	4	SD | EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBCSS34P	SEC III	Bioinformatics Lab	2	1	SD	GLO	-	50	50
		JBMD31CSP	MD I	PC Package Lab	2	1	SD	GLO	-	50	50
		JBES3V	CVAC II	Environmental Science for Sustainable Development	2	2			-	50	50
		JBXTN3	Extension	NSS / CSS	2	2			100	-	100
	V	JBCSX3P/ JBCSX3O	Extra Credit II	NoSQL Lab / *Online Course	-	2	EMP	GLO	-	100	100
				TOTAL	**30**	**23 +2**			**225**	**525+ 100**	**750+ 100**
IV	I	JBLT41/ JBLA41/ JBLHB41/ JBLHA41	Language I	Tamil IV /Arabic IV / Hindi IV a (or) b	5	3			25	75	100
	II	JBLEB42/ JBLEA42	Language II	English IV a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCSC41	Core VII	Operating Systems	5	5	SD | EMP	GLO	25	75	100
		JBCSC42	Core VIII	# Big Data Analytics	4	4	ENT| EMP	GLO	25	75	100
		JBCSC43P	AECC IV	Data Analytics and Visualization Lab	4	3	ENT| EMP	GLO	25	75	100

	IV	JBMD41CSP	MD II	Web Designing Lab	3	2	ENT| EMP	GLO	-	50	50
		JBCSS44P	SEC IV	Linux and Shell Programming Lab	2	1	SD	GLO	-	50	50
		JBDT4V	CVAC III	Digital and Technology Solution	2	2	SD	GLO	-	50	50
	V	JBCSX4P/ JBCSX4O	Extra Credit III	R Tool Lab / *Online Course	-	2	ENT| EMP	GLO	-	100	100
	TOTAL				**30**	**23+2**			**125**	**525+ 100**	**650+ 100**
V	III	JBCSC51	Core IX	Software Engineering	6	5	SD	GLO	25	75	100
		JBCSC52	Core X	Cyber Security	6	6	ENT| EMP	GLO	25	75	100
		JBCSC53P	Core XI	Cyber Security Lab	6	5	ENT| EMP	GLO	25	75	100
	IV	JBMD51CSA/ JBMD51CSB	MD III	a) Internet of Things b) Blockchain Technology	4	3	SD| EMP	GLO	25	75	100
		JBMD52CSAP/ JBMD52CSBP	MD IV	a) IoT Lab b) Blockchain Technology Lab	4	3	SD| EMP	GLO	25	75	100
		JBCSS54P	SEC V	PHP Programming Lab	2	1	SD	GLO	-	50	50
		JBHW5V	CVAC IV	Health and Wellness	2	2			-	50	50
	V	JBESX5	Extra Credit IV	Employability Skills	-	2			100	-	100
	TOTAL				**30**	**25 + 2**			**125+ 100**	**475**	**600+ 100**
VI	III	JBCSC61	Core XII	# Programming in Java	6	6	ENT| EMP	GLO	25	75	100
		JBCSC62	Core XIII	Computer Networks	6	6	SD	GLO	25	75	100
		JBCSC63P	Core XIV	Programming in Java Lab	5	4	ENT| EMP	GLO	25	75	100
		JBCSC64PW	Core XV	Project	6	6	SD| ENT| EMP	GLO	25	75	100
	IV	JBMD61CSA/ JBMD61CSB	MD V	a) Digital Marketing b) Intellectual Property Rights	4	3	SD| EMP	GLO	25	75	100
		JBCSS65P	SEC VI	Mobile Application Development Lab	2	1	SD| EMP	GLO	-	50	50
	V	JBCSX6P/ JBCSX6O	Extra Credit	Data Mining Lab / *Online Course	-	2	ENT| EMP	GLO	-	100	100

			V								
				Library / Browsing	1	-			-	-	-
				TOTAL	**30**	**26 + 2**			**125**	**425+ 100**	**550+ 100**
				Grand Total	**180**	**140 +10**			**850+ 100**	**2850 +400**	**3700 + 500**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX,
Spoken Tutorial, NPTEL or Coursera etc.
For internship course, refer www.internshala.com or any online internship course.
○ For online course integration, syllabus will be taken from spoken tutorial

@SD- Skill Development ENT-Entrepreneurship EMP-Employability
$ REG-Regional NAT-National GLO-Global

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course
MD - Multi Disciplinary
CVAC - Common Value Added Course

CORE I – Fundamentals of Computer

(For Students Admitted from 2025-26)

Semester: I **Hours/week: 6**
Subject Code: JBCSC11 **Credit: 5**

Course objectives:
1. To understand the basics of computers
2. To understand the design of various functional units, components of computers and concepts of combinational circuits

Unit I **(18 Hours)**

Computer Basics: Algorithms – Simple Model of a Computer – Characteristics of Computers – Problem Solving Using Computers. **Input/Output Units:** Traditional Computer Input/output devices. **Computer Memory:** Memory Cell – Memory Organization – Read Only Memory. **Computer Generations and Classification:** First Generation of Computers- Second generation – Third Generation – Fourth Generation – Fifth Generation –Classification of Computers.

Unit II **(18 Hours)**

Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system-decimal to binary, octal to binary, hexadecimal to binary - hexadecimal to octal conversions and vice versa-binary arithmetic-1s and 2s complement representations-BCD addition and subtraction.

Unit III **(18 Hours)**

Basic Boolean functions: canonical sum of products and product of sum simplifications-minimization of logical expressions using K-map-logic gates-AND, OR, NOT, EX- OR, NAND, NOR gate**. Introduction to combinational logic circuits**: arithmetic circuits –half adder, full adder, half subtractor, full subtractor- multiplier and divider.

Unit IV **(18 Hours)**

Basic Computer Organization and Design: Instruction Codes-Computer Registers- Computer Instructions- Timing and Control-Instruction Cycle-Memory Reference Instructions -Input-Output and Interrupts.

Unit V **(18 Hours)**

Micro programmed Control: Control Memory- Address Sequencing- **Central Processing Unit:** Introduction- General Register Organization - Instruction Formats - Addressing Modes- Data Transfer and Manipulation-Program Control-RISC **Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall and explain fundamental computer concepts
CO2: Apply knowledge to solve problems and design digital circuits
CO3: Analyze logical circuits, computer architecture, and microprogrammed control
CO4: Evaluate computer system organization and design
CO5: Design a simple computer system or component

Text Books:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers,* PHI Learning Private Limited, Sixth Edition, 2018.
2. S. Salivahanan, S. Arivazhagan, *Digital Circuits and Design*, Oxford University Press, 2018.
3. Morris Mano M, *Computer System Architecture*, Prentice Hall of India, 2011.

Reference Books:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers,* PHI Learning Private Limited, Sixth Edition, 2018.
2. M. Morris Mano, Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014
3. William Stallings, *Computer Organization and Architecture*, Pearson Publication, Eighth Edition, 2010.

Journal:

1. Info Communication Journal (Scopus)

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/
2. https://www.coursera.org/courses?query=computer%20fundamentals
3. https://nptel.ac.in/courses/108/105/108105113/

4. https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953
5. NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	1	1	3	1	3	13
CO2	3	1	3	1	3	3	3	17
CO3	3	1	3	1	3	3	3	17
CO4	3	1	3	1	3	3	3	17
CO5	3	1	3	1	3	3	3	17
Total	15	5	13	5	15	13	15	81

Low-1 Medium-3 High-9

CORE II - Programming in C

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 6**
Subject Code: JBCSC12 **Credit: 6**

Course Objectives:

1. To acquire a comprehensive understanding of C programming concepts includes data types, operators, control structures, functions, arrays, and strings.
2. To develop skills in applying C programming techniques to solve real-world problems using pointers, structures, and file handling

Unit I **(18 Hours)**

Introduction: History of C –Importance of C – Basic structure of C programs - Constants, Variables and data types – Operators and expressions – Input and Output operations – Decision making and branching – Decision making and looping

Unit II **(18 Hours)**

Arrays: One and two dimensional arrays - Initializing two dimensional arrays – Multidimensional arrays.

Arrays: One and two dimensional arrays - Initializing two-dimensional arrays – Multidimensional arrays - **Character Arrays and Strings:** Declaring and initializing string variables- Reading strings from terminal- Writing strings to screen – String handling functions – Other features of strings.

Unit III **(18 Hours)**

User defined functions : Introduction – Need for user defined functions – A multi-function program – Elements of user defined functions – Definition of functions - Return values and their types - Calling a function – Function declarations - Functions that return multiple values – Nesting of functions - Recursion - Passing arrays to functions - Passing strings to functions - The scope and lifetime of variables

Unit IV **(18 Hours)**

Structures and Unions: Introduction – Defining and declaring structure – Accessing structure members – Structure initialization – Arrays of structures – Arrays within structures - Structures within structures – Structures and functions – Unions - **Pointers :** Introduction - Understanding pointers - Accessing the address of a variable -Declaring and initializing pointers – Accessing a variable through its pointer - Pointer expressions – Pointers and arrays – Pointers and character strings – Array of pointers - Pointers and functions – Pointers and structures

Unit V **(18 Hours)**

File Handling: Defining and opening a file – Closing a file – I/O operations on files - Error handling during I/O operations - Random access to files – Command line arguments - **Preprocessor:** Introduction - Macro substitution - File inclusion - Compiler control directives.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Recall and comprehend the basic structure of C programs

CO2: Apply knowledge of C programming to solve problems and develop programs

CO3: Analyze and design C programs using control structures, functions, arrays, and strings to develop algorithms

CO4: Implement file handling operations and use preprocessor directives to develop efficient C programs

CO5: Develop problem-solving skills using C programming concepts to design, implement, and test programs to solve real-world problems

Text Book:

1. E Balagurusamy, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, IX Edition, 2024

Reference Books:

1. K R Venugopal, Sudeep R Prasad, *Programming with C*, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008
2. Mullish Cooper, *The Spirit of C - An Introduction to Modern Programming*, Jaico Publishing House , Mumbai, 2006
3. Byron S. Gottfried, Jitender Kumar Chhabra, *Programming with C*, Tata McGraw Hill Publishing Company Ltd , NewDelhi, 2006

Journal:

1. Journal of Information and Communication Technology (Scopus)

E - Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview
4. https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

AECC I - Programming in C Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 4**
Subject Code: JBCSA13P **Credit: 3**

Course Objectives

1. To introduce the basic concepts of programming using C language
2. To enhance the analyzing and problem solving skills in C

List of Programs:

Formula substitution

1. Develop a C Program to find sum of the digits and reverse the digits
2. Develop a C Program to generate the Fibonacci series
3. Develop a C Program to generate Prime number within range
4. Develop a C Program to find whether a given number is Armstrong or not
5. Develop a C Program to count the number of positive, negative and zero in the list
6. Develop a C Program to find the area of various shapes using switch case

Array

7. Develop a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of a matrix using switch case
8. Develop a C Program to Check whether the element is present in the given list or not
9. Develop a C Program to sort numbers in ascending and descending order
10. Develop a C Program to sort names in Alphabetical order

Functions & Structures

11. Develop a C Program to find the factorial of a given number using recursion function
12. Develop a C Program to Prepare student mark list using structure

String Manipulation

13. Develop a C Program to count the vowels in the given string
14. Develop a C Program to perform string functions.

Pointers

15. Develop a C Program to find average of two numbers using pointers

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of the course, student will be able to
CO1: Understand C programming basics
CO2: Implement array operations and string manipulation
CO3: Design programs using functions, structures, and recursion
CO4: Analyze and implement pointer operations
CO5: Develop and debug C programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

SEC I - Office Automation Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 2**
Subject Code: JBCSS14P **Credit: 1**

Course Objectives:
1. To acquire hands-on experience with office automation tools, including word processing, spreadsheet, presentation, and database management
2. To learn to analyze and solve real-world problems using office automation tools

List of Programs:
Word Processing
1. Create a word processing document consists two pages in a Book named "XX" and then do the following:
   a. Formatting Text, Alignment and Font Style using Word Art
   b. Perform Find and Replace
   c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages
   d. Display lists using bullet and number
2. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
3. Create a Newsletter Article (using Columns, Drop cap)

Spread Sheet

4. Create a spreadsheet consists of Student details and then do the following:
    a. Calculate student wise total and subject wise total
    b. Find the Maximum and Minimum marks of the subject
    c. Grade is calculated as
        i. If %>=90, then grade A
        ii. If %>=80 and <90, then grade B
        iii. If %>=70 and <80, then grade C
        iv. If %>=60 and <70, then grade D
        v. If %<60, then grade F
5. Create a spreadsheet having Employee details to calculate Net Pay and Gross Pay

Presentation

6. Create a presentation showing your various activities of the department a Performslide translation and Setting background designs
7. Create a presentation showing various aspect of your college and perform custom animation and import sound.

Database:

8. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to findtotal and average and check data entered.
9. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation toretrieve data.

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and understand various options of office application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Evaluated and compare options of different Microsoft office applications
CO5: Build a presentations, advertisements, reports for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE III - Data Structures and Algorithms

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**
Subject Code: JBCSC21 **Credit: 5**

Course Objectives:

1. To design, implement, and analyze basic data structures such as arrays, linked lists, stacks, and queues
2. To develop and apply algorithmic techniques such as sorting, searching, and graph traversal to solve real-world problems efficiently and effectively

Unit I **(15 Hours)**

Introduction: History of Algorithms - Data structures and Algorithms - Data structure - Definition and Classification. **Stacks:** Introduction - stack Operation - Application. **Queues:** Introduction - Operation - circular Queues - Other Types of Queues - Application.

Unit II **(15 Hours)**

Linked Lists: Introduction - Singly Linked Lists - Circularly Linked List - Doubly Linked List - Multiply Linked List - Application. **Trees and Binary Trees:** Introduction -Trees**:** Definition and Basic Terminologies - Representation of Trees -Binary Tree Traversals - Threaded Binary Trees - Applications.

Unit III **(15 Hours)**

Graphs: Introduction-Definitions and Basic Terminologies - Representations of Graphs - Graph Traversals – Single source & all pairs shortest paths problem - Minimum cost spanning trees. **Binary Search Trees and AVL Trees:** Introduction - **Binary Search Trees:** Definition and Operations - AVL Trees: Definition and Operations - Applications.

Unit IV **(15 Hours)**

Red-Black Trees and Splay Trees: Red-Black Trees - Applications. **Hash Tables:** Introduction- Hash Table Structure - Hash Functions - Linear Open Addressing - Chaining - Applications. **Searching:** Introduction-Linear Search-Transpose Sequential Search- Interpolation Search - Binary Search - Fibonacci Search - Other Search Techniques.

Unit V **(15 Hours)**

Internal Sorting: Introduction - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort - Shell Sort - Quick Sort - Heap Sort - Radix Sort. **Algorithms:** Algorithm Specification - Performance analysis - Asymptotic notation.

Course Outcomes:

After successful completion of the course, the students will be able to
CO1: Recall and explain the fundamental concepts of basic data structures
CO2: Apply algorithmic techniques to solve problems efficiently and effectively
CO3: Analyze the time and space complexity of algorithms and evaluate their performance
CO4: Design and implement advanced data structures to solve complex problems
CO5: Evaluate and create solutions using algorithms

Text Books:

1. Vijayalakshmi Pai G A, *Data structures and Algorithms, Concepts, Techniques and Application,* Tata McGraw-Hill Education Private Limited, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms,* Universities Press, Second Edition, 2008.

Reference Books:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms,* Dorling Kindersley Private Limited, 2013.
2. Patel R B, *Expert Data Structures with C,* Khanna Book Publishing, Third Edition, 2000.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs26/preview
4. NPTEL: https://nptel.ac.in/courses/106/106/106106127/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	3	3	3	3	**19**
CO2	3	1	3	3	3	3	3	**19**
CO3	3	1	3	3	3	3	3	**19**
CO4	3	1	3	3	3	3	3	**19**
CO5	3	1	3	3	3	3	3	**19**
Total	**15**	**5**	**15**	**15**	**15**	**15**	**15**	**95**

Low-1 Medium-3 High-9

CORE IV – Data Structures Lab

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**
Subject Code: JBCSC22P **Credit: 4**

Course Objectives:

1 . To introduce the concepts of data structure and its operation
2 . To implement data structures for problem solving

List of programs:

1. Develop a program to implement the stack using array
2. Develop a program to implement the queue using linked lists

3. Develop a program to implement the in-order tree traversal methods
4. Develop a program to search a key element in a list of elements using linear search
5. Develop a program to search a key element in a list of elements using binary search
6. Develop a program to implement insertion sort algorithm
7. Develop a program to implement selection sort algorithm
8. Develop a program to implement merge sort algorithm
9. Develop a program to implement binary search tree
10. Develop a program to create a singly linked list and delete an element from linked list
11. Develop a program to create a doubly linked list and display the contents in the list

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO 1: Understand the basics of data structures and its systematic approaches
CO 2: Implement the data structure and its operations in C or C++
CO 3: Compare the difference between various searching & sorting techniques
CO 4: Demonstrate Tree and linked list algorithm
CO 5: Develop simple applications using data structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

SEC II-Python Lab

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 2**
Subject Code: JBCSS24P **Credit: 1**

Course Objectives:

1. To understand and apply fundamental concepts of Python programming
2. To learn to design and develop web applications using Python

List of Programs:

Display Text

1. Develop a program to display any given text message

Formula Substitution

2. Develop a program to display Fibonacci series

Array

3. Develop a program to count the number of vowel in the string

Function

4. Develop a program to convert a date read from the user, given in DD/MM/YYYY format into written format.
5. Develop a program to print the contents of a file in uppercase using function
6. Develop a program to sort the contents of a file using function Operator Overloading
7. Develop a program to implement Operator Overloading Script
8. Develop a program to implement the Arithmetic Quiz
9. Develop a program to create a button with the text, "HelloWorld"
10. Develop a program to create a combo box with three elements. When the selection is changed the selected item is to be printed
11. Develop a program to create a simple application window with menus and submenus
12. Develop a program to create a simple application window with displaying lines
13. Develop a program to create your own web site for displaying message
14. Write a python program to create a simple blog using models

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and apply fundamental concepts of Python programming
CO2: Apply Python programming concepts to solve problems
CO3: Create Python programs for real-world applications
CO4: Design and develop graphical user interfaces (GUIs) and web interfaces
CO5: Integrate core Python concepts, problem-solving skills, and GUI/web development skills to develop complex applications

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

CORE V- Database Management Systems

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 4**
Subject Code: JBCSC31 **Credit: 4**

Course Objectives:

1. To understand the basic concepts of database systems, relational model, database design

principles and SQL queries

2. To understand the design and implementation of a database security, Transaction concepts and advanced topics in DBMS

Unit I **(12 Hours)**

Introduction to Database Systems: Introduction - File Management Systems (FMS) - Database Management Systems (DBMS) - FMS versus DBMS - An Overview of Database Management - Brief introduction to SQL - Embedded SQL - Dynamic SQL - DBMS Models - Database System Architecture **The Relational Model:** Relational Databases Primer - Relational Database Characteristics - Relational Algebra - Relational Calculus - Database Integrity – Keys - Entity and Referential Integrity -Views.

Unit II **(12 Hours)**

Database Design: Design Considerations - Functional Dependency - Normalization and Normal Forms - Entity/Relationship (E/R) Modelling **Transaction Processing and Management:** Transaction – Recovery - Transaction Models - Two-Phase Commit - Concurrency Problems – Locking - Concurrency Problems Revisited – Deadlocks - Transaction Serialisability - Two-Phase Locking - Isolation Levels.

Unit III **(12 Hours)**

Database Security: Data Classification - Threats and Risks – Cryptography - Digital Signature - Database Control - Users and Database Privileges - Types of Privileges - Object Privileges - Taking Away Privileges - Filtering Table Privileges - Statistical Databases.**Query Execution and Optimisation:** Query Processing - Using Indexes - Optimiser Functionality - Implementing SELECT -Optimisation Recommendations - Database Statistics.

Unit IV **(12 Hours)**

Distributed Databases: Distributed Database Concepts - Distributed Database Architectures - Advantages of Distributed Databases - Distributed Database Requirements - Distributed Database Techniques - Distributed Query Processing - Distributed Concurrency Control and Recovery - Distributed Deadlocks - Client/Server Computing and DDBMS - Date's 12 Rules. **Decision Support Systems, Data Warehousing and Data Mining:** Information and Decision Making - Data warehouse - Data Warehousing Concepts - Data Warehousing Approaches - Online Analytical Processing (OLAP).

Unit V **(12 Hours)**

Object Technology and DBMS: An Introduction to Object Technology – Abstraction – Encapsulation – Inheritance - Object Technology and RDBMS - Object Oriented Database management systems(OODBMS) **Advanced Topics in DBMS:** Deductive Databases - Internet and DBMS - Multimedia Databases - Digital Libraries - Mobile Databases.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Design, implement, and manage databases

CO2: Ensure data security and integrity

CO3: Optimize database performance

CO4: Apply database concepts to real-world scenarios
CO5: Demonstrate an understanding of advanced database topics

Text Book:

1. Atul kahate, *Introduction to Database management systems*, Pearson Education (Singapore) Pvt Ltd, 2004.

Reference Books:

1. Abraham Silberschatz, Henry Forth, S.Sudarshan, *Database System Concepts*, Mc Graw Hill publishers, 5th Edition, 1997.
2. C.J.Date, *An Introduction to Database System*, Addison Wesley Publishers, 3rd Edition, 1998.

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE VI - Database Management Systems Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 4**
Subject Code: JBCSC32P **Credit: 3**

Course Objectives:

3. To get practical knowledge on designing and creating tables
4. To understand various queries such as relational constraints, joins, set operations, aggregate functions and views

List of Programs:

DDL

3. Create an address table with fields name , doorno , street & city

a. Describe its structure
b. Alter the table to include pincode
c. Alter the table to modify street column
d. Drop the table

DML

4. Create a student table with regno, name, age and dept.
    d. Insert records
    e. Delete the students with age above 20
    f. Truncate and drop the table

Functions

18. Create an employee table with fields eno , ename , sex ,age & years of experience
    d. Find out the no. of female employees
    e. Find out the employees with age ranging between 30 and 35
    f. List out the employees who are working more than 5 years
19. Create a library table with fields accno, title, author, cost & no of copies
    d. Arrange the books according to accno
    e. Find out the total no. of books available in the library
    f. Find out the book of minimum cost
20. Create a player table with fields name, sports(cricket, hockey, etc.), age & country
    d. Find out the eldest and youngest player
    e. Group players according to sports
    f. List out the Indian players
21. Develop the SQL queries to illustrate all number functions
22. Develop the SQL queries to illustrate date functions
23. Develop the SQL queries to illustrate all string functions
24. Create an item table with field's item no, item name, quantity & price and insert records. Illustrate the comparison operators (between, like, in & isnull)
25. Create a table with the fields client no , client name & phone no Illustrate the set operators Union, union all, minus & intersect
26. Create a student table with fields' regno, name, English, Tamil, Maths and Total & insert records
    d. Arrange all records according to Total
    e. Find the student who got first mark in Maths
    f. List out the students whose name starts with "S"
27. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    a. Insert records
    b. Update the qnty when it goes less than reorderlevel
    c. List the items with price less than 100
28. Create an employee table with fields ecode, ename, age & salary and create a department table withfields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

29. Create a vendormaster table with fields vencode,venname,place and phoneno
30. Create an ordermaster table with fields itemno, itemcode, vencode, qnty and orderdate. Illstrate the following constraints using the above tables
    a. vencode as primary key in vendormaster

b. vencode as foreign key in ordermaster
c. phoneno as unique
d. place as notnull &
e. qnty > 100

TCL

31. Develop the SQL queries to illustrate TCL commands (savepoint, rollback and commit)

Triggers

32. Develop the SQL queries to create and execute triggers

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall and explain database concepts and structures using DDL commands
CO2: Manipulate and manage data using DML commands and functions
CO3: Analyze and solve problems using SQL queries, including aggregate functions, joins, and subqueries
CO4: Implement data integrity constraints and triggers to manage data consistency
CO5: Develop and execute complex SQL queries to solve real-world problems

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

SEC III - Bioinformatics Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 2**
Subject Code: JBCSS34P **Credit: 1**

Course Objectives:

1. To interpret genomic and transcriptomic data
2. To apply computational biology techniques

List of Programs:

Sequence From GenBank

1. Develop a program to retrieve nucleotide sequence from GenBank 4

2. Develop a program to retrieve protein sequence from GenBank 8
3. Develop a program to implement sequence similarity search using BLASTN 14
4. Develop a program to implement sequence similarity search using BLASTP 22

Protein Structure

5. Develop a program to access structural database and download the protein structure 28
6. Develop a program to work with Ensemble 32
7. Develop a program to implement multiple sequence alignment 36
8. Develop a program to predict physiochemical properties of protein sequence 42
9. Develop a program to predict peptide mass of protein sequence 48
10. Develop a program to predict cleavage site of protein sequence 54

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Develop proficiency in bioinformatics tools and software
CO2: Analyze biological sequence data using bioinformatics techniques
CO3: Interpret and analyze genomic and transcriptomic data
CO4: Construct and interpret phylogenetic trees and networks
CO5: Apply machine learning techniques to analyze bioinformatics data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	3	9	9	**45**
CO2	9	3	9	3	3	9	9	**45**
CO3	9	3	9	3	3	9	9	**45**
CO4	9	3	9	3	3	9	9	**45**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**15**	**45**	**15**	**15**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE VII - Operating Systems

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 5**
Subject Code: JBCSC41 **Credit: 5**

Course Objectives:

1. To design and implement operating system components, including process schedulers, memory managers, and file systems, using appropriate algorithms and data structures.
2. To evaluate and compare different operating system design alternatives, including process synchronization mechanisms, memory management strategies, and security protocols.

Unit I **(15 Hours)**

Introduction: Operating System - Mainframe systems- desktop systems- Multiprocessor Systems- Distributed systems- Clustered Systems- Real time systems- **Operating System Structure:** System components- Operating System services- System calls- - System structure.

Unit II **(15 Hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication**. CPU Scheduling**: Basic Concepts- Scheduling Criteria **Process Synchronization**: Background- The critical section problem--semaphores- Monitors.

Unit III **(15 Hours) Deadlock:**

System Model-Deadlock Characterization- Methods of Handling Deadlock-Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock-**Memory Management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(15 Hours) Virtual**

Memory: Background- Demand paging-Copy-on-Develop -Page replacement-Thrashing. **File system Interface**: File concepts- access methods- Directory structure. **Mass Storage Structure**: Overview of mass storage structure.

Unit V **(15 Hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix. **Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Design and implement operating system components
CO2: Evaluate and compare different operating system design alternatives
CO3: Implement process management and synchronization techniques
CO4: Manage memory and file systems
CO5: Ensure system protection and security

Text Book:

1. Abraham G Silberschatz, *Operating System***,** Wiley Publisher, Tenth Edition, 2017

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design*, Tata McGraw Hill, Second Edition,1997
2. Peter Baer Galvin and Robert Neilson Boyd, *Applied Operating system concepts*, John Wiley & Sons, First Edition, 2000
3. Dhananjay M. Dhamdhere, *Operating System A Concept-Based Approach*, Tata McGraw Hill, Third Edition, 2012
4. W. Stallings, *Operating Systems, Internals & Design Principles*, Prentice Hall of India, Fifth Edition, 2008

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://nptel.ac.in/courses/106/106/106106144/
3. https://onlinecourses.nptel.ac.in/noc21_cs44/preview
4. https://www.udacity.com/course/introduction-to-operating-systems--ud923
5. https://onlinecourses.nptel.ac.in/noc21_cs72/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	3	1	3	3	**15**
CO2	3	1	1	3	1	3	3	**15**
CO3	3	1	1	3	1	3	3	**15**
CO4	3	1	1	3	1	3	3	**15**
CO5	3	1	1	3	1	3	3	**15**
Total	**15**	**5**	**5**	**15**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

Core VIII – Big Data Analytics

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**
Subject Code: JBCSC42 **Credit: 4**

Course Objectives:

1. To understand the Big Data platform and its use cases and Map Reduce jobs
2. To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and apply analytics on Structured, Unstructured data

Unit I **(12 hours)**

Introduction to data: Classification of data-Characteristics- Evolution and definition of Big data. **Introduction to Big Data:** Introduction – understanding Big data-capturing Big data-Volume-velocity-variety-veracity-Benefiting Big Data –Management of big data- organizing big data-Technology challenges**.**

Unit II **(12 hours)**

Big Data Analytics: What is Big data Analytics-Classification of Analytics-Importance of Big Data Analytics-Technologies used in Big data Environments- Few Top Analytical Tools- NoSQL-Hadoop.

Unit III **(12 hours)**

Introduction to Hadoop: Introducing Hadoop-History of Hadoop, HDFS (Hadoop Distributed File System)-Processing data with Hadoop-Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator).

Unit IV **(12 hours)**

Introduction to Map Reduce Programming: Introduction-Mapper, Reducer-Combiner-Partitioner-Searching-Sorting-Compression. **Introduction to MongoDB:** What is MongoDB-Why MongoDB-Terms used in RDBMS and MongoDB-Data Types in MongoDB-MongoDB Query Language.

Unit V **(12 hours)**

Analytics and Big Data: Basic analytics-Advanced analytics-operationalized analytics-Monetizing analytics-modifying business intelligence products to handle big data- big data analytics solution-understanding text analytics-tools for Big data**.**

Data Analytics with R: Machine Learning – Introduction- Supervised Learning,-Unsupervised Learning-Collaborative Filtering-Big Data Analytics with BigR

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand Big Data fundamentals, characteristics, and evolution
CO2: Analyze Hadoop ecosystem, HDFS, and MapReduce concepts
CO3: Apply data analysis, MongoDB query language, and R programming
CO4: Evaluate Big Data analytics solutions, machine learning, and text analytics
CO5: Create innovative Big Data analytics solutions using advanced techniques

Text Books:

1. Seema Acharya and Subhashini Chellappan, *Big data and Analytics*, Wiley India Publishers, 2nd Edition, 2019.
2. Rajkamal and Preeti Saxena, *Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning*, McGraw Hill Publication, 2019.
3. Tom White, *HADOOP: The Definitive Guide*, Third Edit on, O'reily Media, 2012.

Reference Books:

1. Anil Maheshwari, *Data Analytics Made Accessible*, Kindle Edition, 2017.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman , *Big Data for Dummies*, Wiley India Private Limited, 2014.
3. Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley, India Private Limited, 2015.
4. Chris Eaton, Dirk deroos, Understanding *Big data*, McGraw Hill, 2012.
5. Tom Plunkett, Brian Macdonald, Oracle *Big Data Handbook*, Oracle Press, 2014.
6. JyLiebowitz, *Big Data and Business analytics*, CRC press, 2013.
7. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013.

Journal:

1. ICTACT Journal on Soft Computing (UGC)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

2. https://nptel.ac.in/courses/110/106/110106072/

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	3	1	1	3	3	15
CO2	3	1	3	1	1	3	3	15
CO3	3	1	3	1	1	3	3	15
CO4	3	1	3	1	1	3	3	15
CO5	3	1	3	1	1	3	3	15
Total	15	5	15	5	5	15	15	75

Low-1 Medium-3 High-9

AECC IV - Data Analytics and Visualization Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**
Subject Code: JBCSC43P **Credit: 3**

Course Objectives:

1. To identify datasets and explain how they are organized and manipulate data
2. To use functions for data visualization

List of Programs:

Spread Sheet:

1. To perform Basic Functions in Spread sheets
2. To perform Formatting and Proofing
3. To perform Mathematical & Text Functions
4. To Implement Date and Time Functions
5. To Implement Sorting
6. To Implement Filtering Techniques
7. To perform Logical Functions
8. To perform Data Validation
9. To display Pivot Tables
10. To display Charts and Slicers
11. To perform Lookup Functions

R Tool:

12. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
13. To perform data import (.CSV, .XLS, .TXT) operations
14. To perform data export (.CSV, .XLS, .TXT) operations
15. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
16. To create data frames and performs operations on it
17. To perform data pre-processing operations -Handling Missing data

18. To perform data pre-processing operations - Min-Max normalization
19. To perform statistical operations (Mean, Median, Mode and Standard deviation)
20. To perform Simple Linear Regression
21. To perform K-Means clustering operation and visualize for iris data set

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Outline R functions to perform numerical operations
CO2: Demonstrate the concepts of import/export operations
CO3: Illustrate data pre-processing operations
CO4: Evaluate Statistical operations
CO5: Develop an application using K-Means algorithm with visualization

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	9	9	3	9	9	**49**
CO2	9	1	9	9	3	9	9	**49**
CO3	9	1	9	9	3	9	9	**49**
CO4	9	1	9	9	3	9	9	**49**
CO5	9	1	9	9	3	9	9	**49**
Total	**45**	**5**	**45**	**45**	**15**	**45**	**45**	**245**

Low-1 Medium-3 High-9

SEC IV - Linux and Shell Programming Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 2**
Subject Code: JBCSS44P **Credit: 1**

Course Objectives:
1. To understand and make effective use of Linux utilities and shell scripting language to solve problems
2. To develop the skills necessary for systems programming including file system programming, process and signal management and inter-process communication

List of Programs:

Built-in Commands

1. Develop a shell program to use who commands
2. Develop a shell program to use list commands
3. Develop a shell program to use sort commands
4. Develop a shell program to use wc commands
5. Develop a shell program to use cat commands

Formula Substitution

6. Develop a shell program to find odd or even number

7. Develop a shell program to find smallest among three numbers
8. Develop a shell program to find the factorial value
9. Develop a shell program to display multiplication table

Switch case

10. Develop a shell program to use case statement

Functions

11. Develop a shell program to display username and password
12. Develop a shell program to calculate the age of a person

Checking

13. Develop a shell program to check the given file is in directory or not

String Manipulation

14. Develop a shell program to perform string manipulations

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and apply Linux built-in commands to perform basic operations
CO2: Apply shell programming constructs to solve problems
CO3: Create shell programs to perform system administration tasks
CO4: Perform string manipulation operations using shell programming
CO5: Design and implement complex shell scripts to solve real-world problems

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	1	1	3	9	3	**27**
CO2	9	1	1	1	3	9	3	**27**
CO3	9	1	1	1	3	9	3	**27**
CO4	9	1	1	1	3	9	3	**27**
CO5	9	1	1	1	3	9	3	**27**
Total	**45**	**5**	**5**	**5**	**15**	**45**	**15**	**135**

Low-1 Medium-3 High-9

CORE IX - Software Engineering

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 6**
Subject Code: JBCSC51 **Credit: 5**

Course Objectives:

1. To analyze software engineering problems and develop solutions using appropriate process models, such as waterfall, incremental, and evolutionary models.

2. To apply software engineering principles and practices to design, develop, test, and maintain software systems, ensuring quality, reliability, and maintainability.

Unit I **(18 Hours)**

Introduction: Software engineering: A layered technology – A process framework – Process models – The waterfall model – Incremental process models – Evolutionary process models.
Software Engineering practice: Communication practices – Planning practices – Modeling practices – Construction practice.

Unit II **(18 Hours)**

Agile Development :Agility -Agility and the cost of change -Agile process -Extreme Programming -Other agile process models-A tool set for the agile process. **Requirements Engineering:** Requirements engineering tasks – Initiating the requirements engineering process – Eliciting requirements – Developing use-cases – Negotiating requirements – Validating requirements.

Unit III **(18 Hours)**

Design Engineering: Design process and design quality – Design concepts – The design model.
Testing Strategies: A strategic approach to software testing – Test strategies for conventional software – Validation testing – System testing – The art of debugging.

Unit IV **(18 Hours)**

Testing Tactics: Software testing fundamentals – White-box testing – Basis path testing – Control structure testing – Black-box testing. **Project Management:** The management spectrum – The people – The product – The process – The project.

Unit V **(18 Hours)**

Risk Management: Reactive vs proactive risk strategies – Software risks – Risk identification – Risk projection – Risk refinement. **Quality Management:** Quality concepts – Software quality assurance – Software reviews – Formal technical reviews – The ISO 9000 quality standards – The SQA plan.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Explain a process model for a software project development
CO2: Apply project management and requirement analysis, principles to software project development
CO3: Analyze the cost estimate and problem complexity using various estimation techniques
CO4: Compare the SRS, design document, project plan of given software system
CO5: Generate test cases using the techniques involved in selecting: (a) White Box testing (b) Block Box testing

Text Book:

1. Roger S. Pressman, *Software Engineering A Practitioner's Approach*, Tata McGraw Hill, Eighth Edition, 2015

Reference Books:

1. Ian Sommerville, *Software Engineering*, Pearson Education, Seventh Edition, 2004
2. Samarjeet kaur, Sandhir Sharma, P.P Singh, *Software Engineering – Complete Course Book*,

Deep &Deep Publications, 2006
3. Waman S Jawadekar, *Software Engineering -Principles and Practice*, Tata McGraw Hill, 2004

Journal:
1. Journal of ICT Research and Applications (Scopus)

E-Resources:
1. https://nptel.ac.in/courses/106/105/106105182/
2. https://www.coursera.org/courses?query=software%20engineering

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE X - Cyber Security

(For Students Admitted from 2025-26)

Semester: V **Hours/Week: 6**
Subject Code: JBCSC52 **Credit: 6**

Course Objective:
1. To practice with an expertise in academics to design and implement security solutions in Organizations
2. To understand key terms and concepts in Cryptography, Rootkit, Cryptology

Unit I **(18 Hours)**

Introduction to Cyber security: Computer security-threats-Harm-Vulnerabilities-Control-Authentication- Access Control-Cryptography-Malicious Code-Malware-Countermeasures-The web-User side-Browser Attacks-Email Attacks.

Unit II **(18 Hours)**

Security In Operating System & Networks: Security in Operating Systems - Security in the Design of OperatingSystems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security -Denial of Service - Distributed Denial-of-Service.

Unit III **(18 Hours)**

Database Security: Introduction of Databases-Security Requirements in Databases-Reliability and Integrity- Database Disclosure-Data Mining and Big Data-Cloud Computing: Cloud Computing

Concepts-Cloud Securitytools and techniques-Securing IaaS.

Unit IV **(18 Hours)**

Security Planning: Security Planning-Business Continuity Planning-Handling Incidents-Risk Analysis - Legal Issues and Ethics: Protecting Programs and Data-Information and the Law-Rights of Employees and Employers-Computer Crime-Ethical Issues in Computer Security.

Unit V **(18 Hours)**

Cryptography: Cryptology-Symmetric Encryption Algorithms-Message Digests-Quantum Cryptography- Emerging Topics: The Internet of Things-Economics-E-Voting-Cyber Warfare.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Classify the concept of threat, risks and security planning.
CO2: Apply theoretical concepts in different security phases.
CO3: Analyze security concepts needs in cloud and database.
CO4: Examine the concepts and do security in database and organization.
CO5: Develop policies and procedures for database and cloud security and design security architecture for an organization.

Text Book:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, *Security in Computing*, Pearson Education, Fifth Edition, 2015

Reference Books:

1. Martti Lehto, Pekka Neittaanmäki, *Cyber Security: Analytics, Technology and Automation*, Springer International Publishing, 2015
2. Nelson Phillips, Enfinger Steuart, *Computer Forensics and Investigations*, Cengage Learning, 2009

Journal:

1. International Journal of Computing and Digital System (Scopus)

E-Resources:

1. https://www.springboard.com/resources/learning-paths/cybersecurity-foundations/
2. https://www.edx.org/course/cyber-security-basics-a-hands-on-approach

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**

Total	15	5	15	5	15	15	15	85

Low-1 Medium-3 High-9

CORE XI - Cyber Security Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/Week: 6**
Subject Code: JBCSC53P **Credit: 5**

Course Objectives:

1. To implement various cyber security measures to protect computer systems and networks
2. To analyze and detect various types of cyber threats using signature-based and behavior-based detection techniques, and develop skills to prevent and mitigate these threats

List of Programs:

1. Develop a program to stop user from viewing certain URLs or Websites
2. Develop a program to protect Systems from Malicious Software
3. Develop a program to perform signature based detection
4. Develop a program to behavior-based detection
5. Develop a program to Prevent threats from getting on the network using sandboxing
6. Develop a program to perform web Application firewall
7. Develop a program to perform website scraper
8. Develop a program to perform log analyzer

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Build applications for cyber security solutions.
CO2: Perform Malware attacks.
CO3: Demonstrate corrective measures for computer security breaches.
CO4: Illustrate security threats and methodologies.
CO5: Develop firewall and web related issues.

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	1	3	1	9	9	9	41
CO2	9	1	3	1	9	9	9	41
CO3	9	1	3	1	9	9	9	41
CO4	9	1	3	1	9	9	9	41
CO5	9	1	3	1	9	9	9	41
Total	45	5	15	5	45	45	45	205

Low-1 Medium-3 High-9

SEC V - PHP Programming Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/Week: 2**
Subject Code: JBCSS54P **Credit: 1**

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and meta characters.
2. To develop PHP programs that use various PHP library functions and that manipulate files and directories.

List of programs

1. Develop a PHP program to print sum of digits
2. Develop a PHP program to print factorial of a number
3. Develop a PHP program to display count from 10 to 20 using loop
4. Develop a PHP program to print prime number
5. Develop a PHP program to check armstrong number
6. Develop a PHP program to check palindrome number
7. Develop a PHP program to swap two numbers with and without using third variable
8. Develop a PHP program to find if the given year is leap year or not
9. Develop a PHP program to reverse the number with strrev ()
10. Develop a PHP program to show day of the week (for eg: Monday) based on numbers using Switch/case statements
11. Develop a PHP program to print number triangle
12. Develop a PHP program to print alphabet triangle
13. Develop a PHP program to check student grade based on the marks using if-else statement
14. Develop a PHP program Using nested for loop that creates a chess board

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Describe the fundamentals of PHP Language in trivial problem solving
CO2: Determine solution to a problem and apply control structures
CO3: Simplify the use of Strings and String handling functions
CO4: Justify real time applications using PHP language features
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	9	9	**51**

Total	**45**	**15**	**45**	**15**	**45**	**45**	**45**	**255**

Low-1 Medium-3 High-9

Core XII - Programming in Java

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 6**
Subject Code: JBCSC61 **Credit: 6**

Course Objectives:

1. To develop proficiency in Java programming fundamentals, including data types, operators, control structures, functions, and object-oriented programming concepts
2. To design, implement, and test Java programs using advanced concepts, including inheritance, polymorphism, exception handling, multithreading, and applet programming

Unit I **(12 Hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm – basic concepts of oops – benefits of oops – applications of OOPs**. Java Evolution:** java features –java Versus C and C++ -java and internet – java and WWW – web browsers **Overview of Java Language**: simple java program - more of java – application with two classes –java program structure – java tokens – java statements-implementing a java program - java virtual machine - command line arguments.

Unit II **(12 Hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables – scope of variables – symbolic constants – type casting – getting values of variables – standard default values – **Operators and Expressions**: Arithmetic operators – Relational operators- logical operators – assignment operators – increment and decrement operators – conditional operator – bitwise operator – special operators –arithmetic expressions – evaluation of expressions– precedence of arithmetic operators-type conversion in expression –operator precedence and associativity – mathematical functions.- **Decision making and Branching:** if statement – switch - ? : operator –**Decision Making and Looping:** while statement – do statement – for statement – jumps in loops - labeled loops.

Unit III **(12 Hours)**

Classes, Objects and Methods: Introduction – defining a class, field declaration – methods declaration – creating objects– accessing class members – constructors – methods overloading – static members – nesting of methods – inheritance – overriding methods – final variables and methods – final classes–finalizer methods – abstract methods and classes – visibility control - **Arrays Strings and Vectors** :one dimensional array – creating an array –two dimensional arrays – strings –vectors –wrapper classes. **Interfaces, Multiple Inheritance**: defining interfaces –extending interfaces – implementing interfaces accessing interface variables.

Unit IV **(12 Hours)**

Packages, Putting classes together : Introduction - java API packages : using system packages– naming conventions–creating packages –accessing a package –using a package – adding a class to a

package–hiding classes – **Multi-threaded Programming** : creating threads – extending the thread class – stopping and blocking a thread - life cycle of a thread – using thread methods – thread exceptions –thread priority–synchronization –implementing the runnable interface.

Unit V **(12 Hours)**

Managing Errors and Exception: Introduction – types of errors –exceptions -syntax of exception handling code – multiple catch statements –using finally statement –throwing our own exceptions – using exceptions for debugging- **Swing:** JFrame – JOptionPane – Class JButton- Class JLabel- JCheckBox – Introduction to JRadioButton – Class JTextField – JTextArea- JMenu – JcomboBox.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember and understand Java programming basics
CO2: Apply object-oriented programming principle to solve problems
CO3: Analyze the advanced Java concepts and techniques
CO4: Manage data and exception handling mechanisms
CO5: Design and develop Java applications

Text Books:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill, 2015
2. Hortsmann & Cornell, "CORE JAVA 2 ADVANCED FEATURES, VOL II", Pearson Education, 2002

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference*, McGraw Hill, 2017.
2. Robert Sedgewick, Kevin Wayne, *Introduction to Programming in Java*, Addison Wesley, 2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Brief Version Pearson Education, 2017.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English
2. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**

CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XIII - Computer Networks

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 6**
Subject Code: JBCSC62 **Credit: 6**

Course Objectives:

1. To understand the fundamental concepts of computer networking, including network models, protocols, and layers of the OSI and TCP/IP models.
2. To analyze and explain the functioning of different network layers, including physical, data link, network, transport, and application layers, and identify the protocols and technologies used in each layer.

Unit I **(18 Hours)**

Introduction: Data communications - Networks - The Internet - **Network Models**: Layered Tasks - The OSI model - Layers in the OSI model - TCP/IP Protocol suite - Addressing

Unit II **(18 Hours)**

Physical Layer: Transmission Media: Guided media - Unguided media **Switching:** Circuit switched networks - Datagram networks - Virtual circuit networks - **Using Telephone and cable networks for data transmission:** Telephone network - Cable TV networks

Unit III **(18 Hours)**

Data Link Layer: Error Detection and Correction: Introduction - Block coding - Linear block codes - Cyclic Codes – Checksum - **Data Link Control:** Framing - Flow and Error control - Protocols - Noiseless channels - Nosy channels - Point-to-point protocol - **Ethernet:** IEEE Standards - Standard Ethernet - Faster Ethernet - Gigabit Ethernet

Unit IV **(18 Hours)**

Network Layer: Network Layer: IPV4 Addresses - IPV6 Addresses - **Internet Protocol:** Internetworking - IPV4 - IPV6 - **Address Mapping, Error Reporting, and Multicasting:** Address Mapping - ICMP – IGMP

Unit V **(18 Hours)**

Transport Layer: Process - To Process Delivery: UDP, TCP: User Datagram Protocol (UDP) – TCP-**Congestion Control and Quality of Service:** Data traffic - Congestion - Congestion Control - Quality of Service - Technique to improve QoS - **Application Layer: Domain Name System:** Name space - Domain name space - DNS in the Internet - DNS messages - **Remote Logging, Electronic Mail, and File Transfer:** Remote Logging - Electronic Mail - File Transfer - **WWW and HTTP:** Architecture - Web Document - HTTP

Text Book

1. Behrouz A Forouzan, *Data Communications & Networking*, Tata McGraw Hill, New Delhi, Fourth Edition, 2003

Reference Books:

1. Andrew S Tanenboum, *Computer Networks*, Prentice Hall of India Pvt. Ltd., New Delhi, Fourth Edition, 2007
2. Douglas E Comer, *Computer Networks and Internets*, Pearson Education, New Delhi, Fourth Edition, 2004

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview
2. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
3. https://nptel.ac.in/courses/106/105/106105081/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE XIV - Programming in Java Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 5**
Subject Code: JBCSC63P **Credit: 4**

Course Objectives:

1. To develop programming skills in Java, applying fundamental concepts, data structures, and object-oriented programming principles to solve problems.
2. To design, implement, and test Java programs to perform various tasks, including numerical computations, data sorting and searching, string manipulation, and graphical user interface (GUI) development.

List of Programs:

Formula Substitution

1. Develop a program to find the factorial and binomial coefficient value
2. Develop a program to calculate mean, variance and standard deviation

3. Develop a program for number conversions

Checking

4. Develop a program for number checking (prime, perfect, etc.)

Generation

5. Develop a program for number generation (prime, perfect, etc.)

Array

6. Develop a program to arrange numbers and names in order
7. Develop a program to perform matrix addition, subtraction, multiplication & transpose

Searching

8. Develop a program to implement linear search and binary search

String

9. Develop the program to perform string manipulation (case conversion, reversing, etc.)

OOP Concepts

10. Develop a program to implement inheritance concepts
11. Develop a program to implement exception handling
12. Develop a program to implement multithreading

Swing

13. Develop a program with a "Hello World!" message displayed in a JLabel
14. Develop a program to create a user login form using JComponents

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember Java programming concepts to solve problems
CO2: Implement data structures and algorithms in Java
CO3: Illustrate OOP in including inheritance and exception handling
CO4: Create GUI-based applications using Java
CO5: Develop exception handling and multithreading in Java to handle errors and improve program performance

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE XV – Project

(For Students Admitted from 2025-26)

Semester: VI **Hours/Week: 6**
Subject Code: JBCSC64PW **Credit: 6**

Course Objectives:
1. To impart the students to understand the data collection for the project
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:
After successful completion of this course, students will be able to**:**
CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders
CO2: Apply the plan by executing the code
CO3: Illustrate the various aspects of software development for the total project
CO4: Evaluate the entire software project according to the specific problem
CO5: Develop the software project by executing with the various data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

SEC VI - Mobile Application Development Lab

(For Students Admitted from 2025 -26)

Semester: VI **Hours/Week: 2**
Subject Code: JBCSS65P **Credit: 1**

Course Objectives:
1. To facilitate students to understand android SDK and to help students to gain a basic understanding of Android application development
2. To inculcate working knowledge of Android Studio development tool

List of Programs:
1. Develop a program to simulate mobile application to send “hello” message from one to another
2. Develop a program to simulate mobile application to Addition of two numbers
3. Develop a program to simulate mobile application to create login form
4. Develop a program to simulate mobile application to send image from one to another

5. Develop a program to simulate mobile application to chatting
6. Develop a program to simulate mobile application to create any games
7. Develop a program to simulate mobile application to display device information
8. Develop an application that uses GUI components, Font and Colors
9. Develop a native application that uses GPS location information
10. Develop a mobile application to send an email.
11. Develop a mobile application for simple needs (Mini Project)

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, students will be able to
CO1: Understand the basics of Android SDK and application development
CO2: Develop mobile applications using Android Studio
CO3: Implement various mobile application features, including login forms, image sharing, chatting, and device information display
CO4: Integrate location-based services using GPS and email functionality in mobile applications
CO5: Design and develop a mobile application

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

Bachelor of Computer Applications (BCA)

(Three-Year Regular Programme)
(For Students Admitted from 2025-26)

Programme Specific Outcomes:
On completion of this programme, student will be able to gain
PSO1: To impart knowledge about various sub domains related to the field of Accounting, Mathematics and Computer Applications
PSO2: The graduate will equip themselves to pursue higher studies, entrepreneurship, and apply new ideas and technologies in the evolving field
PSO3: To produce students who can analyze a problem and apply the innovation ideas
PSO4: The graduates will become a successful employer as an outcome of Industry-Academia collaboration

PSO5: To produce professionals who show their readiness to work in a team and find solutions to the needs of the society with the help of upcoming technologies
PSO6: An ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm
PSO7: Familiarity with a programming language and open-source platforms

PREAMBLE

The Board of Studies in Computer Science has undertaken a comprehensive review of the curriculum, resulting in the following changes:

CORE Papers

- The Fundamentals of Computer syllabus has been revised to include basics of computer, digital electronics, and computer organization
- The textbook and syllabi for Programming in C, Database Management System, Big Data Analytics and Computer Networks have been updated
- The Data Structure Lab syllabus has been modified
- The Software Engineering syllabus has been revised
- Data Analytics & Visualization Lab have been introduced
- The .Net Programming Lab has been relocated from the Skill Enhancement Course to a CORE paper
- Object-Oriented Programming in C++, Object-Oriented Programming in C++ Lab, and Computer Graphics courses have been removed

Multi-Disciplinary Courses

- PC Package Lab course has been revised
- Blockchain Technology Lab, IoT Lab and Intellectual Property Rights have been introduced
- The Internet of Things course has been modified

Skill Enhancement Courses (SEC)

- The Office Automation Lab course has been reduced
- Cyber Security Lab, Bioinformatics Lab, and Mobile Application Development Lab courses have been introduced
- Web Designing Lab (HTML and JavaScript) and PHP Programming Lab courses have been removed

Ability Enhancement Compulsory Courses

- Digital Electronics, Digital Electronics Lab, and Computer Organization and Architecture courses have been removed

Discipline-Specific Electives

- Mobile Application Development courses has been removed

Common Value-Added Courses

- The Digital and Technology Solution course has been introduced

PROGRAMME STRUCTURE – PROGRAM CODE: UCP

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks

I	I	JBLT11/ JBLA11/ JBLHB11/ JBLHA11	Language I	Tamil I/ Arabic I/ Hindi I a (or) b	5	3			25	75	100
	II	JBLEB12/ JBLEA12	Language II	English I a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCPC11	CORE I	Fundamentals of Computer	6	5	SD	GLO	25	75	100
		JBCPC12	CORE II	o Programming in C	6	6	EMP	GLO	25	75	100
		JBCPA13P	AECC I	Programming in C Lab	4	3	EMP	GLO	25	75	100
	IV	JBCPS14P	SEC I	Office Automation Lab	2	1	SD	GLO	-	50	50
				Library/Browsing	1	-			-	-	-
				Remedial/Games	1	-			-	-	-
				TOTAL	**30**	**21**			**125**	**425**	**550**
II	I	JBLT21/ JBLA21/ JBLHB21/ JBLHA21	Language I	Tamil II/ Arabic II/ Hindi II a (or) b	5	3			25	75	100
	II	JBLEB22/ JBLEA22	Language II	English II a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCPC21	CORE III	Database Management Systems	5	5	SD| EMP	GLO	25	75	100
		JBCPC22P	CORE IV	Database Management Systems Lab	5	4	SD| EMP	GLO	25	75	100
		JBCPA23	AECC II	Statistics	4	4	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBCPS24P	SEC II	Linux & Shell Programming Lab	2	1	SD	GLO	-	50	50
		JBUI2V	CVAC I	Understanding India	2	2			-	50	50
				Library/Browsing	1	-			-	-	-
				Remedial/Games	1	-			-	-	-
	V	JBCPX2P/ JBCPX2O	Extra Credit I	UI and UX Design Lab / * Online Course	-	2	ENT| EMP	GLO	-	100	100

				TOTAL	**30**	**22+2**			**125**	**475 +100**	**600+100**
III	I	JBLT31/ JBLA31/ JBLHB31/ JBLHA31	Language I	Tamil III/ Arabic III/ Hindi III a (or) b	5	3			25	75	100
	II	JBLEB32/ JBLEA32	Language II	English III a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCPC31	CORE V	Data Structures & Algorithms	4	4	SD| EMP	GLO	25	75	100
		JBCPC32P	CORE VI	Data Structures Lab	4	3	SD| EMP	GLO	25	75	100
		JBCPA33	AECC III	Principles of Accounting	4	4			25	75	100
	IV	JBCPS34P	SEC III	Python Lab	2	1	EMP	GLO	-	50	50
		JBMD31CPP	MD I	PC Package Lab	2	1	SD	GLO	-	50	50
		JBES3V	CVAC II	Environmental Science for Sustainable Development	2	2			-	50	50
		JBXTN3	Extension	NSS / CSS	2	2			100	-	100
	V	JBCPX3P/ JBCPX3O	Extra Credit II	NoSQL Lab / * Online Course	-	2	EMP	GLO	-	100	100
				TOTAL	**30**	**23+2**			**225**	**525 +100**	**750+100**
IV	I	JBLT41/ JBLA41/ JBLHB41/ JBLHA41	LanguageI	Tamil IV /Arabic IV /Hindi IV a (or) b	5	3			25	75	100
	II	JBLEB42/ JBLEA42	Language II	English IV a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCPC41	CORE VII	Operating Systems	5	5	SD| EMP	GLO	25	75	100
		JBCPC42	CORE VIII	# Big Data Analytics	4	4	EMP	GLO	25	75	100
		JBCPA43P	AECC IV	Data Analytics & Visualization Lab	4	3	ENT| EMP	GLO	25	75	100
	IV	JBMD41CPP	MD II	Web Designing Lab	3	2	ENT| EMP	GLO	-	50	50
		JBCPS44P	SEC IV	Cyber Security Lab	2	1	SD	GLO	-	50	50

		JBDT4V	CVAC III	Digital and Technology Solution	2	2	SD	GLO	-	50	50
	V	JBCPX4P/ JBCPX4O	Extra Credit III	R Tool Lab/ * Online Course	-	2	ENT| EMP	GLO	-	100	100
				TOTAL	**30**	**23+2**			**125**	**525 +100**	**650+100**
V	III	JBCPC51	CORE IX	Computer Networks	6	6	SD	GLO	25	75	100
		JBCPC52	CORE X	Software Engineering	6	5	SD	GLO	25	75	100
		JBCPC53P	CORE XI	.Net Programming Lab	6	5	ENT| EMP	GLO	25	75	100
	IV	JBMD51CPA/ JBMD51CPB	MD III	a) Internet of Things b) Blockchain Technology	4	3	SD| EMP	GLO	25	75	100
		JBMD52CPAP / JBMD52CPBP	MD IV	a) IoT Lab b) Blockchain Technology Lab	4	3	SD| EMP	GLO	25	75	100
		JBCPS54P	SEC V	Bioinformatics Lab	2	1	SD	GLO	-	50	50
		JBHW5V	CVAC IV	Health and Wellness	2	2			-	50	50
	V	JBESX5	Extra Credit IV	Employability Skills	-	2			100	-	100
				TOTAL	**30**	**25+2**			**125+100**	**475**	**600+100**
VI	III	JBCPC61	CORE XII	Cloud & Distributed Computing	6	6	SD	GLO	25	75	100
		JBCPC62	CORE XIII	# Programming in Java	6	6	ENT| EMP	GLO	25	75	100
		JBCPC63P	CORE XIV	Programming in Java Lab	5	4	ENT| EMP	GLO	25	75	100
		JBCPC64PW	CORE XV	Project	6	6	SD| ENT| EMP	GLO	25	75	100
	IV	JBMD61CPA JBMD61CPB	MD V	a) Digital Marketing b) Intellectual Property Rights	4	3	SD| EMP	GLO	25	75	100
		JBCPS65P	SEC VI	Mobile Application Development Lab	2	1	SD| EMP	GLO	-	50	50
	V	JBCPX6P/ JBCPX6O	Extra Credit V	Data Mining Lab / * Online Course	-	2	ENT| EMP	GLO	-	100	100
				Library / Browsing	1	-			-	-	-
				TOTAL	**30**	**26+2**			**125**	**425 +**	**550+100**

							100	
	Grand Total	**180**	**140+ 10**			**850+ 100**	**285 0+4 00**	**3700+ 500**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX,
Spoken Tutorial, NPTEL or Coursera etc.
For internship course, refer www.internshala.com or any online internship course.
o For online course integration, syllabus will be taken from spoken tutorial
@SD- Skill Development ENT-Entrepreneurship EMP-Employability
$ REG-Regional NAT-National GLO-Global

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course
MD - Multi Disciplinary
CVAC - Common Value Added Course

CORE I - Fundamentals of Computer

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 6**
Subject Code: JBCPC11 **Credit: 5**

Course objectives:

1. To understand the basics of computers
2. To understand the design of various functional units, components of computers and the concepts of combinational circuits.

Unit I **(18 hours) Computer Basics:** Algorithms – Simple Model of a Computer – Characteristics of Computers – Problem Solving Using Computers. **Input/Output Units:** Traditional Computer Input/output devices. **Computer Memory:** Memory Cell – Memory Organization – Read Only Memory. **Computer Generations and Classification:** First Generation of Computers- Second generation – Third Generation – Fourth Generation – Fifth Generation –Classification of Computers.

Unit II **(18 hours)**
Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system-decimal to binary, octal to binary, hexadecimal to binary – hexadecimal to octal conversions and vice versa-binary arithmetic-1s and 2s complement representations-BCD addition and subtraction.

Unit III **(18 hours) Basic Boolean functions**: canonical sum of products and product of sum simplifications- minimization of logical expressions using K-map-logic gates-AND,OR, NOT,EX- OR,NAND,NOR gate**.**

Introduction to combinational logic circuits: arithmetic circuits –half adder, full adder, half subtractor, full subtractor- multiplier and divider.

Unit IV **(18 hours) Basic Computer Organization and Design:** Instruction Codes-Computer Registers- Computer Instructions- Timing and Control-Instruction Cycle-Memory Reference Instructions -Input-Output and Interrupts.

Unit V **(18 hours) Micro programmed Control:** Control Memory- Address Sequencing- **Central Processing Unit:** Introduction- General Register Organization - Instruction Formats - Addressing Modes- Data Transfer and Manipulation-Program Control-RISC **Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall and explain fundamental computer concepts
CO2: Apply knowledge to solve problems and design digital circuits
CO3: Analyze logical circuits, computer architecture, and microprogrammed control
CO4: Evaluate computer system organization and design
CO5: Design a simple computer system or component

Text Book:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers*, PHI Learning Private Limited, Sixth Edition, 2018.
2. S. Salivahanan, S. Arivazhagan, *Digital Circuits and Design*, Oxford University Press, 2018.
3. Morris Mano M, *Computer System Architecture*, Prentice Hall of India, 2011.

Reference Books:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers*, PHI Learning Private Limited, Sixth Edition, 2018.
2. M. Morris Mano, Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014
3. William Stallings, *Computer Organization and Architecture*, Pearson Publication, Eighth Edition, 2010.

Journal:

1. Info Communication Journal (Scopus)

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/
2. https://www.coursera.org/courses?query=computer%20fundamentals
3. https://nptel.ac.in/courses/108/105/108105113/
4. https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953
5. NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	1	3	**13**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**13**	**5**	**15**	**13**	**15**	**81**

Low-1 Medium-3 High-9

CORE II - Programming in C

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 6**
Subject Code: JBCPC12 **Credit: 6**

Course Objectives:

1. To acquire a comprehensive understanding of C programming concepts includes data types, operators, control structures, functions, arrays, and strings
2. To develop skills in applying C programming techniquesto solve real-world problem using pointers, structures, and file handling

Unit I **(18 Hours)**

Introduction: History of C –Importance of C – Basic structure of C programs - Constants, Variables and data types – Operators and expressions – Input and Output operations – Decision making and branching – Decision making and looping

Unit II **(18 Hours)**

Arrays: One and two dimensional arrays - Initializing two dimensional arrays – Multidimensional arrays.

Arrays: One and two dimensional arrays - Initializing two-dimensional arrays – Multidimensional arrays - **Character Arrays and Strings:** Declaring and initializing string variables- Reading strings from terminal- Writing strings to screen – String handling functions – Other features of strings.

Unit III **(18 Hours)**

User defined functions : Introduction – Need for user defined functions – A multi-function program – Elements of user defined functions – Definition of functions - Return values and their types - Calling a function – Function declarations - Functions that return multiple values – Nesting of functions - Recursion - Passing arrays to functions - Passing strings to functions - The scope and lifetime of variables

Unit IV **(18 Hours)**

Structures and Unions: Introduction – Defining and declaring structure – Accessing structure members – Structure initialization – Arrays of structures – Arrays within structures - Structures within

structures – Structures and functions – Unions - **Pointers :** Introduction - Understanding pointers - Accessing the address of a variable -Declaring and initializing pointers – Accessing a variable through its pointer - Pointer expressions – Pointers and arrays – Pointers and character strings – Array of pointers - Pointers and functions – Pointers and structures

Unit V **(18 Hours)**

File Handling: Defining and opening a file – Closing a file – I/O operations on files - Error handling during I/O operations - Random access to files – Command line arguments - **Preprocessor:** Introduction - Macro substitution - File inclusion - Compiler control directives.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Recall and comprehend the basic structure of C programs

CO2: Apply knowledge of C programming to solve problems and develop programs

CO3: Analyze and design C programs using control structures, functions, arrays, and strings to develop algorithms

CO4: Implement file handling operations and use preprocessor directives to develop efficient C programs

CO5: Develop problem-solving skills using C programming concepts to design, implement, and test programs to solve real-world problems

Text Book:

1. E Balagurusamy, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 9th Edition, 2024

Reference Books:

1. K R Venugopal, Sudeep R Prasad, *Programming with C*, Tata McGrawHill Publishing Company Ltd, NewDelhi, 2008
2. Mullish Cooper, *The Spirit of C - An introduction to modern programming*,Jaico publishing house ,Mumbai, 2006
3. Byron S. Gottfried, Jitender Kumar Chhabra, *Programming with C*, Tata McGrawHill Publishing Company Ltd , NewDelhi, 2006

Journal:

1. Journal of Information and Communication Technology (Scopus)

E - Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview
4. https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	3	1	3	3	3	17
CO2	3	1	3	1	3	3	3	17
CO3	3	1	3	1	3	3	3	17
CO4	3	1	3	1	3	3	3	17
CO5	3	1	3	1	3	3	3	17
Total	15	5	15	5	15	15	15	85

Low-1 Medium-3 High-9

AECC I - Programming in C Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 4**
Subject Code: JBCPA13P **Credit: 3**

Course Objectives:

1. To introduce the basic concepts of programming using C language
2. To enhance the analyzing and problem solving skills in C

List of Programs:

Formula substitution

2. Develop a C Program to find sum of the digits and reverse the digits
3. Develop a C Program to generate the Fibonacci series
4. Develop a C Program to generate Prime number within range
5. Develop a C Program to find whether a given number is Armstrong or not
6. Develop a C Program to count the number of positive, negative and zero in the list
7. Develop a C Program to find the area of various shapes using switch case

Array

7. Develop a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of a matrix using switch case
8. Develop a C Program to Check whether the element is present in the given list or not
9. Develop a C Program to sort numbers in ascending and descending order
10. Develop a C Program to sort names in Alphabetical order

Functions & Structures

11. Develop a C Program to find the factorial of a given number using recursion function
12. Develop a C Program to Prepare student mark list using structure

String Manipulation

13. Develop a C Program to count the vowels in the given string
14. Develop a C Program to perform string functions.

Pointers

15. Develop a C Program to find average of two numbers using pointers

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Understand C programming basics
CO2: Implement array operations and string manipulation
CO3: Design programs using functions, structures, and recursion
CO4: Analyze and implement pointer operations
CO5: Develop and debug C programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

SEC I - Office Automation Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 2**
Subject Code: JBCPS14P **Credit: 1**

Course Objectives:

1. To acquire hands-on experience with office automation tools, including word processing, spreadsheet, presentation, and database management
2. To learn to analyze and solve real-world problems using office automation tools

List of Programs:

Word Processing

1. Create a word processing document consists two pages in a Book named "XX" and then do the following:
   a. Formatting Text, Alignment and Font Style using Word Art
   b. Perform Find and Replace
   c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages
   d. Display lists using bullet and number
2. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
3. Create a Newsletter Article (using Columns, Drop cap)

Spread Sheet

4. Create a spreadsheet consists of Student details and then do the following:
   a. Calculate student wise total and subject wise total

b. Find the Maximum and Minimum marks of the subject
c. Grade is calculated as
   i. If %>=90, then grade A
   ii. If %>=80 and <90, then grade B
   iii. If %>=70 and <80, then grade C
   iv. If %>=60 and <70, then grade D
   v. If %<60, then grade F

5. Create a spreadsheet having Employee details to calculate Net Pay and Gross Pay

Presentation

6. Create a presentation showing your various activities of the department a Perform slide translation and Setting background designs
7. Create a presentation showing various aspect of your college and perform custom animation and import sound.

Database

8. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to findtotal and average and check data entered.
9. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation toretrieve data.

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and understand various options of office application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Evaluated and compare options of different Microsoft office applications
CO5: Build a presentations, advertisements, reports for enterprises

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	3	9	9	9	45
CO2	9	3	3	3	9	9	9	45
CO3	9	3	3	3	9	9	9	45
CO4	9	3	3	3	9	9	9	45
CO5	9	3	3	3	9	9	9	45
Total	45	15	15	15	45	45	45	225

Low-1 Medium-3 High-9

CORE III - Database Management Systems

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**

Subject Code: JBCPC21 **Credit: 5**

Course Objectives:

1.To understand the basic concepts of database systems, relational model, database design principles and SQL queries

2.To understand the design and implementation of a database security, Transaction concepts and advanced topics in DBMS

Unit I **(15 Hours)**

Introduction to Database Systems: Introduction - File Management Systems (FMS) - Database Management Systems (DBMS) - FMS versus DBMS - An Overview of Database Management - Brief introduction to SQL - Embedded SQL - Dynamic SQL - DBMS Models - Database System Architecture **The Relational Model:** Relational Databases Primer - Relational Database Characteristics - Relational Algebra - Relational Calculus - Database Integrity – Keys - Entity and Referential Integrity -Views.

Unit II **(15 Hours)**

Database Design: Design Considerations - Functional Dependency - Normalisation and Normal Forms - Entity/Relationship (E/R) Modelling **Transaction Processing and Management:** Transaction – Recovery - Transaction Models - Two-Phase Commit - Concurrency Problems – Locking - Concurrency Problems Revisited – Deadlocks - Transaction Serialisability - Two-Phase Locking - Isolation Levels.

Unit III **(15 Hours)**

Database Security: Data Classification - Threats and Risks – Cryptography - Digital Signature - Database Control - Users and Database Privileges - Types of Privileges - Object Privileges - Taking Away Privileges - Filtering Table Privileges - Statistical Databases -**Query Execution and Optimisation:** Query Processing - Using Indexes - Optimiser Functionality - Implementing SELECT - Optimisation Recommendations - Database Statistics.

Unit IV **(15 Hours)**

Distributed Databases: Distributed Database Concepts - Distributed Database Architectures - Advantages of Distributed Databases - Distributed Database Requirements - Distributed Database Techniques - Distributed Query Processing - Distributed Concurrency Control and Recovery - Distributed Deadlocks - Client/Server Computing and DDBMS - Date's 12 Rules

Decision Support Systems, Data Warehousing and Data Mining: Information and Decision Making - Data warehouse - Data Warehousing Concepts - Data Warehousing Approaches - Online Analytical Processing (OLAP).

Unit V **(15 Hours)**

Object Technology and DBMS: An Introduction to Object Technology – Abstraction – Encapsulation – Inheritance - Object Technology and RDBMS - Object Oriented Database Management Systems(OODBMS) **Advanced Topics in DBMS:** Deductive Databases - Internet and DBMS - Multimedia Databases - Digital Libraries - Mobile Databases.

Course Outcomes:

After successful completion of this course, students will be able to
CO1: Design, implement, and manage databases
CO2: Ensure data security and integrity
CO3: Optimize database performance
CO4: Apply database concepts to real-world scenarios
CO5: Demonstrate an understanding of advanced database topics

Text Book:

1. Atul kahate, *Introduction to Database Management Systems*, Pearson Education (Singapore) pvt Ltd, 2004.

Reference Books:

1. Abraham Silberschatz, Henry Forth, S.Sudarshan, *Database System Concepts*, Mc Graw Hill publishers, 5th Edition, 1997.
2. C. J. Date, *An Introduction to Database System*, Addison Wesley Publishers, 3rd Edition, 1998.

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE IV - Database Management Systems Lab

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**
Subject Code: JBCPC22P **Credit: 4**

Course Objectives:

1. To get practical knowledge on designing and creating tables
2. To understand various queries such as relational constraints, joins, set operations, aggregate functions and views

List of Programs:

DDL

1. Create an address table with fields name , doorno , street & city
    a. Describe its structure
    b. Alter the table to include pincode
    c. Alter the table to modify street column
    d. Drop the table

DML

2. Create a student table with regno, name, age and dept.
    a. Insert records
    b. Delete the students with age above 20
    c. Truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
    a. Find out the no. of female employees
    b. Find out the employees with age ranging between 30 and 35
    c. List out the employees who are working more than 5 years
4. Create a library table with fields accno, title, author, cost & no of copies
    a. Arrange the books according to accno
    b. Find out the total no. of books available in the library
    c. Find out the book of minimum cost
5. Create a player table with fields name, sports(cricket, hockey, etc.), age & country
    a. Find out the eldest and youngest player
    b. Group players according to sports
    c. List out the Indian players
6. Develop the SQL queries to illustrate all number functions
7. Develop the SQL queries to illustrate date functions
8. Develop the SQL queries to illustrate all string functions
9. Create an item table with field's item no, item name, quantity & price and insert records. Illustrate the comparison operators (between, like, in & isnull)
10. Create a table with the fields client no , client name & phone no Illustrate the set operators Union, union all, minus & intersect
11. Create a student table with fields' regno, name, English, Tamil, Maths and Total & insert records
    a. Arrange all records according to Total
    b. Find the student who got first mark in Maths
    c. List out the students whose name starts with "S"
12. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    a. Insert records
    b. Update the qnty when it goes less than reorderlevel
    c. List the items with price less than 100
13. Create an employee table with fields ecode, ename, age & salary and create a department table withfields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

14. Create a vendormaster table with fields vencode,venname,place and phoneno
15. Create an ordermaster table with fields itemno, itemcode, vencode, qnty and orderdate. Illstrate the following constraints using the above tables
    a. vencode as primary key in vendormaster
    b. vencode as foreign key in ordermaster
    c. phoneno as unique
    d. place as notnull &
    e. qnty > 100

TCL

16. Develop the SQL queries to illustrate TCL commands (savepoint, rollback and commit)

Triggers

17. Develop the SQL queries to create and execute triggers

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall and explain database concepts and structures using DDL commands
CO2: Manipulate and manage data using DML commands and functions
CO3: Analyze and solve problems using SQL queries, including aggregate functions, joins, and subqueries
CO4: Implement data integrity constraints and triggers to manage data consistency
CO5: Develop and execute complex SQL queries to solve real-world problems

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

SEC II - Linux and Shell Programming Lab

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 2**
Subject Code: JBCPS24P **Credit: 1**

Course Objectives:

1. To understand and make effective use of Linux utilities and shell scripting language to solve problems

2. To develop the skills necessary for systems programming including file system programming, process and signal management and inter-process communication

List of Programs:

Built-in Commands

1. Develop a shell program to use who commands
2. Develop a shell program to use list commands
3. Develop a shell program to use sort commands
4. Develop a shell program to use wc commands
5. Develop a shell program to use cat commands

Formula Substitution

6. Develop a shell program to find odd or even number
7. Develop a shell program to find smallest among three numbers
8. Develop a shell program to find the factorial value
9. Develop a shell program to display multiplication table

Switch case

10. Develop a shell program to use case statement

Functions

11. Develop a shell program to display username and password
12. Develop a shell program to find the age of a person

Checking

13. Develop a shell program to check the given file is a directory or not

String Manipulation

14. Develop a shell program to perform String Manipulations

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and apply Linux built-in commands to perform basic operations
CO2: Apply shell programming constructs to solve problems
CO3: Create shell programs to perform system administration tasks
CO4: Perform string manipulation operations using shell programming
CO5: Design and implement complex shell scripts to solve real-world problems

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	1	1	3	9	3	**27**
CO2	9	1	1	1	3	9	3	**27**
CO3	9	1	1	1	3	9	3	**27**
CO4	9	1	1	1	3	9	3	**27**
CO5	9	1	1	1	3	9	3	**27**
Total	**45**	**5**	**5**	**5**	**15**	**45**	**15**	**135**

Low-1 Medium-3 High-9

CORE V - Data Structures and Algorithms

(For Students Admitted from 2025-26)

Semester: III **Hours / Week: 4**
Subject Code: JBCPC31 **Credit: 4**

Course Objectives:

1. To design, implement, and analyze basic data structures such as arrays, linked lists, stacks, and queues.
2. To develop and apply algorithmic techniques such as sorting, searching, and graph traversal to solve real-world problems efficiently and effectively.

Unit I **(12 hours)**

Introduction: History of Algorithms - Data structures and Algorithms - Data structure - Definition and Classification. **Stacks:** Introduction - stack Operation - Application. **Queues:** Introduction - Operation - circular Queues - Other Types of Queues - Application.

Unit II **(12 hours)**

Linked Lists: Introduction - Singly Linked Lists - Circularly Linked List - Doubly Linked List - Multiply Linked List - Application. **Trees and Binary Trees:** Introduction -Trees**:** Definition and Basic Terminologies - Representation of Trees -Binary Tree Traversals - Threaded Binary Trees - Applications.

Unit III **(12 hours)**

Graphs: Introduction-Definitions and Basic Terminologies - Representations of Graphs - Graph Traversals – Single source & all pairs shortest paths problem - Minimum cost spanning trees. **Binary Search Trees and AVL Trees:** Introduction - **Binary Search Trees:** Definition and Operations - AVL Trees: Definition and Operations - Applications.

Unit IV **(12 hours)**

Red-Black Trees and Splay Trees: Red-Black Trees - Applications. **Hash Tables:** Introduction- Hash Table Structure - Hash Functions - Linear Open Addressing - Chaining - Applications. **Searching:** Introduction-Linear Search-Transpose Sequential Search- Interpolation Search - Binary Search - Fibonacci Search - Other Search Techniques.

Unit V **(12 hours)**

Internal Sorting: Introduction - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort - Shell Sort - Quick Sort - Heap Sort - Radix Sort. **Algorithms:** Algorithm Specification - Performance analysis - Asymptotic notation.

Course Outcomes:

After successful completion of the course, the students will be able to
CO1: Recall and explain the fundamental concepts of basic data structures
CO2: Apply algorithmic techniques to solve problems efficiently and effectively

CO3: Analyze the time and space complexity of algorithms and evaluate their performance
CO4: Design and implement advanced data structures to solve complex problems
CO5: Evaluate and create solutions using algorithms

Text Books:

1. Vijayalakshmi Pai G A, *Data structures and Algorithms, Concepts, Techniques and Application,* Tata McGraw-Hill Education Private Limited, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms,* Universities Press, Second Edition, 2008.

Reference Books:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms,* Dorling Kindersley Private Limited, 2013.
2. Patel R B, *Expert Data Structures with C,* Khanna Book Publishing, Third Edition, 2000.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs26/preview
4. NPTEL: https://nptel.ac.in/courses/106/106/106106127/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	3	3	3	3	**19**
CO2	3	1	3	3	3	3	3	**19**
CO3	3	1	3	3	3	3	3	**19**
CO4	3	1	3	3	3	3	3	**19**
CO5	3	1	3	3	3	3	3	**19**
Total	**15**	**5**	**15**	**15**	**15**	**15**	**15**	**95**

Low-1 Medium-3 High-9

CORE VI – Data Structures Lab

(For Students Admitted from 2025-26)

Semester: III **Hours / Week: 4**
Subject Code: JBCPC32P **Credit: 3**

Course Objectives:

1. To introduce the concepts of data structure and its operation
2. To implement data structures for problem solving

List of Programs:

1. Develop a program to implement stack using arrays
2. Develop a program to implement queue using linked lists
3. Develop a program to implement the in-order tree traversal methods
4. Develop a program to search a key element in a list of elements using linear search
5. Develop a program to search a key element in a list of elements using binary search
6. Develop a program to implement insertion sort
7. Develop a program to implement selection sort
8. Develop a program to implement merge sort
9. Develop a program to implement binary search tree
10. Develop a singly linked list and perform delete an element from linked list
11. Develop a doubly linked list and display the contents in the list

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO 1: Understand the basics of data structures and its systematic approaches
CO 2: Implement the data structure and its operations
CO 3: Compare the difference between various searching & sorting techniques
CO 4: Demonstrate tree and linked list algorithm
CO 5: Develop simple applications using data structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

SEC III – Python Lab

(For Students Admitted from 2025-26)

Semester: III **Hours / Week: 2**
Subject Code: JBCPS34P **Credit: 1**

Course Objectives:

1. To understand and apply fundamental concepts of Python programming
2. To learn to design and develop web applications using Python

List of Programs:

Display Text

1. Develop a program to display any given text message

Formula Substitution

2. Develop a program to display Fibonacci series

Array

3. Develop a program to count the number of vowel in the string

Function

4. Develop a program to convert a date read from the user, given in DD/MM/YYYY format into written format.
5. Develop a program to print the contents of a file in uppercase using function
6. Develop a program to sort the contents of a file using function Operator Overloading
7. Develop a program to implement Operator Overloading Script
8. Develop a program to implement the Arithmetic Quiz
9. Develop a program to create a button with the text, "HelloWorld"
10. Develop a program to create a combo box with three elements. When the selection is changed the selected item is to be printed
11. Develop a program to create a simple application window with menus and submenus
12. Develop a program to create a simple application window with displaying lines
13. Develop a program to create your own web site for displaying message
14. Develop a program to create a simple blog using models

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and apply fundamental concepts of Python programming

CO2: Apply Python programming concepts to solve problems

CO3: Create Python programs for real-world applications

CO4: Design and develop graphical user interfaces (GUIs) and web interfaces

CO5: Integrate CORE Python concepts, problem-solving skills, and GUI/web development skills to develop complex applications

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

CORE VII - Operating Systems

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 5**
Subject Code: JBCPC41 **Credit: 5**

Course Objectives:

1. To design and implement operating system components, including process schedulers, memory managers, and file systems, using appropriate algorithms and data structures.
2. To evaluate and compare different operating system design alternatives, including process synchronization mechanisms, memory management strategies, and security protocols.

Unit I **(15 Hours)**

Introduction: Operating System - Mainframe systems- desktop systems- Multiprocessor Systems- Distributed systems- Clustered Systems- Real time systems- **Operating System Structure:** System components- Operating System services- System calls- - System structure.

Unit II **(15 Hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication**. CPUScheduling**: Basic Concepts- Scheduling Criteria **Process Synchronization**: Background- The critical section problem--semaphores- Monitors.

Unit III **(15 Hours) Deadlock:**

System Model-Deadlock Characterization- Methods of Handling Deadlock-Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock-**Memory Management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(15 Hours) Virtual**

Memory: Background- Demand paging-Copy-on-Develop -Page replacement -Thrashing. **File system Interface**: File concepts- access methods- Directory structure. **Mass Storage Structure**: Overview of mass storage structure.

Unit V **(15 Hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix. **Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Design and implement operating system components
CO2: Evaluate and compare different operating system design alternatives
CO3: Implement process management and synchronization techniques
CO4: Manage memory and file systems
CO5: Ensure system protection and security

Text Book:

1. Abraham G Silberschatz, *Operating System***,** Wiley Publisher, Tenth Edition, 2017

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design*, Tata McGraw Hill, Second Edition,1997
2. Peter Baer Galvin and Robert Neilson Boyd, *Applied Operating system concepts*, John Wiley & Sons, First Edition, 2000
3. Dhananjay M. Dhamdhere, *Operating System A Concept-Based Approach*, Tata McGraw Hill, Third Edition, 2012
4. W. Stallings, *Operating Systems, Internals & Design Principles*, Prentice Hall of India, Fifth Edition, 2008

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://nptel.ac.in/courses/106/106/106106144/
3. https://onlinecourses.nptel.ac.in/noc21_cs44/preview
4. https://www.udacity.com/course/introduction-to-operating-systems--ud923
5. https://onlinecourses.nptel.ac.in/noc21_cs72/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	3	1	3	3	**15**
CO2	3	1	1	3	1	3	3	**15**
CO3	3	1	1	3	1	3	3	**15**
CO4	3	1	1	3	1	3	3	**15**
CO5	3	1	1	3	1	3	3	**15**
Total	**15**	**5**	**5**	**15**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE VIII – Big Data Analytics

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**
Subject Code: JBCPC42 **Credit: 4**

Course Objectives:

1. To understand the Big Data platform and its use cases and Map Reduce jobs
2. To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and apply analytics on Structured, Unstructured data

Unit I **(12 hours)**

Introduction to data: Classification of data-Characteristics- Evolution and definition of Big data. **Introduction to Big Data:** Introduction – understanding Big data-capturing Big data-Volume-velocity-variety-veracity-Benefiting Big Data –Management of big data- organizing big data-Technology challenges**.**

Unit II **(12 hours)**

Big Data Analytics: What is Big data Analytics-Classification of Analytics-Importance of Big Data Analytics-Technologies used in Big data Environments- Few Top Analytical Tools- NoSQL-Hadoop.

Unit III **(12 hours)**

Introduction to Hadoop: Introducing Hadoop-History of Hadoop, HDFS (Hadoop Distributed File System)-Processing data with Hadoop-Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator).

Unit IV **(12 hours)**

Introduction to Map Reduce Programming: Introduction-Mapper, Reducer-Combiner-Partitioner-Searching-Sorting-Compression. **Introduction to MongoDB:** What is MongoDB-Why MongoDB-Terms used in RDBMS and MongoDB-Data Types in MongoDB-MongoDB Query Language.

Unit V **(12 hours)**

Analytics and Big Data: Basic analytics-Advanced analytics-operationalized analytics-Monetizing analytics-modifying business intelligence products to handle big data- big data analytics solution-understanding text analytics-tools for Big data.

Data Analytics with R: Machine Learning – Introduction- Supervised Learning,-Unsupervised Learning-Collaborative Filtering-Big Data Analytics with BigR

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand Big Data fundamentals, characteristics, and evolution
CO2: Analyze Hadoop ecosystem, HDFS, and MapReduce concepts
CO3: Apply data analysis, MongoDB query language, and R programming
CO4: Evaluate Big Data analytics solutions, machine learning, and text analytics
CO5: Create innovative Big Data analytics solutions using advanced techniques

Text Books:

1. Seema Acharya and Subhashini Chellappan, *Big data and Analytics*, Wiley India Publishers, 2nd Edition, 2019.
2. Rajkamal and Preeti Saxena, *Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning*, McGraw Hill Publication, 2019.
3. Tom White, *HADOOP: The Definitive Guide*, Third Edit on, O'reily Media, 2012.

Reference Books:

1. Anil Maheshwari, *Data Analytics Made Accessible*, Kindle Edition, 2017.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman , *Big Data for Dummies*, Wiley India Private Limited, 2014.

3. Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley, India Private Limited, 2015.
4. Chris Eaton, Dirk deroos, Understanding *Big data*, McGraw Hill, 2012.
5. Tom Plunkett, Brian Macdonald, Oracle *Big Data Handbook*, Oracle Press, 2014.
6. JyLiebowitz, *Big Data and Business analytics*, CRC press, 2013.
7. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013.

Journal:

1. ICTACT Journal on Soft Computing (UGC)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://nptel.ac.in/courses/110/106/110106072/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	1	3	3	**15**
CO2	3	1	3	1	1	3	3	**15**
CO3	3	1	3	1	1	3	3	**15**
CO4	3	1	3	1	1	3	3	**15**
CO5	3	1	3	1	1	3	3	**15**
Total	**15**	**5**	**15**	**5**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

AECC IV - Data Analytics & Visualization Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**
Subject Code: JBCPA43P **Credit: 3**

Course Objectives:

1. To identify datasets and explain how they are organized and manipulate data
2. To use functions for data visualization

List of Programs:

Spreadsheet

1. Develop a program to perform Basic Functions in Spread sheets
2. Develop a program to perform Formatting and Proofing
3. Develop a program to perform Mathematical & Text Functions
4. Develop a program to Implement Date and Time Functions
5. Develop a program to Implement Sorting
6. Develop a program to Implement Filtering Techniques
7. Develop a program to perform Logical Functions
8. Develop a program to perform Data Validation
9. Develop a program to display Pivot Tables

10. Develop a program to display Charts and Slicers
11. Develop a program to perform Lookup Functions

R Tool

12. Develop a program to get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
13. Develop a program to perform data import (.CSV, .XLS, .TXT) operations
14. Develop a program to perform data export (.CSV, .XLS, .TXT) operations
15. Develop a program to get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
16. Develop a program to create data frames and performs operations on it
17. Develop a program to perform data pre-processing operations -Handling Missing data
18. Develop a program to perform data pre-processing operations - Min-Max normalization
19. Develop a program to perform statistical operations (Mean, Median, Mode and Standard deviation)
20. Develop a program to perform Simple Linear Regression
21. Develop a program to perform K-Means clustering operation and visualize for iris data set

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline R functions to perform numerical operations
CO2: Demonstrate the concepts of import/export operations
CO3: Illustrate data pre-processing operations
CO4: Evaluate Statistical operations
CO5: Develop an application using K-Means algorithm with visualization

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	9	9	3	9	9	**49**
CO2	9	1	9	9	3	9	9	**49**
CO3	9	1	9	9	3	9	9	**49**
CO4	9	1	9	9	3	9	9	**49**
CO5	9	1	9	9	3	9	9	**49**
Total	**45**	**5**	**45**	**45**	**15**	**45**	**45**	**245**

Low-1 Medium-3 High-9

SEC IV - Cyber Security Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 2**
Subject Code: JBCPS44P **Credit: 1**

Course Objectives:

1. To implement various cyber security measures to protect computer systems and networks
2. To analyze and detect various types of cyber threats using signature-based and behavior-based detection techniques, and develop skills to prevent and mitigate these threats

List of Programs:

1. Develop a program to stop user from viewing certain URLs or websites
2. Develop a program to protect systems from malicious software
3. Develop a program to implement Signature Based Detection
4. Develop a program to implement Behavior-Based Detection
5. Develop a program to prevent threats from getting on the network using Sandboxing
6. Develop a program to implement web application firewall
7. Develop a program to implement website scraper
8. Develop a program to implement log analyzer

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build applications for cyber security solutions
CO2: Perform Malware attacks
CO3: Demonstrate corrective measures for computer security breaches
CO4: Illustrate security threats and methodologies
CO5: Develop firewall and web related issues.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	1	9	9	9	**41**
CO2	9	1	3	1	9	9	9	**41**
CO3	9	1	3	1	9	9	9	**41**
CO4	9	1	3	1	9	9	9	**41**
CO5	9	1	3	1	9	9	9	**41**
Total	**45**	**5**	**15**	**5**	**45**	**45**	**45**	**205**

Low-1 Medium-3 High-9

CORE IX - Computer Networks

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 6**
Subject Code: JBCPC51 **Credit: 6**

Course Objectives:

1. To understand the fundamental concepts of computer networking, including network models,

protocols, and layers of the OSI and TCP/IP models.
2. To analyze and explain the functioning of different network layers, including physical, data link, network, transport, and application layers, and identify the protocols and technologies used in each layer.

Unit I **(18 Hours)**

Introduction: Data communications - Networks - The Internet - **Network Models**: Layered Tasks - The OSI model - Layers in the OSI model - TCP/IP Protocol suite - Addressing

Unit II **(18 Hours)**

Physical Layer: Transmission Media: Guided media - Unguided media **Switching:** Circuit switched networks - Datagram networks - Virtual circuit networks - **Using Telephone and cable networks for data transmission:** Telephone network - Cable TV networks

Unit III (**18 Hours)**

Data Link Layer: Error Detection and Correction: Introduction - Block coding - Linear block codes - Cyclic Codes – Checksum - **Data Link Control:** Framing - Flow and Error control - Protocols - Noiseless channels - Nosy channels - Point-to-point protocol - **Ethernet:** IEEE Standards - Standard Ethernet - Faster Ethernet - Gigabit Ethernet

Unit IV **(18 Hours)**

Network Layer: Network Layer: IPV4 Addresses - IPV6 Addresses - **Internet Protocol:** Internetworking - IPV4 - IPV6 - **Address Mapping, Error Reporting, and Multicasting:** Address Mapping - ICMP – IGMP

Unit V **(18 Hours)**

Transport Layer: Process - To Process Delivery: UDP, TCP: User Datagram Protocol (UDP) – TCP-**Congestion Control and Quality of Service:** Data traffic - Congestion - Congestion Control - Quality of Service - Technique to improve QoS - **Application Layer: Domain Name System:** Name space - Domain name space - DNS in the Internet - DNS messages - **Remote Logging, Electronic Mail, and File Transfer:** Remote Logging - Electronic Mail - File Transfer - **WWW and HTTP:** Architecture - Web Document - HTTP

Text Book

1. Behrouz A Forouzan, *Data Communications & Networking*, Tata McGraw Hill, New Delhi, Fourth Edition, 2003

Reference Books:

1. Andrew S Tanenboum, *Computer Networks*, Prentice Hall of India Pvt. Ltd., New Delhi, Fourth Edition, 2007
2. Douglas E Comer, *Computer Networks and Internets*, Pearson Education, New Delhi, Fourth Edition, 2004

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview
2. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
3. https://nptel.ac.in/courses/106/105/106105081/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE X - Software Engineering

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 6**
Subject Code: JBCPC52 **Credit: 5**

Course Objectives:

1. To analyze software engineering problems and develop solutions using appropriate process models, such as waterfall, incremental, and evolutionary models.
2. To apply software engineering principles and practices to design, develop, test, and maintain software systems, ensuring quality, reliability, and maintainability.

Unit I **(18 Hours)**

Introduction: Software engineering: A layered technology – A process framework – Process models – The waterfall model – Incremental process models – Evolutionary process models.
Software Engineering practice: Communication practices – Planning practices – Modeling practices – Construction practice.

Unit II **(18 Hours)**

Agile Development: Agility - Agility and the cost of change - Agile process - Extreme Programming - Other agile process models - A tool set for the agile process. **Requirements Engineering:** Requirements engineering tasks – Initiating the requirements engineering process – Eliciting requirements – Developing use-cases – Negotiating requirements – Validating requirements.

Unit III **(18 Hours)**

Design Engineering: Design process and design quality – Design concepts – The design model.
Testing Strategies: A strategic approach to software testing – Test strategies for conventional software – Validation testing – System testing – The art of debugging.

Unit IV **(18 Hours)**

Testing Tactics: Software testing fundamentals – White-box testing – Basis path testing – Control structure testing – Black-box testing. **Project Management:** The management spectrum – The people – The product – The process – The project.

Unit V **(18 Hours)**

Risk Management: Reactive vs proactive risk strategies – Software risks – Risk identification – Risk projection – Risk refinement. **Quality Management:** Quality concepts – Software quality assurance – Software reviews – Formal technical reviews – The ISO 9000 quality standards – The SQA plan

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain a process model for a software project development

CO2: Apply project management and requirement analysis, principles to software project development

CO3: Analyze the cost estimate and problem complexity using various estimation techniques

CO4: Compare the SRS, design document, project plan of given software system

CO5: Generate test cases using the techniques involved in selecting: (a) White Box testing (b) Block Box testing

Text Book:

1. Roger S. Pressman, *Software Engineering A Practitioner's Approach*, Tata McGraw Hill, Eighth Edition, 2015

Reference Books:

2. Ian Sommerville, *Software Engineering*, Pearson Education, Seventh Edition, 2004
3. Samarjeet kaur, Sandhir Sharma, P.P Singh, *Software Engineering – Complete Course Book*, Deep &Deep Publications, 2006
4. Waman S Jawadekar, *Software Engineering -Principles and Practice*, Tata McGraw Hill, 2004

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://www.coursera.org/courses?query=software%20engineering

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**

Total	15	5	15	5	15	15	15	85

Low-1 Medium-3 High-9

CORE XI - .Net Programming Lab

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 6**
Subject Code: JBCPC53P **Credit: 5**

Course Objectives:

1. To develop skills in designing and developing console, windows, and web applications using .Net Framework
2. To apply knowledge of controls in creating dynamic and interactive web applications

List of Programs:

Console Application

1. Develop a program to calculate the factorial of a number N, assuming the number is more than zero
2. Develop a program to check a given numbers (Prime, Perfect, Palindrome)
3. Develop a program to calculate the age for a person
4. Develop a program to sort a given list of numbers and find out the average of a list of numbers.
5. Develop a program to display how many days are in a given month (check for leap years also)
6. Develop a program to calculate a area of different shapes using case
7. Develop a program to calculate the arithmetic operations using functions

Windows Application

8. Develop a program to build a simple calculator
9. Develop a program to display pictures using picture and list box
10. Develop a program to do String manipulation
11. Develop a program to count of the number of words in a string
12. Develop a program to change font style and color of the given text
13. Develop a program to create notepad
14. Develop a program to create a greeting card generator
15. Develop a program to create a digital clock

Web Application

16. Develop a program to create a login page and personal webpage. Enter the username and password in the login page. If the username and password are correct, the personal web page should be loaded otherwise the error page should be loaded.
17. Develop a program to create a student details form and validate the details using validation controls
18. Develop a program to display employee details using data grid control
19. Develop a program to display an Electricity bill using data list control
20. Develop a program to display employee details using repeater control

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basics of .Net Framework and IDE

CO2: Develop console and windows applications using .Net Framework

CO3: Create web applications using controls

CO4: Implement data validation and controls in web applications

CO5: Develop and design interactive web applications

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**15**	**45**	**15**	**45**	**45**	**45**	**255**

Low-1 Medium-3 High-9

SEC V – Bioinformatics Lab

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 2**

Subject Code: JBCPS54P **Credit: 1**

Course Objectives:

1.To interpret genomic and transcriptomic data

2.To apply computational biology techniques

List of Programs:

Sequence From GenBank

1. Develop a program to retrieve Nucleotide sequence from GenBank 4
2. Develop a program to retrieve Protein sequence from GenBank 8
3. Develop a program to implement Sequence Similarity Search using BLASTN 14
4. Develop a program to implement Sequence Similarity Search using BLASTP 22

Protein Structure

5. Develop a program to access Structural Database and Download the Protein Structure 28
6. Develop a program to work with Ensemble 32
7. Develop a program to implement Multiple Sequence Alignment 36
8. Develop a program to predict Physiochemical properties of protein sequence 42
9. Develop a program to predict Peptide mass of protein sequence 48
10. Develop a program to predict Cleavage site of protein sequence 54

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Develop proficiency in bioinformatics tools and software
CO2: Analyze biological sequence data using bioinformatics techniques
CO3: Interpret and analyze genomic and transcriptomic data
CO4: Construct and interpret phylogenetic trees and networks
CO5: Apply machine learning techniques to analyze bioinformatics data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	3	9	9	**45**
CO2	9	3	9	3	3	9	9	**45**
CO3	9	3	9	3	3	9	9	**45**
CO4	9	3	9	3	3	9	9	**45**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**15**	**45**	**15**	**15**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE XII - Cloud and Distributed Computing

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 6**
Subject Code: JBCPC61 **Credit: 6**

Course Objectives:

1. To impart the complete understanding of cloud, virtualization and distributed clouds and able to understand the leader election in cloud and distributed systems
2. To enhance the students to understand the significance of classical distributed algorithms, give the clear idea about recovery in clouds and cloud storage and enable the students to understand cloud applications, cloud native computing.

Unit I ` **(18 Hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to CloudComputing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration Network Virtualization and Geo- Distributed Clouds: Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker – Software - Defined Network

Unit II **(18 Hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction – Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election

Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: BullyElection - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems.

Unit III **(18 Hours)**

Consensus, Paxos, and Recovery in Clouds: Introduction – Consensus – Byzantine Agreement – Failures and Recovery approaches in Distributed systems **Cloud Storage:** Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase.

Unit IV **(18 Hours)**

P2P Systems and Their applications in Industry systems: Introduction – Bitcoin cryptocurrency system –Blockchain technology and its applications beyond bitcoin solutions
Cloud Applications: MapReduce, Spark, and Apache Kafka – MapReduce – Spark – Kafka.

Unit V **(18 Hours)**

Cloud-Native Computing: Introduction – Micro services – Docker – Kubernetes-Introduction to Edge Computing - Classification of Edge Computing - **Software-Defined Networking and Network Function Virtualization:** Introduction - Software-Defined Networking -Applications and Use Cases-Software - Defined NFV – Network Slicing - Ongoing Research Opportunities.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Understand the fundamentals of cloud computing, virtualization, and virtual machines
CO2: Apply classical distributed algorithms to solve problems in distributed systems
CO3: Design and implement cloud storage systems and understand recovery approaches in distributed systems
CO4: Develop cloud-native applications using technologies
CO5: Analyze emerging trends in cloud computing and ongoing research opportunities

Text Book:

1. Rajiv Misra, Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithm and Systems***,** Wiley Emerging Technology Series, 2020.

Reference Books:

1. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*,OReilly Media, First Edition, 2019.
2. Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill, 2017.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms*,John Wiley & Sons Publishing, 2011.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata McGraw Hill Publishing, 2010.

Journal:

1. Intl. Journal of Internet of Things and Information Technology

E- Resources:

1. https://nptel.ac.in/courses/106/104/106104182/
2. www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	3	1	3	3	**17**
CO2	3	1	3	3	1	3	3	**17**
CO3	3	1	3	3	1	3	3	**17**
CO4	3	1	3	3	1	3	3	**17**
CO5	3	1	3	3	1	3	3	**17**
Total	**15**	**5**	**15**	**15**	**5**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XIII - Programming in Java

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 6**
Subject Code: JBCPC62 **Credit: 6**

Course Objectives:

1. To develop proficiency in Java programming fundamentals, including data types, operators, control structures, functions, and object-oriented programming concepts.
2. To design, implement, and test Java programs using advanced concepts, including inheritance, polymorphism, exception handling, multithreading, and applet programming

Unit I **(18 Hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm – basic concepts of oops – benefits of oops – applications of OOPs**. Java Evolution:** java features –java Versus C and C++ -java and internet – java and WWW – web browsers **Overview of Java Language**: simple java program - more of java – application with two classes –java program structure – java tokens – java statements-implementing a java program - java virtual machine - command line arguments.

Unit II **(18 Hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables – scope of variables – symbolic constants – type casting – getting values of variables – standard default values – **Operators and Expressions**: Arithmetic operators –Relational operators- logical operators – assignment operators – increment and decrement operators – conditional operator – bitwise operator – special operators –arithmetic expressions – evaluation of expressions– precedence of arithmetic operators-type conversion in expression –operator precedence and associativity – mathematical functions.- **Decision making and Branching:** if statement – switch - ? : operator –**Decision Making and Looping:** while statement – do statement – for statement – jumps in loops - labeled loops.

Unit III **(18 Hours)**

Classes, Objects and Methods: Introduction – defining a class, field declaration – methods declaration – creating objects– accessing class members – constructors – methods overloading – static members – nesting of methods – inheritance – overriding methods – final variables and methods – final classes–finalizer methods – abstract methods and classes – visibility control - **Arrays Strings and Vectors** :one dimensional array – creating an array –two dimensional arrays – strings –vectors –wrapper classes. **Interfaces, Multiple Inheritance**: defining interfaces –extending interfaces – implementing interfaces accessing interface variables.

Unit IV **(18 Hours)**

Packages, Putting classes together : Introduction - java API packages : using system packages– naming conventions–creating packages –accessing a package –using a package – adding a class to a package–hiding classes – **Multi-threaded Programming** : creating threads – extending the thread class – stopping and blocking a thread - life cycle of a thread – using thread methods – thread exceptions –thread priority–synchronization –implementing the runnable interface.

Unit V **(18 Hours)**

Managing Errors and Exception: Introduction – types of errors –exceptions -syntax of exception handling code – multiple catch statements –using finally statement –throwing our own exceptions – using exceptions for debugging- **Swing:** JFrame – JOptionPane – Class JButton- Class JLabel- JCheckBox – Introduction to JRadioButton – Class JTextField – JTextArea- JMenu – JcomboBox.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember and understand Java programming basics
CO2: Apply object-oriented programming principle to solve problems
CO3: Analyze the advanced Java concepts and techniques
CO4: Manage data and exception handling mechanisms
CO5: Design and develop Java applications

Text Books:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill, 2015.
2. Hortsmann & Cornell, *CORE Java 2 Advanced Features*, Vol II, Pearson Educatio, 2002

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference*, McGraw Hill, 2017.
2. Robert Sedgewick, Kevin Wayne, *Introduction to Programming in Java*, Addison Wesley, 2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Brief Version Pearson Education, 2017.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English
2. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XIV - Programming in Java Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 5**
Subject Code: JBCPC63P **Credit: 4**

Course Objectives:

1. To develop programming skills in Java, applying fundamental concepts, data structures, and object-oriented programming principles to solve problems.
2. To design, implement, and test Java programs to perform various tasks, including numerical computations, data sorting and searching, string manipulation, and graphical user interface (GUI) development.

List of Programs:

Formula Substitution

1. Develop a program to find the factorial and binomial coefficient
2. Develop a program to calculate mean, variance and standard deviation
3. Develop a program for Number conversions

Checking

4. Develop a program for Number checking (prime, perfect, etc.)

Generation

5. Develop a program for Number generation (prime, perfect, etc.)

Array

6. Develop a program to arrange numbers and names in order
7. Develop a program to perform matrix addition, subtraction, multiplication & transpose

Searching

8. Develop a program to implement linear search and binary search

String

9. Develop a program to perform String manipulation (case conversion, reversing, etc.)

OOP Concepts

10. Develop a program to implement inheritance concepts
11. Develop a program to implement exception handling
12. Develop a program to implement multithreading

Swing

13. Develop a program with a "Hello World!" message displayed in a JLabel
14. Develop a program to create a user login form using JComponents

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember Java programming concepts to solve problems
CO2: Implement data structures and algorithms in Java
CO3: Illustrate OOP in including inheritance and exception handling
CO4: Create GUI-based applications using Java
CO5: Develop exception handling and multithreading in Java to handle errors and improve program performance

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE XV - Project

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 6**
Subject Code: JBCPC64PW **Credit: 6**

Course Objectives:

1. To impart the students to implement project by data collection and selecting the softwaretool
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders

CO2: Apply the plan by executing the code

CO3: Illustrate the various aspects of software development for the total project

CO4: Evaluate the entire software project according to the specific problem

CO5: Develop the software project by executing with the various data.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

SEC VI - Mobile Application Development Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 2**

Subject Code: JBCPS65P **Credit: 1**

Course Objectives:

1. To facilitate students to understand android SDK and to help students to gain a basic understanding of Android application development
2. To inculcate working knowledge of Android Studio development tool

List of Programs:

1. Develop a program to simulate mobile application to send “hello” message from one to another
2. Develop a program to simulate mobile application to Addition of two numbers
3. Develop a program to simulate mobile application to create login form
4. Develop a program to simulate mobile application to send image from one to another
5. Develop a program to simulate mobile application to chatting
6. Develop a program to simulate mobile application to create any games
7. Develop a program to simulate mobile application to display device information
8. Develop an application that uses GUI components, Font and Colours
9. Develop a native application that uses GPS location information
10. Develop a mobile application to send an email.
11. Develop a Mobile application for simple needs (Mini Project)

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, students will be able to
CO1: Understand the basics of Android SDK and application development
CO2: Develop mobile applications using Android Studio
CO3: Implement various mobile application features, including login forms, image sharing, chatting, and device information display
CO4: Integrate location-based services using GPS and email functionality in mobile applications
CO5: Design and develop a mobile application

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

Multi-Disciplinary Course

(For Students Admitted from 2025-26)
(For BSc IT, BSc CS, BCA)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
V	IV	JBMD51ITA/ JBMD51ITB JBMD51CSA/ JBMD51CSB JBMD51CPA JBMD51CPB	MD III	a) Internet of Things b) Blockchain Technology	4	3	SD| EMP	GLO	25	75	100
		JBMD52ITAP/ JBMD52ITBP JBMD52CSAP/ JBMD52CSBP JBMD52CPAP/	MD IV	a) IoT Lab b) Blockchain Technology Lab	4	3	SD| EMP	GLO	25	75	100

		JBMD52CPBP									
VI		JBMD61ITA/ JBMD61ITB JBMD61CSA/ JBMD61CSB JBMD61CPA/ JBMD61CPB	MD V	a) Digital Marketing b) Intellectual Property Rights	4	3	SD| EMP	GLO	25	75	100

MD III- a) Internet of Things

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
SubjectCode: JBMD51ITA/ JBMD51CSA/ JBMD51CPA **Credit: 3**

Course Objectives:

1. To understand the application areas of IoT, building blocks of Internet of Things And characteristics
2. To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

Unit I (12 Hours)

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT Reference Architecture - IoT Functional Architecture - IoT levels and deployment templates – **Application domains of IoT**: Home automation – Cities – Energy – Industry – Agriculture.

Unit II (12 Hours)

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT- IoT System Management with NETCONF-YANG-Need for IoT Systems Management- SNMP- Network Operator Requirements-NETCONF- YANG- IoT Systems Management with NETCONF-YANG.

Unit III (12 Hours)

IOT Platforms Design Methodology: Step 1 to Step 10 - Case Study on IoT System for Weather Monitoring - Motivation for Using Python - IoT Systems Logical Design using Python - Introduction - Installing Python - Python Data Types and Data Structures - Control Flow –Functions – Modules - Packages-File Handling - Date/Time Operations – Classes - Python Packages of Internet for IoT.

Unit IV (12 Hours)

IoT Physical Devices and Endpoints: IoT Device - Exemplary Device: Raspberry Pi- About the board - Linux and Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoT Devices.

Unit V **(12 Hours)**

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API – WAMP - AutoBahn for IoT - Xively Cloud for IoT - Python Web Application Framework – Django - Designing a Restful Web API - Amazon Web Services for IoT - Home Automation – Cities - Environment.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the basics of IoT, enabling technologies, and characteristics

CO2: Explain the concepts of IoT and M2M, including differences and similarities

CO3: Apply design methodology to create IoT platforms and systems

CO4: Analyze and implement Wi-Fi data communications, remote data storage in cloud, and handle data using web applications

CO5: Evaluate potential problems and solutions using IoT, considering factors like scalability, security, and efficiency

Text Book:

1. ArshdeepBahga,VijayMadisetti,Internet of Things:AHands-*OnApproach*,Universities Press, 2015

Reference Books:

1. Charles Platt, *Make Electronics –LearningbyDiscovery*,O'ReillyMedia,2015.
2. Michael Miller, *The Internet of Things*,PearsonEducation,2015.

Journal:

1. Intl. Journal of Internet of Things and Information Technology

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://www.classcentral.com/course/swayam-introduction-to-internet-of-things-10093

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	3	1	3	3	3	17
CO2	3	1	3	1	3	3	3	17
CO3	3	1	3	1	3	3	3	17
CO4	3	1	3	1	3	3	3	17
CO5	3	1	3	1	3	3	3	17
Total	15	5	15	5	15	15	15	85

Low-1 Medium-3 High-9

MD III- b) Blockchain Technology

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
SubjectCode: JBMD51ITB/ JBMD51CSB/ JBMD51CPB **Credit: 3**

Course Objectives:

1. To understand how blockchain System (Bitcoin and Ethereum) works.
2. To integrate ideas from blockchain technology into their own projects.

Unit I **(18 Hours)**

Introduction of Blockchain: Block 101-Distributed Systems-Consensus-The history of blockchain- Introduction of blockchain-Features of blockchain-Applications of blockchain technology-Tiers of blockchain technology-Consensus in blockchain-CAP theorem and block chain-Benefits and limitations of blockchain.

Unit II **(18 Hours)**

Cryptography and Technical Foundations: Introduction-Mathematics – Cryptography - Confidentiality- Integrity-Authentication-Non repudiation-Accountability-Block Ciphers- DES-AES-Public and Private keys- RSA-hash Functions-Secure hash algorithms-Merkle trees-Patricia trees-DHT-ECDSA-Financial markets and trading-Trading-Exchanging.

Unit III **(18 Hours)**

Bitcoin: Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain- The genesis of Block-The bitcoin network-wallets-Alternative coins: Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin-Lite coin.

Unit IV **(18 Hours)**

Ethereum101: Introduction-Ethereum block chain-The consensus mechanism-The world state-the account state-Transactions-Contract creation transaction-Message call transaction- Elements of ethereum block chain-EVM-Execution Environment-Opcodes and their Meaning-Accounts-Block-Block header.

Unit V **(18 Hours)**

Blockchain–Outside of Currencies: Internet of things-IoT Block chain experiment- Government-Health-Finance-EmergingTrends:ABC's-Enterprise-gradeblockchains-Private Blockchains-startups-standardization- Enhancements-Real world Implementations- Consortia-Education in block chain technologies-Employment-Crypto Economics.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Explain the fundamental concept of blockchain including distributed systems, consensus, and cryptography

CO2: Analyze blockchain systems and networks, including Bitcoin, Ethereum, and alternative coins

CO3: Apply blockchain concepts to real-world scenarios, including finance, healthcare, and Internet of Things (IoT)

CO4: Evaluate blockchain technologies and trends, including enterprise-grade blockchains, private blockchains, and emerging trends
CO5: Design and implement blockchain-based solutions, including smart contracts and decentralized applications

Text Book:
1. Imran Bashir, *Mastering Blockchain: Deeper insights into decentralization, Cryptography, Bitcoinand Popular block chain frameworks***,** Packt Publishing, 2017.

Reference Books:
1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin*, O"Reilly, 2014.
2. Roger Wattenhofer**,** *The Science of the Block chain***,** Create Space Independent Publishing, 2016.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies:A Comprehensive Introduction*, Princeton University Press, 2016.

Journal:
1. Intl. Journal of Internet of Things and Information Technology

E-Resources:
1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/
3. https://www.mygreatlearning.com/academy/learn-for-free/courses/blockchain-basics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	1	3	3	**15**
CO2	3	1	3	1	1	3	3	**15**
CO3	3	1	3	1	1	3	3	**15**
CO4	3	1	3	1	1	3	3	**15**
CO5	3	1	3	1	1	3	3	**15**
Total	**15**	**5**	**15**	**5**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High

MD IV- a) IoT Lab
(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
Subject Code: JBMD52ITAP/ JBMD52CSAP/ JBMD52CPAP **Credit: 3**

Course Objectives:
1.To understand Internet of Things concept
2.To provide strong foundation for designing real world applications Arduino

List of Programs:
1. Develop a program to display temperature and humidity

2. Develop a program to implement Automatic Street Light System
3. Develop a program to create automatic irrigation System
4. Develop a program to create Light Automation & Home Automation
5. Develop a program to create Obstacle Avoiding
6. Develop a program to create Voice Control and Bluetooth Control Robot

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, students will be able to
CO1: Understand the basics of Internet of Things (IoT) concepts and their applications.
CO2: Design and develop IoT projects using Arduino, including sensor integration and automation systems
CO3: Implement automation systems using IoT, including automatic street light systems, irrigation systems, and home automation
CO4: Develop IoT-based robotics projects, including obstacle-avoiding robots and voice-controlled robots
CO5: Integrate IoT with sensors and actuators, including temperature and humidity sensors, to create interactive and automated systems

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

MD IV- b) Blockchain Technology Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
SubjectCode: JBMD52ITBP/ JBMD52CSBP/ JBMD52CPBP **Credit: 3**

Course Objectives:
1. Understanding Blockchain fundamentals and creating basic blocks.
2. Able to Develop Blockchain applications in a structured manner and to create own crypto currency and get familiarity with future currencies

List of Programs:
1. Develop a program to create merkle tree

2. Develop a program to create block
3. Develop a program to implement blockchain programming code
4. Develop a program to create ERC20 token
5. Develop a program to implement blockchain in merkle Trees
6. Develop a program to implement mining using block chain algorithm substitution
7. Develop a program to implement peer-to-peer using block chain
8. Develop a program to create a crypto-currency wallet

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Understand the basics of blockchain technology and creating basic blocks
CO2: Develop blockchain applications, including creating own cryptocurrency and implementing blockchain programming code
CO3: Implement blockchain data structures, including Merkle trees and blocks
CO4: Develop blockchain-based cryptocurrency systems including creating ERC20 tokens and cryptocurrency wallets
CO5: Implement blockchain algorithms and protocol including mining, peer-to-peer networking, and blockchain-based security measures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	3	9	9	**39**
CO2	9	3	3	3	3	9	9	**39**
CO3	9	3	3	3	3	9	9	**39**
CO4	9	3	3	3	3	9	9	**39**
CO5	9	3	3	3	3	9	9	**39**
Total	**45**	**15**	**15**	**15**	**15**	**45**	**45**	**195**

Low-1 Medium-3 High-9

MD V- a) Digital Marketing

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 4**
Subject Code: JBMD61ITA/ JBMD61CSA/ JBMD61CPA **Credit: 3**

Course Objectives:
1. To understand the fundamental concepts and strategies of digital marketing, including internet marketing, search engine advertising, social media marketing, and search engine optimization (SEO).
2. To develop skills in creating and implementing effective digital marketing campaigns using various channels, including social media, email, mobile, and search engines.

Unit I **(12 Hours)**

Introduction to Digital Marketing: Introduction - Evolution of Digital Marketing from traditional to modern era- Role of Internet; Current trends - Drivers of the new marketing environment - Digital marketing strategy; P.O.E.M. framework - Digital marketing plan- Digital marketing models.

Unit II **(12 Hours) Internet Marketing and Digital Marketing Mix**: Internet Marketing - opportunities and challenges - Digital marketing framework - Impact of digital channels on IMC. **Search Engine Advertising:** Pay for Search Advertisements - Ad Placement - Display marketing: Types of Display Ads - Programmable Digital Marketing - YouTube marketing.

Unit III **(12 Hours) Social Media Marketing:** Understanding Social Media Marketing – Social Networking- Role of Influencer Marketing-Modes of Social Media Marketing- Tools & Plan - Facebook Marketing: - Business through Facebook Marketing, Facebook Marketing Tools - LinkedIn Marketing: - Introduction and Importance of LinkedIn Marketing, -Twitter Marketing: Introduction to Twitter Marketing, Mobile Advertising

Unit IV **(12 Hours) Introduction to SEO**: SEM - Web Analytics - Mobile Marketing - Trends in Digital Advertising - Introduction and need for SEO- How to use internet & search engines; search engine and its working pattern: SEO Tactics - Introduction to SEM Web Analytics: Google Analytics & Google AdWords

Unit V **(12 Hours)**

Social Media Channels: Introduction - Key terms and concepts - Traditional media vs Social media - Social networking - Content creation - Tracking social media campaigns **Social Media Strategy:** Introduction - Key terms and concepts - Using social media to solve business challenges - Dealing with opportunities and threats

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the practical factor to improve results in digital marketing.

CO2: Implement a structured digital marketing plan and budget.

CO3: Examine the operations of digital marketing, and track the progress of digital marketing.

CO4: Evaluate the functions of social media marketing, Internet marketing, and social media channels.

CO5: Design and Initialize implement process to conduct digital marketing campaigns.

Text Book:

1. Seema Gupta “Digital Marketing” Mc-Graw Hill 1st Edition – 2017

Reference Books:

1. Damian Ryan, Calvin Jones “Understanding Digital Marketing-Marketing Strategies For Engaging the Digital Generation” Kogan Page - Fourth Edition

2. Teresa Pineiro-Otero and Xabier Martinez-Rolan "Understanding Digital Marketing- Basics and Actions" Springer International Publishing – 2009

Journal:

1. International Journal of Computing and Digital System (Scopus)

E-Resource:

1. https://www.simplilearn.com/tutorials/digital-marketing-tutorial

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	3	3	3	3	**19**
CO2	3	1	3	3	3	3	3	**19**
CO3	3	1	3	3	3	3	3	**19**
CO4	3	1	3	3	3	3	3	**19**
CO5	3	1	3	3	3	3	3	**19**
Total	**15**	**5**	**15**	**15**	**15**	**15**	**15**	**95**

Low-1 Medium-3 High-9

MD V- b) Intellectual Property Rights

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 4**
Subject Code: JBMD61ITB/ JBMD61CSB/ JBMD61CPB **Credit: 3**

Course Objectives

1. To recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights
2. To identify the significance of practice and procedure of patents and to make the students to understand the statutory provisions of different forms of IPRs in simple forms

Unit I **(12 Hours)**

Overview of Intellectual Property : Introduction and the need for intellectual property right (IPR)- Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varietiesand Layout Design-Genetic Resources and Traditional Knowledge-Trade Secret - **IPR in India** : Genesis and development – IPR in abroad-Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994.

Unit II **(12 Hours)**

Patents : Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application – Non Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents,

Infringement, Remedies & Penalties - Patent office and Appellate Board.

Unit III **(12 Hours)**

Copyrights: Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership ofcopyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights.

Unit IV **(12 Hours)**

Trademarks: Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, wellknown marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties -Trademarks registry and appellate board. **Current Contour :** India`s New National IP Policy, 2016 – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – Career Opportunities in IP - IPR in current scenariowith case studies.

Unit V **(12 Hours)**

Other forms of IP: Design- meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection.**Plant variety protection**: meaning and benefit sharing and farmers' rights – Procedure for registration, effect of registration and term of protection. **Layout Design protection**: meaning – Procedure for registration, effect of registration and term of protection.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basics of intellectual property rights
CO2: Analyze patent law and procedure
CO3: Explain copyright law and related rights
CO4: Identify trademark law and procedure
CO5: Recognize other forms of Intellectual Property Protection

Text Book:

1. Nithyananda K V, *Intellectual Property Rights: Protection and Management*, Cengage Learning Private Limited,2019.

Reference Books:

1. Neeraj.P, Khusdeep.D, *Intellectual Property Rights*, PHI Learning Private Limited, 2014.
2. Virendra Kumar Ahuja, *Law relating to Intellectual Property Rights*, Lexis Nexis Butterworths, 2017.

Journal:

1. Journal of Intellectual Property Rights (JIPR)
2. Journal on Development of Intellectual Property and Research (JDIPR)

E-Resources:

1. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm
2. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
3. https://nptel.ac.in/courses/110/105/110105139/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	1	3	3	**13**
CO2	3	1	1	1	1	3	3	**13**
CO3	3	1	1	1	1	3	3	**13**
CO4	3	1	1	1	1	3	3	**13**
CO5	3	1	1	1	1	3	3	**13**
Total	**15**	**5**	**5**	**5**	**5**	**15**	**15**	**65**

Low-1 Medium-3 High-9

B Sc INFORMATION TECHNOLOGY WITH CYBER SECURITY

(Three Year Regular Programme)
(For Students Admitted from 2025-26)

Programme Specific Outcomes:
On completion of this programme, student will be able to gain
PSO1: To impart knowledge about various sub domains related to the field of Accounting, Mathematics and Computer Applications
PSO2: The graduate will equip themselves to pursue higher studies, entrepreneurship, and apply new ideas and technologies in the evolving field
PSO3: To produce students who can analyze a problem and apply the innovation ideas
PSO4: The graduates will become a successful employer as an outcome of Industry-Academia collaboration
PSO5: To produce professionals who show their readiness to work in a team and find solutions to the needs of the society with the help of upcoming technologies
PSO6: An ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm
PSO7: Familiarity with a programming language and open-source platforms

PREAMBLE

The Board of Studies in Computer Science has undertaken a comprehensive review of the curriculum, resulting in the following changes:

Core Papers

- Principles of Information Technology, **Fundamental of Cyber security and Network Security, Pentesting,Pentesting lab, Cyber Defense, Cyber defense Lab, SOC, SOC Lab, Security Engineering, Security Engineering Lab, Network Security Expert, Red Teaming, Red Teaming Lab** have been introduced
- The Data Structure Lab syllabus has been modified
- The Programming in Python Lab has been relocated from the Core Paper to Skill Enhancement Course.

- Principles of Cyber Security, Database Security, Python Programming, Programming in Java, Programming in Java Lab, Cyber Forensics, Cloud Computing and Security, Cyber Law, Cryptography and Network Security have been removed

Multi-Disciplinary Courses

- PC Package Lab course has been revised
- Organizational Behavior, Blockchain Technology, Accounting Principles & Package have been introduced
- The Internet of Things course has been modified

Skill Enhancement Courses (SEC)

- The Office Automation Lab course has been reduced
- Data Analytics Lab,Blockchain technology Lab and Machine Learning Lab have been introduced
- Web Designing Lab (HTML and JavaScript), Graphics and Animation Lab (Flash) Cryptography and Network Security Lab and PHP Programming Lab courses have been removed

Ability Enhancement Compulsory Courses

- Discrete Mathematics, Digital Electronics, Database Security, and Operation research courses have been removed
- Statistics course have been moved Semester IV to Semester I.
- **Linux and Window Fundamental, Cyber Threats and Defense Strategies, Web Application Pentesting have been introduced**

Discipline-Specific Electives

- Mobile Computing, Malware Analysis, Wireless Security, Intellectual Property Rights, Operating System Security and Ethical Hacking courses has been removed

Common Value-Added Courses

- The Digital and Technology Solution course has been introduced

PROGRAMME STRUCTURE – PROGRAM CODE: UIC

Sem	Part	Subject Code	Course	Subject Title	Hours/ Week	Credit	@SD| ENT| EMP	$GLO	CIA	ESE	Total Marks
I	I	JBLT11/ JBLA11/ JBLHB11/ JBLHA11	Language I	Tamil I/ Arabic I/ Hindi I a (or) b	5	3			25	75	100
	II	JBLEB12/ JBLEA12	Language II	English I a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBICC11	CORE I	Principles of Information Technology	4	3	SD	GLO	25	75	100
		JBICC12	CORE II	Programming in C	4	4	EMP	GLO	25	75	100
		JBICC13P	CORE III	Programming in C Lab	4	3	EMP	GLO	25	75	100
		JBICA14	AECC I	Statistics	4	4	SD| EMP|	REG| NAT|	25	75	100

							ENT	GLOA			
	IV	JBICS15P	SEC I	Office Automation Lab	2	1	SD	GLO	-	50	50
				Library/Browsing	1	-			-	-	-
				Remedial/Games	1	-			-	-	-
				TOTAL	**30**	**21**			**150**	**425**	**550**
II	I	JBLT21/ JBLA21/ JBLHB21/ JBLHA21	Language I	Tamil II/ Arabic II/ Hindi II a (or) b	5	3			25	75	100
	II	JBLEB22/ JBLEA22	Language II	English II a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBICC21	CORE III	**Fundamentals of Cyber Security & Network Security**	5	5	EMP	GLO	25	75	100
		JBICC22P	CORE IV	Data Structures Lab	5	4	SD| EMP	GLO	25	75	100
		JBICA23	AECC II	**Linux and Windows Fundamental**	4	4	SD	GLO	25	75	100
	IV	JBICS24P	SEC II	Linux and Shell Programming Lab	2	1	SD	GLO	-	50	50
		JBUI2V	CVAC I	Understanding India	2	2			-	50	50
				Library/Browsing	1				-	-	-
				Remedial/Games	1				-	-	-
	V	JBICX2P/ JBICX2O	Extra Credit I	UI and UX Design Lab/ *Online Course	-	2	ENT| EMP	GLO	-	100	100
				TOTAL	**30**	**22 + 2**			**125**	**475+ 100**	**600+ 100**
III	I	JBLT31/ JBLA31/ JBLHB31/ JBLHA31	Language I	Tamil III/ Arabic III/ Hindi III a (or) b	5	3			25	75	100
	II	JBLEB32/ JBLEA32	Language II	English III a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBICC31	CORE V	**Pentesting**	4	4	SD| EMP	GLO	25	75	100
		JBICC32P	CORE VI	**Pentesting Lab**	4	3	SD| EMP	GLO	25	75	100

		JBICA33	AECC III	**Cyber Threats and Defense Strategies**	4	4	SD| EMP	GLO	25	75	100
	IV	JBICS34P	SEC III	Data Analytics Lab	2	1	ENT| EMP	GLO	-	50	50
		JBMD31ICP	MD I	PC Package Lab	2	1	SD	GLO	-	50	50
		JBES3V	CVAC II	Environmental Science for Sustainable development	2	2			-	50	50
		JBXTN3	Extension	NSS / CSS	2	2			100	-	100
	V	JBICX3P/ JBICX3O	Extra Credit II	NoSQL Lab/ *Online Course	-	2	EMP	GLO	-	100	100
				TOTAL	**30**	**23 +2**			**225**	**525+ 100**	**750 + 100**
IV	I	JBLT41/ JBLA41/ JBLHB41/ JBLHA41	Language I	Tamil IV /Arabic IV / Hindi IV a (or) b	5	3			25	75	100
	II	JBLEB42/ JBLEA42	LanguageII	English IV a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBICC41	CORE VII	**Cyber Defense**	4	4	SD| EMP	GLO	25	75	100
		JBICC42P	COREV III	**Cyber Defense Lab**	2	1	SD| EMP	GLO	25	75	100
		JBICC43P	CORE IX	**Web Application Pentesting Lab**	3	2	ENT| EMP	GLO	25	75	100
		JBICA44	AECC IV	**Web Application Pentesting**	4	4	ENT| EMP	GLO	25	75	100
	IV	JBMD41ICP	MD II	Web Designing Lab	3	2	ENT| EMP	GLO	-	50	50
		JBICS45P	SEC IV	Programming in Python Lab	2	1	EMP	GLO	-	50	50
		JBDT4V	CVAC III	Digital and Technology Solution	2	2	SD	GLO	-	50	50
	V	JBICX4P/ JBICX4O	Extra Credit III	R Tool Lab/ *Online Course	-	2	ENT| EMP	GLO	-	100	100
				TOTAL	**30**	**22+ 2**			**150**	**600+ 100**	**750 + 100**
V	III	JBICC51	CORE X	**SOC**	4	4	SD	GLO	25	75	100
		JBICC52P	CORE XI	**SOC Lab**	4	3	SD	GLO	25	75	100
		JBICC53	CORE XII	**Security Engineering**	5	5	SD| EMP	GLO	25	75	100

		JBICC54P	CORE XIII	**Security Engineering Lab**	5	4	SD| EMP	GLO	25	75	100
	IV	JBMD51ICA/ JBMD51ICB	MD III	a) Organizational Behavior b) Blockchain Technology	4	3	SD| EMP	GLO	25	75	100
		JBMD52ICA/ JBMD52ICB	MD IV	a) Accounting Principles b) Internet of Things	4	3	SD| EMP	GLO	25	75	100
		JBICS55P	SEC V	Blockchain Technology Lab	2	1	SD	GLO	-	50	50
		JBHW5V	CVAC IV	Health and wellness	2	2			-	50	50
	V	JBESX5	Extra Credit IV	Employability Skills	-	2			100	-	100
				TOTAL	**30**	**25+ 2**			**150+ 100**	**550+ 100**	**800+ 100**
VI	III	JBICC61	CORE XIV	**Network Security Expert**	4	4	SD	GLO	25	75	100
		JBICC62PW	CORE XV	Project	6	6	SD| ENT| EMP	GLO	25	75	100
		JBICC63	CORE XVI	**Red Teaming**	4	4	SD	GLO	25	75	100
		JBICC64P	CORE XVII	**Red Teaming Lab**	4	3	SD	GLO	25	75	100
		JBICC65	CORE XVIII	# Machine Learning	5	5	SD| EMP	GLO	25	75	100
	IV	JBMD61ICA/ JBMD61ICB	MD V	a) Digital Marketing b) Intellectual Property Rights	4	3	SD| EMP	GLO	25	75	100
		JBICS66P	SEC VI	Machine Learning Lab	2	2	SD	GLO	-	50	50
	V	JBICC6P/ JBICX6O	Extra Credit V	Data Mining Lab/ *Online Course	-	2	ENT| EMP	GLO	-	100	100
				Library / Browsing	1	-			-	-	-
				TOTAL	**30**	**27+ 2**			**150**	**500+ 100**	**650 + 100**
				Grand Total	**180**	**140 +10**			**950+10 0**	**3075+ 500**	**4100 + 500**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX,
Spoken Tutorial, NPTEL or Coursera etc.
#For internship course, refer www.internshala.com or any online internship course.
For online course integration, syllabus will be taken from spoken tutorial
@SD- Skill Development ENT-Entrepreneurship EMP-Employability

$ REG-Regional NAT-National GLO-Global

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course
MD – Multi Disciplinary
VAC – Value Added Course

CORE I- Principles of Information Technology

(For Students Admitted from 2025-26)

Semester: I **Hours/week: 4**
Subject Code: JBICC11 **Credit: 3**

Course objectives:

1. To understand the basics of computers.
2. To understand the design of various functional units and components of computers.
3. To know the concepts of combinational circuits.

Unit I **(12 hours)**

Computer Basics: Algorithms – Simple Model of a Computer – Characteristics of Computers – Problem Solving Using Computers. **Input/output Units:** Traditional Computer Input/output devices. **Computer Memory:** Memory Cell – Memory Organization – Read Only Memory. **Computer Generations and Classification:** First Generation of Computers- Second generation – Third Generation – Fourth Generation – Fifth Generation –Classification of Computers.

Unit II **(12 hours)**

Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system-decimal to binary, octal to binary, hexadecimal to binary – hexadecimal to octal conversions and vice versa-binary arithmetic-1s and 2s complement representations-BCD addition and subtraction.

Unit III **(12 hours)**

Basic Boolean functions: canonical sum of products and product of sum simplifications-minimization of logical expressions using K-map-logic gates-AND,OR, NOT,EX- OR,NAND,NOR gate**. Introduction to combinational logic circuits**: arithmetic circuits –half adder, full adder, half subtractor, full subtractor- multiplier and divider.

Unit IV **(12 hours)**

Basic Computer Organization and Design: Instruction Codes-Computer Registers- Computer Instructions- Timing and Control-Instruction Cycle-Memory Reference Instructions -Input-Output and Interrupts.

Unit V **(12 hours)**

Micro programmed Control: Control Memory- Address Sequencing- **Central Processing Unit:** Introduction- General Register Organization - Instruction Formats - Addressing Modes- Data Transfer and Manipulation-Program Control-RISC **Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Summarize the basics of computers and its generations

CO2: Illustrate number systems and its conversions

CO3: Analyzetheoperations of various logical circuits

CO4:Definethe fundamental organization of a computer system

CO5: Examine the function of input-output organization

Text Book:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers,* PHI Learning Private Limited, Sixth Edition, 2018.
2. S. Salivahanan, S. Arivazhagan, *Digital Circuits and Design*, Oxford University Press, 2018.
3. Morris Mano M, *Computer System Architecture,* Prentice Hall of India, 2011.

Reference Books:

1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers,* PHI Learning Private Limited, Sixth Edition, 2018.
2. M. Morris Mano, Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014
3. William Stallings, *Computer Organization and Architecture*, Pearson Publication, Eighth Edition, 2010.

Journal:

1. Info Communication Journal (Scopus)

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/
2. https://www.coursera.org/courses?query=computer%20fundamentals
3. https://nptel.ac.in/courses/108/105/108105113/
4. https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953
5. NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	9	9	9	**45**
CO2	9	1	9	3	9	9	9	**49**
CO3	9	3	3	9	9	9	3	**45**
CO4	9	9	3	9	9	9	9	**57**
CO5	9	3	9	9	9	9	3	**51**
Total	**39**	**19**	**27**	**39**	**45**	**45**	**33**	**247**

Low-1 Medium-3 High-9

CORE II - Programming in C

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 4**
Subject Code: JBICC12 **Credit: 4**

Course Objectives:

1. To acquire a comprehensive understanding of C programming concepts includes data types, operators, control structures, functions, arrays, and strings.
2. To develop skills in applying C programming techniques to solve real-world problems using pointers, structures, and file handling.

Unit I **(12 Hours)**

Introduction: History of C –Importance of C – Basic structure of C programs - Constants, Variables and data types – Operators and expressions – Input and Output operations – Decision making and branching – Decision making and looping

Unit II **(12 Hours)**

Arrays: One and two dimensional arrays - Initializing two dimensional arrays – Multidimensional arrays.

Arrays: One and two dimensional arrays - Initializing two-dimensional arrays – Multidimensional arrays - **Character Arrays and Strings:** Declaring and initializing string variables- Reading strings from terminal- Writing strings to screen – String handling functions – Other features of strings.

Unit III **(12 Hours)**

User defined functions : Introduction – Need for user defined functions – A multi-function program – Elements of user defined functions – Definition of functions - Return values and their types - Calling a function – Function declarations - Functions that return multiple values – Nesting of functions - Recursion - Passing arrays to functions - Passing strings to functions - The scope and lifetime of variables

Unit IV **(12 Hours)**

Structures and Unions: Introduction – Defining and declaring structure – Accessing structure members – Structure initialization – Arrays of structures – Arrays within structures - Structures within structures – Structures and functions – Unions - **Pointers :** Introduction - Understanding pointers - Accessing the address of a variable -Declaring and initializing pointers – Accessing a variable through its pointer - Pointer expressions – Pointers and arrays – Pointers and character strings – Array of pointers - Pointers and functions – Pointers and structures

Unit V **(12 Hours)**

File Handling: Defining and opening a file – Closing a file – I/O operations on files - Error handling during I/O operations - Random access to files – Command line arguments - **Preprocessor:** Introduction - Macro substitution - File inclusion - Compiler control directives.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Describe the basic programming knowledge of C, operators and expressions

CO2: Demonstrate data input and output, control statements & functions

CO3: Analyze program structure and arrays
CO4: Evaluate strings and pointers
CO5: Formulate structures, unions and file handling

Text Book:

1. E Balagurusamy, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, VI Edition, 2012

Reference Books:

1. K R Venugopal, Sudeep R Prasad, *Programming with C*, Tata McGrawHill Publishing Company Ltd, NewDelhi, 2008
2. Mullish Cooper, *The Spirit of C - An introduction to modern programming*,Jaico publishing house ,Mumbai, 2006
3. Byron S. Gottfried, Jitender Kumar Chhabra, *Programming with C*, Tata McGrawHill Publishing Company Ltd , NewDelhi, 2006

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview
4. https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

AECC I - Programming in C Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 4**
Subject Code: JBICC13P **Credit: 3**

Course Objectives

1.To introduce the basic concepts of programming using C language

2.To enhance the analyzing and problem solving skills in C

List of Programs:

Formula substitution

1. Develop a C Program to find sum of the digits and reverse the digits
2. Develop a C Program to generate the Fibonacci series
3. Develop a C Program to generate Prime number within range
4. Develop a C Program to find whether a given number is Armstrong or not
5. Develop a C Program to count the number of positive, negative and zero in the list
6. Develop a C Program to find the area of various shapes using switch case

Array

7. Develop a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of a matrix using switch case
8. Develop a C Program to Check whether the element is present in the given list or not
9. Develop a C Program to sort numbers in ascending and descending order
10. Develop a C Program to sort names in Alphabetical order

Functions & Structures

11. Develop a C Program to find the factorial of a given number using recursion function
12. Develop a C Program to Prepare student mark list using structure

String Manipulation

13. Develop a C Program to count the vowels in the given string
14. Develop a C Program to perform string functions.

Pointers

15. Develop a C Program to find average of two numbers using pointers

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Understand C programming basics
CO2: Implement array operations and string manipulation
CO3: Design programs using functions, structures, and recursion
CO4: Analyze and implement pointer operations
CO5: Develop and debug C programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

SEC I - Office Automation Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 2**
Subject Code: JBS15P **Credit: 1**

Course Objectives:

1. To acquire hands-on experience with office automation tools, including word processing, spreadsheet, presentation, and database management
2. To learn to analyze and solve real-world problems using office automation tools

List of Programs:

Word Processing

1. Create a two-page document for a book titled 'XX' and apply text formatting, use the Find and Replace feature, and insert a header and footer with relevant details."
2. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
3. Create a Newsletter Article (using Columns, Drop cap)
4. Create a document using tables in MS Word to design a menu card for a hotel.

Spread Sheet

5. Create a spreadsheet consists of Student details and then do the following:
    a. Calculate student wise total and subject wise total
    b. Find the Maximum and Minimum marks of the subject
    c. Identify the grade based on the percentage
6. Create a spreadsheet having Employee details to calculate Net Pay and Gross Pay

Presentation

7. Create a presentation showing your various activities of the department a Perform slide translation and Setting background designs
8. Create a presentation that provides an audio-visual tour of our college, utilizing custom animations in PowerPoint to enhance the visual and auditory experience.
9. Create a presentation using PowerPoint to insert and customize charts and tables to display the rainfall data for the last five years

Database

10. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to findtotal and average and check data entered.
11. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation toretrieve data.

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and understand various options of office application

CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Evaluated and compare options of different Microsoft office applications
CO5: Build a presentations, advertisements, reports for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE III - Fundamentals of Cyber Security & Network Security

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**
Subject Code: JBICC21 **Credit: 5**

Course Objectives:

1. Understand the cybersecurity landscape, modern threats, and attacker methodologies.
2. Analyze various cyberattack types, including malware, ransomware, and phishing techniques.
3. Learn about security models, including Zero Trust and Perimeter-Based Security.
4. Develop a solid understanding of networking fundamentals, protocols, and security challenges.
5. Explore modern security solutions such as firewalls, IDS/IPS, endpoint security, and next-generation security technologies.

Unit I **(15 Hours)**

Cybersecurity Landscape - Modern Computing Trends - New Application Threat Vectors - Tactics, Techniques, and Procedures - New Application Threat Vectors - SaaS Application Risks - Standards and Regulations - Attacker Profiles Cyberattack Lifecycle - High-Profile Attacks - MITRE Attack Framework

Unit II **(15 Hours)**

Cyberattack Types - Malware and Ransomware - Malware Types - Advanced or Modern Malware - Ransomware Types - Vulnerabilities and Exploits – Cyber-attack Techniques - Business Email Compromise - Phishing Attacks - Bots and Botnets.

Unit III **(15 Hours)**

Advanced Persistent Threats - Wi-Fi Challenges - Wireless Security - Evil Twin - Jasager - SSLstrip - Security Models - Perimeter-Based Security Model - Zero Trust Security Model - Zero Trust Architecture - Security Operating Platform - Prevention-First Architecture.

Unit IV **(15 Hours)**

Common Network Devices - Routed and Routing Protocols - Area Networks and Topologies - Domain Name System (DNS) - Internet of Things (IoT) - TCP/IP Overview - Numbering Systems - IP Addressing Basics - Introduction to Sub netting - OSI and TCP/IP Models

Unit V **(15 Hours)**

Legacy Firewalls - Intrusion Detection and Prevention - Web Content Filters - Virtual Private Networks - Data Loss Prevention - Unified Threat Management - Endpoint Security - Malware and Anti-Malware - Firewalls and HIPSs - Mobile Device Management - Server Management - Structured Host and Network Troubleshooting - Prevention-First Architecture - Next-Generation Firewalls - App-ID - User-ID - Content-ID - Panorama

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Explain the cybersecurity landscape, attacker tactics, and MITRE ATT&CK framework.
CO2: Identify and analyze cyber threats, malware types, and attack techniques.
CO3: Evaluate security models and architectures, including Zero Trust and Perimeter-Based Security.
CO4: Demonstrate an understanding of networking fundamentals, protocols, and subnetting.
CO5: Assess security technologies, including firewalls, IDS/IPS, endpoint protection, and next-generation security solutions.

Text Book:

1. Doug Lowe,"Networking All-in-One For Dummies", 8th Edition, John Wiley & Sons, Inc., 2021
2. Lawrence C. Miller, "Cybersecurity For Dummies", Palo Alto Networks Edition, John Wiley & Sons, Inc., 2014

Reference Books:

1. Michael E. Whitman & Herbert J. Mattord, Principles of Information Security, Cengage Learning, 6th Edition, 2018.
2. Richard Bejtlich, The Practice of Network Security Monitoring: Understanding Incident Detection and Response, No Starch Press, 2013.
3. Bruce Schneier, Applied Cryptography: Protocols, Algorithms, and Source Code in C, Wiley, 2nd Edition, 2015.
4. Chris Sanders, Practical Packet Analysis: Using Wireshark to Solve Real-World Network Problems, No Starch Press, 3rd Edition, 2017.

Journals:

1. Journal of Network Security
2. Journal of Cybersecurity

E - Resource:

1. https://www.paloaltonetworks.com/cybersecurity-academy

Course	Programme Outcomes

Outcomes								
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE IV – Data Structures Lab

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 5**
Subject Code: JBICC22P **Credit: 4**

Course Objectives:

1. To introduce the concepts of data structure and its operation
2. To implement data structures for problem solving in C/ C++/python

List of programs:

1. Develop a program to implement the stack-using array
2. Develop a program to implement the queue using linked lists
3. Develop a program to implement the in-order tree traversal methods
4. Develop a program to search a key element in a list of elements using linear search
5. Develop a program to search a key element in a list of elements using binary search
6. Develop a program to implement insertion sort algorithm
7. Develop a program to implement selection sort algorithm
8. Develop a program to implement merge sort algorithm
9. Develop a program to implement binary search tree
10. Develop a program to create a singly linked list and delete an element from linked list
11. Develop a program to create a doubly linked list and display the contents in the list

Note: Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, the students will be able to
CO1: Understand the basics of data structures and its systematic approaches
CO2: Implement the data structure and its operations in C or C++
CO3: Compare the difference between various searching & sorting techniques
CO4: Demonstrate Tree and linked list algorithm
CO5: Develop simple applications using data structures

Course Outcomes	Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	1	9	3	9	49
CO2	9	3	9	1	9	3	9	43
CO3	9	1	9	1	9	1	9	39
CO4	9	1	9	1	9	1	9	39
CO5	9	1	9	1	9	1	9	39
Total	**45**	**15**	**45**	**5**	**45**	**9**	**45**	**209**

Low-1 Medium-3 High-9

AECC II - Linux and Windows Fundamental

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 4**
Subject Code: JBICA23 **Credit: 4**

Course Objectives:

1. Gain foundational knowledge of Linux and Windows operating systems.
2. Develop hands-on skills in file system interaction, permissions, and shell operations in Linux.
3. Learn about process management, automation, and package management in Linux.
4. Understand Windows system architecture, file system, user account management, and system utilities.
5. Explore Windows security features, including antivirus, firewall, and BitLocker encryption.

Unit I **(12 hours)**

Background on Linux - Interacting with the File system! - Listing Files - Outputting the Contents - Searching for Files - Find - Grep - An Introduction to Shell Operators

Unit II **(12 hours)**

SSH - Introduction to Flags and Switches - Manual Page - File system Interaction - Creating Files - Moving files - Deleting files - Permissions 101 - Users & Groups - Common Directories

Unit III **(12 hours)**

Terminal Text Editors - Nano - VIM - General/Useful Utilities - SCP - Processes 101 - Viewing Processes - Backgrounding and Foregrounding - Maintaining Your System: Automation - Maintaining Your System: Package Management - Maintaining Your System: Logs

Unit IV **(12 hours)**

Windows Editions - The Desktop (GUI) - The File System - The Windows\System32 Folders - User Accounts, Profiles, and Permissions - User Account Control - Settings and the Control Panel - Task Manager - System Configuration - Change UAC Settings - Computer Management

Unit V **(12 hours)**

System Information - Resource Monitor - Command Prompt - Registry Editor - Windows Updates - Windows Security - Virus & threat protection - Firewall & network protection - App & browser control - Device security - BitLocker - Volume Shadow Copy Service

Course Outcomes:
After successful completion of this course, the student will be able to
CO1: Demonstrate proficiency in basic Linux file system navigation and shell operations.
CO2: Manage Linux file permissions, user accounts, and system directories.
CO3: Utilize Linux system administration tools for automation, package management, and process control.
CO4: Explain Windows system architecture, user profiles, and system utilities.
CO5: Apply Windows security configurations, including firewall, antivirus, and encryption tools.

Text Book:

1. William Shotts, The Linux Command Line: A Complete Introduction, No Starch Press, 2nd Edition, 2019.
2. Brian Knittel, Windows 10 Inside Out, Microsoft Press, 3rd Edition, 2020.
3. William Pollock, "Linux Basics for Hackers" , 2019

Reference Books:

1. Richard Blum, Christine Bresnahan, Linux Command Line and Shell Scripting Bible, Wiley, 4th Edition, 2021.
2. Mark Minasi, Mastering Windows Server 2019, Sybex, 2019.
3. Jason Eckert, Linux+ Guide to Linux Certification, Cengage Learning, 5th Edition, 2020.
4. Charles Petzold, Windows Internals, Microsoft Press, 7th Edition, 2017.

Journals:

1. Journal of Open Source Software
2. Journal of Advances in Shell Programming

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

SEC IV - Linux and Shell Programming Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 2**

Subject Code: JBICS24P **Credit: 2**

Course Objectives:

1. To understand and make effective use of Linux utilities and shell scripting language to solve problems
2. To develop the skills necessary for systems programming including file system programming, process and signal management and inter-process communication

List of programs:

1. Develop a shell program to use who commands
2. Develop a shell program to use list commands
3. Develop a shell program to use sort commands
4. Develop a shell program to use wc commands
5. Develop a shell program to use cat commands
6. Develop a shell program to find odd or even number
7. Develop a shell program to find smallest among three numbers
8. Develop a shell program to find the factorial value
9. Develop a shell program to display multiplication table
10. Develop a shell program to use case statement
11. Develop a shell program to display username and password
12. Develop a shell program to Find age of a person
13. Develop a shell program to check the given file is a directory or not
14. Develop a shell program to Perform String Manipulation

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize shell commands, scripts, managing files, pipes and redirections

CO2: Apply appropriate Linux commands to make effective use of the environment to solve problems

CO3: Illustrate shell scripts to perform repetitive tasks using while and for loops

CO4: Evaluate shell functions

CO5: Derive command-line arguments

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**45**	**15**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

CORE V - Pentesting

(For Students Admitted from 2025-26)

Semester: III **HoursWeek: 4**
Subject Code: JBICC31 **Credit: 4**

Course Objectives:

1. Gain an understanding of offensive and defensive security, threat intelligence, and digital forensics.
2. Learn the fundamentals of penetration testing, security methodologies, and ethical considerations.

Unit I **(12 hours)**

Intro to Offensive Security - Intro to Defensive Security - Security Operations Center - Threat Intelligence - Digital Forensics and Incident Response - Digital Forensics - Incident Response - Malware Analysis - Career in Cyber Security - Pentesting Fundamentals - Penetration Testing Ethics - Penetration Testing Methodologies - Black box - White box - Grey box - Principles of Security - CIA Triad - Security Models

Unit II **(12 hours)**

Walking an Application - Inspector - Debugger - Network - Content Discovery - Manual Discovery - OSINT - Automated Discovery - Subdomain Enumeration - Authentication Bypass - Brute Force - Logic Flaw – IDOR - Path Traversal - File Inclusion - Local File Inclusion - Remote File Inclusion - SSRF - XSS - Reflected XSS - Stored XSS - DOM Based XSS - Command Injection - SQL Injection - In-Band SQLi - Blind SQLi - Out-of-Band SQLi

Unit III **(12 hours)**

Burp Suite: Basics - Dashboard - Navigation - Site Map and Issue Definitions - Burp Proxy - Scoping and Targeting - Proxying HTTPS - Burp Suite: Repeater - Inspector - Burp Suite: Intruder - Payloads - Sniper - Battering Ram - Pitchfork - Cluster Bomb - Burp Suite: Other Modules - Decoder - Comparer - Sequencer - Burp Suite: Extensions - The BApp Store

Unit IV **(12 hours)**

Passive Reconnaissance - Whois - nslookup - DNSDumpster - Shodan.io - Active Reconnaissance - Ping - Traceroute - Telnet - Netcat - Nmap Live Host Discovery - Enumerating Targets - Discovering Live Hosts - Nmap Basic Port Scan - TCP and UDP Ports - Nmap Advanced Port Scan - Nmap Post Port Scan - TCP Null Scan - FIN Scan - mas Scan - Protocols and Servers - Net Sec Challenge

Unit V **(12 hours)**

Vulnerabilities 101 - Vulnerability Databases - Exploit Vulnerabilities - Manual Exploitation - Vulnerability Capstone - Metasploit: Introduction - Main Components - Msfconsole - Metasploit: Exploitation - Scanning - Msfvenom - Metasploit: Meterpreter - Meterpreter Flavors - Meterpreter Commands - Post-Exploitation - What is a Shell - Netcat - Socat - WebShells - Linux Privilege Escalation - Windows Privilege Escalation

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Understand the principles of cybersecurity, penetration testing methodologies, and security models.

CO2: Identify and exploit web application vulnerabilities, including XSS, SQLi, and authentication bypass.

CO3: Utilize Burp Suite for manual security testing, payload manipulation, and web vulnerability scanning.

CO4: Conduct reconnaissance, including OSINT, active and passive scanning, and enumeration techniques.

CO5: Perform vulnerability assessments, exploitation using Metasploit, and privilege escalation techniques.

Text Book:

1. Georgia Weidman, Penetration Testing: A Hands-On Introduction to Hacking, No Starch Press, 2014.
2. Dafydd Stuttard & Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Wiley, 2nd Edition, 2011.

Reference Books:

1. Peter Kim, The Hacker Playbook 3: Practical Guide To Penetration Testing, Secure Planet, 2018.
2. Stuart McClure, Joel Scambray, George Kurtz, Hacking Exposed 7: Network Security Secrets and Solutions, McGraw-Hill, 7th Edition, 2012.
3. David Kennedy, Jim O'Gorman, Devon Kearns, Metasploit: The Penetration Tester's Guide, No Starch Press, 2011.
4. Nikhil Srivastava, Kali Linux Penetration Testing Bible, Wiley, 2021.

Journals:

1. Global Journal of Computer Science and Technology
2. International Journal of Digital Crime and Forensics (IJDCF)
3. International Journal of Advanced Engineering Technologies and Innovations

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE VI - Pentesting Lab

(For Students Admitted from 2025-26)

Semester: III **Hours / Week: 4**

Subject Code: JBICC32P **Credit: 3**

Course Objectives

1. To understand the principles and methodologies behind penetration testing.
2. To explore web application vulnerabilities, authentication bypass, and injection attacks.

List of Programs:

1. Perform subdomain enumeration and content discovery using Gobuster and dirb.
2. Exploit authentication bypass vulnerabilities, including IDOR and session fixation.
3. Perform SQL Injection (SQLi) and command injection on a web application.
4. Conduct Server-Side Request Forgery (SSRF) and File Inclusion (LFI & RFI) attacks.
5. Use Burp Suite Intruder and Repeater to automate web security testing.
6. Conduct network reconnaissance using whois, nslookup, and Nmap scans.
7. Perform live host discovery and advanced port scanning using Nmap.
8. Research and exploit vulnerabilities using Exploit-DB and CVE databases.
9. Execute Metasploit-based exploitation and gain remote access to a target system.
10. Perform Windows privilege escalation using token impersonation and misconfigured services.
11. Exploit Linux privilege escalation vulnerabilities, including SUID and kernel exploits.
12. Conduct a full penetration testing simulation, from reconnaissance to exploitation.

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Apply penetration testing methodologies and security assessment techniques.
CO2: Identify and exploit web vulnerabilities using manual and automated tools.
CO3: Conduct network reconnaissance, scanning, and vulnerability research.
CO4: Utilize Metasploit for exploitation and post-exploitation techniques.
CO5: Perform privilege escalation on Windows and Linux systems for security assessment.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

AECC III - Cyber Threats and Defense Strategies

(For Students Admitted from 2025-26)

Semester: III **Hours / Week: 4**
Subject Code: JBICA33 **Credit: 4**

Course Objectives:

1. Develop an understanding of networking fundamentals, command-line tools, and network protocols.
2. Learn cryptographic principles, encryption types, hashing, and password security techniques.

Unit I **(12 hours)**

Active Directory Basics - Group Policies - Authentication Methods - Windows Command Line - Network Troubleshooting - File and Disk Management - Task and Process Management - Windows PowerShell - Linux Shells - Networking Concepts - OSI Model - TCP/IP Model - UDP and TCP - DHCP - Networking Core Protocols- ICMP - NAT - FTP - SMTP - Networking Secure Protocols - Tcpdump - Wireshark - Packet Dissection - Packet Navigation - Packet Filtering

Unit II **(12 hours)**

Cryptography Basics - Importance of Cryptography - Ciphers - Types of Encryption - Asymmetric Encryption - Diffie-Hellman Key Exchange - PGP and GPG - Hashing - Hash Functions - Secure Password Storage - Password Cracking - Integrity Checking - John the Ripper - Cracking Basic Hashes - Custom Rules

Unit III **(12 hours)**

Web Application Overview - Uniform Resource Locator - HTTP Request - HTTP Response - JavaScript Essentials - SQL Fundamentals - OWASP Top 10 - Broken Access Control - Cryptographic Failures - Injection - Insecure Design - Security Misconfiguration - Vulnerable and Outdated Components - Identification and Authentication Failures - Software and Data Integrity Failures - Security Logging & Monitoring Failures - Server-Side Request Forgery - Hydra - Gobuster - Shells - SQLMap

Unit IV **(12 hours)**

Defensive Security - Introduction to SOC - Purpose and Components - People - Process - Technology - Digital Forensics - Methodology - Evidence Acquisition - Windows Forensics - Incident Response - Incidents - Types of Incidents - Incident Response Process - Incident Response Techniques - Logs - Types of Logs - Windows Event Logs Analysis - Web Server Access Logs Analysis

Unit V **(12 hours)**

SIEM - Log Sources - Log Ingestion - Analysing Logs - Alerts - Firewall - Types - Rules - Windows Defender Firewall - IDS - Types - Snort - Snort Usage - Vulnerability Scanner - CVE & CVSS - OpenVAS - CyberChef - CAPA - REMnux - FlareVM - Security Principles - CIA - DAD - Defence-in-Depth - ISO/IEC 19249 - Zero Trust - Trust but Verify

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Demonstrate knowledge of Active Directory, Windows/Linux command-line tools, and network troubleshooting.

CO2: Explain cryptographic techniques, password security, and integrity verification methods.

CO3: Identify and analyze web security vulnerabilities, OWASP Top 10 threats, and automated security tools.

CO4: Evaluate SOC operations, incident response methodologies, and digital forensics techniques.

CO5: Implement security monitoring, log analysis, firewall configurations, and zero-trust security models.

Text Book:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson, 7th Edition, 2017.
2. Jason Andress, Cybersecurity: The Beginner's Guide, No Starch Press, 2021.

Reference Books:

1. Kevin Beaver, Hacking for Dummies, Wiley, 6th Edition, 2022.
2. Michael Sikorski & Andrew Honig, Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software, No Starch Press, 2012.
3. Niels Ferguson, Bruce Schneier, & Tadayoshi Kohno, Cryptography Engineering: Design Principles and Practical Applications, Wiley, 2010.

Journals:

1. International Journal of Computer Trends and Technology
2. International Journal of Computer Science and Technology
3. Journal of Quantum Science and Technology

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

SEC V - Data Analytics Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 2**

Subject Code: JBICS34P **Credit: 1**

Course Objectives:

1. To know the modern quantitative tools to data analysis in a business context
2. To apply the tools to transform the data into useful information

List of Programs

Spread Sheet

1. To perform Basic Functions in Spread sheets
2. To perform Formatting and Proofing
3. To perform Mathematical & Text Functions
4. To Implement Date and Time Functions
5. To Implement Sorting
6. To Implement Filtering Techniques
7. To perform Logical Functions
8. To perform Data Validation
9. To display Pivot Tables
10. To display Charts and Slicers
11. To perform Lookup Functions

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Excel functions to solve mathematical, text, date and time operations
CO2: Demonstrate the concepts of sorting, filtering using Excel
CO3: Illustrate Data validation feature of spread sheet
CO4: Evaluate Statistical operations using Pivot Table tool
CO5: Develop spread sheet with visualization using charts

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	**45**	**9**	**45**	**15**	**5**	**45**	**45**	**209**

Low-1 Medium-3 High-9

CORE VII - Cyber Defense

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**

Subject Code: JBICC41 **Credit: 4**

Course Objectives:

1. Understand cyber defense frameworks, threat intelligence models, and threat-hunting techniques.
2. Learn network security fundamentals, IDS/IPS configuration, and traffic analysis using Snort, Zeek, and Wireshark.

Unit I **(12 Hours)**

Cyber Defense Frameworks - Pyramid Of Pain - Hash Values - IP Address - Domain Names - Host Artifacts - Network Artifacts - Cyber Kill Chain - Unified Kill Chain - Diamond Model - MITRE - Cyber Threat Intelligence - CTI Lifecycle - CTI Standards & Frameworks - Threat Intelligence Tools - Yara - Yara Rules - Yara Modules - OpenCTI - MISP

Unit II **(12 Hours)**

Network Security - Network Data - Traffic Analysis - Snort - IDS/IPS - Operation Mode - Snort Rule Structure - Writing IDS Rules - NetworkMiner - Zeek - Zeek Scripts - Brim - Wireshark - Packet Dissection - Packet Navigation - Packet Filtering - Traffic Analysis - TShark - CLI Wireshark Features

Unit III **(12 Hours)**

Endpoint Security - Logging and Monitoring - Log Analysis - Core Windows Processes - Task Manager - System - csrss.exe - wininit.exe - lsass.exe - Sysinternals - File and Disk Utilities - Networking Utilities - Process Utilities - Security Utilities - Windows Event Logs - Sysmon - Osquery - Wazuh - Agents - Policy Auditing

Unit IV **(12 Hours)**

SIEM - Log Sources - Log Ingestionv - Logs - Alerts - ELK 101 - ElasticStack - Visualizations - Dashboards - Splunk - Components - Navigating Splunk - Incident Handling - Incident Handling - Life Cycle - Phishing Analysis - Email Delivery - Email Headers - Email Body - Types of Phishing - Phishing Emails - Analysis Tools - Prevention

Unit V **(12 Hours)**

DFIR - DFIR Tools - Incident Response process - Windows Forensics - Data Acquisition - FAT - NTFS - Recovering deleted files - Linux Forensics - Autopsy - Ingest Modules - User Interface - Redline - IOC Search Collector - KAPE - Target Options - Module Options - Volatility - Memory Extraction - TheHive Project - Malware Analysis - Techniques - Static Analysis - Dynamic Analysis - Memory Forensics

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Apply cyber defense frameworks, threat intelligence standards, and hunting techniques.

CO2: Configure and analyze network security tools, IDS/IPS systems, and network monitoring solutions.

CO3: Perform endpoint security analysis, system logging, and event monitoring using industry tools.

CO4: Utilize SIEM platforms for log analysis, security alerts, and phishing email investigations.

CO5: Conduct digital forensics investigations, memory analysis, and malware detection techniques.

Text Book:

1. William Stallings, Network Security Essentials: Applications and Standards, Pearson, 6th Edition, 2022.
2. Security Operations Management 4th Edition by Robert McCrie (Author), Seungmug Lee (Author)
3. Jason T. Luttgens, Matthew Pepe, Kevin Mandia, Incident Response & Computer Forensics, McGraw-Hill, 3rd Edition, 2014.

Reference Books:

1. Chris Sanders, Practical Packet Analysis: Using Wireshark to Solve Real-World Network Problems, No Starch Press, 3rd Edition, 2017.
2. Richard Bejtlich, The Practice of Network Security Monitoring, No Starch Press, 2013.
3. Michael Hale Ligh, Andrew Case, The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory, Wiley, 2014.
4. Zeek Documentation – Network Security Monitoring with Zeek, 2021.

Journal:

1. Cyber Defense Magazine
2. Cyber Defense Review

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE VIII - Cyber Defense Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 2**
Subject Code: JBICC42P **Credit: 1**

Course Objectives

1.To understand cyber defense frameworks, cyber kill chains, and threat intelligenc methodologies.
2.To perform network security monitoring and traffic analysis using Snort, Zeek, and Wireshark.

List of Programs:

1. Analyze Cyber Kill Chain and Unified Kill Chain frameworks for attack detection.

2. Perform threat intelligence gathering using OSINT and MISP for adversary tracking.
3. Configure and analyze Snort rules to detect network intrusions.
4. Perform network traffic analysis using Zeek and NetworkMiner.
5. Capture and analyze malicious network traffic using Wireshark and TShark.
6. Monitor Windows event logs and system activities using Sysmon and Osquery.
7. Set up and configure Wazuh for endpoint security monitoring.
8. Investigate security incidents using ELK and Splunk.
9. Perform Windows forensics and analyze registry artifacts for threat detection.
10. Conduct memory forensics using Volatility and Redline.
11. Perform phishing email analysis and detect malicious email campaigns.
12. Investigate a real-world cyber defense scenario using SOC tools and techniques.

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Apply cyber defense frameworks and threat intelligence techniques.
CO2: Perform network security monitoring and detect anomalies in network traffic.
CO3: Implement endpoint security monitoring and log analysis for threat detection.
CO4: Utilize SIEM tools for investigating security incidents and event correlation.
CO5: Conduct forensic investigations, memory analysis, and phishing detection.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

CORE IX - Web Application Pentesting Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 3**
Subject Code: JBICC43P **Credit: 2**

Course Objectives

1. To develop hands-on skills in identifying and exploiting authentication and session management flaws.
2. To perform various injection attacks, including SQL, NoSQL, XXE, and LDAP injection.

List of Programs:

1. Perform authentication enumeration and brute-force attacks using Hydra and Burp Suite.
2. Exploit insecure session management using cookie manipulation and JWT attacks.
3. Perform SQL Injection (SQLi) and NoSQL Injection on vulnerable applications.

4. Exploit XML External Entity (XXE) Injection to retrieve sensitive files.
5. Conduct Server-Side Request Forgery (SSRF) attacks to bypass network restrictions.
6. Exploit Server-Side Template Injection (SSTI) vulnerabilities in web frameworks.
7. Execute Cross-Site Scripting (XSS) attacks, including reflected, stored, and DOM-based XSS.
8. Perform Cross-Site Request Forgery (CSRF) exploitation and token bypass techniques.
9. Exploit path traversal and file inclusion vulnerabilities to access restricted files.
10. Perform HTTP request smuggling to manipulate web proxies and load balancers.
11. Analyze CORS misconfigurations and Same-Origin Policy (SOP) bypass techniques.
12. Conduct a real-world web app pentesting challenge, exploiting multiple vulnerabilities.

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:
After successful completion of the course, student will be able to
CO1: Identify and exploit authentication and session management vulnerabilities.
CO2: Perform injection attacks to compromise database and web applications.
CO3: Execute server-side and client-side attack techniques, including SSTI and XSS.
CO4: Bypass security controls such as CSRF protection and access control mechanisms.
CO5: Assess advanced web vulnerabilities like HTTP request smuggling and CORS misconfigurations.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

AECC IV - Web Application Pentesting

(For Students Admitted from 2025-26)

Semester: IV **Hours / Week: 4**
Subject Code: JBICA44 **Credit: 4**

Course Objectives:

1. Understand authentication mechanisms, session management, and OAuth vulnerabilities in web applications.
2. Learn advanced injection techniques, including SQL, NoSQL, XXE, LDAP, and ORM injections.

Unit I **(12 Hours)**

Authentication - Enumeration - Verbose Errors - Password Reset Logic - HTTP Basic Authentication - OSINT - Session Management - Authentication vs Authorisation - Cookies vs Tokens - Session Lifecycle - Insecure Session Management - Token-Based Authentication - JSON Web Tokens - Sensitive Information Disclosure - Signature Validation Mistakes - Cross-Service Relay Attacks - OAuth Vulnerabilities - Key Concepts - OAuth Grant Types - OAuth Services - Exploiting OAuth - Multi-Factor Authentication - Common Vulnerabilities

Unit II **(12 Hours)**

Injection Attacks - Advanced SQL Injection - Second-Order SQL Injection - Filter Evasion Techniques - NoSQL Injection - Operator Injection - Syntax Injection - XXE Injection - XML Parsing Mechanisms - Exploiting XXE - In-Band - Exploiting XXE - Out-of-Band - Mitigation - Server-side Template Injection - Template Engines - LDAP Injection - Search Queries - Exploiting LDAP - Blind LDAP Injection - ORM Injection

Unit III **(12 Hours)**

Advanced Server-Side Attacks - Insecure Deserialisation - Serialisation Formats - SSRF - Anatomy of SSRF Attack - Types of SSRF - Web Application Architecture - File Inclusion Types - PHP Wrappers - Base Directory Breakouts - Race Conditions - Multi-Threading - Exploiting Race Conditions - Prototype Pollution - Property Injection - Denial of Service

Unit IV **(12 Hours)**

Advanced Client-Side Attacks - XSS - Terminology - Types - Reflected XSS - Stored XSS - DOM-Based XSS - Context and Evasion - CSRF - Types - Double Submit Cookie Bypass - Samesite Cookie Bypass - Defence Mechanisms - DOM-Based Attacks - Modern Frontend Frameworks - DOM-Based XSS - XSS Weaponisation - SOP - CORS - Common Misconfigurations - Arbitrary Origin - Bad Regex in Origin - Null Origin

Unit V **(12 Hours)**

HTTP Request Smuggling - Modern Infrastructure - Request Smuggling CL.TE - Request Smuggling TE.CL - Transfer Encoding Obfuscation - HTTP/2 Request Smuggling - HTTP/2 Explained - Desync - Request Tunneling - h2c Smuggling - WebSockets - Abusing Websockets - Defeating Secure Proxies - HTTP Browser Desync

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Identify authentication and session management flaws, OAuth weaknesses, and token-based vulnerabilities.

CO2: Exploit injection vulnerabilities in SQL, NoSQL, XML, and LDAP-based systems.

CO3: Assess server-side security risks, including SSRF, insecure deserialization, and file inclusion attacks.

CO4: Demonstrate client-side attack techniques like XSS, CSRF, and DOM-based vulnerabilities.

CO5: Conduct HTTP request smuggling, WebSockets exploitation, and infrastructure-based web attacks.

Text Book:

1. Nicolas Grégoire, Practical Web Application Security Testing, Packt Publishing, 2018.
2. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Apps, O'Reilly, 2020.

Reference Books:

1. Stuart McClure, Joel Scambray, George Kurtz, Hacking Exposed Web Applications, McGraw-Hill, 3rd Edition, 2010.
2. Orange Tsai, Advanced Web Hacking, Black Hat Trainings, 2021.
3. PortSwigger Academy, Burp Suite Web Security Academy (Online).

Journal:

1. International Journal of Information Technology and Computer Science
2. International Journal of Engineering and Technology
3. International Journal of Computer Applications

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

SEC IV -Programming in Python Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 2**
Subject Code: JBICS45P **Credit:1**

Course Objectives:

1. To acquire programming skills in Core Python
2. To develop the web designing in Python

List of programs:

1. Develop a python program to display any given text message
2. Develop a python program to display Fibonacci series
3. Develop a python program to count the number of vowel in the string
4. Develop a python program to convert a date read from the user, given in DD/MM/YYYY format into written format.
5. Develop a python program to print the contents of a file in uppercase using function

6. Develop a python program to sort the contents of a file using function Operator Overloading
7. Develop a python program to implement Operator Overloading Script
8. Develop a python script that implements the Arithmetic Quiz
9. Develop a python script to create a button with the text, "HelloWorld"
10. Develop a python script that creates a combo box with three elements. When the selection is changed the selected item is to be printed
11. Develop a python script that creates a simple application window with menus and submenus
12. Develop a python script that creates a simple application window with displaying lines
13. Develop a python program to create your own web site for displaying message
14. Develop a python program to create a simple blog using models

Note: Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Acquiring the basic knowledge of functions
CO 2: Examine test and debug simple Python programs
CO 3: Implement Python programs with conditionals and loops
CO 4: Develop Python programs step-wise by defining functions
CO 5: Design GUI application

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	3	3	9	**39**
CO2	9	9	9	9	3	9	9	**57**
CO3	9	9	9	3	3	9	9	**51**
CO4	9	3	9	3	3	3	9	**39**
CO5	3	9	3	3	3	3	9	**33**
Total	**39**	**39**	**33**	**21**	**15**	**27**	**45**	**219**

Low-1 Medium-3 High-9

CORE X - SOC
(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 4**
Subject Code: JBICC51 **Credit: 4**

Course Objectives:
1. Develop expertise in log analysis, detection engineering, and security monitoring tools.
2. Understand ELK stack, Splunk, Wazuh, and threat intelligence-driven detection methodologies.

Unit I **(12 Hours)**

Log Analysis - Types - Formats - Standards - Collection - Management - Centralisation - Storage - Retention - Deletion - Log Configuration - Planning and Implementation - Investigation Theory - Detection Engineering - Tools - Advanced Splunk - Search & Reporting App - Splunk Processing Language - Transformational Commands - Dashboards and Reports - Data Manipulation

Unit II **(12 Hours)**

Advanced ELK - Logstash: Data Processing Unit - Installation and Configuration - Writing Configurations - Output Plugins - Running Configurations - Wazuh - Decoders - Rules - Advanced ELK Queries - Nested Queries - Fuzzy Searches - Proximity Searches - Regular Expressions - Detection Engineering - Methodologies - Frameworks - Tactical Detection - Threat Intelligence - Sigma - Aurora EDR - Security Orchestration, Automation and Response

Unit III **(12 Hours)**

Threat Hunting - Mindset - Process - Goals - Foothold - Defense Evasion - Persistence - Command and Control - Pivoting - Privilege Escalation - Credential Access - Lateral Movement - Threat Emulation - Emulation Methodologies - Emulation Process - Threat Modelling - DREAD Framework - STRIDE Framework - PASTA Framework - CALDERA - Emulation to Detection - Autonomous Incident Response

Unit IV **(12 Hours)**

Incident Response - Incident Response Capability - Documentation Preparation - Technology Preparation - Visibility - Identification - Scoping - Pre-Containment - Containment Strategies - Creating Threat Intelligence - Eradication Techniques - Remediation - Recovery - Targeted System Cleanup - Unique Threat Intelligence

Unit V **(12 Hours)**

Malware Analysis - x86 Architecture - CPU architecture overview - Registers overview - Memory overview - x86 Assembly - Opcodes and Operands - Arithmetic and Logical Instructions - Conditionals and Branching - Stack and Function calls - Windows Internals - Dissecting PE Headers - Basic Static Analysis - String search - Fingerprinting malware - Signature-based detection - Advanced Static Analysis - Basic Dynamic Analysis - Debugging - Anti-Reverse Engineering - Anti-Debugging - Identifying and Unpacking - MalDoc: Static Analysis

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Configure and analyze security logs, detection tools, and reporting dashboards.
CO2: Implement ELK, Splunk, and Wazuh for advanced security data processing.
CO3: Conduct proactive threat hunting using structured methodologies and frameworks.
CO4: Execute incident response techniques, containment strategies, and remediation actions.
CO5: Perform malware analysis, unpack binaries, and detect evasive threats in real-world scenarios.

Text Book:

1. Josh Brower, Security Operations Center Guidebook: A Practical Guide for Securing Your Enterprise, Apress, 2022.
2. David Swift, The Security Analyst's Guide to Splunk, Apress, 2021.

Reference Books:

1. Tyler Wrightson, Advanced Persistent Threat Hacking: The Art and Science of Hacking Any Organization, McGraw-Hill, 2014.
2. Zeek Documentation – Network Security Monitoring with Zeek, 2021.
3. Chris Sanders, Practical Threat Intelligence and Data-Driven Threat Hunting, No Starch Press, 2020.
4. Bruce Dang, Practical Reverse Engineering: x86, x64, ARM, Windows Kernel, Reversing Tools, and Obfuscation, Wiley, 2014.

Journal:

1. International Journal of Engineering and Technology
2. International Journal of Computer Applications

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XI – SOC Lab

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 4**
Subject Code: JBICC52P **Credit: 3**

Course Objectives

1. To understand log analysis, SIEM tools, and security monitoring fundamentals.
2. To gain hands-on experience with Splunk and ELK stack for threat detection and investigation.

List of Programs:

1. Perform log analysis and parsing using Splunk and ELK for security event monitoring.
2. Set up and configure Splunk dashboards and reports for real-time security insights.
3. Implement custom alert rules in Wazuh for detecting suspicious activities.
4. Conduct advanced ELK queries to analyze security logs efficiently.
5. Apply Sigma detection rules to identify threats in a SIEM environment.
6. Perform threat hunting using Splunk to detect foothold and lateral movement activities.
7. Execute Atomic Red Team simulations to emulate real-world cyber threats.

8. Analyze an incident response case study, including identification, containment, and remediation.
9. Conduct Windows malware static analysis, including PE header examination and signature detection.
10. Perform dynamic malware analysis using a sandbox environment to observe behavior.
11. Investigate malicious documents (MalDoc) using static and behavioral analysis techniques.
12. Simulate a real-world cyberattack using CALDERA for adversary emulation and analyze its impact.

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Configure and analyze logs for real-time security monitoring.
CO2: Implement detection engineering techniques and develop custom SIEM rules.
CO3: Perform proactive threat hunting and adversary tracking using SIEM tools.
CO4: Execute incident response strategies, including threat containment and remediation.
CO5: Conduct malware analysis using static, dynamic, and behavioral techniques.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

CORE XII - Security Engineering

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 5**
Subject Code: JBICC53 **Credit: 5**

Course Objectives:

1. Understand core security engineering concepts, cryptography, IAM, and risk management.
2. Learn secure network architecture, system hardening, cloud security, and secure software development practices.

Unit I **(15 Hours)**

Introduction to Security Engineering - Core Responsibilities - Cryptography - Symmetric Encryption - Asymmetric Encryption - Diffie-Hellman Key Exchange - Hashing - PKI and SSL/TLS - Identity and Access Management - Identification - Authentication - Authorisation and Access Control - Governance & Regulation - Information Security Frameworks - GRC - NIST - Risk

Management - Frame Risk - Assess Risk - Risk Analysis - Vulnerability Management - Vulnerability Management Life Cycle

Unit II **(15 Hours)**

Network and System Security - Secure Network Architecture - Linux System Hardening - Microsoft Windows Hardening - Active Directory Hardening - Network Device Hardening - Network Security Protocols - Virtualization and Containers - Cloud Security - Cloud Security Concepts - Auditing and Monitoring - OWASP API Security - Secure Software Development Lifecycle - SAST - DAST - Weaponizing Vulnerabilities

Unit III **(15 Hours)**

Incident Response and Management - Incident Management Process - Logging and Data Aggregation - Types of Logs - Data Sources - Preservation of Evidence - Business Continuity Plan - Documentation - Crisis Management - The CMT Process - DevSecOps - Shifting Left - Software Development Lifecycle - CALMS - DevOps Metrics

Unit IV **(15 Hours)**

Security of the Pipeline - Pipeline Automation - Source Code and Version Control - Dependency Management - Automated Testing - Continuous Integration and Delivery - Source Code Security - Version Control Concepts - Cloud Based Version Control - Insufficient Credential Hygiene - CI/CD Pipeline - Dependency Management - External Dependencies - Internal Dependencies

Unit V **(15 Hours)**

Container Security - Containerisation - Docker - History of Docker - Docker Syntax - Dockerfiles - Docker Compose - Docker Socket - Kubernetes - Kubernetes Architecture - Configuration - Container Vulnerabilities - Container Hardening - Infrastructure as Code - IaC Lifecycle - On-Premises IaC - Vagrant Basics - Ansible Basics - Security Concerns - Cloud-based IaC - Terraform Configuration - Workflow – CloudFormation

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Explain the principles of security engineering, cryptographic mechanisms, and risk management.

CO2: Implement network and system security measures, including hardening techniques and cloud security.

CO3: Design and execute incident response plans, business continuity strategies, and DevSecOps workflows.

CO4: Secure software development pipelines, manage dependencies, and enforce security in CI/CD processes.

CO5: Apply container security best practices, manage infrastructure as code, and secure cloud-based environments.

Text Book:

1. Ross Anderson, Security Engineering: A Guide to Building Dependable Distributed Systems, Wiley, 3rd Edition, 2020.
2. Julia Knecht & Tanya Janca, Alice and Bob Learn Application Security, Wiley, 2020.

Reference Books:

1. Michael Howard & Steve Lipner, The Security Development Lifecycle, Microsoft Press, 2006.
2. Geoffroy Couprie, Securing DevOps: Security in the Cloud, Manning Publications, 2018.
3. Liz Rice, Container Security: Fundamental Technology Concepts That Protect Containerized Applications, O'Reilly, 2020.
4. Kief Morris, Infrastructure as Code: Dynamic Systems for the Cloud Age, O'Reilly, 2nd Edition, 2020.

Journal:

1. International Journal of Safety and Security Engineering
2. IEEE Transactions on Information Forensics and Security
3. Journal of Cybersecurity and Privacy

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XIII - Security Engineering Lab

(For Students Admitted from 2025-26)

Semester: V **Hours / Week: 5**
Subject Code: JBICC54P **Credit: 4**

Course Objectives

1. To understand fundamental security principles, cryptography, and access control mechanisms.
2. To implement network and system hardening techniques for Linux, Windows, and Active Directory.

List of Programs:

1. Implement cryptographic algorithms including AES, Diffie-Hellman, and hashing techniques.
2. Perform Linux and Windows system hardening to mitigate security threats.
3. Secure Active Directory by applying authentication and authorization best practices.
4. Configure network security protocols and implement secure network architectures.

5. Conduct static and dynamic application security testing (SAST & DAST) on a vulnerable web app.
6. Perform OWASP Top 10 vulnerability assessments and demonstrate exploit scenarios.
7. Implement CI/CD pipeline security and secure build environments in DevSecOps.
8. Analyze SIEM logs and implement incident response procedures.
9. Deploy Docker containers, identify vulnerabilities, and apply container hardening techniques.
10. Implement cloud security best practices and perform cloud infrastructure penetration testing.
11. Secure infrastructure as code (IaC) using Terraform and AWS Cloud Formation security best practices.
12. Develop a secure software lifecycle (SSDLC) plan and implement secure coding principles.

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Implement security engineering principles, cryptographic mechanisms, and IAM models.
CO2: Perform network and system hardening, including Active Directory security.
CO3: Conduct secure software development practices and perform application security testing.
CO4: Analyze logs, monitor security events, and execute incident response strategies.
CO5: Implement security measures for cloud environments, containers, and infrastructure as code.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

SEC V - Blockchain Technology Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
Subject Code: JBICS55P **Credit: 4**

Course Objectives:

1. Understanding Blockchain fundamentals and creating basic blocks.
2. Able to Develop Blockchain applications in a structured manner and to create own crypto currency and get familiarity with future currencies

List of Programs:

1. Develop a program to create merkle tree
2. Develop a program to create block
3. Develop a program to implement blockchain programming code
4. Develop a program to create ERC20 token
5. Develop a program to implement blockchain in merkle Trees
6. Develop a program to implement mining using block chain algorithm substitution
7. Develop a program to implement peer-to-peer using block chain
8. Develop a program to create a crypto-currency wallet

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basics of blockchain technology and creating basic blocks

CO2: Develop blockchain applications, including creating own cryptocurrency and implementing blockchain programming code

CO3: Implement blockchain data structures, including Merkle trees and blocks

CO4: Develop blockchain-based cryptocurrency systems including creating ERC20 tokens and cryptocurrency wallets

CO5: Implement blockchain algorithms and protocol including mining, peer-to-peer networking, and blockchain-based security measures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	3	9	9	**39**
CO2	9	3	3	3	3	9	9	**39**
CO3	9	3	3	3	3	9	9	**39**
CO4	9	3	3	3	3	9	9	**39**
CO5	9	3	3	3	3	9	9	**39**
Total	**45**	**15**	**15**	**15**	**15**	**45**	**45**	**195**

Low-1 Medium-3 High-9

CORE XIV - Network Security Expert

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 4**

Subject Code: JBICC61 **Credit: 4**

Course Objectives:

1. Learn firewall administration, policies, NAT configurations, and authentication mechanisms.
2. Understand logging, monitoring, SSL/TLS encryption, certificate operations, and web filtering.

Unit I **(12 Hours)**

Introduction and Initial Configuration - High-level features - Basic Administration - Fundamental Maintenance - Firewall Policies - Configuring Firewall Policies - Managing Firewall Policies - Introduction to NAT- Firewall Policy NAT - Central NAT - Firewall Authentication - Methods of Firewall Authentication - User groups

Unit II **(12 Hours)**

Logging and Monitoring - Log basics - Local and Remote Logging - Log Setting and Search - Protect Log Data - Certificate Operations - Authenticate and Secure Data using Certificates - Inspect Encrypted Data - Web Filtering Basics - Inspection Modes – Proxy-based Web Filtering - Video Filtering - Application Control Basics - Application Control Configuration - Logging and Monitoring Application Control Events

Unit III **(12 Hours)**

Antivirus Basics - Antivirus Scanning Modes - Antivirus Configuration - Intrusion Prevention - Denial of Service - Security Fabric - Deploying Security Fabric - Security Fabric Features - Security Fabric Rating - Topology View

Unit IV **(12 Hours)**

Routing - Routing Monitor - ECMP - RPF - Link Health Monitor - Diagnostics - VDOM Concepts - VDOM Administrators - Configuring VDOMs - Inter-VDOM Links - FSSO function - FSSO with AD - FSSO Settings - ZTNA Introduction - Comparing ZTNA to SSL and IPsec VPN

Unit V **(12 Hours)**

SSL VPN Deployment Modes - Configuring SSL VPNs - IPsec Introduction - IPsec configuration - Routing and Firewall policies - Redundant VPNs - High Availability - HA Operation modes - HA Cluster Synchronization - HA Failover and Workload - General Diagnosis - Debug Flow - CPU and Memory - Firmware and Hardware

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Configure firewall policies, NAT settings, and authentication mechanisms for secure access control.

CO2: Implement logging, monitoring, web filtering, and encrypted traffic inspection techniques.

CO3: Deploy intrusion prevention systems, antivirus configurations, and security fabric integrations.

CO4: Manage routing, VDOM configurations, and Zero Trust Network Access for secure communication.

CO5: Set up SSL and IPsec VPNs, high-availability clusters, and diagnose network security issues.

Text Book:

1. Rob Kraus, Mastering FortiGate Security: Expert Firewall Configuration and Management, Packt Publishing, 2022.
2. Matt Conran, Mastering Palo Alto Networks: Expert Solutions for Network Security, Packt Publishing, 2021.

Reference Books:

1. Sean Wilkins, CCNP Security VPN 642-648 Official Cert Guide, Cisco Press, 2011.
2. Richard Bejtlich, The Practice of Network Security Monitoring: Understanding Incident Detection and Response, No Starch Press, 2013.
3. Gilbert Held, Network Security: The Complete Reference, McGraw-Hill, 2005.
4. Nirav Shah, Hands-On Firewall Configuration and Management, Packt Publishing, 2019.

Journals:

1. Journal of Network Security
2. IEEE Transactions on Information Forensics and Security
3. Network Security Journal

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XV – Project

(For Students Admitted from 2025-26)

Semester: VI **Hours/Week: 6**
Subject Code: JBICC62PW **Credit: 6**

Course Objectives:

1. To impart the students to understand the data collection for the project
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:

After successful completion of this course, students will be able to**:**

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders

CO2: Apply the plan by executing the code

CO3: Illustrate the various aspects of software development for the total project

CO4: Evaluate the entire software project according to the specific problem

CO5: Develop the software project by executing with the various data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	3	9	57
CO2	9	3	9	3	9	9	9	51
CO3	9	3	9	9	9	9	9	57
CO4	9	3	9	9	9	9	9	57
CO5	9	9	9	9	9	9	9	45
Total	**45**	**27**	**45**	**39**	**45**	**39**	**45**	**285**

Low-1 Medium-3 High-9

CORE XVI - Red Teaming

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 4**
Subject Code: JBICC63 **Credit: 4**

Course Objectives:

1. Understand the fundamentals of red team operations, vulnerability assessments, and command and control (C2) frameworks.
2. Develop reconnaissance techniques, weaponization strategies, phishing infrastructure, and password attacks.

Unit I **(12 Hours)**

Vulnerability Assessment - Penetration Tests Limitations - Red Team Engagements - Defining Scope and Objectives - Rules of Engagement - Campaign Planning - Engagement Documentation - Resource Plan - Operations Plan - Mission Plan - Threat Intelligence - The TIBER-EU Framework - TTP Mapping - Critical Information Identification - Threat Analysis - Vulnerability Analysis - Risk Assessment - Command and Control Framework Structure - Common C2 Frameworks - C2 Operation Basics - Advanced C2 Setups

Unit II **(12 Hours)**

Red Team Recon - Taxonomy of Reconnaissance - Built-in Tools - Advanced Searching - Recon-ng - Maltego - Weaponization - Windows Scripting Host - An HTML Application - Visual Basic for Application - PowerShell - Command And Control - Delivery Techniques - Password Attacks - Password Attacking Techniques - Password Profiling - Password spray attack - Intro To Phishing Attacks - Phishing Infrastructure - Using GoPhish - Droppers - Choosing A Phishing Domain

Unit III **(12 Hours)**

Network Infrastructure - Active Directory (AD) environment - Users and Groups Management - Host Security Solution - Network Security Solutions - Applications and Services - Linux Enumeration - Windows Enumeration - DNS, SMB, and SNMP - Windows Local Persistence - Lateral Movement and Pivoting - Data Exfiltration

Unit IV **(12 Hours)**

Host Evasions - Windows Internals - Introduction to Windows API - Abusing Windows Internals - Introduction to Antivirus - AV Evasion: Shellcode - Obfuscation Principles - Signature Evasion - Bypassing UAC - Runtime Detection Evasion - Evading Logging and Monitoring - Network Security Evasion - Firewalls - Sandbox Evasion

Unit V **(12 Hours)**

Introduction to AD Breaches - OSINT and Phishing - NTLM Authenticated Services - LDAP Bind Credentials - Authentication Relays - Microsoft Deployment Toolkit - Enumerating Active Directory - Lateral Movement and Pivoting - Exploiting Active Directory - Persisting Active Directory - Credentials Harvesting

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Conduct red team engagements, define attack scope, and execute command and control operations.
CO2: Utilize reconnaissance tools, perform phishing attacks, and conduct password-based attacks.
CO3: Exploit network infrastructures, pivot through AD environments, and exfiltrate data.
CO4: Evade security controls, bypass antivirus software, and defeat monitoring solutions.
CO5: Perform advanced Active Directory attacks, credential harvesting, and persistence techniques.

Text Book:

1. Joe Vest & James Tubberville, Red Team Development and Operations, Packt Publishing, 2020.
2. IppSec, Advanced Red Team Operations, O'Reilly, 2022.

Reference Books:

1. Tim Medin, Red Team Field Manual (RTFM), CreateSpace Independent Publishing, 2014.
2. Johnny Long, No Tech Hacking: A Guide to Social Engineering, Dumpster Diving, and Shoulder Surfing, Syngress, 2008.
3. Bryce Galbraith, Offensive Countermeasures: The Art of Active Defense, Elsevier, 2011.
4. Aditya Balapure, Hands-On Red Team Tactics, Packt Publishing, 2019.

Journals:

1. Cyber Security and Applications
2. International Journal of Science and Research Archive
3. Journal of Information Systems Education

E - Resources:

1. https://tryhackme.com/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**

CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE XVII - Red Teaming Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 4**
Subject Code: JBICC64P **Credit: 3**

Course Objectives

1. To develop hands-on experience in red team operations, engagement planning, and threat intelligence.
2. To learn reconnaissance, weaponization, phishing, and password attack techniques.

List of Programs:

1. Conduct OSINT and reconnaissance using Recon-ng, Maltego, and theHarvester.
2. Create custom payloads for initial access using Windows Scripting Host and PowerShell.
3. Set up a phishing campaign using GoPhish, craft an email, and analyze results.
4. Perform password attacks using Hydra, Hashcat, and Kerberoasting.
5. Enumerate Active Directory (AD) using BloodHound and LDAP queries.
6. Execute Windows privilege escalation using WinPEAS and Seatbelt.
7. Establish persistence using scheduled tasks, registry modifications, and startup folders.
8. Conduct lateral movement using Pass-the-Hash (PtH) and Pass-the-Ticket (PtT) attacks.
9. Bypass Windows Defender and EDR using obfuscation and AMSI bypass techniques.
10. Evade logging and monitoring using Event Tracing for Windows (ETW) evasion.
11. Exploit Active Directory authentication using NTLM relay and Golden Ticket attacks.
12. Perform data exfiltration using DNS tunneling, HTTP covert channels, and PowerShell payloads.

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Conduct reconnaissance, phishing, and password attacks for initial access.
CO2: Exploit network vulnerabilities and execute lateral movement strategies.
CO3: Perform post-compromise actions such as privilege escalation and persistence.
CO4: Evade detection, bypass security controls, and deploy stealthy payloads.
CO5: Compromise and persist in Active Directory environments.

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**

CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

CORE XVIII – Machine Learning

(For Students Admitted from 2025-26)

Semester: VI **Hours/week: 5**
Subject Code: JBICC65 **Credit:5**

Course Objectives:

1. To recognize the characteristics of machine learning that makes it useful to real-world problems
2. To understand the concept behind neural networks for learning non-linear functions

Unit I **(15 hours)**

Introduction: Well-Posed Learning Problems-Designing a Learning System-Perspectives and Issues in Machine Learning. Concept Learning: Introduction - A Concept Learning Task-Concept Learning as Search - Decision Tree Learning: Introduction-Decision Tree Representation-Appropriate Problems-Basic Decision Tree Learning Algorithm-Hypothesis Space Search-Inductive Bias-Issues.

Unit II **(15 hours)**

Artificial Neural Networks: Introduction-Neural Network Representations - Appropriate Problems - Perceptrons - Multilayer Networks and the Back Propagation Algorithm-An Illustrative Example: Face Recognition-Advanced Topics.

Unit III **(15 hours)**

Bayesian Learning: Introduction-Bayes Theorem-- Bayes Theorem and Concept Learning – Maximum Likelihood and Least-squared Error Hypotheses- Maximum Likelihood Hypothesis for Predicting Probabilities-Minimum Description Length Principle-Bayes Optimal Classifier-Gibbs Algorithm-Naïve Bayes Classifier-An Example: Learning to Classify Text-Bayesian Belief Networks-The EM Algorithm.

Unit IV **(15 hours)**

Instance-Based Learning: Introduction-K-Nearest Neighbour Learning-Locally Weighted Regression-Radial Basis Functions-Case-based Reasoning - Genetic Algorithms: Genetic Algorithms-An Illustrative Example-Hypothesis Space Search-Genetic programming-Models of Evolution and Learning-Parallelizing Genetic Algorithms.

Unit V **(15 hours)**

Learning Sets of Rules: Introduction-Sequential Covering Algorithms-Learning Rule Sets: Summary-Learning First-Order Rules-Learning Sets of First-Order Rules: FOIL - Induction as Inverted Deduction-Inverting Resolution - Reinforcement Learning: Introduction- Learning Task-Q Learning-

Nondeterministic Rewards and Actions-Temporal Difference Learning-Generalizing from Examples-Relationship to Dynamic Programming.

Course Outcomes:

After successful completion of this course, students will be able to:

CO1: Recognize the importance of machine learning in problem-solving.
CO2: Demonstrate various machine learning algorithms with examples.
CO3: Classify supervised, semi-supervised, and unsupervised learning algorithms.
CO4: Apply classification techniques to real-world scenarios.
CO5: Develop suitable machine learning algorithms for specific problems.

Text Book:

1. Tom M. Mitchell, *Machine Learning*, Tata McGraw Hill, 2017.

Reference Books:

1. Jeremy Watt, Reza Borhani, Aggelos K Katsaggelos, *Machine Learning Refined Foundations, Algorithms & Applications*, Cambridge University Press, , 2016.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press Cambridge, 2010.
3. Andreas C. Muller and Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, First Edition, 2016.

Journals:

1. Journal of Artificial Intelligence Research
2. Machine Learning with Applications
3. Nature Machine Intelligence

E -Resources:

1. https://nptel.ac.in/courses/106/106/106106139/
2. https://onlinecourses.nptel.ac.in/noc22_cs58/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	6	9	3	3	9	3	9	**42**
CO2	9	9	3	9	9	3	9	**51**
CO3	3	9	3	9	9	3	9	**45**
CO4	9	9	3	3	9	3	9	**45**
CO5	9	9	3	9	9	3	9	**51**
Total	**36**	**45**	**15**	**33**	**45**	**1**	**45**	**234**

Low-1 Medium-3 High-9

SEC VI - Machine Learning Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours/week: 2**

Subject Code: JBICS66P **Credit:2**

Course Objectives:

1. To introduce the fundamental concepts and techniques of Machine Learning, emphasizing its necessity and applications
2. To apply Machine Learning to learn, predict and classify the real-world problems in the Supervised Learning paradigms

List of Programs:

1. Develop a python program to Implement k-nearest neighbors classification using python
2. Develop a python program to implement linear regression using python.
3. Extract the data from database using python
4. Implementation of Python Libraries for ML application such as Pandas and Matplotlib.
   a) Create a Series using pandas and display
   b) Access the index and the values of our Series
   c) Compare an array using Numpy with a series using pandas
5. Develop a Python program to implement Simple Linear Regression and plot the graph
6. Develop a Python program to implement Simple Linear Regression for iris using sklearn and plot the confusion matrix
7. Develop a python program Implement Support Vector Machine for a dataset and compare the accuracy by applying the following kernel functions:
   i. Linear
   ii. Polynomial
   iii. RBF
8. Develop a python program Implement Naïve Bayes theorem to classify the English text
9. Develop a python program to implement K-Means clustering Algorithm
10. Implement an algorithm to demonstrate the significance of genetic algorithm

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basic concepts and techniques of Machine Learning
CO2: Apply Machine Learning to learn, predict and classify the real-world problems
CO3: Illustrate the concept of Reinforcement Learning and Ensemble Methods
CO4: Evaluate modern notions in data analysis-oriented computing;
CO5: Outline predictions using machin e learning algorithm.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**

Total	45	9	45	15	5	45	45	209

Low-1 Medium-3 High-9

Multi-Disciplinary Course

(For Students Admitted from 2025-26)

(For BSc Information Technology with Cyber Security)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
V		JBMD51ICA/ JBMD51ICB	MD III	a)Organizational Behavior b)Blockchain Technology	4	3	SD| EMP	GLO	25	75	100
		JBMD52ICA/ JBMD52ICB	MD IV	a)Accounting Principles & Package b)Internet of Things	4	3	SD| EMP	GLO	25	75	100
VI		JBMD61ICA/ JBMD61ICB	MD V	a)Digital Marketing b)Intellectual Property Rights	4	3	SD| EMP	GLO	25	75	100

MD III – c) Organization Behaviour

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 4**
Subject Code: JBMD51ICA **Credit: 3**

Course Objectives:

1. To identify the various leadership styles and the role of leaders in a decision making process and processes used in developing communication and resolving conflicts
2. To discuss the development of the field of organizational behaviour and explain the micro and macro approaches and development of the field of organizational behaviour and explain the micro and macro approaches

Unit I **(15 hours)**

Explaining organizational behavior: Introduction - Explaining organizational behavior - Research and practice: evidence-based management - Human resource management: OB in action. **Environment:** Analysing the organization's environment - PESTLE and scenario planning - Ethical behaviour - Business ethics and corporate social responsibility. **Technology:** Determinism or choice - Automating knowledge work - New ways of working - Four challenges – Cybercrime.

Unit II **(15 hours)**

Culture: Rise of organizational culture - Culture: surface manifestations, values and basic assumptions - Organizational socialization - Perspectives on culture contrasted - Culture strength and organizational performance - Types of organizational culture - National cultures. **Individuals in the organization**: **Learning**: The learning process - The behaviourist approach to learning - The cognitive approach to learning - Behaviour modification versus socialization. **Personality**: Defining personality - Types and traits - Personality Types A and B - Stress management: individual and organizational - Selection method.

Unit III **(15 hours)**

Communication: Interpersonal communication - Verbal communication - Non-verbal communication - Cultural differences in communication style - Impression management -Emotional intelligence - Organizational communication. **Perception:** Selectivity and organization - Perceptual sets and perceptual worlds - Perceptual sets and assumptions - Sex, appearance, attractiveness and discrimination - Perceptual errors. **Motivation:** Drives, motives and motivation - Content theories - Process theories - The social process of motivating others - Engagement and high performance.

Unit IV **(15 hours)**

Groups and teams in the organization: Group formation: Groups in organizations - Definitions of groups - Types of group tasks - Group-oriented view of organizations - Formal and informal groups - Group formation - Group development - Groups and teams. **Group structure:** Group structure and process - Power structure - Status structure - Liking structure - Communication structure - Role structure - Leadership structure - Virtual teams - Networked individualism. **Individuals in groups**: The individual and the group - Group influences on individuals' perceptions - Group influences on individuals' performance - Group influences on individuals' behaviour.

Unit V **(15 hours)**

Team working: The T-word and teamwork design - Types of teams - Advice teams - Action teams - Project teams - Production teams - Teamwork activities. **Elements of structure:** Organization structuring - Types of jobs - Line, staff and functional relationships - -Roles in organizations - Formalization - Centralization versus decentralization. **Leadership:** Leadership versus management - Trait-spotting - - Style-counselling - Context-fitting - Distributed leadership. **Decision making:** Models of decision making - Decision conditions: risk and programmability - Group decision making - Problems with group decision making. **Power and politics:** Power in organizations - Power and influence - Organization politics and political skills.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the development of the field of organizational behaviour and explain the micro and macro approaches

CO2: Demonstrate the applicability of analysing the complexities associated with management of individual behavior in the organization and how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization

CO3: Analyse and compare different models used to explain individual behaviour related to motivation and rewards and the complexities associated with management of the group behavior in the organization

CO4: Evaluate the applicability of the concept of organizational behavior to understand the behavior of people in the organization
CO5: Formulate the various leadership styles and the role of leaders in a decision making process

Text Book:
1. David A. Buchanan, Andrzej A. Huczynski, *Organizational Behaviour*, Pearson Education, Ninth Edition, 2017.

Reference Books:
1. Prof. Dr. A. Mustafa**,** *Organizational Behavior*, Aitbs Publishers, First Edition, 2011.
2. L M Prasad, *Organizational Behavior*, Sultan Chand & Sons, Fifth Edition, 2011.
3. K Aswathappa, *Organizational Behavior***,** Himalaya Publishing House, Tenth Edition, 2012.
4. Mirza S Saiyadain, *Organizational Behavior***,** Tata McGraw Hill, Ninth Edition, 2010.

Journals:
1. Journal of Organizational Behavior
2. Organizational Behavior and Human Decision Processes

E - Resources:
1. https://nptel.ac.in/courses/110/106/110106145/
2. https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	3	1	9	**49**
CO2	9	9	9	9	3	1	9	**49**
CO3	9	9	9	9	3	1	9	**49**
CO4	9	9	9	9	3	1	9	**49**
CO5	9	9	9	9	3	1	9	**49**
Total	**45**	**45**	**45**	**45**	**15**	**5**	**45**	**245**

Low-1 Medium-3 High-9

MD III - b) Blockchain Technology

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
Subject Code: JBMD511CB **Credit:3**

Course Objectives:
1. To understand how blockchain System (Bitcoin and Ethereum) works.
2. To integrate ideas from blockchain technology into their own projects.

Unit I **(18 Hours)**
Introduction of Blockchain: Block 101-Distributed Systems-Consensus-The history of

blockchain- Introduction of blockchain-Features of blockchain-Applications of blockchain technology-Tiers of blockchain technology-Consensus in blockchain-CAP theorem and block chain-Benefits and limitations of blockchain.

Unit II **(18 Hours)**

Cryptography and Technical Foundations: Introduction-Mathematics – Cryptography - Confidentiality- Integrity-Authentication-Non repudiation-Accountability-Block Ciphers- DES-AES-Public and Private keys- RSA-hash Functions-Secure hash algorithms-Merkle trees-Patricia trees-DHT-ECDSA-Financial markets and trading-Trading-Exchanging.

Unit III **(18 Hours)**

Bitcoin: Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain- The genesis of Block-The bitcoin network-wallets-Alternative coins: Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin-Lite coin.

Unit IV **(18 Hours)**

Ethereum101: Introduction-Ethereum block chain-The consensus mechanism-The world state-the account state-Transactions-Contract creation transaction-Message call transaction- Elements of ethereum block chain-EVM-Execution Environment-Opcodes and their Meaning-Accounts-Block-Block header.

Unit V **(18 Hours)**

Blockchain–Outside of Currencies: Internet of things-IoT Block chain experiment- Government-Health-Finance-EmergingTrends:ABC's-Enterprise-gradeblockchains-Private Blockchains-startups-standardization- Enhancements-Real world Implementations- Consortia-Education in block chain technologies-Employment-Crypto Economics.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Explain the fundamental concept of blockchain including distributed systems, consensus, and cryptography

CO2: Analyze blockchain systems and networks, including Bitcoin, Ethereum, and alternative coins

CO3: Apply blockchain concepts to real-world scenarios, including finance, healthcare, and Internet of Things (IoT)

CO4: Evaluate blockchain technologies and trends, including enterprise-grade blockchains, private blockchains, and emerging trends

CO5: Design and implement blockchain-based solutions, including smart contracts and decentralized applications

Text Book:

1. Imran Bashir, *Mastering Blockchain: Deeper insights into decentralization, Cryptography, Bitcoinand Popular block chain frameworks***,** Packt Publishing, 2017.

Reference Books:

1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin*, O‟Reilly, 2014.

2. Roger Wattenhofer**,** *The Science of the Block chain***,** Create Space Independent Publishing, 2016.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies:A Comprehensive Introduction*, Princeton University Press, 2016.

Journals:

1. Journal of Blockchain and Intelligent Computing
2. Scientific Journal of Metaverse and Blockchain Technologies
3. International Journal of Blockchain Technologies and Applications

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/
3. https://www.mygreatlearning.com/academy/learn-for-free/courses/blockchain-basics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	1	3	3	**15**
CO2	3	1	3	1	1	3	3	**15**
CO3	3	1	3	1	1	3	3	**15**
CO4	3	1	3	1	1	3	3	**15**
CO5	3	1	3	1	1	3	3	**15**
Total	**15**	**5**	**15**	**5**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

MD IV- b) Internet of Things

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
SubjectCode: JBMD52ICB **Credit: 3**

Course Objectives:

1. To understand the application areas of IoT, building blocks of Internet of Things And characteristics
2. To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

Unit I **(12 Hours)**

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT Reference Architecture - IoT Functional Architecture - IoT levels and deployment templates – **Application domains of IoT**: Home automation – Cities – Energy – Industry – Agriculture.

Unit II **(12 Hours)**

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT-IoT System Management with NETCONF-YANG-Need for IoT Systems Management- SNMP-Network Operator Requirements-NETCONF- YANG- IoT Systems Management with NETCONF-YANG.

Unit III **(12 Hours)**

IOT Platforms Design Methodology: Step 1 to Step 10 - Case Study on IoT System for Weather Monitoring - Motivation for Using Python - IoT Systems Logical Design using Python - Introduction - Installing Python - Python Data Types and Data Structures - Control Flow –Functions – Modules - Packages-File Handling - Date/Time Operations – Classes - Python Packages of Internet for IoT.

Unit IV **(12 Hours)**

IoT Physical Devices and Endpoints: IoT Device - Exemplary Device: Raspberry Pi- About the board - Linux and Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoT Devices.

Unit V **(12 Hours)**

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API – WAMP - AutoBahn for IoT - Xively Cloud for IoT - Python Web Application Framework – Django - Designing a Restful Web API - Amazon Web Services for IoT - Home Automation – Cities - Environment.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the basics of IoT, enabling technologies, and characteristics

CO2: Explain the concepts of IoT and M2M, including differences and similarities

CO3: Apply design methodology to create IoT platforms and systems

CO4: Analyze and implement Wi-Fi data communications, remote data storage in cloud, and handle data using web applications

CO5: Evaluate potential problems and solutions using IoT, considering factors like scalability, security, and efficiency

Text Book:

1. ArshdeepBahga,VijayMadisetti,Internet of Things:AHands-*OnApproach*, Universities Press, 2015

Reference Books:

1. Charles Platt, *Make Electronics –LearningbyDiscovery*,O'ReillyMedia,2015.
2. Michael Miller, *The Internet of Things*,PearsonEducation,2015.

Journal:

1. Intl. Journal of Internet of Things and Information Technology

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://www.classcentral.com/course/swayam-introduction-to-internet-of-things-10093

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

MD V- a) Digital Marketing

(For Students Admitted from 2025-26)

Semester: VI **Hour/Week: 4**
Subject Code: JBMD61ICA **Credit: 3**

Course Objectives:

1. To understand the fundamental concepts and strategies of digital marketing, including internet marketing, search engine advertising, social media marketing, and search engine optimization (SEO).
2. To develop skills in creating and implementing effective digital marketing campaigns using various channels, including social media, email, mobile, and search engines.

Unit I **(12 Hours)**

Introduction to Digital Marketing: Introduction - Evolution of Digital Marketing from traditional to modern era- Role of Internet; Current trends - Drivers of the new marketing environment - Digital marketing strategy; P.O.E.M. framework - Digital marketing plan- Digital marketing models.

Unit II **(12 Hours)**

Internet Marketing and Digital Marketing Mix: Internet Marketing - opportunities and challenges - Digital marketing framework - Impact of digital channels on IMC. **Search Engine Advertising:** Pay for Search Advertisements - Ad Placement - Display marketing: Types of Display Ads - Programmable Digital Marketing - YouTube marketing.

Unit III **(12 Hours)**

Social Media Marketing: Understanding Social Media Marketing – Social Networking- Role of Influencer Marketing-Modes of Social Media Marketing- Tools & Plan - Facebook Marketing: - Business through Facebook Marketing, Facebook Marketing Tools - LinkedIn Marketing: - Introduction and Importance of LinkedIn Marketing, -Twitter Marketing: Introduction to Twitter Marketing, Mobile Advertising

Unit IV **(12 Hours)**

Introduction to SEO: SEM - Web Analytics - Mobile Marketing - Trends in Digital Advertising - Introduction and need for SEO- How to use internet & search engines; search engine and its working pattern: SEO Tactics - Introduction to SEM Web Analytics: Google Analytics & Google AdWords

Unit V **(12 Hours)**

Social Media Channels: Introduction - Key terms and concepts - Traditional media vs Social media - Social networking - Content creation - Tracking social media campaigns **Social Media Strategy:** Introduction - Key terms and concepts - Using social media to solve business challenges - Dealing with opportunities and threats

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the practical factor to improve results in digital marketing.
CO2: Implement a structured digital marketing plan and budget.
CO3: Examine the operations of digital marketing, and track the progress of digital marketing.
CO4: Evaluate the functions of social media marketing, Internet marketing, and social media channels.
CO5: Design and Initialize implement process to conduct digital marketing campaigns.

Text Book:

1. Seema Gupta "Digital Marketing" Mc-Graw Hill 1st Edition – 2017

Reference Books:

1. Damian Ryan, Calvin Jones "Understanding Digital Marketing-Marketing Strategies For Engaging the Digital Generation" Kogan Page - Fourth Edition
2. 2.Teresa Pineiro-Otero and Xabier Martinez-Rolan "Understanding Digital Marketing- Basics and Actions" Springer International Publishing – 2009

Journal:

1. International Journal of Computing and Digital System (Scopus)

E-Resources:

1. https://www.simplilearn.com/tutorials/digital-marketing-tutorial

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	3	3	3	3	**19**
CO2	3	1	3	3	3	3	3	**19**
CO3	3	1	3	3	3	3	3	**19**
CO4	3	1	3	3	3	3	3	**19**
CO5	3	1	3	3	3	3	3	**19**
Total	**15**	**5**	**15**	**15**	**15**	**15**	**15**	**95**

Low-1 Medium-3 High-9

MD V- b) Intellectual Property Rights
(For Students Admitted from 2025-26)

Semester: VI **Hours/ Week: 4**
Subject Code: JBMD61ICB **Credit:3**

Course Objectives

1. To recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights
2. To identify the significance of practice and procedure of patents and to make the students to understand the statutory provisions of different forms of IPRs in simple forms

Unit I **(12 Hours)**

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR)- Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varietiesand Layout Design-Genetic Resources and Traditional Knowledge-
Trade Secret - **IPR in India** : Genesis and development – IPR in abroad-Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994.

Unit II **(12 Hours)**

Patents : Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application – Non Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board.

Unit III **(12 Hours)**

Copyrights: Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership ofcopyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights.

Unit IV **(12 Hours)**

Trademarks: Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, wellknown marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties -Trademarks registry and appellate board. **Current Contour :** India`s New National IP Policy, 2016 – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – Career Opportunities in IP - IPR in current scenariowith case studies.

Unit V **(12 Hours)**

Other forms of IP: Design- meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection. **Plant variety protection**: meaning and benefit sharing and farmers' rights – Procedure for registration, effect of registration and term of protection. **Layout Design protection**: meaning – Procedure for registration, effect of registration and term of protection.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basics of intellectual property rights
CO2: Analyze patent law and procedure
CO3: Explain copyright law and related rights
CO4: Identify trademark law and procedure
CO5: Recognize other forms of Intellectual Property Protection

Text Book:

1. Nithyananda K V, *Intellectual Property Rights: Protection and Management*, Cengage Learning Private Limited,2019.

Reference Books:

1. Neeraj.P, Khusdeep.D, *Intellectual Property Rights*, PHI Learning Private Limited, 2014.
2. Virendra Kumar Ahuja, *Law relating to Intellectual Property Rights*, Lexis Nexis Butterworths, 2017.

Journal:

3. Journal of Intellectual Property Rights (JIPR)
4. Journal on Development of Intellectual Property and Research (JDIPR)

E-Resources:

1. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm
2. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
3. https://nptel.ac.in/courses/110/105/110105139/

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	1	3	3	**13**
CO2	3	1	1	1	1	3	3	**13**
CO3	3	1	1	1	1	3	3	**13**
CO4	3	1	1	1	1	3	3	**13**
CO5	3	1	1	1	1	3	3	**13**
Total	**15**	**5**	**5**	**5**	**5**	**15**	**15**	**65**

Low -1 Medium – 3 High - 9

Extra Credit Courses

(For Students Admitted from 2025-26)

(For BSc IT, BSc CS, BCA, BSc IT with Cyber Security)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
II	V	JBITX2P/ JBCSX2P/ JBCPX2P/ JBICX2P	Extra Credit I	UI and UX Design Lab	-	2	ENT| EMP	GLO	-	100	100
III		JBITX3P/ JBCSX3P/ JBCPX3P/ JBICX3P	Extra Credit II	NoSQL Lab	-	2	EMP	GLO	-	100	100
IV		JBITX4P/ JBCSX4P/ JBCPX4P/ JBICX4P	Extra Credit III	R Tool Lab	-	2	ENT| EMP	GLO	-	100	100
VI		JBITX6P/ JBCSX6P/ JBCPX6P/ JBICC6P	Extra Credit V	Data Mining Lab	-	2	ENT| EMP	GLO	-	100	100

Extra Credit I - UI and UX Design Lab

(For Students Admitted from 2025-26)

Semester: II

Subject Code: JBITX2P/ JBCSX2P/ JBCPX2P/ JBICX2P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of FIGMA
2. To gain knowledge about various tools of FIGMA

List of Programs:

FIGMA

1. Create an Animated Text
2. Create an Animated Image
3. Create a bouncing ball using interactive component
4. Design ON/OFF toggle
5. Create a responsive grid system for web
6. Create a poster
7. Create an animation notification
8. Create an animated card grid
9. Design a glass morphism

10. Design an Appreciation certificate.
11. Design a Sign Up page
12. Create a News page design

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the concepts of tools and techniques in Figma.
CO2: Apply the concept of creation and modification of objects.
CO3: Simplify the process of designing, editing and animating.
CO4: Create a website screen and any form of certificate.
CO5: Construct and design an application.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

Extra Credit II - NoSQL Lab

(For Students Admitted from 2025-26)

Semester: III
Subject Code: JBITX3P/ JBCSX3P/ JBCPX3P/ JBICX3P **Credit: 2**

Course Objectives:

1. The students get practical knowledge on developing No SQL database using MongoDB and ability to read or query the collection
2. To understand various advanced methods such as update one MongoDB document in the collection and update many MongoDB documents in the collection

List of Programs:

1. MongoDB installation and configuration in windows
2. Demonstrate how to create and drop a database in MongoDB
3. Developing the collection in MongoDB on the fly
4. Developing collection with options before inserting the documents and drop the collection created
5. MongoDB insert document
    a. Insert single document

   b. Insert multiple documents in collection
6. Querying all the documents in JSON format and Querying based on the criteria
7. MongoDB update document
   a. Using update ( ) method
   b. Using save ( ) method
8. MongoDB delete document from a collection
   a. Using remove ( ) method
   b. Remove only one document matching your criteria
   c. Remove all documents
9. Develop a MongoDB projection
10. Apply limit ( ), skip ( ), sort ( ) methods in MongoDB
11. MongoDB indexing
   a. Develop index in MongoDB
   b. Finding the indexes in collection
   c. Drop indexes in a collection
   d. Drop all the indexes
12. MongoDB with java and PHP
   a. Develop a simple application that uses MongoDB with JAVA
   b. Develop a simple application that uses MongoDB with PHP
13. Build a social media app using document API and a No SQL Database

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Installing and configuring MongoDB in windows
CO2: Perform all database operations using MongoDB
CO3: Implement and harness the power of indexes
CO4: Use MongoDB compass to analyze a database
CO5: Develop applications by integrating MongoDB with JAVA/PHP

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	9	9	9	**43**
CO2	9	1	3	3	9	9	9	**43**
CO3	9	1	3	3	9	9	9	**43**
CO4	9	1	3	3	9	9	9	**43**
CO5	9	1	3	3	9	9	9	**43**
Total	**45**	**5**	**15**	**15**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

Extra Credit III - R Tool Lab

(For Students Admitted from 2025-26)

Semester: IV

Subject Code: JBITX4P/ JBCSX4P/ JBCPX4P/ JBICX4P **Credit: 2**

Course Objectives:

1. To understand the concept of R Tool
2. To implement the statistics analysis

List of Programs:

1. Develop a program to implement correlation analysis
2. Develop a program to implement regression analysis
3. Develop a program to implement t-test
4. Develop a program to implement z-test
5. Develop a program to implement f-test
6. Develop a program to implement chi-square test
7. Develop a program to implement kruskal-wallis test
8. Develop a program to implement likert scaling techniques
9. Develop a program to implement analysis of variance (ANOVA)

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes

After successful completion of this course, students will be able to

CO1: Demonstrate the basics in R programming in terms of constructs, control statements and functions

CO2: Apply data analytics software

CO3: Enhance problem solving, programming and debugging skills

CO4: Plan the R programming from a statistical perspective

CO5: Analyze and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**15**	**45**	**15**	**45**	**45**	**45**	**255**

Low-1 Medium-3 High-9

Extra Credit V - Data Mining Lab

(For Students Admitted from 2025-26)

Semester: VI

Subject Code: JBITX6P/ JBCSX6P/ JBCPX6P/ JBICC6P **Credit: 2**

Course Objectives:

1. To understand the concept of Data Mining Tool

2. To implement the various data mining algorithms

List of Programs:

1. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set
2. Demonstration of Association rule process on data-set contact lenses.arff /supermarket using apriori algorithm
3. Demonstration of classification rule process on WEKA data-set using j48 algorithm
4. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm
5. Demonstration of clustering rule process on data-set iris.arff using simple k-means

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Describe Data mining concept
CO 2: Apply the knowledge of data mining techniques
CO 3: Adapt to new data mining tools
CO 4: Explore recent trends in data mining such as web mining, spatial-temporal mining
CO 5: Build different types of algorithm

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**15**	**45**	**15**	**45**	**45**	**45**	**255**

Low-1 Medium-3 High-9

B Sc Artificial Intelligence and Data Science

Three Years Regular Programme
(For Students Admitted from 2025-26)

Programme Specific Outcomes:

On completion of this programme, student will be able to

PSO 1: Disciplinary Knowledge: Apply computing theory, languages and algorithms, as well as mathematical and statistical models and the principles of optimization to appropriates, formula and use data analyze. Formulate and use appropriate models of data analysis to solve hidden solution to business related challenges

PSO 2: Effective Communication: Organize, visualize and analyze large, complex datasets using descriptive statistics and graphs to make decisions

PSO 3: Research Skill and Critical Thinking: Apply the theories and methodologies of data science to new research in their primary area of study.

PSO 4: Ethical Awareness: Develop and implement data analysis Strategies base on theoretical principles, ethical considerations and detailed knowledge of the underlying data

PSO 5: Digital Literacy: Demonstrate an ability to articulate, assess and apply appropriate theories and principles of information management. Student can construct complex statistical models, assess the fit of such models to the data and apply the models in real-world contexts

PSO 6: Problem Solving Skill: Identify, assess and select appropriate among data analytics methods and models for solving a particular real-world problem, weighing their advantages and disadvantages.

PSO 7: Self-Learning: Recognize the need for lifelong learning and have the ability to engage independent learning keeping in mind the rapid technological changes

PREAMBLE

The Board of Studies in Computer Science has undertaken a comprehensive review of the Curriculum, resulting in the following changes:

Core papers

- Exiting C Programming paper has been included the computer fundamentals and computer memory. So the paper renamed as Computer Fundamentals and C Programming.
- Fundamental of Data Science and Analytics, Artificial Intelligence and Artificial Intelligence lab has been introduced
- Data Exploration and Visualization, Computer Networks has been introduced.

Multidisciplinary Course

- PC Package Lab course has been revised
- Machine Learning, Blockchain Technology has been revised
- Data and Information Security, Embedded Systems and IoT has been introduced
- Web Designing Lab syllabus has been reduced

Skill Enhancement Course

- Database Management system Lab, Web Designing Lab has been introduced
- Office Automation lab syllabus has been reduced
- Data Science and Analytics lab, Deep Learning Lab, R Programming Lab has been introduced.

Ability Enhancement Compulsory Courses

- Python Programming lab has been introduced

Common Value-Added Courses

- The Digital and Technology Solution course has been introduced

PROGRAMME STRUCTURE – PROGRAM CODE: UAD

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
I	I	JBLT11/JBLA11/JBLHB11/JBLHA11	Language I	Tamil I/ Arabic I/ Hindi I	5	3			25	75	100

	II	JBLEB12/ JBLEA12	Language II	English I a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBADC11	CORE I	Computer Fundamentals and C Programming	6	6	SD| EMP	GLO	25	75	100
		JBADC12P	CORE II	o Programming in C Lab	6	5	EMP	GLO	25	75	100
		JBADA13	AECC I	Fundamentals of Mathematics	4	3	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBADS14P	SEC I	Office Automation Lab	2	1	SD |ENT	GLO	-	50	50
				Library/Browsing	1	-			-	-	-
				Remedial/Games	1	-			-	-	-
				TOTAL	**30**	**21**			**125**	**425**	**550**
II	I	JBLT21/JBLA21/JBLHB21/JBLHA21	Language I	Tamil II/ Arabic II/ Hindi II	5	3			25	75	100
	II	JBLEB22/JBLEA22	Language II	English II a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBADC21	CORE III	Fundamentals of Data Science and Analytics	5	5	SD| EMP	GLO	25	75	100
		JBADC22	CORE IV	Structured Query Language	5	5	SD| EMP	GLO	25	75	100
		JBADA23	AECC II	Mathematical Statistics-I	4	4	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBADS24P	SEC II	Database Management System Lab	2	1	SD| EMP	GLO	-	50	50
		JBUI2V	CVAC I	Understanding India	2	2			-	50	50
				Library/Browsing	1	-			-	-	-
				Remedial Games	1	-			-	-	-
	V	JBADX2/JBADX2O	Extra Credit I	Arithmetic for Competitive Examinations/* Online Course	-	2	SD| EMP| ENT	REG| NAT| GLO	-	100	100
				TOTAL	**30**	**23+2**			**125**	**525+100**	**600+100**
III	I	JBLT31/JBLA31/JBLHB31/JBLHA31	Language I	Tamil III/ Arabic III/ Hindi III	5	3			25	75	100
	II	JBLEB32/JBLEA32	Language II	English III a (or) b	5	3	SD| ENT|	REG| NAT|	25	75	100

							EMP	GLO			
	III	JBADC31	CORE V	# Data Structures and Algorithms	4	4	SD| EMP	GLO	25	75	100
		JBADC32P	CORE VI	Data Structures and Algorithms Lab	4	3	SD| EMP	GLO	25	75	100
		JBADA33	AECC III	Mathematical Statistics-II	4	4	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBADS34P	SEC III	Web Designing Lab	2	1	ENT| EMP	GLO	-	50	50
		JBMD31ADP	MD I	PC Package Lab	2	1	SD	GLO	-	50	50
		JBES3V	CVAC II	Environmental Science for Sustainable Development	2	2			-	50	50
		JBXTN3	Extension	NSS/CSS	2	2			100	-	100
	V	JBADX3/ JBADX3O	Extra Credit II	Logical Reasoning/*Online Course	-	2	SD| EMP| ENT	REG| NAT| GLO	-	100	100
				TOTAL	**30**	**23+2**			**225**	**525+ 100**	**750+10 0**
IV	I	JBLT41/JBL A41/JBLHB4 1/JBLHA41	LanguageI	Tamil IV /Arabic IV /Hindi IV	5	3			25	75	100
	II	JBLEB42/ JBLEA42	Language II	English IV a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBADC41	CORE VII	Operations Research	5	5	SD| EMP| ENT	REG| NAT| GLO	25	75	100
		JBADC42	CORE VIII	# Python Programming	4	4	ENT |EMP	GLO	25	75	100
		JBADA43P	AECC IV	Python Programming Lab	4	3	ENT| EMP	GLO	25	75	100
	IV	JBMD41ADP	MD II	Web Designing Lab	3	2	ENT| EMP	GLO	-	50	50
		JBADS44P	SEC IV	Data Science & Analytics Lab	2	1	SD| EMP	GLO	-	50	50
		JBDT4V	CVAC III	Digital and Technology Solution	2	2	SD	GLO	-	50	50
	V	JBADX4P/ JBADX4O	Extra Credit III	NoSQL Lab/* Online Course	-	2	ENT| EMP	GLO	-	100	100
				TOTAL	**30**	**23+2**			**125**	**525+ 100**	**650+ 100**
V	III	JBADC51	CORE IX	Artificial Intelligence	6	5	SD| EMP	GLO	25	75	100

		JBADC52P	CORE X	Artificial Intelligence Lab	6	5	ENT|EMP	GLO	25	75	100
		JBADC53	CORE XI	Data Exploration and Visualization	6	6	SD	GLO	25	75	100
	IV	JBMD51ADA / JBMD51ADB	MD III	a. Machine Learning b. Blockchain Technology	4	3	SD| EMP	GLO	25	75	100
	IV	JBMD52ADA / JBMD52ADB	MD IV	a. Discrete Mathematics b. Data and Information Security	4	3	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBADS54P	SEC V	R Programming Lab	2	1	SD |EMP	REG |NAT| GLO	-	50	50
	IV	JBHW5V	CVAC IV	Health and Wellness	2	2			-	50	50
	V	JBESX5	Extra Credit IV	Employability Skills	-	2			100	-	100
				TOTAL	**30**	**25+2**			**125 + 100**	**475**	**600+100**
VI	III	JBADC61	CORE XII	Deep Learning	6	6	SD| EMP	GLO	25	75	100
	III	JBADC62	CORE XIII	Natural Language Processing	6	5	ENT| EMP	GLO	25	75	100
	III	JBADC63	CORE XIV	Computer Networks	5	4	ENT| EMP	GLO	25	75	100
	III	JBADC64PW	CORE XV	Project	6	6	EMP| ENT	GLO	25	75	100
	IV	JBMD61ADA / JBMD61ADB	MD V	a. Calculus and Differential Equations b. Embedded Systems and IoT	4	3	SD| EMP| ENT	REG| NAT| GLO	25	75	100
	IV	JBADS65P	SEC VI	Deep Learning Lab	2	1	SD| EMP	GLO	-	50	50
	V	JBADX6P/ JBADX6O	Extra Credit V	Bioinformatics Lab/* Online Course	-	2	ENT| EMP	GLO	-	100	100
				Library/Browsing	1	-			-	-	-
				TOTAL	**30**	**25+2**			**125**	**425+100**	**550+100**
				Grand Total	**180**	**140+10**			**850 + 100**	**2850 +400**	**3700+500**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX,

Spoken Tutorial, NPTEL or Coursera etc.
#For internship course, refer www.internshala.com or any online internship course.
For online course integration, syllabus will be taken from spoken tutorial
@SD- Skill Development ENT-Entrepreneurship EMP-Employability
$ REG-Regional NAT-National GLO-Global

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course
MD - Multi Disciplinary
CVAC - Common Value Added Course

CORE I - Computer Fundamentals and C Programming

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 6**
Sub Code: JBADC11 **Credit: 6**

Course Objectives:

1. To understand the basics of computers
2. To acquire a comprehensive understanding of C programming concepts includes data types, operators, control structures, functions, arrays, and strings

Unit I **(18 hours)**

Computer Basics: Algorithms-Simple model of Computer - Characteristics of a Computer Problem solving of a computer. **Data Representation:** Representation of Characters, Integers, Fractions and Hexadecimal numbers.Number systems: decimal, octal, binary and hexadecimal; **Input/output Units**: Traditional Computer Input/output Units- other Input Technologies- Computer Output Devices. **Computer Generation**: First Generation Second Generation-Third Generation-Fourth Generation-Fifth Generation-Classification of **Computer Memory:** Memory Cell-Memory Organization ROM-Serial Access Memory- Physical Devices Used to Construct Memories-Magnetic Hard Disk CDROM-Magnetic Tape Drive- Memory Hierarchy. Computers.

Unit II **(18 hours)**

Basic structure of C programs - Constants, Variables and data types – Operators and expressions – Input and Output operations – Decision making and branching – Decision making and looping- **Arrays:** One and two dimensional arrays - Initializing two dimensional arrays – Multidimensional arrays.

Unit III **(18 hours)**

Character Arrays and Strings: Declaring and initializing string variables- Reading strings from terminal- Writing strings to screen – Arithmetic operations on characters - Putting strings together – Comparison of Two Strings - String handling functions – Table of strings – Other features of strings.

Unit IV **(18 Hours)**

User defined functions : Introduction – Need for user defined functions – A multi-function program Elements of user defined functions – Definition of functions - Return values and their types - Calling

a function – Function declarations - Categories of functions – Functions that return multiple values – Nesting of functions - Recursion - Passing arrays to functions - Passing strings to functions - The scope and lifetime of variables

Unit V **(18 Hours)**

Structures and Unions: Introduction – Defining and declaring structure – Accessing structure members – Structure initialization – Arrays of structures – Arrays within structures - Structures within structures – Structures and functions – Unions. **Pointers :** Introduction - Understanding pointers - Accessing the address of a variable -Declaring and initializing pointers – Accessing a variable through its pointer - Pointer expressions – Pointers and arrays – Pointers and character strings – Array of pointers - Pointers and functions – Pointers and structures

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Summarize the basics of computers and its generations

CO2: Recall and comprehend the basic structure of C programs

CO3: Apply knowledge of C programming to solve problems and develop programs

CO4: Analyze and design C programs using control structures, functions, arrays, and strings to develop algorithms

CO5: Develop problem-solving skills using C programming concepts to design, implement, and test programs to solve real-world problems

Text Book:

1. E Balagurusamy, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, IX Edition, 2012

Reference Books:

1. K R Venugopal, Sudeep R Prasad, *Programming with C*, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008
2. Mullish Cooper, *The Spirit of C - An Introduction to Modern Programming*, Jaico Publishing House , Mumbai, 2006
3. Byron S. Gottfried, Jitender Kumar Chhabra, *Programming with C*, Tata McGraw Hill Publishing Company Ltd , NewDelhi, 2006

Journal:

1. Journal of Information and Communication Technology (Scopus)

E - Resources:

1.https://onlinecourses.nptel.ac.in/noc19_cs42/preview 2. https://nptel.ac.in/courses/106/105/106105171/

3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview

4. https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE II - Programming in C Lab

(For Students Admitted from 2025-26)

Semester: I **Hours/week: 6**
Subject Code: JBADC12P **Credit: 5**

Course Objectives:

1. To introduce the programming skills using C language
2. To enhance the analysing and problem solving skills and use the same for writing programs in C

List of Programs:

Formula Substitution

1. Develop a program to check the given number is odd or even
2. Develop a program to find sum of the digits and reverse the digits
3. Develop a program to generate the Fibonacci series
4. Develop a program to generate Prime number within range
5. Develop a program to find whether a given number is Armstrong or not
6. Develop a program to count the number of positive, negative and zero in the list
7. Develop a program to find the area of various shapes using switch case

Array

8. Develop a program to check whether the element is present in the given list or not
9. Develop a program to sort numbers in ascending and descending order 10.Develop a program to sort names in Alphabetical order

Functions & Structures

10. Develop a program to find the factorial of a given number using function declaration
11. Develop a program to find the factorial of a given number using recursion function
12. Develop a program to Prepare student mark list using structure
13. String Manipulation
14. Develop a program to count the vowels in the given string
15. Develop a program to convert the case of given string from upper case to lower case and vice versa

Pointers

16. Develop a program to find average of two numbers using pointers

Note:-Questions for Internal and external examination will be based on concept learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Remember the control structures and loops
CO2: Apply the concepts of functions and pointers
CO3: Analyze the concepts of structures by creating student mark list and electricity bill
CO4: Evaluate string handling functions
CO5: Create programs with pointers, arrays and structures

Course Outcomes				Programme Outcomes				
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	45	15	15	5	45	45	45	**215**

Low- 1 Medium-3 High-9

SEC I - Office Automation Lab

(For Students Admitted from 2025-26)

Semester: I **Hours / Week: 2**
Subject Code: JBADS14P **Credit: 1**

Course Objectives:
1. To acquire hands-on experience with office automation tools, including word processing, spreadsheet, presentation, and database management
2. To learn to analyze and solve real-world problems using office automation tools

List of Programs:
Word Processing

1. Create a word processing document consists two pages in a Book named “XX” and then do the following:
   a. Formatting Text, Alignment and Font Style using Word Art
   b. Perform Find and Replace
   c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages
   d. Display lists using bullet and number
2. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
3. Create a Newsletter Article (using Columns, Drop cap)

Spread Sheet

4. Create a spreadsheet consists of Student details and then do the following:
   a. Calculate student wise total and subject wise total
   b. Find the Maximum and Minimum marks of the subject
   c. Grade is calculated as
      i. If %>=90, then grade A
      ii. If %>=80 and <90, then grade B
      iii. If %>=70 and <80, then grade C iv. If %>=60 and <70, then grade D
      iv. If %<60, then grade F
5. Create a spreadsheet having Employee details to calculate Net Pay and Gross Pay

Presentation

6. Create a presentation showing your various activities of the department a Perform slide translation and Setting background designs
7. Create a presentation showing various aspect of your college and perform custom animation and import sound.

Database

8. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to findtotal and average and check data entered.
9. Create an Inventory database having Item Name, Item no. Quantity and Price.

Perform query operation toretrieve data.

Note: Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and understand various options of office application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Evaluated and compare options of different Microsoft office applications
CO5: Build a presentations, advertisements, reports for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low- 1 Medium-3 High-9

CORE III - Fundamentals of Data Science and Analytics

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 5**
Subject Code: JBADC21 **Credit: 5**

Course Objectives:

1. To understand the techniques and processes of data science including data analytics
2. To learn data for various applications and to build predictive models from data

Unit I **(15 hours)**

Introduction to Data Science-Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

Unit II **(15 hours)**

Descriptive Analytics:Frequency distributions – Outliers –interpreting distributions – graphs – averages - describing variability – interquartile range – variability for qualitative and ranked data - Normal distributions – z scores –correlation – scatter plots – regression – regression line – least squares regression line

Unit III **(15 hours)**

Inferential Statistics: -Populations – samples – random sampling – Sampling distribution- standard error of the mean - Hypothesis testing – z-test – z-test procedure –decision rule – calculations – decisions – interpretations - one-tailed and two-tailed tests

Unit IV **(15 hours)**

Analysis of variance : t-test for one sample – sampling distribution of t – t-test procedure – t-test for two independent samples – p-value – statistical significance – t-test for two related samples. F-test – ANOVA – Twofactor experiments – three f-tests – two-factor ANOVA –Introduction to chi-square tests.

Unit V **(15 hours)**

Predictive analytics -Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling. Regression using StatsModels – multiple regression – nonlinear relationships – logistic regression

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Define the Data Analytics Pipeline
CO2: Describe the visual data
CO3: Perform statistical inferences from data
CO4: Analyse the variance in the data
CO5: Design models for predictive analysis

Text Books

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (first two chapters for Unit I).
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.

3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

Reference Books:

1. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, “Fundamentals of Data Science”, CRC Press, 2022.
3. Chirag Shah, “A Hands-On Introduction to Data Science”, Cambridge University Press, 2020.
4. Vineet Raina, Srinath Krishnamurthy, “Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice”, Apress, 2021.

Journal:

1. ICTACT Journal on Soft Computing (UGC)

E-Resources:

1. https://archive.nptel.ac.in/courses/106/105/106105175/
2. https://onlinecourses.nptel.ac.in/c21_cs04/p review

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

CORE IV - Structured Query Language

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 5**
Subject Code: JBADC22 **Credit: 5**

Course Objectives:

1. To know the basic concepts and the applications of Database Systems
2. To understand the basics of SQL and queries using SQL

Unit I **(15 hours)**

Introduction to Database Management Systems: Introduction-Database System Applications- Purpose of Database Systems- Views of Data- Data Abstraction- Instances and Schemas- Data Models- Database Languages- DDL- DML- Database Architecture- Database Users and Administrators- Database Design- ER Diagrams- Entities- Attributes and Entity Sets- Relationships and Relationship sets- Integrity Constraints- Views.

Unit II **(15 hours)**

SQL Operators and Relational Theorems: Relational Algebra and Calculus- Selection and Projection- Set Operations- Renaming- Joins- Division- Relational calculus- Tuple Relational Calculus- Domain Relational Calculus- Forms of Basic SQL Query- Nested Queries- Comparison Operators- Aggregate Operators- NULL values- Logical connectives- AND, OR and NOT- Outer Joins- Triggers.

Unit III **(15 hours)**

Normalization: Problems Caused by Redundancy- Decompositions- Functional Dependencies- Normal Forms- First, Second, Third Normal forms- BCNF- Properties of Decompositions- Lossless Join Decomposition- Dependency Preserving Decomposition- Multi Valued Dependencies- Fourth Normal Form- Join Dependencies- Fifth Normal Form.

Unit IV **(15 hours)**

Transactions: Transaction Management- Transaction Concept -Transaction State- Implementation of Atomicity and Durability- Concurrent Executions- Serializability- Recoverability- Implementation of Isolation- testing for serializability- Concurrency Control- Lock- Timestamp Based Protocols- Validation Based Protocols- Recovery- Failure Classification- Storage Structure- Atomicity- Log Based Recovery- Remote Backup Systems.

Unit V **(15 hours)**

No SQL: Overview of No SQL- Types of No SQL Databases- No SQL Storage Architecture- CRUD Operations in MongoDB- Querying- Modifying and Managing No SQL Databases- Indexing and Ordering- Migrating from RDBMS to No SQL- No SQL in Cloud- Database Administration.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the basic concepts and the applications of Database Systems
CO2: Demonstrate basics of SQL and queries using SQL
CO3: Illustrate Normalization
CO4: Evaluate indexing and ordering in No SQL
CO5: Create No SQL data bases

Text Book:

1. A.Silberschatz, H.F. Korth, S.Sudarshan, 2006, *Database System Concepts*, McGraw Hill.

Reference Books:

1. Ramez Elmasri, ShamkatB.Navathe, 2013, *Database Systems*, Pearson.
2. Pramod J. Sadalage, Martin Fowler, 2012, *No SQL Distilled*, Addison Wesley.
3. Guy Harrison, 2015, *Next Generation Databases: No SQL and Big Data*, Apress.
4. Raghurama Krishnan, Johannes Gehrke, 2003, *Database Management Systems*, McGraw Hill

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://archive.nptel.ac.in/courses/106/105/106105175/
2. https://onlinecourses.nptel.ac.in/c21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	3	3	3	**15**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	1	1	1	3	3	3	**15**
CO4	3	1	1	1	3	3	3	**15**
CO5	3	1	1	1	3	3	3	**15**
Total	**15**	**5**	**5**	**5**	**15**	**15**	**15**	**75**

Low-1 Medium-3 High-9

SEC II - Database Management System Lab

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 2**
Subject Code: JBADS24P **Credit: 1**

Course Objectives:

1. To acquire practical knowledge on designing and creating Tables.
2. To understand various queries such as relational constraints, joins, set operations, aggregate functions and views.

List of Programs:

DDL

1. Create an address table with fields name , doorno , street & city
   a) Describe its structure
   b) Alter the table to include pincode
   c) Alter the table to modify street column
   d) Drop the table

DML

2. Create a student table with regno, name, age and dept.
   a) Insert records
   b) Delete the students with age above 20
   c) Truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   a) Find out the no. of female employees
   b) Find out the employees with age ranging between 30 and 35
   c) List out the employees who are working more than 5 years
4. Create a library file with fields accno, title, author, cost & no of copies
   a) Arrange the books according to accno

b) Find out the total no. of books available in the library
c) Find out the book of minimum cost

5. Write the SQL queries to illustrate all number functions
6. Write the SQL queries to illustrate date functions
7. Write the SQL queries to illustrate all string functions
8. Create an item table with field's item no, item name, quantity & price and insert records. Illustrate the comparison operators (between, like, in & isnull)
9. Create a student table with fields' regno, name, English, Tamil, Maths and Total & insert records Arrange all records according to Total
   a) Find the student who got first mark in Maths
   b) List out the students whose name starts with "S"

Note: - Questions for Internal and External examination will be based on concept learnt

Course Outcomes:
After successful completion of this course, students will be able to
CO1: Build DDL, DML Commands
CO2: Make use of implementing constraints in tables
CO3: Apply to create block structure programming language
CO4: Create the concepts of functions
CO5: Develop the Real Time database

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	3	3	3	**27**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	1	3	3	3	9	3	**31**
CO4	9	1	3	3	9	3	9	**37**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**9**	**19**	**15**	**21**	**27**	**27**	**163**

Low-1 Medium-3 High-9

CORE V- Data Structures and Algorithms

(For Students Admitted from 2025-26)

Semester: III **Hours / Week: 4**
Subject Code: JBADC31 **Credit: 4**

Course Objectives:
1. To design, implement, and analyze basic data structures such as arrays, linked lists, stacks, and queues.
2. To develop and apply algorithmic techniques such as sorting, searching, and graph traversal to solve real-world problems efficiently and effectively.

Unit I **(12 Hours)**

Introduction: History of Algorithms - Data structures and Algorithms - Data structure - Definition and Classification. **Stacks:** Introduction - stack Operation - Application. **Queues:** Introduction - Operation - circular Queues - Other Types of Queues - Application.

Unit II **(12 Hours)**

Linked Lists: Introduction - Singly Linked Lists - Circularly Linked List - Doubly Linked List - Multiply Linked List - Application. **Trees and Binary Trees:** Introduction -Trees: Definition and Basic Terminologies - Representation of Trees -Binary Tree Traversals - Threaded Binary Trees - Applications.

Unit III **(12 Hours)**

Graphs: Introduction-Definitions and Basic Terminologies - Representations of Graphs - Graph Traversals – Single source & all pairs shortest paths problem - Minimum cost spanning trees. **Binary Search Trees and AVL Trees:** Introduction - **Binary Search Trees:** Definition and Operations - AVL Trees: Definition and Operations - Applications.

Unit IV **(12 Hours)**

Red-Black Trees and Splay Trees: Red-Black Trees - Applications. **Hash Tables:** Introduction-Hash Table Structure - Hash Functions - Linear Open Addressing - Chaining - Applications. **Searching:** Introduction-Linear Search-Transpose Sequential Search- Interpolation Search - Binary Search - Fibonacci Search - Other Search Techniques.

Unit V **(12 Hours)**

Internal Sorting: Introduction - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort – Shell Sort- Quick Sort - Heap Sort - Radix Sort. **Algorithms:** Algorithm Specification Performance analysis - Asymptotic notation.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Define and explain the fundamental concepts of basic data structures

CO2: Apply algorithmic techniques to solve problems efficiently and effectively

CO3: Analyze the time and space complexity of algorithms and evaluate their performance

CO4: Design and implement advanced data structures to solve complex problems

CO5: Evaluate and create solutions using algorithms

Text Books:

1. Vijayalakshmi Pai G A, *Data structures and Algorithms, Concepts, Techniques and Application,* Tata McGraw-Hill Education Private Limited, 2008.

2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms,* Universities Press, Second Edition, 2008.

Reference Books:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms,* Dorling Kindersley Private Limited, 2013.

2. Patel R B, *Expert Data Structures with C,* Khanna Book Publishing, Third Edition, 2000.

Journal:
1. Journal of ICT Research and Applications (Scopus)

E-Resources:
1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs26/preview
4. 4. NPTEL: https://nptel.ac.in/courses/106/106/106106127/

Course Outcomes	Programme Outcomes							
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	Total
CO1	3	1	3	3	3	3	3	19
CO2	3	1	3	3	3	3	3	19
CO3	3	1	3	3	3	3	3	19
CO4	3	1	3	3	3	3	3	19
CO5	3	1	3	3	3	3	3	19
Total	15	5	15	15	15	15	15	95

Low-1 Medium-3 High-9

CORE VI - Data Structures and Algorithms Lab

(For Students Admitted from 2025-26)

Semester: II **Hours / Week: 4**
Subject Code: JBADC32P **Credit: 3**

Course Objectives:
1. To introduce the concepts of data structure and its operation
2. To implement data structures for problem solving in C/ C++/python

List of programs:
1. Develop a program to implement the stack using array
2. Develop a program to implement the queue using linked lists
3. Develop a program to implement the in-order tree traversal methods
4. Develop a program to search a key element in a list of elements using linear search
5. Develop a program to search a key element in a list of elements using binary search
6. Develop a program to implement insertion sort algorithm
7. Develop a program to implement selection sort algorithm
8. Develop a program to implement merge sort algorithm
9. Develop a program to implement binary search tree
10. Develop a program to create a singly linked list and delete an element from linked list
11. Develop a program to create a doubly linked list and display the contents in the list

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of the course, the students will be able to
CO 1: Explain the basics of data structures and its systematic approaches
CO 2: Implement the data structure and its operations in C or C++
CO 3: Compare the difference between various searching & sorting techniques
CO 4: Demonstrate Tree and linked list algorithm
CO 5: Develop simple applications using data structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

SEC III -Web Designing Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 2**
Subject Code: JBADS34P **Credit: 1**

Course Objectives:
1. To analyze a web page and identify its elements and attributes and create web pages using XHTML and Cascading Style Sheets
2. To build dynamic web pages using JavaScript (Client side programming) and create XML documents and Schemas

List of programs:
1. Develop a program to illustrate all basic tags
2. Develop a program to display study time table for end semester examination
3. Develop a program to display a menu list for bakery
4. Develop a program to use all style sheets
5. Develop a program to demonstrate frame
6. Develop a program to use hyperlink for both text and image
7. Develop a program to demonstrate forms
8. Develop a program to create a simple website for our college
9. Develop a program to create a dictionary using frames. The words are displayed in one frame and when you click the word, the meaning will be displayed on the other frame.

Java Script

10. Develop a program for Leap year checking

11. Develop a program to create login form
12. Develop a JavaScript program to reverse a given string

Note: - Questions for the internal examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Explain the basics of all HTML tags to create the static web page
CO2: Apply the concepts of table and list in HTML
CO3: Examine the use of style sheets, frames and hyperlinks
CO4: Evaluate the concept of validation using JavaScript
CO5: Create interactive web page using Script

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	9	3	3	**31**
CO2	9	3	1	3	9	3	3	**31**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	9	9	3	3	**39**
CO5	9	3	9	3	9	9	3	**45**
Total	**45**	**15**	**17**	**21**	**45**	**21**	**15**	**179**

Low-1 Medium-3 High-9

CORE VIII - Python Programming

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 4**
Subject Code: JBADC42 **Credit: 4**

Course Objectives:
1. To understand lists, tuples and dictionaries in Python programs.
2. To learn exception handling in Python applications for error handling.

Unit I **(12 hours)**

Introduction: History of Python- Need of Python Programming- Applications Basics of Python Programming Using the REPL(Shell)- Running Python Scripts- Variables- Assignment- Keywords- Input- Output- Indentation.

Unit II **(12 hours)**

Types, Operators and Expressions: Types - Integers- Strings- Booleans; Operators- Arithmetic Operators- Comparison (Relational) Operators- Assignment Operators- Logical Operators- Bitwise Operators- Membership Operators- Identity Operators- Expressions.

Unit III **(12 hours)**

Data Structures and Control Flow: Lists- Operations- Slicing- Methods- Tuples- Sets- Dictionaries- Sequences- Comprehensions- Conditional blocks using If- Else and El-if- For Loop- For loop using Ranges- String- list and Dictionaries- While Loop- Loop Manipulation using Pass- Continue- Break and Else- Conditional and Loops Block.

Unit IV **(12 hours)**

Functions, Modules and Packages: Defining Functions- Calling Functions- Passing Arguments- Keyword Arguments- Default Arguments- Variable-length arguments- Anonymous Functions- Function Returning Values- Scope of the Variables in a Function - Global and Local Variables. Creating modules- Name Spacing- Introduction to PIP- Installing Packages via PIP- Using Python Packages.

Unit V **(12 hours)**

Object Oriented Programming & Exception Handling: Classes- Self-Variable- Methods- Constructor Method- Inheritance- Overriding Methods- Data Hiding- Difference between an Error and Exception- Handling Exception- Try Except Block- Raising Exceptions- and User Defined Exceptions.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explore lists, tuples, and dictionaries in Python programs

CO2: Demonstrate the concepts of loops and decision statements in Python

CO3: Illustrate functions and pass arguments in Python

CO4: Design object-oriented programs with Python classes

CO5: Develop Python applications.

Text Book:

1. R. Nageswara Rao, *Core Python Programming*, Dreamtech, 2018

Reference Books:

1. John Hearty, *Advanced Machine Learning with Python*, Packt, 2016
2. Jake VanderPlas, *Python Data Science Handbook: Essential Tools for Working with Data*, O'Reilly, 2016 Mark Lutz, *Programming Python*, O'Reilly,2010
3. Tim Hall and J-P Stacey, *Python 3 for Absolute Beginners*, Apress,2009

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs31/preview

Course Outcomes	Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	1	1	3	1	3	**13**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**13**	**5**	**15**	**13**	**15**	**81**

Low-1 Medium-3 High-9

AECC IV - Python Programming Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 4**
Subject Code: JBADA43P **Credit: 3**

Course Objectives:

1. To learn the basic programming constructs in python
2. To understand about Functions, Modules and Regular Expressions in Python Programming

List of Programs:

Display Text

1. Develop a program to display any given text message

Checking

2. Develop a program to check whether the given string is palindrome or not
3. Develop a program to check a number is positive or negative using if-else

Formula Substitution

4. Develop a program to display Fibonacci series
5. Develop a program to find factorial of a given number
6. Develop a program to find first N Natural numbers and sum

Array

7. Develop a program to count the number of vowel in the string

String

8. Develop a program to perform string functions

Function

9. Develop a program to convert a date read from the user, given in DD/MM/YYYY format into written format. For example, Enter a date in DD/MM/YYYY Format: 16/7/2003 Output: 16 July, 2003
10. Develop a program to print the contents of a file in uppercase using function

Operator Overloading

11. Develop a program to implement Operator Overloading **Script**

12. Develop a program for implementing Arithmetic Quiz
13. Develop a program to create a button with the text, "Hello World"

Note: Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Develop and execute simple python programs
CO2: Perform formula substitution and checking in programs
CO3: Demonstrate array and strings in python
CO4: Compose scripts and applications in python script
CO5: Deploy function to execute python programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

SEC IV - Data Science & Analytics Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 2**
Subject Code: JBADS44P **Credit: 1**

Course Objectives:
1. To develop data analytic code in python to perform data visualization using plots
2. To be able to use python libraries for handling data and develop analytical applications using python

List of Programs
Working with Numpy arrays
1. Working with Pandas data frames
2. Basic plots using Matplotlib
3. Frequency distributions, Averages, Variability
4. Normal curves, Correlation and scatter plots, Correlation coefficient
5. Regression
6. Building and validating linear models
7. Time series analysis

Course Outcomes:

Upon successful completion of this course, students will be able to:
CO1: Explain python programs to handle data using Numpy and Pandas
CO2: Perform descriptive analytics
CO3: Apply data exploration using Matplotlib
CO4: Analyse inferential data analytics
CO5: Design models of predictive analytics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	9	9	9	45
CO2	1	3	3	3	9	9	9	37
CO3	3	3	3	3	9	9	9	39
CO4	3	9	1	9	9	9	9	49
CO5	9	1	1	1	9	9	9	39
Total	19	19	11	25	45	45	45	209

Low-1 Medium-3 High-9

Extra Credit III - NoSQL Lab

(For Students Admitted from 2025-26)

Semester: IV
Subject Code: JBADX4P **Credit: 2**

Course Objectives:
1. The students get practical knowledge on developing No SQL database using MongoDB and ability to read or query the collection
2. To understand various advanced methods such as update one MongoDB document in the collection and update many MongoDB documents in the collection

Program List
1. MongoDB installation and configuration in windows
2. Demonstrate how to create and drop a database in MongoDB
3. Developing the collection in MongoDB on the fly
4. Developing collection with options before inserting the documents and drop the collection created
5. MongoDB insert document
   a) Insert single document
   b) Insert multiple documents in collection
6. Querying all the documents in JSON format and Querying based on the criteria
7. MongoDB update document
   a) Using update ( ) method
   b) Using save ( ) method
8. MongoDB delete document from a collection
   a) Using remove ( ) method

b) Remove only one document matching your criteria
c) Remove all documents

9. Develop a MongoDB projection
10. Apply limit ( ), skip ( ), sort ( ) methods in MongoDB
11. MongoDB indexing
    a) Develop index in MongoDB
    b) Finding the indexes in collection
    c) Drop indexes in a collection
    d) Drop all the indexes
12. MongoDB with java and PHP
    a) Develop a simple application that uses MongoDB with JAVA
    b) Develop a simple application that uses MongoDB with PHP
13. Build a social media app using document API and a No SQL Database

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Installing and configuring MongoDB in windows
CO2: Perform all database operations using MongoDB
CO3: Implement and harness the power of indexes
CO4: Use MongoDB compass to analyze a database
CO5: Develop applications by integrating MongoDB with JAVA/PHP

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

CORE IX - Artificial Intelligence

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 6**
Subject Code: JBADC51 **Credit: 5**

Course Objectives:

1. To learn the basic AI approaches
2. To develop problem-solving agents using logical and probabilistic reasoning

Unit –I **(18 Hours)**

Intelligent Agents - Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

Unit II **(18 Hours)**

Problem Solving -Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments

Unit III **(18 Hours)**

Game Playing and CSP- Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CS

Unit IV **(18 Hours)**

Logical Reasoning -Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution.

Unit V **(18 Hours)**

Probabilistic Reasoning Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN causal networks.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Explain intelligent agent frameworks
CO2: Apply problem solving techniques
CO3: Examine game playing and CSP techniques
CO4: Perform logical reasoning
CO5: Evaluate reasoning under uncertainty

Text Books:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.

References Books:

1. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education,2007
2. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013.

Journal:

1. IAES International Journal of Artificial Intelligence (Scopus)

E-Resources:
1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CORE X - Artificial Intelligence Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 6**
Subject Code: JBADC52P **Credit: 5**

Course Objectives:
1. To design and implement search strategies, game playing techniques and CSP techniques
2. To develop systems with logical reasoning and with probabilistic reasoning

List of Programs:
1. Implement basic search strategies – 8-Puzzle, 8 - Queens problem, Crypto arithmetic.
2. Implement A* and memory bounded A* algorithms
3. Implement Minimax algorithm for game playing (Alpha-Beta pruning)
4. Solve constraint satisfaction problems
5. Implement propositional model checking algorithms
6. Implement forward chaining, backward chaining, and resolution strategies
7. Build naïve Bayes models
8. Implement Bayesian networks and perform inferences

Course Outcomes:
After successful completion of the course, the students will be able to
CO1: Explain and implement search strategies
CO2: Apply the concept of game playing and CSP techniques
CO3: Develop logical reasoning systems
CO4: Evaluate probabilistic reasoning systems
CO5: Design Bayesian networks for performing inferences

Course Outcomes	Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	9	9	9	9	9	49
CO2	1	3	9	9	9	9	9	49
CO3	9	1	9	9	9	9	9	55
CO4	3	1	1	1	9	9	9	33
CO5	9	1	1	1	9	9	9	39
Total	**25**	**7**	**29**	**29**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

CORE XI - Data Exploration and Visualization

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 6**
Subject Code: JBADC53 **Credit: 6**

Course Objectives:

1. To understand an overview of exploratory data analysis.
2. To learn Data exploration and visualization techniques for multivariate and time series data.

Unit I **(18 Hours)**

Exploratory Data Analysis -EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.

Unit II **(18 Hours)**

Visualizing Using Matplotlib -Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

Unit III **(18 Hours)**

Univariate Analysis -Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

Unit IV **(18 Hours)**

Bivariate Analysis -Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations.

Unit V **(18 Hours)**

Multivariate And Time Series Analysis -Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA –

Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

Course Outcomes:
After successful completion of the course, the students will be able to
CO1: Explain the fundamentals of exploratory data analysis.
CO2: Implement the data visualization using Matplotlib.
CO3: Perform univariate data exploration and analysis.
CO4: Apply bivariate data exploration and analysis.
CO5: Examine Data exploration and visualization techniques for multivariate and time series data.

Text Books:
1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2)
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

Reference Books:
1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015

Journal:
1. Journal of ICT Research and Applications (Scopus)

E-Resources:
1. https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/data-visualization-with-r/?v=c86ee0d9d7ed
2. https://onlinecourses.swayam2.ac.in/ntr24_ed70/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

MD III – (a) Machine Learning

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
Subject Code: JBMD51ADA **Credit: 3**

Course Objectives:
1. To acquire the characteristics of machine learning that makes it useful to real-world problems
2. To understand the concept behind neural networks for learning non-linear functions

Unit I **(12 hours)**
Introduction: Well-Posed Learning Problems-Designing a Learning System-Perspectives and Issues in Machine Learning. Concept Learning: Introduction - A Concept Learning Task Concept Learning as Search - Decision Tree Learning: Introduction-Decision Tree Representation-Appropriate Problems- Basic Decision Tree Learning Algorithm-Hypothesis Space SearchInductive Bias-Issues.

Unit II **(12 hours)**
Artificial Neural Networks: Introduction-Neural Network Representations - Appropriate Problems - Perceptions - Multilayer Networks and the Back Propagation Algorithm-An Illustrative Example: Face Recognition-Advanced Topics.

Unit III **(12 hours)**
Bayesian Learning: Introduction-Bayes Theorem-- Bayes Theorem and Concept Learning – Maximum Likelihood and Least-squared Error Hypotheses- Maximum Likelihood Hypothesis for Predicting Probabilities-Minimum Description Length Principle-Bayes Optimal Classifier Gibbs Algorithm-Naïve Bayes Classifier-An Example: Learning to Classify Text-Bayesian Belief Networks-The EM Algorithm.

Unit IV **(12 hours)**
Instance-Based Learning: Introduction-K-Nearest Neighbor Learning-Locally Weighted Regression-Radial Basis Functions-Case-based Reasoning - Genetic Algorithms: Genetic Algorithms-An Illustrative Example- Hypothesis Space Search-Genetic programmingModels of Evolution and Learning- Parallelizing Genetic Algorithms.

Unit V **(12 hours)**
Learning Sets of Rules: Introduction-Sequential Covering Algorithms-Learning Rule Sets: Summary-Learning First-Order Rules-Learning Sets of First-Order Rules: FOIL - Induction as Inverted Deduction- Inverting Resolution - Reinforcement Learning: Introduction- Learning TaskQ Learning-Nondeterministic Rewards and Actions-Temporal Difference Learning Generalizing from Examples-Relationship to Dynamic Programming.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Descibe the need for machine learning for various problem solving
CO2: Demonstrate Decision Tree Learning Algorithm, Back propagation algorithm, Gibbs Algorithm, K-Nearest Neighbour Learning and Temporal Difference Learning with examples

CO3: Categorize the various supervised, semi-supervised and unsupervised learning **algorithms** in machine learning
CO4: Apply different classification techniques in real time examples
CO5: Design appropriate machine learning algorithms for different problems

Text Book:
1. Tom M. Mitchell, *Machine Learning*, Tata McGraw Hill, 2017.

Reference Books:
1. Jeremy Watt, Reza Borhani, Aggelos K Katsaggelos, *Machine Learning Refined Foundations, Algorithms & Applications*, Cambridge University Press, , 2016.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press Cambridge, 2010.
3. Andreas C. Muller and Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, First Edition, 2016.

Journal:
1. Intl. Journal of Internet of Things and Information Technology

E-Resources:
1. https://nptel.ac.in/courses/106/106/106106139/
2. https://onlinecourses.nptel.ac.in/noc22_cs58/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

MD III - (b) Blockchain Technology

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
Subject Code: JBMD51ADB **Credit: 3**

Course Objectives:
1. To understand how block chain system (Bitcoin and Ethereum) work
2. To integrate Ideas from block chain technology into their own projects

Unit I **(12 hours)**

Introduction of Block chain: Block 101-Distributed Systems-Consensus-The history of block chain-Introduction of block chain-Features of block chain-Applications of block chain technology-Tiers of Block chain technology-Consensus in block chain-CAP theorem and block chain-Benefits and limitations of Block chain.

Unit II **(12 hours)**

Cryptography and technical Foundations: Introduction-Mathematics-Cryptography-Confidentiality- Integrity- Authentication-Non repudiation-Accountability-Block Ciphers-DES-AES-Public and Private keys- RSA-hash Functions-Secure hash algorithms-Merkle trees-Patricia trees-DHT-ECDSA-Financial markets and trading-Trading- Exchanging.

Unit III **(12 hours)**

Bitcoin: Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain-The Genesis of Block-The bitcoin network-wallets-**Alternative coins**: Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin-Lite coin.

Unit IV **(12 hours)**

Ethereum101: Introduction-Ethereum block chain-The consensus mechanism-The world state- the account state- Transactions-Contract creation transaction-Message call transactionElements of ethereum block chain- EVM-Execution Environment-Opcodes and their meaningAccounts- Block-Block header

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Unit V **(12 hours)**

Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure communication-Protocols - Transport Level Security. Secure Electronic Transaction- Entities DS Verification-SET processing.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the fundamental concept of block chain and consensus algorithm
CO2: Apply cryptography algorithms in protecting the block chain
CO3: Examine transactions held in bitcoins
CO4: Develop an application in ethereum framework
CO5: Design block chain technology in popular fields

Text Book:

1. Imran Bashir, *Mastering Block chain: Deeper insights into decentralization, Cryptography, Bitcoin and Popular block chain frameworks***,** Packt Publishing, 2017.

Reference Books:

1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin***,** O'Reilly, 20142. roger Wattenhofer**,** *The Science of the Block chain*, Create Space Independent Publishing, 2016.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction***,** Princeton University Press, 2016.

Journal:

1. Intl. Journal of Internet of Things and Information Technology

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/
3. https://www.mygreatlearning.com/academy/learn-for-free/courses/blockchain-basics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	1	3	3	**15**
CO2	3	1	3	1	1	3	3	**15**
CO3	3	1	3	1	1	3	3	**15**
CO4	3	1	3	1	1	3	3	**15**
CO5	3	1	3	1	1	3	3	**15**
Total	**15**	**5**	**15**	**5**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

MD IV – (b) Data and Information Security

(For Students Admitted from 2025-26)

Semester: V **Hours/week:4**
Subject Code: JBMD52ADB **Credit: 3**

Course Objectives:

1. To understand the basics of Information Security
2. To know the legal, ethical and professional issues in Information Security and to equip the students' knowledge on digital signature, email security and web security

Unit I **(12 hours)**

Introduction -History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

Unit II **(12 hours)**

Security Investigation - Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

Unit III **(12 hours)**

Digital Signature and Authentication Digital Signature and Authentication Schemes: Digital signature - Digital Signature Schemes and their Variants- Digital Signature StandardsAuthentication: Overview- Requirements Protocols Applications - Kerberos -X.509 Directory Services

Unit IV **(12 hours)**

E-Mail And Ip Security - Electronic mail security: Email Architecture -PGP – Operational Descriptions- Key management- Trust Model- S/MIME.IP Security: Overview- Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management.

Unit V **(12 hours)**

Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure communication- Protocols - Transport Level Security. Secure Electronic Transaction- Entities DS Verification-SET processing.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Define the basics of data and information security
CO2: Apply the legal, ethical and professional issues in information security
CO3: Examine the various authentication schemes to simulate different applications.
CO4: Evaluate various security practices and system security standards
CO5:Develop the Web security protocols for E-Commerce applications

Text Books:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security, Course Technology, 6th Edition, 2017.
2. Stallings William. Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson Education, 2017.

Reference Books:

1. Harold F. Tipton, Micki Krause Nozaki,, "Information Security Management Handbook, Volume 6, 6th Edition, 2016.
2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", McGraw- Hill, Seventh Edition, 2012.
3. Matt Bishop, "Computer Security Art and Science, Addison Wesley Reprint Edition, 2015.
4. Behrouz A Forouzan, Debdeep Mukhopadhyay, Cryptography And network security, 3rd Edition, McGraw-Hill Education, 2015.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources

1. https://archive.nptel.ac.in/courses/106/106/106106129/
2. https://onlinecourses.swayam2.ac.in/cec22_cs15/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	1	3	3	**15**
CO2	3	1	3	1	1	3	3	**15**

CO3	3	1	3	1	1	3	3	**15**
CO4	3	1	3	1	1	3	3	**15**
CO5	3	1	3	1	1	3	3	**15**
Total	**15**	**5**	**15**	**5**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

SEC V- R -Programming lab

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 2**
Subject Code: JBADS54P **Credit: 1**

Course Objectives:

1. To gain knowledge for developing basic R programs.
2. To know how to generate dynamic documents and import external data into R for data processing and statistical analysis, learn the main R data structures and compute basic summary statistics

List of Programs

1. Develop a program to print Hello World
2. Develop a program to take input from user.
3. Develop a program to demonstrate working with operators (Arithmetic, Relational, Logical, Assignment operators).
4. Develop a program to check if a Number is Odd or Even
5. Develop a program to check if the given Number is a Prime Number
6. Develop a program to find the Factorial of a Number
7. Develop a program to find the Factors of a Number
8. Develop a program to find the Fibonacci sequence Using Recursive Function
9. Develop a program to make a Simple Calculator
10. Develop a program to Find L.C.M of two numbers

Note:-Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Classify the basics concept in R programming in terms of constructs, control statements and functions
CO 2: Apply data analytics software
CO 3: Examine the problem solving, programming and debugging skill
CO 4: Evaluate the R programming from a statistical perspective
CO 5: Create and implement the various data structures of R

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**

CO1	9	3	3	3	9	3	9	**39**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**33**	**27**	**33**	**45**	**33**	**45**	**261**

Low-1 Medium-3 High-9

Core XII - Deep Learning

(For Students Admitted from 2025-26)

Semester : VI **Hours/week: 6**
Subject Code: JBADC61 **Credit: 6**

Course Objectives:

1. To understand about the Deep learning, its principles and approaches
2. To learn about the Deep Learning algorithms and approaches.

Unit I **(18 hours)**

Fundamentals of Deep Networks: Defining Deep Learning- Common Architectural Principles of Deep Networks- Parameters- Layers- Activation Functions- Loss Functions- Optimization Algorithms- Hyper parameters and Frameworks to Deploy Deep learning Networks - Building Blocks of Deep Networks- Restricted Boltzmann Machines .

Unit II **(18 hours)**

Regularization & Optimization for Training Deep Models: Parameter Norm Penalties- Norm Penalties as Constrained Optimization- Regularization and Under-Constrained Problems- Dataset Augmentation- Multitask Learning- Parameter Tying and Sharing- Sparse Representations- Ensemble Methods and Challenges in Neural Network Optimization- Basic Algorithms and Algorithms with Adaptive Learning Rates.

Unit III **(18 hours)**

Convolutional Neural Networks: Convolution Operation- Pooling- Shortcomings of Feature Selection- Filters and Feature Maps- Convolutional layer- Architecture of CNN- Working with MNIST dataset- Image Pre- processing Pipelines.

Unit IV **(18 hours)**

Sequence Analysis: Analyzing Variable-Length Inputs- tackling seq2seq with Neural N- Grams- Implementing Part-of- Speech Tagger- Unfolding Computation Graphs- Recurrent Neural Networks- Bidirectional-RNN- Recursive Neural Network- Echo-State Networks- Long Short-Term Memory- Tensor flow Primitives for RNN models.

Unit V **(18 hours)**

Applications of Deep Learning: Deep Reinforcement Learning- Markov Decision Processes-

Versus Exploit- Policy versus Value learning- Open AI Gym- Q-Learning and Deep Q- Networks- Applications of Deep Learning in various disciplines such as Computer Vision- Speech Recognition- NLP and others.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Deep Learning algorithms and approaches

CO2: Apply Deep Learning algorithms to solve problems which are almost impossible to handle via Traditional Approaches

CO3: Illustrate different types of Deep Neural Networks like CNN

CO4: Examine deep learning algorithms in real time problems

CO5: Develop applications such as NLP using Deep Learning Algorithms

Text Book:

1. Josh Patterson and Adam Gibson. (2018). *Deep Learning: A Practitioner's Approach*. O'Reilly.

Reference Books:

1. Francois Chollet. (2018). *Deep Learning with Python*. O'Reilly.
2. Sandro Skansi. (2018). *Introduction to Deep Learning: From Logical Calculus to Artificial Intelligence*. Springer.
3. Antonio Gulli and Sujit Pal. (2017). *Deep Learning with Keras.* Packt.
4. Nikhil Buduma. (2017). *Fundamentals of Deep Learning*. O'Reilly.
5. Ian GoodFellow, Yoshua Bengio and Aaron Courville. (2016). *Deep Learning.* MITPress.

Journal:

1. International Journal of Computing and Digital System (Scopus)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2. https://nptel.ac.in/courses/106106184

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	1	3	3	**15**
CO2	3	1	3	1	1	3	3	**15**
CO3	3	1	3	1	1	3	3	**15**
CO4	3	1	3	1	1	3	3	**15**
CO5	3	1	3	1	1	3	3	**15**
Total	**15**	**5**	**15**	**5**	**5**	**15**	**15**	**75**

Low-1 Medium-3 High-9

Core XIII -Natural Language Processing

(For Students Admitted from 2025-26)

Semester: VI **Hours/week: 6**
Subject Code: JBADC62 **Credit: 5**

Course Objectives:
1. To know the concepts of Text Analytics, Unstructured Information Analysis for better decision making
2. To understand the roots behind Text Mining which evolved from Machine Learning, Natural Language Processing and Statistics

Unit I **(18 hours)**
Introduction to Text Mining: Basics of Text Mining- Natural Language Content Analysis- Core Text Mining Operations- Associations- Using Background Knowledge for Text Mining- Domain Ontologies- Domain Lexicons. Text Mining Pre-processing Techniques- Task Oriented Approaches- NLP Tasks- Tokenization.

Unit II **(18 hours)**
Extracting Features, Relations from Text: Finding Implicit Features- Finding Opinion Phrases and their Polarity- Context-Specific Word Semantic Orientation- Analysis of Word- and Document Frequency- tf-idf - Zipf's Law- bind tf-idf Function- Subsequence Kernels for Relation Extraction- Capturing Relation Patterns with a String Kernel.

Unit III **(18 hours)**
Text Categorization and Clustering: Applications of Text Categorization- Document Representation- Knowledge Engineering Approach to Text Categorization- Machine Learning Approach to Text Categorization- Evaluation of Text Classifiers. Clustering Tasks in Text Analysis- Clustering Algorithms and Clustering of Textual Data.

Unit IV **(18 hours)**
Relationships between Words: Tokenizing by N-gram- Counting and Filtering N-gram- Analyzing Bigrams to provide Context in Sentiment Analysis- visualizing a Network of Bigrams using ggraph- Counting and Correlating Pairs of Words with the widyr Package- Counting and Correlating among Sections- Examining Pairwise Correlation.

Unit V **(18 hours)**
Topic Modelling and Probabilistic Models for Information Extraction: Latent Dirichlet Allocation- Word Topic Probabilities- Per-Document Classification- By-words Assignments- Alternative LDA Implementations. Hidden Markov models- Stochastic Context Free Grammar- Conditional Random fields- Parallel Learning Algorithms.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Describe the approaches to Syntax and Semantics in NLP
CO2: Demonstrate various methods for Statistical approaches to Machine Translation
CO3: Illustrate Topic Modelling and Probabilistic Models for Information Extraction.
CO4: Implement and deploy programs based on Relationship Extraction, POS Tagging and clustering Algorithms based on NLP.
CO5: Build Models which extract information from Textual Unstructured Data

Text Book:
1. Julia Silge, David Robinson, 2018, *Text Mining with R-A Tidy Approach*, O'Reilly

Reference Books:
1. Matthew L. Jockers, 2014, *Text Analysis with R for Students of Literature,* Springer.
2. James Pustejovsky, Amber Stubbs, 2012, *Natural Language Annotation for Machine Learning,* O'Reilly.
3. Steve R. Poteet, 2007, *Natural Language Processing with Text Mining,* Springer. *Advanced Approaches in Analyzing Unstructured Data,* Cambridge.

Journal:
1. Journal of ICT Research and Applications (Scopus)

E-Resources:
1. https://nptel.ac.in/courses/106105158 .

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	3	3	**31**
CO2	9	3	3	1	9	3	3	**31**
CO3	9	3	3	1	9	3	9	**37**
CO4	9	3	3	1	9	3	3	**31**
CO5	9	3	3	1	9	3	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**15**	**27**	**167**

Low-1 Medium-3 High-9

CORE XIV - Computer Networks

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 5**
Subject Code:JBADC63 **Credit: 4**

Course Objectives:
1. To understand the fundamental concepts of computer networking, including network models, protocols, and layers of the OSI and TCP/IP models.
2. To analyze and explain the functioning of different network layers, including physical, data link, network, transport, and application layers, and identify the protocols and technologies used in each layer.

Unit I **(15 Hours)**
Introduction: Data communications - Networks - The Internet - **Network Models**: Layered Tasks - The OSI model - Layers in the OSI model - TCP/IP Protocol suite - Addressing

Unit II **(15 Hours)**

Physical Layer: Transmission Media: Guided media - Unguided media **Switching:** Circuit switched networks - Datagram networks - Virtual circuit networks - **Using Telephone and cable networks for data transmission:** Telephone network - Cable TV networks

Unit III **(15 Hours)**

Data Link Layer: Error Detection and Correction: Introduction - Block coding - Linear block codes - Cyclic Codes – Checksum - **Data Link Control:** Framing - Flow and Error control - Protocols- Noiseless channels - Nosy channels - Point-to point protocol - **Ethernet:** IEEE Standards - Standard Ethernet - Faster Ethernet - Gigabit Ethernet

Unit IV **(15 Hours)**

Network Layer: Network Layer: IPV4 Addresses - IPV6 Addresses - Internet Protocol: Internetworking - IPV4 - IPV6 - Address Mapping, Error Reporting, and Multicasting: Address Mapping - ICMP – IGMP

Unit V **(15 Hours)**

Transport Layer: Process - To Process Delivery: UDP, TCP: User Datagram Protocol (UDP) – TCP Congestion Control and Quality of Service**:** Data traffic - Congestion - Congestion Control - Quality of Service - Technique to improve QoS - **Application Layer:** Domain Name System**:** Name space - Domain name space - DNS in the Internet - DNS messages

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the basic layers and its functions in computer networks
CO2: Apply the basics of how data flows from one node to another
CO3: Analyse routing alogrithms
CO4: Examine protocols of various functions in the networks
CO5: Evaluate the working of various application layer protocol

Text Book

1. Behrouz A Forouzan, *Data Communications & Networking,* Tata McGraw Hill, New Delhi, Fourth Edition, 2003

Reference Books:

1. Andrew S Tanenboum, *Computer Networks,* Prentice Hall of India Pvt. Ltd., New Delhi, Fourth Edition, 2007
2. Douglas E Comer, *Computer Networks and Internets,* Pearson Education, New Delhi, Fourth Edition, 2004

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview

2. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
3. https://nptel.ac.in/courses/106/105/106105081

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	1	3	1	3	3	3	17
CO2	3	1	3	1	3	3	3	17
CO3	3	1	3	1	3	3	3	17
CO4	3	1	3	1	3	3	3	17
CO5	3	1	3	1	3	3	3	17
Total	15	5	15	5	15	15	15	85

Low-1 Medium-3 High-9

CORE XV - Project

(For Students Admitted from 2025-26)

Semester: VI **Hours / Week: 6**
Subject Code: JBADC64PW **Credit: 6**

Course Objectives:
1. To impart the students to implement project by data collection and selecting the software tool
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders
CO2: Apply the plan by executing the code
CO3: Illustrate the various aspects of software development for the total project
CO4: Evaluate the entire software project according to the specific problem
CO5: Develop the software project by executing with the various data.

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	9	9	9	9	9	57
CO2	9	3	9	9	9	9	9	57
CO3	9	3	9	9	9	9	9	57
CO4	9	3	9	9	9	9	9	57
CO5	9	3	9	9	9	9	9	57
Total	45	15	45	45	45	45	45	285

Low-1 Medium-3 High-9

MD V - (b) Embedded Systems and IoT

(For Students Admitted from 2025-26)

Semester: VI **Hours/week: 4**
Subject Code: JBMD61ADB **Credit: 3**

Course Objectives:
1. To learn the internal architecture and programming of an embedded processor.
2. To understand interfacing I/O devices to the processor.

Unit I **(12 Hours)**
8-Bit Embedded Processor 8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.

Unit II **(12 Hours)**
Embedded C Programming Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

Unit III **(12 Hours)**
Iot And Arduino Programming Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.

Unit IV **(12 Hours)**
Iot Communication And Open Platforms IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

Unit V **(12 Hours)**
Applications Development Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare

Course Outcomes:
CO1: Explain the architecture of embedded processors.
CO2: Apply embedded C programs.
CO3: Examine simple embedded applications.
CO4: Compare the communication models in IOT
CO5: Design IoT applications using Arduino/Raspberry Pi /open platform.

Text Books:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2014
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.

Reference Books:

1. Michael J. Pont, "Embedded C", Pearson Education, 2007.
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.
3. Andrew N Sloss, D. Symes, C. Wright, "Arm System Developer's Guide", Morgan Kauffman/ Elsevier, 2006.
4. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015

Journal:

1. Intl. Journal of Internet of Things and Information Technology

E-Resources:

https://onlinecourses.nptel.ac.in/noc20_cs14/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

SEC VI -Deep Learning Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours/week: 2**
Subject Code: JBADS65P **Credit: 1**

Course Objectives:

1. To understand the tools and techniques to implement deep neural networks
2. To apply different deep learning architectures for solving problems

List of Programs:

1. Solving XOR problem using DNN
2. Character recognition using CNN

3. Face recognition using CNN
4. Language modeling using RNN
5. Sentiment analysis using LSTM
6. Parts of speech tagging using Sequence to Sequence architecture
7. Machine Translation using Encoder-Decoder model

Course Outcomes:
After the completion of this course, students will be able to:
CO1: Explain deep neural network for simple problems
CO2: Demonstrate Convolution Neural Network for image processing
CO3: Utilize Recurrent Neural Network and its variants for text analysis
CO4: Analyze generative models for data augmentation
CO5: Develop real-world solutions using suitable deep neural networks

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

Extra Credit V – Bioinformatics Lab

(For Students Admitted from 2025-26)

Semester: V
Subject Code: JBADX6P **Credit: 2**

Course Objectives:
1. To interpret genomic and transcriptomic data
2. To apply computational biology techniques

List of Programs:
Sequence From GenBank
1. Develop a program for retrieval of Nucleotide sequence from GenBank 4
2. Develop a program for retrieval of Protein sequence from GenBank 8
3 Develop a program for sequence Similarity Search using BLASTN 14

Protein Structure
4. Develop a program for accessing Structural Database and Download the Protein Structure 28
5. Develop a program for working with Ensemble 32
6. Develop a program for multiple Sequence Alignment 36
7. Develop a program for predicting Physiochemical properties of protein sequence 42

Course Outcomes:
After successful completion of this course, student will be able to

CO1: Develop proficiency in bioinformatics tools and software
CO2: Analyze biological sequence data using bioinformatics techniques
CO3: Interpret and analyze genomic and transcriptomic data
CO4: Construct and interpret phylogenetic trees and networks
CO5: Apply machine learning techniques to bioinformatics data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	3	1	9	**49**
CO2	9	9	9	9	3	1	9	**49**
CO3	9	9	9	9	3	1	9	**49**
CO4	9	9	9	9	3	1	9	**49**
CO5	9	9	9	9	3	1	9	**49**
Total	**45**	**45**	**45**	**45**	**15**	**5**	**45**	**245**

Low-1 Medium-3 High-9

Multi-Disciplinary Courses - I & II

(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
III	IV	JBMD31ITP/ JBMD31CSP/ JBMD31CPP/ JBMD31ICP/ JBMD31ADP	MD I	PC Package Lab	2	1	SD	GLO	-	50	50
IV		JBMD41ITP/ JBMD41CSP/ JBMD41CPP/ JBMD41ICP/ JBMD41ADP	MD II	Web Designing Lab	3	2	ENT| EMP	GLO	-	50	50

MD I- PC Package Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 2**
Subject Code: JBMD31ITP/ JBMD31CSP/ JBMD31CPP/ JBMD31ICP/ JBMD31ADP **Credit: 1**

Course Objectives:

1. To acquire hands-on experience with office automation tools, including word processing, spreadsheet, presentation, and database management
2. To learn to analyze and solve real-world problems using office automation tools

List of Programs:

Word Processing

1. Create a word processing document consists two pages in a Book named "XX" and then do the following:
    a. Formatting Text, Alignment and Font Style using Word Art
    b. Perform Find and Replace
    c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages
    d. Display lists using bullet and number
2. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
3. Create a Newsletter Article (using Columns, Drop cap)

Spread Sheet

4. Create a spreadsheet consists of Student details and then do the following:
    a. Calculate student wise total and subject wise total
    b. Find the Maximum and Minimum marks of the subject
    c. Grade is calculated as
        vi. If %>=90, then grade A
        vii. If %>=80 and <90, then grade B
        viii. If %>=70 and <80, then grade C
        ix. If %>=60 and <70, then grade D
        x. If %<60, then grade F
5. Create a spreadsheet having Employee details to calculate Net Pay and Gross Pay

Presentation

6. Create a presentation showing your various activities of the department a Perform slide translation and Setting background designs
7. Create a presentation showing various aspect of your college and perform custom animation and import sound.

Database:

8. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to findtotal and average and check data entered.
9. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation toretrieve data.

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall and understand various options of office application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Evaluated and compare options of different Microsoft office applications

CO5: Build a presentations, advertisements, reports for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	3	3	3	9	9	9	**45**
Total	**45**	**15**	**15**	**15**	**45**	**45**	**45**	**225**

Low-1 Medium-3 High-9

MD II- Web Designing Lab

(For Students Admitted from 2025 -26)

Semester: IV **Hours/week: 3**

Subject Code: JBMD41ITP/ JBMD41CSP/ JBMD41CPP/ JBMD41ICP/ JBMD41ADP **Credit: 2**

Course Objectives:

1.To analyze a web page and identify its elements and attributes

2.To build dynamic web pages by using script languages

List of Programs:

HTML

1. Create a HTML page for displaying the personal information by using various tags such as backgroundcolor, heading tag, font tag
2. Create a HTML page, which includes images and audio for any application.
3. Create a HTML page for displaying the Tender notice which is given to you
4. To create a Time Table of your class using HTML
5. Creation of Lists in HTML
6. Design a dictionary using frames. The words are displayed in one frame and when you click the word,the meaning will be displayed on the other frame
7. Design webpage for your company product advertisement using frames

VBScript

8. Develop a VBScript program to generate random number
9. Develop a VBScript program to check whether the given number is odd or even
10. Develop a VBScript program to find the largest of three given integers
11. Develop a VBScript program to sort the numbers in ascending order

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Understand the basics of HTML and Scripting Language
CO2: Implement webpages using basic tags
CO3: Examine the use of tables in webpages
CO4: Develop a web pages with frames
CO5: Design interactive web pages using VBScript

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**15**	**45**	**15**	**45**	**45**	**45**	**255**

Low-1 Medium-3 High-9

B Com with Computer Applications

Three Years Regular Programme
(For Students Admitted From 2025 – 2026)

Program Specific Outcomes: (PSOs)

On completion of this programme, student will be able to gain

PSO1: Disciplinary Knowledge in the concepts of commerce and its application.
PSO2: Effective Communication skills to lead the group and organization in the attainment of overall objective
PSO3: Research Skills and Critical Thinking to identify, understand, analyse and assess the business problems and to suggest solutions
PSO4: Moral, Ethical Awareness/ Reasoning to run the business with Corporate Social Responsibility
PSO5: Professional skills to be placed in ever changing challenging situations.
PSO6: Entrepreneurial Skills to explore, innovate, plan, execute, start and run business as job providers
PSO7: Life long Learning Skills to be self-directed for independent thinking and action to tackle day today problems.

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following change

Core Papers

- Principles of Information Technology course has been removed, Computer Fundamentals and Programming in C course has been introduced
- The Ability Enhancement Compulsory Course "Data Base Management System" has been transferred into a Core course.
- Digital Marketing course has been introduced.

- The core course "PHP" has been introduced as a special course, which includes theory and lab experiments.

Skill Enhancement Course

- The Ability Enhancement Compulsory Course "DBMS Lab" has been transferred into a Skill Enhancement Course.
- The Ability Enhancement Compulsory Course "Programming in Java Lab" has been transferred into a Skill Enhancement Course.
- "Designing Lab I" and "Graphics and Animation Lab" have been moved from the V semester to the VI semester and vice versa.
- The Skill Enhancement Course "Designing Lab II " has been removed.

PROGRAMME STRUCTURE - PROGRAMME CODE: UCC

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@SD| ENT| EMP	$ REG| NAT| GLO	CIA	ESE	Total Marks
I	I	JBLT11/ JBLA11/ JBLHB11/ JBLHA11	Language I	Tamil I/ Arabic I/ Hindi I a (or) b	5	3			25	75	100
	II	JBLEB12/ JBLEA12	Language II	English I a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCCC11	Core I	Financial Accounting - I	6	6	SD |EMP	REG| NAT |GLO	25	75	100
		JBCCC12	**Core II**	**Computer Fundamentals and Programming in C**	**6**	**6**	**SD**	**REG/ NAT/ GLO**	**25**	**75**	**100**
		JBCCA13P	**AECC I**	**Programming in C Lab**	**4**	**2**	**SD**	**REG/ NAT/ GLO**	**25**	**75**	**100**
	IV	**JBCCS14P**	**SEC I**	**PC Package Lab**	**2**	**1**	**SD|EM P|ENT**	**REG/ NAT/ GLO**	**-**	**50**	**50**
				Library/Browsing	1	-			-	-	-
				Games	1	-			-	-	-
				Total	**30**	**21**			**125**	**425**	**550**
	I	JBLT21/ JBLA21/ JBLHB21/ JBLHA21	Language I	Tamil II/ Arabic II/ Hindi II a (or) b	5	3			25	75	100
	II	JBLEB22/ JBLEA22	Language II	English II a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100

II	III	JBCCC21	Core III	Financial Accounting – II	5	5	SD/ EMP	REG| NAT |GLO	25	75	100
		JBCCC22	**Core IV**	**Database Management System**	**5**	**5**	**SD/E MP**	**REG/ NAT/ GLO**	**25**	**75**	**100**
		JBCCA23	AECC II	Business Statistics	4	3	SD/ EMP	REG/ NAT/ GLO	25	75	100
	IV	**JBCCS24P**	**SEC II**	**DBMS Lab**	**2**	**1**	**SD/E MP**	**REG/ NAT/ GLO**	**-**	**50**	**50**
		JBUI2V	CVAC I	Understanding India	2	2	EMP	REG/ NAT	-	50	50
				Library/Browsing	1						
				Remedial/Games	1						
	V	JBCCX2/ JBCCX2O	Extra Credit I	Business Communication / Online Course*	-	2	SD/ EMP	REG| NAT |GLO	-	100	100
				Total	**30**	**22+2**			**125**	**475+ 100**	**600+ 100**
III	I	JBLT31/ JBLA31/ JBLHB31/ JBLHA31	Language I	Tamil III/ Arabic III/ Hindi III a (or) b	5	3			25	75	100
	II	JBLEB32/ JBLEA32	Language II	English III a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	**JBCCC31**	**Core V**	**Digital Marketing**	**4**	**3**	SD/ EMP	REG| NAT |GLO	**25**	**75**	**100**
		JBCCC32	Core VI	Partnership Accounting	4	4	SD/ EMP	REG| NAT |GLO	25	75	100
		JBCCA33P	**AECC III**	**Web Designing Lab**	**4**	**3**	**SD**	**REG/ NAT/ GLO**	**25**	**75**	**100**
	IV	**JBCCS34P**	**SEC III**	**Business Analytics Lab**	**2**	**1**	**SD**	**REG/ NAT/ GLO**	**-**	**50**	**50**
		JBMD31CC	MD I	Logical Reasoning	2	2	SD/ EMP	REG| NAT |GLO	-	50	50

		JBES3V	CVAC II	Environmental Science for Sustainable Development	2	2	EMP	REG| NAT |GLO	-	50	50
		JBXTN3	Extension	NSS/ CSS	2	2			100	-	100
	V	JBCCX3/ JBCCX3O	Extra Credit II	Principles of Marketing / Online Certificate Course*	-	2	SD |ENT |EMP	REG| NAT |GLO	-	100	100
				Total	**30**	**23+2**			**225**	**525+ 100**	**750+ 100**
IV	I	JBLT41/ JBLA41/ JBLHB41/ JBLHA41	Language I	Tamil IV /Arabic IV / Hindi IV a (or) b	5	3			25	75	100
	II	JBLEB42/ JBLEA42	Language II	English IV a (or) b	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
	III	JBCCC41	Core VII	Banking Law and Practice • Internship/ Online Internship*	4	4	SD |ENT |EMP	REG| NAT |GLO	25	75	100
		JBCCC42	Core VIII	Management Accounting	5	5	SD |EMP	REG| NAT |GLO	25	75	100
		JBCCA43	**AEC C IV**	**Programming in Java**	**4**	**4**	**SD**	**REG/ NAT/ GLO**	**25**	**75**	**100**
	IV	JBMD41CC	MD II	Corporate Compliance Management	3	2	SD |EMP	REG| NAT |GLO	-	50	50
		JBCCS44P	**SEC IV**	**Programming in Java Lab**	**2**	**1**	**SD**	**REG/ NAT/ GLO**	**-**	**50**	**50**
		JBDT4V	CVAC III	Digital and Technology Solution	2	2	SD	REG/ NAT/ GLO	-	50	50
	V	JBCCX4/ JBCCX4O	Extra Credit III	Business Environment /Online Certificate Course*	-	2	SD |EMP	REG| NAT |GLO	-	100	100
				Total	**30**	**24+2**			**125**	**525 + 100**	**650+ 100**

V	III	JBCCC51	Core IX	Income Tax Theory, Law and Practice – I	6	5	SD |EMP	REG| NAT |GLO	25	75	100
		JBCCC52	Core X	Corporate Accounting	6	5	SD |EMP	REG| NAT |GLO	25	75	100
		JBCCC53	**Core XI**	**PHP**	**6 (4+2)**	**5**	**SD|EMP**	**REG/ NAT/ GLO**	**25**	**75**	**100**
	IV	JBMD51CCA/ JBMD51CCB	MD III	Practical Auditing*/ Goods and Service Tax	4	4	SD |EMP	REG| NAT |GLO	25	75	100
		JBMD52CCP	**MD IV**	**# UI/UX Design lab***	**4**	**4**	**SD**	**REG/ NAT/ GLO**	**25**	**75**	**100**
		JBCCS54P	**SEC V**	**Designing Lab I**	**2**	**1**	**SD**	**REG/ NAT/ GLO**	**-**	**50**	**50**
		JBHW5V	CVAC IV	Health and Wellness	2	2	|EMP	REG| NAT |GLO	-	50	50
	V	JBESX5	Extra Credit IV	Employability Skills	-	2	SD |EMP	REG| NAT |GLO	100	-	100
				Total	**30**	**26+2**			**150 + 100**	**550**	**700 + 100**
	III	JBCCC61	Core XII	Accounting for Public Utility	6	6	SD |EMP	REG| NAT |GLO	25	75	100
		JBCCC62	Core XIII	Income Tax Theory, Law and Practice – II	6	5	SD |EMP	REG| NAT |GLO	25	75	100
		JBCCC63P	Core XIV	Accounting Package for Business (Tally Prime) * Integrated Course- Front Accounting	5	4	SD |EMP	REG| NAT |GLO	25	75	100
		JBCCC64PW	Core XV	Project	6	4	SD |EMP	REG| NAT |GLO	25	75	100
VI	IV	JBMD61CCA/ JBMD61CCB	MD V	Principles of Management / Business Research Methods	4	4	SD |ENT |EMP	REG| NAT |GLO	25	75	100
		JBCCS65P	**SEC VI**	**Graphics and Animation Lab**	**2**	**1**	**SD**	**REG/ NAT/ GLO**	**-**	**50**	**50**

V	JBCCX6/ JBCCX6O	Extra Credit V	Total Quality Management/ Online Certificate Course*	-	2	SD |EMP	REG| NAT |GLO	-	100	100
			Library/ Browsing	1	-			-	-	
			Total	**30**	**24+2**			**125**	**425 + 100**	**550+ 100**
			GRAND TOTAL	**180**	**140 + 10**			**850 + 100**	**2850 + 400**	**3700 + 500**

* For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX,
Spoken Tutorial, NPTEL or Coursera etc.
For internship course, refer www.internshala.com or any online internship course.
o For online course integration, syllabus will be taken from spoken tutorial
@SD- Skill Development ENT-Entrepreneurship EMP-Employability
$ REG-Regional NAT-National GLO-Global

AECC-Ability Enhancement Compulsory Course
SEC-Skill Enhancement Course
DSE-Discipline Specific Elective
OEC-Open Elective Course

Core II – Computer Fundamentals and Programming in C

(For Students Admitted From 2025 – 26)

Semester: I **Hours/Week: 6**
Subject Code: JBCCC12 **Credit: 6**

Course Objectives:

1. To learn the basics of computer systems, including hardware, software, and memory, and the fundamentals of C programming.
2. To build practical C programming skills in control structures, functions, arrays, pointers, file handling, and memory management.

Unit I **(18 hours)**

Introduction to computers: characteristics and limitations of computer, Block diagram of computer, types of computers, uses of computers, computer generations. **Input and output devices:** Keyboard and mouse, inputting data in other ways, Types of Software: system software, Application software, commercial, open source, domain and free ware software, Memories: primary, secondary and cache memory. Computer Networks and the Internet.

Unit II **(18 hours)**

Introduction to C: Introduction – Structure of C Program – Writing the first C Program – File used in C Program – Compiling and Executing C Programs – Using Comments – Keywords – Identifiers –

Basic Data Types in C – Variables – Constants – I/O Statements in C- Operators in C- Programming Examples

Unit III **(18 hours)**

Decision Control and Looping Statements: Introduction to Decision Control Statements – Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement. **Functions:** Introduction – using functions – Function declaration/ prototype – Function definition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive function

Unit IV **(18 hours)**

Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array– Operations on Array – Introduction String and Character functions. **Pointers:** Understanding Computer Memory – Introduction to Pointers – declaring Pointer Variables

Unit V **(18 hours)**

Structure, Union, and Enumerated Data Types: Introduction – Structures and Functions - Unions – Enumerated Data Types Files: Introduction to Files – Using Files in C – Reading Data from Files – Writing Data from Files – Detecting the End-of-file – Close a file – Random Access Files – Binary Files.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize the fundamental concepts of computer systems, including types of computers, software, and memory types.

CO2: Identify the basic structure of a C program, keywords and basic data types.

CO3: Illustrate an understanding of control structures, loops, functions and arrays in C programming.

CO4: Evaluate the efficiency of different c programming constructs such as loops, functions and arrays for solving specific tasks.

CO5: Apply C programming concepts to write and execute basic programs.

Text Book:

1. Reema Thareia, *Computer Fundamentals and Programming in C***,** Oxford University Third Edition, 2021.

Reference Books:

1. Sharma A.K, *Computer Fundamentals and Programming in C***,** Universities Press, Second Edition, 2018.
2. Balagurusamy E, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company, Ninth Edition, 2024.

Journal:

1. Journal of Information and Communication Technology (Scopus)

E-Resources:

1. https://onlinecourses.swayam2.ac.in/nou25_cs01/preview

2. https://onlinecourses.nptel.ac.in/noc19_cs42/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	9	3	9	**37**
CO2	9	3	3	3	3	9	9	**39**
CO3	9	1	9	9	3	3	9	**43**
CO4	3	1	3	9	9	3	3	**31**
CO5	9	1	9	3	3	9	9	**43**
Total	**39**	**9**	**25**	**27**	**27**	**27**	**39**	**193**

Low-1 Medium-3 High-9

AECC I – Programming in C Lab

(For Students Admitted From 2024-25)

Semester: I **Hours/week: 4**
Subject Code: JBCCA13P **Credit: 2**

Course Objectives:

1. To introduce the field of programming using C language
2. To enhance the analyzing and problem solving skills and use the same for writing programs in C

List of Programs:

Formula Substitution

1. Develop a C program to find largest number among three numbers
2. Develop a C program to find the sum of the digits of a given Integer.
3. Develop a C program to generate the Fibonacci series
4. Develop a C Program to find the area of shapes using switch case
5. Develop a C program to check whether the given number is palindrome or not

Arrays

6. Develop a C program to check whether the element is present in the given list or not
7. Develop a C program to sort the numbers in ascending order

Conversion

8. Develop a C program to convert the case of given string from upper case to lower case

Function

9. Develop a C program to find the factorial of a given number using recursive and non- recursive function

Structure

10. Develop a C program to prepare student mark list using structure

Note: Questions for internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the control structures and loops
CO2: Apply the concepts of functions
CO3: Analyze the concepts of Structures and arrays
CO4: Evaluate string handling functions
CO5: Create programs with arrays, structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**37**
CO2	9	3	3	1	9	9	9	**46**
CO3	9	3	3	1	9	9	9	**37**
CO4	9	3	3	1	9	9	9	**37**
CO5	9	3	3	1	9	9	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**185**

Low-**1** Medium-3 High-9

SEC I – PC Package Lab

(For Students Admitted From 2025 – 26)

Semester: I **Hours/ week: 2**
Subject Code: JBCCS14P **Credit: 1**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

List of Programs:

Word Processing

1. Create a word processing document consists of two pages in a Book named "XX" andthen do the following:
   a) Formatting Text, Alignment and Font Style
   b) Perform Find and Replace
   c) Add Header and Footer option to specify name of the Book Chapter Heading and page number in all pages
2. Create a word processing document having details of our college courses usingbulleted and numbered lists. Type the title using Word
3. Design an invitation to invite seniors for a farewell party and use Font Setting/Page Borders/Word Art/Clip Art/Symbols in it
4. Create a Newsletter Article (using Columns, Drop cap)
5. Create your class time table (using Table)
6. Use Mail Merge to create many letters to send it to more recipients
7. Create your resume in a word document

Spread Sheet

1. Create a Spreadsheet consists of Student details and then do the following:
    a. Calculate student wise total and subject wise total.
    b. Find maximum and minimum marks of the subject.
    c. Grade is calculated as
        i. If % of marks >=90, then grade A
        ii. If % >=80 and <90, then grade B
        iii. If % >=70 and <80, then grade C
        iv. If % >=60 and <70, then grade D
        v. If % < 60, then grade F
2. Create a Spreadsheet having employee details suitably and then do following.
    a. Use functions to calculate Net Pay and Gross Pay.
    b. Perform conditional formatting and validation.
    c. Create a chart for these details

Presentation

1. Create a presentation showing various activities of your department and applySlide transition and background designs

2. Create a presentation showing various activities of your college. Apply animations andinsert Audio in this presentation

Database

1. Create a Student Database having Name, Reg no, Tamil, English, Maths, Total, andAverage. Calculate Total and Average and apply validation.
2. Create an Inventory database having Item Name, Item no, Quantity and Price.Perform query operation to retrieve data.

Note: Questions for internal and external examination will be based on concepts learnt.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall various options of Office Applications
CO2: Identify the icons to work with document, presentation, spreadsheet and database
CO3: Simplify the process of creating reports to solve the problems of manual report handling
CO4: Compare the options of different Office Applications to use appropriately
CO5: Create Presentations, Advertisements, Reports etc for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

Core IV – Database Management System

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 5**
Subject Code: JBCCC22 **Credit: 5**
Course Objectives:

1. To understand the basic concepts of database systems, relational model, database design principles and SQL queries
2. To understand the design and implementation of a database security, Transaction concepts and advanced topics in DBMS

Unit I **(15 hours)**

Introduction to Database Systems: Introduction - Database Management Systems (DBMS) - An Overview of Database Management - Brief introduction to SQL - Embedded SQL - Dynamic SQL. **The Relational Model:** Relational Databases Primer - Relational Database Characteristics -Relational Algebra.

Unit II **(15 hours)**

Database Design: Design Considerations - Functional Dependency - Normalization and Normal Forms Entity/Relationship (E/R) Modeling - **Transaction Processing and Management:** Transaction –Recovery - Transaction Models - Two-Phase Commit - Locking Deadlocks.

Unit III **(15 hours)**

Database Security: Threats and Risks -Cryptography - Digital Signature - Database Control - Users and Database Privileges - Types of Privileges - **Distributed Databases:** Distributed Database Concepts-Distributed Database Architectures - Advantages of Distributed Databases.

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Unit IV **(15 hours)**

Indexing and hashing: Hash organization - Bit mapped Indexing- Static Hashing -Dynamic Hashing - Comparison of ordered indexing & Hashing - **Transactions:** Transaction concept -Transaction state - Implementation of Atomicity and Durability – Recoverability.

Unit V **(15 hours)**

Object Technology and DBMS: An Introduction to Object Technology - Abstraction -Encapsulation - Inheritance - Object Technology and RDBMS.

Course Outcomes:

After successful completion of this course, students will be able to:

CO1: Explore about DBMS concepts such as database designs, database modeling, security indexing and Hashing and Advanced DBMS
CO2: Extend about database design and security
CO3: Distinguish the Relational model, Indexing and Hashing
CO4: Apply Structured query language (SQL), Transactions and Constraints
CO5: Evaluate the functions of ODBMS and Advanced DBMS

Text Book:

1. Atul Kahate, *Introduction to Database Management Systems*, Pearson Education, Tenth Impression, 2012.

Reference Books:

1. Abraham Silberschatz, Henry Forth, S.Sudarshan, *Database System Concepts*, Tata McGrawHill, Fifth Edition, 2006.
2. C J Date, *An Introduction to Database System***,** Addison- Wesley Publishing Company, Third Edition, 1998.

Journal:

1. ICTACT Journal on Communication Technology (UGC)

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

SEC II – DBMS Lab

(For Students Admitted From 2025 –26)

Semester: II **Hours/week: 2**
Subject Code: JBCCS24P **Credit: 2**

Course Objectives:

1. To get practical knowledge on designing and creating Tables
2. To understand various queries such as relational constraints, joins, set operations, aggregate functions and views

SQL Programs
DDL

3. Create an address table with fields name , doorno , street & city
   - Describe its structure
   - Alter the table to include pincode

- Alter the table to modify street column
- Drop the table

DML

4. Create a student table with regno, name, age and dept.
   - Insert records
   - Delete the students with age above 20
   - Truncate and drop the table

Functions

5. Create an employee table with fields eno , ename , sex ,age & years of experience
   - Find out the no. of female employees
   - Find out the employees with age ranging between 30 and 35
   - List out the employees who are working more than 5 years
6. Create a library file with fields accno, title, author, cost & no of copies
   - Arrange the books according to accno
   - Find out the total no. of books available in the library
   - Find out the book of minimum cost
7. Create a player table with fields name, sports(cricket,hockey,etc.),age & country
   - Find out the eldest and youngest player
   - Group players according to sports
   - List out the Indian players
8. Write the SQL queries to illustrate all number functions
9. Write the SQL queries to illustrate date functions
10. Write the SQL queries to illustrate all string functions
11. Create an item table with field's item no, item name, quantity & price and insert records. Illustrate the comparison operators (between, like, in & isnull)
12. Create a table with the fields client no , client name & phone no Illustrate the set operators Union, union all, minus & intersect
13. Create a student table with fields' regno, name, English, Tamil, Maths and Total & insert records without total values.
    - Update Total in the table
    - Find the student who got first mark in Maths
    - List out the students whose name starts with "S"
14. Create an employee table with fields ecode, ename, age & salary and create a department table withfields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Note: Questions for the internal and external examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Build DDL, DML Commands
CO2: Make use of implementing constraints in tables
CO3: Apply to create block structure programming language
CO4: Create the concepts of functions
CO5: Develop the Real Time database

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	3	3	3	**27**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	1	3	3	3	9	3	**31**
CO4	9	1	3	3	*9*	3	9	**37**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**9**	**19**	**15**	**21**	**27**	**27**	**163**

Low-1 Medium-3 High-9

Core V - Digital Marketing

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 4**
Subject Code: JBCCC31 **Credit: 3**

Course Objectives:

1.To know the fundamental concepts associated with the digital marketing.
2.To understand the concepts of different strategies, search engine, and social media channels utilized in the different marketing systems.

Unit I **(12 hours)**

Introduction to Digital Marketing: Introduction - Evolution of Digital Marketing from traditional to modern era- Role of Internet; Current trends - Drivers of the new marketing environment - Digital marketing strategy; P.O.E.M. framework - Digital marketing plan- Digital marketing models.

Unit II **(12 hours)**

Internet Marketing and Digital Marketing Mix: Internet Marketing - opportunities and challenges - Digital marketing framework - Impact of digital channels on IMC. **Search Engine Advertising:** Pay for Search Advertisements - Ad Placement - Display marketing: Types of Display Ads - Programmable Digital Marketing - YouTube marketing.

Unit III **(12 hours)**

Social Media Marketing: Understanding Social Media Marketing – Social Networking- Role of Influencer Marketing-Modes of Social Media Marketing- Tools & Plan - Facebook Marketing: - Business through Facebook Marketing, Facebook Marketing Tools - LinkedIn Marketing: - Introduction and Importance of LinkedIn Marketing, -Twitter Marketing: Introduction to Twitter Marketing, Mobile Advertising

Unit IV **(12 hours)**

Introduction to SEO: SEM - Web Analytics - Mobile Marketing - Trends in Digital Advertising - Introduction and need for SEO- How to use internet & search engines; search engine and its working pattern: SEO Tactics - Introduction to SEM Web Analytics: Google Analytics & Google AdWords

Unit V **(12 hours)**

Social Media Channels: Introduction - Key terms and concepts - Traditional media vs Social media - Social networking - Content creation - Tracking social media campaigns **Social Media Strategy:** Introduction - Key terms and concepts - Using social media to solve business challenges - Dealing with opportunities and threats

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the practical factor to improve results in digital marketing.
CO2: Implement a structured digital marketing plan and budget.
CO3: Examine the operations of digital marketing, and track the progress of digital marketing.
CO4: Evaluate the functions of social media marketing, Internet marketing, and social media channels.
CO5: Design and Initialize implement process to conduct digital marketing campaigns.

Text Book:

1. Seema Gupta "Digital Marketing" Mc-Graw Hill 1st Edition – 2017

Reference Books:

1. Damian Ryan, Calvin Jones "Understanding Digital Marketing-Marketing Strategies For Engaging the Digital Generation" Kogan Page - Fourth Edition
2. Teresa Pineiro-Otero and Xabier Martinez-Rolan "Understanding Digital Marketing- Basics and Actions" Springer International Publishing – 2009

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://www.simplilearn.com/tutorials/digital-marketing-tutorial

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	3	3	9	**43**
CO2	9	9	3	3	9	9	9	**51**
CO3	9	3	9	1	9	9	9	**49**
CO4	9	9	3	3	9	1	9	**43**
CO5	9	3	3	1	9	3	9	**37**
Total	**45**	**33**	**27**	**9**	**39**	**25**	**45**	**223**

Low-1 Medium-3 High-9

AECC III – Web Designing Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 4**
Subject Code: JBCCA33P **Credit: 3**

Course Objectives:

1. To design web pages using HTML Elements
2. To make use of frames in web designing

List of Programs

1. Create a HTML page for displaying the personal information by using various tags such as background color, heading tag, font tag
2. Create a HTML page for displaying the Tender notice which is given to you
3. Create a Time Table of your class using HTML
4. Create a HTML page to advertise the opportunities for the job in a Company
5. Create a web page depicting the application form of our College
6. Create a HTML page for displaying your Curriculum vitae
7. Create a simple web page for a company which includes the following details: History,LOGO, Departments, and Sales reports of the company
8. Design a web page by using images,lists and links

Frames

9. To create a simple web site for our college which includes the following details: History ofthe college and courses offered for both UG and PG, Individual department Details, Fee particulars for the courses using frames
10. To create dictionary using frames. The words are displayed in one frame and when you click the word, the meaning will be displayed on the other frame

Note: Questions for the External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Illustrate the uses of various formatting tags
CO2: Identify the tags for creating forms
CO3: Simplify the process of designing a web page by including frames
CO4: Support web developers by designing effective web pages
CO5: Develop web pages for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	3	3	9	9	3	9	9	**45**
CO3	3	3	9	9	1	9	9	**43**
CO4	3	3	9	9	3	3	3	**33**
CO5	3	3	3	9	1	9	3	**31**
Total	**21**	**15**	**33**	**39**	**17**	**39**	**33**	**197**

Low-1 Medium -3 High-9

SEC III - Business Analytics Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 2**
Subject Code: JBCCS34P **Credit: 1**

Course Objectives:

1. To provide hands-on experience with tools and techniques used in business analytics.
2. To develop skills in data cleaning, transformation, visualization, and interpretation.
3. To build familiarity with statistical methods and their application to business problems.
4. To enable students to create dashboards and derive actionable insights from data.

List of Programs

1. Demonstrate how to enter and edit business insights in Excel.
2. Explain how to change the width of a column and wrap text in a cell.
3. Perform Logical Functions
4. Handling missing values, normalization, and outlier treatment
5. Display Pivot Tables for company insights
6. Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, and ROUND)
7. Perform statistical operations (Mean, Median, Mode and Standard deviation)
8. Creating summaries and interactive dashboards
9. Perform Linear and multiple regression using Excel tools

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the role of business analytics in decision-making
CO2: Apply descriptive statistical techniques using Excel for analyzing business data.
CO3: Perform inferential statistical tests (Z-test, T-test, ANOVA) to draw business conclusions.
CO4: Clean, preprocess, and transform raw data to make it suitable for analysis.
CO5: Build dashboards and visualize data using Excel and Power BI to derive actionable insights.

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium -3 High-9

AECC IV– Programming in Java

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 4**
Subject Code: JBCCA43 **Credit: 4**

Course Objectives:

1. To Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc
2. To Understand the fundamentals of object-oriented programming in Java, including defining Classes, objects, invoking methods etc. and exception handling mechanisms

Unit I **(12 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm –Basic concepts of oops – benefits of oops – applications of OOPs. Java Evolution: java features – java Versus C and C++ - java and internet – java and WWW – web browsers **Overview of Java Language:** simple java program - more of java – application with two classes –java program structure – java tokens – java statements-implementing a java program.

Unit II **(12 hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables- Scope of variables-symbolic constants- type casting- getting values of variables -standard default values- **Operators and Expressions**: Arithmetic operators-Relational operators- logical operators-assignment operators-increment and decrement operators-conditional operator-bitwise operator-special operators-arithmetic expressions-evaluation of expressions - precedence of arithmetic operators.

Unit III **(12 hours)**

Decision-making and Branching: if statement –switch - ? : Operator –Decision Making and Looping: while statement – do statement – for statement – jumps in loops - labelled loops. **Classes, Objects and Methods**: Introduction – defining a class, field declaration–methods declaration– creating objects – accessing class members – constructors – methods overloading – static members – nesting of methods – inheritance – overriding methods – final variables and methods – final classes – finalizer methods.

Unit IV **(12 hours)**

Arrays Strings and Vectors: one-dimensional array- creating an array –two-dimensional arrays. **Multithreaded Programming**: creating threads- extending the thread class-stopping and blocking a thread - life cycle of a thread – using thread methods - thread exceptions-thread priority – synchronization – implementing the runnable interface.

Unit V **(12 hours)**

Applet Programming: Introduction –how applets differ from applications –building applet code – applet life cycle – creating an executable applet –designing a web page - applet tag – adding applet to html file –running the applet – more about applet tags –passing parameters to Applets– aligning the display.

Course Outcomes:

After successful completion of this course, student will be able to:

CO1: Remember the importance of java with its data types, control statements and class fundamentals
CO2: Apply the concepts of inheritance, method overriding and implement packages and interfaces
CO3: Analyze the concept of exception handling and multi-threading
CO4: Evaluate string buffer handling functions
CO5: Create applet programming through awt controls, layout managers and menus

Text Book:

1. E. Balaguruswamy, *Programming with JAVA - A Primer,* McGraw Hill Professional, 2015.

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference***,** McGraw Hill Professional, 2017.
2. Robert Sedgewick & Kevin Wayne, *Introduction to Programming in Java*, Addison Wesley2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Brief Version Pearson Education 2017.

Journal:

1. Journal of ICT Research and Applications (Scopus)

E-Resources:

1. https://spokentutorial.org/tutorialsearch/?search_foss=Java&search_language=English
2. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**37**
CO2	9	3	3	1	9	9	9	**46**
CO3	9	3	3	1	9	9	9	**37**
CO4	9	3	3	1	9	9	9	**37**
CO5	9	3	3	1	9	9	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**185**

Low-1 Medium-3 High-9

SEC IV – Programming in Java Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 2**
Subject Code: JBCCS44P **Credit: 1**

Course Objectives:

1. To make the students to understand Programming language 'Java'
2. To enhance the students to develop inheritance and exception handling programs

List of Programs:

Formula Substitution

1. Develop a java program to find the factorial and binomial coefficient
2. Develop a java program to calculate mean, variance and standard deviation
3. Develop a java programs for Number conversions (Decimal to Binary, etc.)

Checking

4. Develop a java program for perfect number checking

Generation

5. Develop java programs for Number generation (prime, Fibonacci)

Array

6. Develop a java program to arrange numbers in order
7. Develop a java program to perform matrix addition and subtraction

String

8. Develop a java program for String manipulations (case conversion, reversing, etc.)

OOP Concepts

9. Develop a java program for implementing inheritance
10. Develop a java program for implementing exception handling
11. Develop a java program for implementing multithreading

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple mathematical problems, number checking and generation

CO2: Demonstrate the concepts of String Manipulation

CO3: Illustrate OOP in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	9	**39**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**33**	**27**	**33**	**45**	**33**	**45**	**261**

Low-1 Medium-3 High-9

Core XI – PHP

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 6 (4+2)**

Subject Code: JBCCC53 **Credit: 5**

Course Objectives:

1. To understand the uses of various PHP statements
2. To gain knowledge about arrays and user defined functions

Unit I **(12 Hours)**

Introducing PHP-History- Unique features-Basic development concepts-creating your first PHP Script-writing and running the script-understanding the script-handling script errors

Unit II **(12 Hours)**

Storing data in variables-assigning values of variables-destroying variables-inspecting variable contents-**understanding PHP's data types**-setting and checking variables data types-using constants –manipulating variables with operators.

Unit III **(12 Hours)**

Controlling program flow-writing simple conditional statements-the if statement-the if-else statement-writing more complex conditional statements-the if - elseif statement-the switch-case statement-combining conditional statements-repeating actions with loops-working with string and numeric functions.

Unit IV **(12 Hours)**

Working with arrays-storing data in arrays-processing arrays with loops and iterators-using arrays with forms-working with array functions-working with date and times-creating User-defined functions-creating classes-using advanced OOP concepts.

Unit V **(12 Hours)**

Working with files and directories-reading files-writing files-processing directories-performing other file and directory operations-working with databases and SQL-**introducing databases and SQL**-using PHP's MySQLi extension-adding or modifying data-handling errors

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the uses of various PHP statements
CO2: Solve the problems of website users by using PHP
CO3: Associate web developers to generate dynamic content
CO4: Apply data base connectivity in developing web applications
CO5: Create websites for enterprises, educational institutions etc.

Text Book:

1. Vikram Vaswani, **PHP: A Beginner's Guide**, Tata McGraw-Hill, New Delhi, Second Edition, 2009

Reference Books:

1.Steven Holzner, **PHP: The Complete Reference**, Tata McGraw-Hill, New Delhi, Second Edition, 2007

2. Larry Ullman, **PHP Advanced and Object-Oriented Programming: Visual QuickPro Guide**, *Pearson Education, New Delhi, Third Edition, 2013*

Journal:

1. Journal of ICT Research and Applications (Scopus

E - Resources:

1. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	9	9	3	9	9	3	**51**
CO3	9	1	9	9	9	9	9	**55**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	1	9	9	9	9	9	**55**
Total	**45**	**15**	**39**	**27**	**45**	**45**	**39**	**255**

Low-1 Medium-3 High-9

Core XI – PHP Lab

(For Students Admitted from 2025-26)

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and meta characters
2. To develop PHP programs that use various PHP library functions and that manipulate files and directories

List of Programs

1. Develop a PHP program to print Sum of digits.
2. Develop a PHP program to print factorial of a number.
3. Develop a PHP program to display count, from 10 to 20 using loop.
4. Develop a PHP program to print prime number.
5. Develop a PHP program to check Armstrong number.
6. Develop a PHP program to check Palindrome number.
7. Develop a PHP program to swap two numbers with and without using third variable.
8. Develop a PHP program to reverse the number with strrev ().
9. Develop a PHP program to show day of the week (for eg: Monday) based on numbers using Switch/casestatements
10. Develop a PHP program to print alphabet triangle
11. Develop a PHP program to check student grade based on the marks using if-else statement
12. Develop a PHP program Using nested for loop that creates a chess board

Note: Questions for the internal and external examinations will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Describe the fundamentals of PHP Language in trivial problem solving
CO2: Determine solution to a problem and apply control structures
CO3: Simplify the use of Strings and String Handling functions
CO4: Justify real time applications using PHP language feat
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	3	9	3	3	**33**
CO3	9	3	1	3	9	9	3	**37**
CO4	9	3	3	3	9	9	3	**39**
CO5	9	3	3	3	9	9	3	**39**
Total	**45**	**15**	**11**	**13**	**45**	**31**	**13**	**173**

Low-1 Medium-3 High-9

MD IV – UI/ UX Design Lab

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 4**
Subject Code: JBMD52CCP **Credit: 4**

Course Objectives:
1. To understand the basic concepts of FIGMA
2. To gain knowledge about various tools of FIGMA

List of Programs:
FIGMA
1. Create an Animated Text
2. Create an Animated Image
3. Create a bouncing ball using interactive component
4. Design ON/OFF toggle
5. Create a responsive grid system for web
6. Create a poster
7. Create an animation notification
8. Create an animated card grid
9. Design a glass morphism
10. Design an Appreciation certificate.
11. Design a Sign Up page
12. Create a News page design

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Describe the concepts of tools and techniques in Figma.
CO2: Apply the concept of creation and modification of objects.
CO3: Simplify the process of designing, editing and animating.
CO4: Create a website screen and any form of certificate.
CO5: Construct and design an application.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	9	9	9	**57**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**45**	**45**	**45**	**45**	**45**	**285**

Low-1 Medium-3 High-9

SEC V – Designing Lab I

(For Students Admitted from 2025-26)

Semester: V **Hours/week: 2**
Subject Code: JBCCS54P **Credit: 1**

Course Objectives:
1. To understand the basic concepts of GIMP
2. To gain knowledge about various tools of GIMP

List of Program:
1. Design a Business card
2. Create a logo
3. Convert an image into pencil drawing
4. Design a scenery using various brushes
5. Design a greeting card
6. Create clipping mask- place an image inside text
7. Create passport size photo
8. Animate a still photo
9. Create ashadow effect for an objkect
10. Create a mirror effect for an image
11. Apply the following tools in an image
    a.smudge b.Blur Sharpen c.Dodge Burn
12. Create a mosaic photo collage

Note: Questions for the internal and external Examinations shall be based on the concepts learnt

Course Outcomes:
After completion of this course, student will be able to
CO1: Recognize the uses of various tools and effects in GIMP
CO2: Identify the steps to start designing with images
CO3: Simplify the process of desingning, editing, masking to solve the difficulties of designs
CO4: Support studios to create passport size photo
CO5: Design Visiting card, ID card, Birthday card, logo etc

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

SEC VI – Graphics and Animation Lab

(For Students Admitted from 2025-26)

Semester: VI **Hours/week: 2**
Subject Code: JBCCS65P **Credit: 1**

Course Objectives:
1. To understand the basic concepts of animation
2. To gain knowledge about creating animated pictures using Blender

List of Program:
1. Create a coffee cup
2. Create a dinner table fork
3. Create a cup with wooden texture
4. Create a wooden table
5. Model a leather couch
6. Create a teddy bear
7. Create a photo realistic ring
8. Create a simple character
9. Create a stylized number animation
10. Animate a bouncing ball
11. Animate a shape of an object into another shape

Note: Questions for the internal and external examinations will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Recognize the uses of various tools in macromedia flash
CO2: Predict the steps that are needed to create animation
CO3: Critically analyze the required options to create animation with respect to its nature
CO4: Evaluate the use of 'Motion tween' in the given concept
CO5: Create animated scenes, animated logos, animated cartoon characters etc

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	9	3	**31**
CO2	9	1	9	3	3	9	3	**37**
CO3	9	1	9	3	9	9	9	**49**
CO4	9	1	3	3	9	9	9	**43**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**13**	**33**	**21**	**33**	**45**	**33**	**223**

Low-1 Medium-3 High-9

Skill Enhancement Course (SEC) for B Com, B Com PA & BBA

(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@SD| ENT| EMP	$GLO	CIA	ESE	Total Marks
IV	IV	JBCOS44P/ JBPAS44P/ JBBAS44P	SEC IV	Designing Lab	2	1	SD| ENT	GLO	-	50	50
V		JBCOS54P/ JBPAS54P/ JBBAS54P	SEC V	Business Analytics Lab - I			SD| ENT	GLO	-	50	50
VI		JBCOS65P/ JBPAS65P/ JBBAS65P	SEC VI	Business Analytics Lab - II			ENT| EMP	GLO	-	50	50

SEC IV - Designing Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 2**
Subject Code: JBCOS44P/ JBPAS44P/ JBBAS44P **Credit: 1**

Course Objectives:
1. To understand the basic functions and interface of Canva.

2. To learn how to create a new design using templates.

CANVA

1. Design a professional business card including name, designation, contact details, and use appropriate design elements to create a visually appealing layout.
2. Create a Greeting card for a special occasion (eg: Birthday or Anniversary) using canva Including event details like time, date, and location on your invitation, suitable templates, fonts, and graphics to enhance the appeal.
3. Design a professional logo using canva for a business or organization. Including icons, typography and colors, that are appropriate for the brand.
4. Create a basic design using canva for a social media post (Marketing or Awareness)
5. Using canva, create a visually appealing resume suitable for a job in your field (Eg: Software Development, Marketing, and Teaching). Use appropriate fonts, Icons, and formatting. Export your resume as a PDF.
6. Create a presentation using canva on a topic of cyber security. Include headings, Bullet points, Visuals, and Transitions. Maintain a consistent theme and font style.
7. Create a new video project in Canva. Add **multiple slides or scenes** to build your video. Then, **insert background music or record a voiceover** to enhance your content.
8. Using canva, Design a certificates of participantion template. Include Fields for name, Event Title, date, and Signature Placeholders.

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the purpose and importance of visual design in communication.
CO2: Demonstrate the ability to navigate Canvas's interface and tools.
CO3: Create professional-looking designs using Canva templates.
CO4: Design personalized business cards, greeting cards, and invitations.
CO5: Develop digital resumes using Canva layouts and formatting tools.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

SEC V - Business Analytics Lab-I

(For Students Admitted from 2023-24)

Semester: V **Hours/week: 2**
Subject Code: JBCOS54P/ JBPAS54P/ JBBAS54P **Credit: 1**

Course Objectives:

1. To provide hands-on experience with tools and techniques used in business analytics.
2. To develop skills in data cleaning, transformation, visualization, and interpretation.

List of Programs

1. Demonstrate how to enter and edit business insights in Excel.
2. Explain how to change the width of a column and wrap text in a cell.
3. Perform Logical Functions
4. Handling missing values, normalization, and outlier treatment
5. Display Pivot Tables for company insights
6. Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, and ROUND)
7. Perform statistical operations (Mean, Median, Mode and Standard deviation)
8. Creating summaries and interactive dashboards
9. Perform Linear and multiple regression using Excel tools

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Understand the role of business analytics in decision-making
CO2: Apply descriptive statistical techniques using Excel for analyzing business data.
CO3: Perform inferential statistical tests (Z-test, T-test, ANOVA) to draw business conclusions.
CO4: Clean, preprocess, and transform raw data to make it suitable for analysis.
CO5: Build dashboards and visualize data using Excel and Power BI to derive actionable insights.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

SEC VI - Business Analytics Lab-II

(For Students Admitted from 2023-24)

Semester: VI **Hours/week: 2**

Subject Code: JBCOS65P/ JBPAS65P/ JBBAS65P **Credit: 1**

Course Objectives:

1. To understand advanced analytics techniques and their applications in solving business problems.
2. To gain hands-on experience with advanced data analysis and visualization tools.

List of Programs

1. Getting started with powerBi for Customer data
2. Implement Real-world business problem analysis using Excel + Power BI
3. Predict the Customer Credit Risk for Credit card data-set using Linear Regression
4. Apply HR Analytics to make a prediction of the demand for hourly-employees for the following month or for the next few years
5. Apply analytics for forecasting and inventory planning for a large retailer.
6. Perform predictive analytics for customers behaviour in marketing and sales

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Apply advanced statistical and data processing techniques using Excel or Python/R.
CO2: Perform predictive modeling using regression, classification, and time series forecasting methods.
CO3: Create dynamic dashboards using Power BI for real-time business monitoring.
CO4: Analyze and interpret business scenarios using case-based datasets.
CO5: Present analytical insights effectively through storytelling, visualization,

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

Ability Enhancement Compulsory Course (AECC) & Skill Enhancement Course (SEC) for BSc Mathematics

(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours/ Week	Credit	@SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks

III	III	JBMXA33P	AECC III	Programming in C lab	4	3	EMP	GLO	25	75	100
IV	III	JBMXA43P	AECC IV	Programming in Java Lab	4	3	ENT| EMP	GLO	25	75	100
IV	IV	JBMXS54P	SEC V	R Tool Lab	2	1	ENT| EMP	GLO	-	50	50

AECC III – Programming in C Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 4**
Subject Code: JBMXA33P **Credit: 3**

Course Objectives:

1. To implement formula substitution using C language
2. To gain knowledge in implementing numerical methods using C language

List of Programs:

Formula substitution

1. Develop a C Program to check whether the given number is odd or even
2. Develop a C Program to find sum of the digits
3. Develop a C Program to find whether a given number is Armstrong or not
4. Develop a C Program to find the area of various shapes using switch case

Array

5. Develop a C Program to Check whether the element is present in the given list or not

Functions & Structures

6. Develop a C Program to find the factorial of a given number using recursion function
7. Develop a C Program to prepare student mark list using structure

String Manipulation

8. Develop a C Program to count the vowels in the given string

Pointers

9. Develop a C Program to find average of two numbers using pointers

Numerical methods

10. Develop a C program to illustrate the use of Taylor Series method
11. Develop a C program to implement Euler's method
12. Develop a C program to implement Newton Raphson method
13. Develop a C program to implement bisection method
14. Develop a C program to implement Simpson's 1/3 rule
15. Develop a C program to implement Runge Kutta Method
16. Develop a C program to implement Fixed point iteration Method

Note: - Questions for internal and external examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Illustrate the different concepts of C language

CO2: Identify the steps to implement functions, structures and pointers in C language

CO3: Simplify the process of solving differential equations using numerical methods

CO4: Discover new logic to solve the critical problems

CO5: Design algorithm with simple problems and control structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	1	9	1	9	9	9	**47**
CO3	9	3	9	3	3	9	9	**45**
CO4	9	9	9	3	3	9	9	**51**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**25**	**45**	**13**	**33**	**45**	**45**	**251**

Low-1 Medium-3 High-9

AECC IV – Programming in Java Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 4**

Subject Code: JBMXA43P **Credit: 3**

Course Objectives:

1. To develop programming skills in Java, applying fundamental concepts, data structures, and object-oriented programming principles to solve problems.
2. To design, implement, and test Java programs to perform various tasks, including numerical computations, data sorting and searching, string manipulation, and graphical user interface (GUI) development.

List of Programs:

Formula Substitution

1. Develop a program to find the factorial and binomial coefficient value
2. Develop a program to calculate mean, variance and standard deviation
3. Develop a program for number conversions

Checking

4. Develop a program for number checking (prime, perfect, etc.)

Generation

5. Develop a program for number generation (prime, perfect, etc.)

Array

6. Develop a program to arrange numbers and names in order
7. Develop a program to perform matrix addition, subtraction, multiplication & transpose

Searching

8. Develop a program to implement linear search and binary search

String

9. Develop the program to perform string manipulation (case conversion, reversing, etc.)

OOP Concepts

10. Develop a program to implement inheritance concepts
11. Develop a program to implement exception handling
12. Develop a program to implement multithreading

Applet

13. Develop a program to handle Keyboard events
14. Develop a program to simulate a calculator (arithmetic operations) using GUI components

Note: - Questions for the internal and external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple Mathematical problems, number checking and number generation

CO2: Demonstrate the concepts of String Manipulation, Linear Search and Binary Search

CO3: Illustrate OOP in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling and GUI components

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	9	9	3	9	9	**49**
CO2	9	1	9	9	3	9	9	**49**
CO3	9	1	9	9	3	9	9	**49**
CO4	9	1	9	9	3	9	9	**49**
CO5	9	1	9	9	3	9	9	**49**
Total	**45**	**5**	**45**	**45**	**15**	**45**	**45**	**245**

Low-1 Medium-3 High-9

SEC V - R Tool Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 2**

Subject Code: JBMXS54P **Credit: 1**

Course Objectives:

1. To navigate and optimize the R integrated development environment (IDE) R Studio and install and load add-in packages

2. To import external data into R for data processing and statistical analysis, learn the main R data structures and compute basic summary statistics

List of Programs:

1. Develop a program to implement correlation analysis
2. Develop a program to implement regression analysis
3. Develop a program to implement t-test
4. Develop a program to implement z-test
5. Develop a program to implement f-test
6. Develop a program to implement chi-square test
7. Develop a Program to implement analysis of variance (ANOVA

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Classify the basics concept in R programming in terms of constructs, control statements and functions

CO 2: Identify data analytics software

CO 3: Enhance the problem solving, programming and debugging skill

CO 4: Apply the R programming from a statistical perspective

CO 5: Learn and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	1	3	1	3	**27**
CO3	3	3	3	9	3	1	9	**31**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	1	9	9	3	1	**35**
Total	**27**	**23**	**25**	**37**	**27**	**9**	**31**	**179**

Low-1 Medium-3 High-9

Skill Enhancement Course (SEC) for B A Arabic

(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours/ Week	Credit	@SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
III	IV	JBARS34P	SEC III	PC Package Lab	2	1	SD| ENT	GLO	-	50	50
IV		JBARS44P	SEC IV	Designing Lab	2	1	SD| EMP	GLO	-	50	50

SEC III - PC Package Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 2**
Subject Code: JBARS34P **Credit: 1**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

List of Programs:

Word Processing

1. Create a word processing document consists two pages in a Book named "XX" and then do the following:
    a. Formatting Text, Alignment and Font Style
    b. Perform Find and Replace
    c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages
2. Create a word processing document having details of our College courses using bulleted and number lists.Type the title using Word Art.
3. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
4. Create a Newsletter Article (using Columns, Drop cap)

Spread Sheet

1. Create a spreadsheet consists of Student details and then do the following:
    a. Calculate student wise total and subject wise total
    b. Find the Maximum and Minimum marks of the subject
2. Grade is calculated as
    i. If %>=90, then grade A
    ii. If %>=80 and <90, then grade B
    iii. If %>=70 and <80, then grade C
    iv. If %>=60 and <70, then grade D
    v. If %<60, then grade F
3. Create a spreadsheet having Employee details suitably and then do the following
    a. Use functions to calculate Net Pay and Gross Pay
    b. Perform conditional formatting and validation

Presentation

1. Create a presentation showing your various activities of the department a Performslide translation and Setting background designs
2. Create a presentation showing various aspect of your college and perform custom animation and import sound.

Database

1. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to findtotal and average and check data entered.
2. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation toretrieve data.

Note: Questions for internal and external examination will be based on concept learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Illustrate various options of office application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Compare the options of different Microsoft office applications to use appropriately
CO5: Build a presentation, advertisement, reports etc for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

SEC IV- Designing Lab

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 2**
Subject Code: JBARS44P **Credit: 1**

Course Objectives:
1. To understand the basic concepts of GIMP
2. To gain knowledge about various tools of GIMP

List of Program:
1. Design a Business card
2. Create a logo
3. Convert an image into pencil drawing
4. Design a scenery using various brushes
5. Design a greeting card
6. Create clipping mask – place an image inside text
7. Create passport size photo
8. Animate a still photo
9. Create a shadow effect for an object
10. Create a mirror effect for an image
11. Apply the following tools in an image:
i) Smudge ii) Blur/Sharpen iii) Dodge/Burn

12. Create a mosaic photo collage

Note: Questions for the internal and external examinations will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Recognize the uses of various tools and effects in Photoshop
CO2: Identify the steps to start designing with images
CO3: Simplify the process of designing, editing, masking, morphing to solve the difficulties of designers
CO4: Support studios to create passport size photo
CO5: Design Visiting card, ID card, Birthday card, logo etc.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

Discipline Specific Elective (DSE) for M Com

(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours/ Week	Credit	@SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
II	III	JMCOE2BP	DSE II	b) Web Designing Lab	6	4	SD	GLO	25	75	100
III		JMCOE3AP	DSE III	a) Statistics through R Tool Lab	6	4	SD| EMP	GLO	25	75	100

DSE II – b) Web Designing Lab

(For Students Admitted from 2025-26)

Semester: II **Hours/week: 6**
Subject Code: JMCOE2BP **Credit: 4**

Course Objectives:
1. To analyze a web page and identify its elements and attributes and create web pages using XHTML and Cascading Style Sheets

2. To build dynamic web pages using JavaScript (Client side programming) and create XML documents and Schemas

List of Programs

HTML

1. Write a program to illustrate all basic tags
2. Write a program to display study time table for end semester examination
3. Write a program to display a menu list for bakery
4. Write a program to implement all style sheets
5. Write a program to demonstrate frame
6. Write a program to demonstrate hyperlinks for both text and image
7. Write a program to illustrate form tags

Java Script

8. Write a program to check the given year is Leap year or not.
9. Write a program to convert temperature from Fahrenheit to Celsius
10. Write a program to create login form
11. Write a program to create a HTML page to demonstrate validation for mail registration
12. Write a program to develop college website
13. Write a program to develop website for online shopping

Note: Questions for the internal examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the basics of all HTML tags to create the static web page
CO2: Apply the concepts of table and list in HTML
CO3: Examine the use of style sheets, frames and hyperlinks
CO4: Evaluate the concept of validation using JavaScript
CO5: Create a dynamic website

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	9	9	51
CO2	9	9	3	3	9	9	9	51
CO3	9	9	3	3	9	9	9	51
CO4	9	9	3	3	9	9	9	51
CO5	9	9	3	3	9	9	9	51
Total	45	45	15	15	45	45	45	255

Low-1 Medium-3 High-9

DSE III – a) Statistics through R Tool Lab

(For Students Admitted from 2025-26)

Semester: III **Hours/week: 6**

Subject Code: JMCOE3AP **Credit: 4**

Course Objectives:

1. To navigate and optimize the R integrated development environment (IDE) R Studio and install andload add-in packages
2. To import external data into R for data processing and statistical analysis, learn the R data structures and compute basic summary statistics

List of Programs

1. Develop a Program to implement correlation analysis
2. Develop a Program to implement regression analysis
3. Develop a Program to implement t-test
4. Develop a Program to implement z-test
5. Develop a Program to implement f-test
6. Develop a Program to implement chi-square test
7. Develop a Program to implement kruskal-wallis test
8. Develop a Program to implement likert scaling techniques
9. Develop a Program to implement analysis of variance (ANOVA)
10. Develop a Program to implement factor analysis
11. Develop a Program to implement cluster analysis
12. Develop a Program to calculate financial losses and generate financial report for a bank
13. Develop a program to mine data and generate actionable insights to improve customer experience for an insurance company

Note: - Questions for internal and external examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the basics in R programming in terms of constructs, control statements and functions

CO2: Apply data analytics software

CO3: Enhance problem solving, programming and debugging skills

CO4: Plan the R programming from a statistical perspective

CO5: Analyze and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Value Added Programme in Web Designing

(For Students Admitted from 2025-26)

Programme Specific Outcomes:

PSO1: Demonstrate the fundamental technical skills to build and implement a web site
PSO2: Develop basic programming skills using Java Script to create interactive webpage
PSO3: Understand techniques to embed text/image/video content into web pages
PSO4: Design and Develop dynamic websites using CSS

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following change
1. Web designing theory course has been removed

Programme Structure

Course	Subject Code	Subject Title	Contact Hours	Credit	External Marks
Core I	ECWD21P	Web Designing Lab	50	50	100
		Total	**50**	**50**	**100**

Core I - Web Designing Lab

(For Students Admitted from 2025-26)

Subject Code: ECWD21P **Hours: 50**

Course Objectives:

1. To build web pages using basic HTML elements, CSS and JavaScript
2. To make use of frames, forms, hyperlink to design an interactive web pages

List of Programs

HTML

1. Create a HTML page to illustrate all basic tags
2. Create a HTML page to display study time table
3. Create a HTML page to display a menu list for bakery
4. Create a HTML page to use all style sheets
5. Create a HTML page to demonstrate frame
6. Create a HTML page to use hyperlink for both text and image
7. Create a HTML page to demonstrate forms

JavaScript

8. Write a JavaScript program to display the current day and time
9. Write a JavaScript program to check leap year
10. Write a JavaScript program to convert temperature from Fahrenheit to Celsius
11. Create a HTML page to create login form
12. Create a HTML page to demonstrate validation in any forms

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Understand the basics of all HTML tags to create the static web page
CO 2: Apply the concepts of table and list
CO 3: Examine the use of style sheets, frames and hyperlinks
CO 4: Evaluate the concept of VBScript and validation using JavaScript
CO 5: Create a dynamic website

Common Value Added Course
(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ GLO	CIA	ESE	Total Marks
II	IV	JBUI2V	CVAC I	Understanding India	2	2	EMP	REG| NAT	-	50	50
III		JBES3V	CVAC II	Environmental Science for Sustainable Development	2	2	SD| ENT| EMP	REG| NAT| GLO	-	50	50
IV		JBDT4V	CVAC III	Digital and Technology Solution	2	2	SD	GLO	-	50	50
V		JBHW5V	CVAC IV	Health and Wellness	2	2	SD| ENT| EMP	NAT| GLO	-	50	50

CVAV I - Understanding India
(For Students Admitted from 2025-2026)

Semester: II **Hours/week: 2**
Subject Code: JBUI2V **Credit: 2**

Course Objective:
1. To introduce students to the historical milestones in India's freedom struggle and Indian knowledge systems.
2. To provide an interdisciplinary understanding of India's geography, social structure, cultural narratives, and political evolution.

Unit I **(6 hours)**
History of India: India's freedom struggle: An introduction to Indian knowledge systems: Indian First War of Independence, Non-Cooperation Movement in Indian Independence, Quit India Movement, Civil Disobedience Movement

Unit II **(6 hours)**

Geography of India: India's Geographical overview with neighbors - India and its relationship with neighbouring countries -Types of diversities in India -Geographical diversities of India

Unit III **(6 hours)**

Communicating Culture: Oral narratives: Myths, tales and folklore- Introduction to the Tribal Cultures of India - Indian Oral narrative, myths, tales & folklore - Tribal cultures of India - Odisha's Special Development Councils

Unit IV **(6 hours)**

Indian Social Structure: Continuity and change of the Indian Social Structure: Caste, Community, Class and Gender - Continuity and change in social structure in India - Caste. Class and Gender in India - Indian Caste and Communities

Unit V **(6 hours)**

Understanding Indian Polity: The evolution of State in India: Nature and origin Interpreting India: Traditional, Modern and Contemporary Constitution as a living document - The evolution of Indian state - changing the Nature of Indian state - The traditional, modern and contemporary India - Constitution of India.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify key events in India's freedom movement and explain their impact on national identity.

CO2: Analyze the geographical diversity of India and its influence on regional and international relations.

CO3: Interpret Indian myths, oral traditions, and tribal cultures as a means of understanding cultural heritage.

CO4: Evaluate the changing nature of India's social structure in relation to caste, class, community, and gender.

CO5: Demonstrate knowledge of the Indian Constitution and understand the evolution of India's polity from traditional to contemporary governance.

Text Books:

1. Chandra, B. *India's Struggle for Independence*, 1st Ed., Penguin Books India, 2000.
2. Dikshit, Ramesh Dutta.*Political Geography: Politics of Place and Spatiality of Politics*, 1st Ed., Macmillan Education, 2020.
3. Thapar, Romila.*Interpreting Early India: A Historical Perspective*, 1st Ed., Oxford University Press, 1992.
4. Deshpande, Satish.*Contemporary India: A Sociological View*, 1st Ed., Penguin Books, 2003.
5. Basu, D.D.*Introduction to the Constitution of India*, 21st Ed., LexisNexis, 2013.

Reference Books:

1. Ramesh Dutta Dikshit, Political Geography: Politics of Place and Spatiality of Politics,Macmillan Education, 2020.
2. Austin, Granville.*The Indian Constitution: Cornerstone of a Nation*, 1st Ed., Oxford University Press, 1999.

3. Uberoi, Patricia.*Family, Kinship and Marriage in India*, Oxford University Press, 1993.
4. Blackburn, Stuart H.*Oral Epics in India*, University of California Press, 1986.
5. Grover, B.L. & Mehta, A.*A New Look at Modern Indian History*, Revised Ed., S. Chand Publishing, 2006.
6. Ambedkar, B.R.*Annihilation of Caste*, Self-published, 1936.

Journals:

1. Caste in Contemporary India" – *Sociological Bulletin*
2. Indian Journal of Political Science
3. Economic and Political Weekly (EPW)

E-Resources:

1. https://iksindia.org
2. https://ndl.iitkgp.ac.in/
3. https://epgp.inflibnet.ac.in/
4. https://legislative.gov.in/constitution-of-india
5. https://bharatavani.in

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	3	9	9137	3	29
CO2	1	3	3	9	1	3	9	29
CO3	3	1	9	3	9	1	3	29
CO4	3	1	3	9	1	3	1	21
CO5	1	9	3	1	3	1	3	21
Total	**11**	**15**	**19**	**25**	**23**	**17**	**19**	**129**

Low-1 Medium-3 High-9

CVAV II – Environmental Science for Sustainable Development

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 2**
Subject Code: JBES3V **Credits: 2**

Course Objectives:

1. To introduce students to the principles of sustainable development, environmental conservation, and the global efforts supporting ecological balance and human well-being.
2. To develop awareness and practical understanding of biodiversity, pollution control, natural resource management, and the role of institutions in promoting sustainability.

Unit I **(6 hours)**

Sustainable Development Goals (SDGs) – Introduction, History, 17 SDGs, Agenda 21, Earth Summit, eight Millennium Development Goals (MDGs), UN Sustainable Development Summit, Paris Agreement on Climate Change.

On ground activity: Plant and maintain a sapling

Unit II **(6 hours)**

The concept of Environmental Science – Introduction, Definition, Scope and importance Natural Resources – Forest, Marine, Wet land, Water and Land Resources, Food resources; changes caused by agriculture and overgrazing; effects of fertilizer and pesticide. Energy resources – use of alternate energy resources; Role of individual in conservation of natural resources.

Ecosystems – Concept – Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow; food chains; food webs and ecological pyramids.

Unit III **(6 hours)**

Land and Marine Biodiversity conservation - Introduction**,** Definition, biodiversity- Land and marine, threats to biodiversity: habitat loss, poaching of wildlife, endangered and endemic species of India, In- situ and Ex- situ conservation of biodiversity (Turtle Hatchery), Wildlife Protection Act, Forest Conservation Act. Birds Sanctuary in Ramanathapuram, Gulf of Mannar Bioreserve, Mangrove Forest and Ecotourism in Ramanathapuram district
Field trip: Gulf of Mannar National Park

Unit IV **(6 hours)**

Environmental Pollution and its Prevention – Definition, causes, effects and control measures of air, water, and soil pollution. Climate change, global warming, acid rain, ozone layer depletion. Environment Protection Act – Air and Water (Prevention and Control of Pollution) Act, Solid Waste management
On-ground activity: Coastal clean up

Unit V **(6 hours)**

Role of research institutes in sustainable livelihood – Population growth; Education for Women, Balanced Diet, Menstrual hygiene, Role of ICAR-CMFRI, CSIR-MARS, KVK, and UNICEF in the development of sustainable food resources.

Course Outcomes:

After successful the completion of the course, the students will be able to
CO1: Understand the history, goals, and importance of the Sustainable Development Goals (SDGs) and related global initiatives
CO2: Recognize the value of natural resources and ecosystems
CO3: Learn why biodiversity matters, what harms it, and how to protect plants and animals, especially in places like the Gulf of Mannar.
CO4: Understand what causes pollution and how we can prevent it through laws and personal actions.
CO5: Know how research centers and organizations help people live better through food, health, and education programs.

Text Books:

1. Erach Bharucha, *Environmental studies for undergraduate courses,* University Grant commission, New Delhi, 202
2. Kumaraswamy K., *Environmental Studies,* Jazym Publications, 2013.

References Books:

1. Arumugam N. and Kumaresan B., *Environmental Studies*, Saras publications, 2012.
2. Dr. Biswarup Mukherjee., *Fundamentals of Environmental Biology*, Silver line Publications, 2008
3. Dr. D. K. Asthana & Dr. Meera Asthana, *A Text Book of Environmental Studies*, S Chand & Co Ltd, Revise Edition, 2006.

Journals:

1. Journal of Environmental Studies and Sciences
2. Journal of environmental sciences
3. Nature climate change

E- Resources:

1. https://nptel.ac.in/courses/127/105/127105018/
2. https://sdgs.un.org/goals
3. http://eprints.cmfri.org.in/14270/
4. https://nios.ac.in/online-course-material/sr-secondary-courses/enviornmental-science-(333).aspx
5. https://rajneeshrajoria.weebly.com/uploads/4/9/0/6/49069889/environmental_science_birm301.pdf
6. https://nios.ac.in/media/documents/srsec314newE/PDFBIO.EL24.pdf
7. https://nios.ac.in/media/documents/srsec314newE/PDFBIO.EL25.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	3	9	9137	3	29
CO2	1	3	3	9	1	3	9	29
CO3	3	1	9	3	9	1	3	29
CO4	3	1	3	9	1	3	1	21
CO5	1	9	3	1	3	1	3	21
Total	11	15	19	25	23	17	19	129

Low-1 Medium-3 High-9

CVAC III – Digital and Technology Solution
(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 2**
Subject Code: JBDT4V **Credit: 2**

Course Objectives:

1. To introduce key concepts in operating systems, communication systems, digital tools, and emerging technologies.

2. To equip students with skills in e-commerce, cybersecurity, and innovative technologies for effective problem-solving and governance.

Unit I **(6 Hours)**

Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts. Communication Systems: Principles, Model & Transmission Media, Computer Networks & Internet: Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking.

Unit II **(6 Hours)**

Computer Based Information System: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges. Digital India & e-Governance: Initiatives, Infrastructure, Services and Empowerment.

Unit III **(6 Hours)**

Digital Financial Tools: Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit/Debit Cards, e-Wallets, Internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and PoS. Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures, & Tools, legal and ethical perspectives.

Unit IV **(6 Hours)**

Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things, and Virtual Reality.

Unit V **(6 Hours)**

Emerging Technologies & their applications: Blockchain & Cryptocurrency, Robotics, Machine Learning & Artificial Intelligence, 3-D Printing. Digital Signatures

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Understand key digital concepts
CO2: Apply e-commerce and digital marketing concepts
CO3: Analyze digital financial tools and cyber security
CO4: Explain emerging technologies and their applications
CO5: Evaluate the impact of emerging technologies

Text Books:

1. Pramod Kumar, Anuradha Tomar, R. Sharmila, "*Emerging Technologies in Computing - Theory, Practice, and Advances*", Chapman and Hall / CRC, 1st Edition, 2021
2. V. Rajaraman, "*Introduction to Information Technology*", PHI, 3rd Edition, 2018
3. E. Balagurusamy, *"Fundamentals of Computers"*, Tata Mc GrawHill, 2nd Edition, 2011
4. Behrouz A. Forouzan, "*Data Communications and Networking*", McGraw Hill, 4 Edition, 2007,

Reference Books:

1. Rajkumar Buvya, James Broberg, and Andrzej Gosciniski, "*Cloud Computing-Principals and Paradigms"*, Wiley, 2011

2. Stuart Russel and Peter Norvig, "*Artificial Intelligence - A Modern Approach"*, Pearson Education, 3rd Edition, 2010
3. Samuel Greengard, *"Internet of Things"*, The MIT Press, 2015
4. C.S.V. Murthy, "*E-Commerce Concept, Models & Strategies*", Himalaya Publishing House, 2015
5. Hurwith, Nugent Halper, Kaufman, "*Big Data for Dummies*", Wiley & Sons, 1st Edition, 2013

Journals:

1. https://dl.acm.org/journal/osr
2. https://www.ijcaonline.org/
3. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=9739

E-Resources:

1. https://nptel.ac.in/courses/106106144
2. https://www.managementstudyguide.com/information-systems.htm
3. https://onlinecourses.nptel.ac.in/noc22-cs35
4. https://www.simplilearn.com/big-data-basics-article
5. https://experiments.withgoogle.com/collection/ai

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

CVAC IV - Health and Wellness

(For Students Admitted from 2025-2026)

Semester: V **Hours/week: 2**
Subject Code: JBHW5V **Credit: 2**

Course Objectives:

1. To understand the importance of a healthy lifestyle and familiarize students on physical and mental health
2. To increase awareness of various diseases associated with lifestyle and enable understanding of stress management

Unit I **(6 hours)**

Introduction to health & wellness: Define, differentiate health and wellness, Importance of health and wellness education, Local, demographic, societal issues, factors affecting health and wellness.

Unit II **(6 hours)**

The Role of Essential Nutrients in a Balanced Diet: Diet and nutrition for health & wellness, Essential components of balanced diet for healthy living, Specific reference to the role of carbohydrates, proteins, fats, vitamins & minerals. Malnutrition.

Unit III **(6 hours)**

Unhealthy Eating Habits, and Lifestyle Factors on Body Systems: Processed foods, unhealthy eating habits, Body systems, common diseases, Sedentary lifestyle and its risk of disease, stress, anxiety, and depression.

Unit IV **(6 hours)**

Management of health and wellness: Healthy foods for prevention, progression of Cancer, Hypertension, Cardiovascular, Types of Physical Fitness and its Health benefits.

Unit V **(6 hours)**

Spirituality and mental health: Role of Yoga, asanas, meditation in maintaining health and wellness, Role of sleep in maintenance of physical, mental health.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the principles of physical, mental, and emotional well-being and their role in overall health.

CO2: Assess the impact of diet, physical activity, and lifestyle habits on health and disease prevention.

CO3: Identify stressors and implement effective coping mechanisms to enhance mental and emotional well-being.

CO4: Apply knowledge of health policies, disease prevention, and wellness programs to advocate for community health.

CO5: Explore alternative and complementary health practices, including mindfulness, fitness, and self-care techniques.

Text Books:

1. Raheena, *S. Health and Wellness: A Practical Approach. CBS Publishers & Distributors*, 2nd Edition.2019
2. Tariq, *M. Food and Health: The Interlinking of Nutrition and Wellness*. Springer, 1st Edition,2020.
3. Pood, V., & Gopinath, S. *Foundations of Health and Wellness*. Wiley-Blackwell, 1st Edition,2021.

Reference Books:

1. Bouchard, C., Blair, S. N., & Haskell, W. L, *Physical Activity and Health*. Human Kinetics,2007
2. Attached, E., & Fernandez, M., *Mental Health Workbook*. Independently published,2021.
3. Lorick, N. *Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Wellbeing*. Rockridge Press,2022
4. Nyambichu, C., & Lumiri, J. *Lifestyle Diseases: Lifestyle Disease Management*. Independently published, 2018.

Journals:

1. Journal of Nutrition and Health Sciences
2. Health Promotion International
3. American Journal of Health Promotion

E-Resources:

1. https://www.who.int/health-topics
2. https://www.nimh.nih.gov/
3. https://pmc.ncbi.nlm.nih.gov/
4. https://pmc.ncbi.nlm.nih.gov/
5. https://portal.ct.gov/-/media/DMHAS/SkillBuilding/Dana/Health-and-Wellness-FULL-Revised.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	9	9	**63**
CO2	9	9	9	9	9	9	3	**57**
CO3	9	9	9	9	9	9	9	**63**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**45**	**45**	**45**	**45**	**45**	**39**	**309**

Low-1 Medium-3 High-9

Extra Credit IV - Employability Skills for UG Programme

(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ |GLO	CIA	ESE	Total Marks
V	V	JBESX5	Extra Credit IV	Employability Skills	-	2			100	-	100

Extra Credit IV - Employability Skills

(For Students Admitted from 2025-26)

Semester: V **Credit: 2**
Subject Code: JBESX5

Course Objectives:

1. To create awareness on the skills necessary for getting, keeping and being successful in a profession

2. To expose the students to leadership and team-building skills

Unit I
Introduction to Soft Skill.

Unit II
Self-management.

Unit III
Critical thinking development.

Unit IV
Reflective thinking and writing.

Unit V
Group work and Peer to peer interaction.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Recognize prioritizing tasks
CO 2: Construct personal strategies for independent learning
CO 3: Communicate clearly and precisely to interested audience in a range of different contexts
CO 4: Consider and respect others' point of view in offering constructive feedback to others
CO 5: Lead team while working for a task

Text Book:
1. Alfredo, Becky and Alison. *Soft Skills (Academic Guide and Teaching Materials).* Shoo fly publishing, Ukraine, 2015.

Reference Books:
1. Rao, Manchanahalli Satyaranayana. *Soft skills-enhancing employability: connecting campus with corporate*. IK International Pvt Ltd, 2010.
2. Verma, Shalini. *Enhancing employability@ soft skills*. Pearson Education India, 2012.

Journals:
1. International Journal of Trend In Scientific Research and Development
2. International Journal of Evaluation and Research in Education (IJERE)
3. International Journal on Industry and Higher Education

E-Resources:
1. https://www.exeter.ac.uk/ambassadors/HESTEM/resources/General/STEMNET%20
2. Emplo yability%20skills%20guide.pdf
3. http://psydilab.univer.kharkov.ua/resources/ucheba/softskills/Chapter_1_Introduction.PDF

	Programme Outcomes	

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	9	9	9	9	**63**
CO2	9	9	9	9	9	9	9	**63**
CO3	9	9	9	9	9	9	9	**63**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**315**

Low-1 Medium-3 High-9

Extra Credit III - Employability Skills for PG Programme

(For Students Admitted from 2025-26)

Sem	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ |GLO	CIA	ESE	Total Marks
III	JMESX3	Extra Credit III	Employability Skills	-	2	EMP	GLO	100	-	100

Extra Credit III - Employability Skills

(For Students Admitted from 2025-26)

Semester: III **Credit: 2**
Subject Code: JMESX3

Course Objectives:

1. Get ready the students for job market with good communication skill
2. Appear for interviews and make presentations confidently

Unit I
Behavioural Skill
Personal Strength Analysis -Perception Management-Social Etiquette.

Unit II
Communication Skill
Self-Introduction- Verbal Communication- Non-Verbal Communication-Campus to Work.

Unit III
I.T. Literacy
MS-Word-File Conversion & Reducing File Size-Web browsers & Search Engines-Email-Mobile Application-Online CV.

Unit IV

Entrepreneurship Skill

Need of becoming Entrepreneur-Ways to become a good Entrepreneur-Different Government Institutions/Schemes Promoting Entrepreneur-Day to day mechanism for maintaining an enterprise.

Unit V

Preparation to the World of Work

Career Plan-Basic Professional Skill-Career Pathways-Search and Apply for a Job.

Self-Study Component:

1. **Learn from the Experts – TED Talks on Career Development**
   (Activity: Watch at least two TED Talks or expert interviews related to career building, communication skills, or entrepreneurship like Simon Sinek's "Start with Why" or Amy Cuddy's "Your Body Language May Shape Who You Are").

2. **LinkedIn Profile Creation and Online CV**
   (Activity: Students must create or update their LinkedIn profile and generate a professional CV including educational background, skills, and career objectives using an online CV builder like Canva, Zety, or NovoResume).

3. **Skill-Based Micro-Course Completion -** Title: Digital Literacy and Beyond
   (**Enrol in a free online course** (1–2 hours) from platforms like SWAYAM, NPTEL on topics such as: Resume writing, Time management, Basic Excel or MS Word)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Identify a planned approach towards career
CO 2: Associate skills and interests with chosen career path
CO 3: Take part in group discussions
CO 4: Develop thinking ability
CO 5: Perceive personal interviews through mock interviews

Text Books:

1. M Esther, Doug Graham & Deepthi Lamahewa. "Trainer Manual for Soft Skills:Applied for Entry Level Occupation".WUSC-ASSET Project, Srilanka, 2019.
2. Lata, Pushp, and Kumar, Sanjay. *Communication Skills,* 2nd Edition. India, Oxford University Press, 2015.
3. Maluth, John Monyjok. *Basic Computer Knowledge. N.p.*, Independently Published, 2016.
4. *Khanka, S S. Entrepreneurial Development. S Chand and Company Limited, New Delhi, 2001.*
5. *Ann, Mary Bailey. Finding the Right Career Path*: Wetfeet Insider Guide. Wetfeet.Com Publisher, 2006.

Reference Books:

1. Rath, Tom, et al. *Strengths-Based Leadership: Great Leaders, Teams, and Why People Follow*. Philippines, Gallup Press, 2009.

2. Chaturvedi, P. D. *Business Communication: Concepts, Cases and Applications* (for Chaudhary Charan Singh University). N.p., Dorling Kindersley (India), 2011.
3. Morrison, Connie, and Wells, Dolores. *Computer Literacy BASICS*. United States, Cengage Learning, 2012.
4. *Promoting Entrepreneurship and Innovative SMEs in a Global Economy*. France, OECD Publishing, 2008.
6. Janson, Simone. *Wanted! The Job of Your Dreams – Better Career Choice Reorientation Job Application: Develop Your Skills Potential & Self-confidence, Discover Chances & Strategies, Achieve Goals*. Germany, Best of HR – Berufebilder.de®, 2021.

Journals:

1. International Journal on Procedia-Social Sciences and Behaviour
2. e-Journal of Business Education & Scholarship of Teaching
3. Journal of Further and Higher Education

E- Resources:

1. https://opentextbc.ca/organizationalbehavioropenstax/chapter/employee-abilities-and-skills/
2. https://courses.lumenlearning.com/wm-businesscommunicationmgrs/chapter/verbal-and-nonverbal-communication/
3. https://www.avantixlearning.ca/microsoft-word/reduce-file-size-large-word-documents- avoid-bloat-slowness-corruption-crashes/
4. https://support.microsoft.com/en-us/office/video-resumes-in-word-ce00832f-8388-4291- a417-0f70cd2e5914
5. https://gfgc.kar.nic.in/mccw-mysore/FileHandler/410-00295b1f-7b5c-49b1-ae68-3debdd957e67.pdf
6. https://learnenglish.britishcouncil.org/skills/listening

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	9	9	9	9	63
CO2	9	9	9	9	9	9	9	63
CO3	9	9	9	3	9	9	9	57
CO4	9	9	9	9	9	9	9	63
CO5	9	9	9	9	9	9	9	63
Total	45	45	45	39	45	45	45	309

Low-1 Medium-3 High-9

Part I & Part II Courses

(For Students Admitted from 2025-26)

Sem	Part	Subject Code	Course	Subject Title	Hours / Week	Credit	@ SD| ENT| EMP	$ |GLO	CIA	ESE	Total Marks
I	I	JBLT11	Language I	இக்கால இலக்கியமும் சிற்றிலக்கியமும்	5	3	SD	GLO	25	75	100
		JBLA11		Basic Arabic I	5	3	SD| ENT| EMP	GLO	25	75	100
		JBLHB11/ JBLHA11		General Hindi I (Basic) Hindi Grammar & Translation (Advanced)	5	3	SD| ENT| EMP	GLO	25	75	100
	II	JBLEB12/ JBLEA12	Language II	Part II – English for Everyday Communication (Basic) & Literature and Language for Life (Advanced)	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
II	I	JBLT21	Language I	காப்பிய இலக்கியமும் புதினமும்	5	3	SD	GLO	25	75	100
		JBLA21		Basic Arabic II	5	3	SD| ENT| EMP	GLO	25	75	100
		JBLHB21/ JBLHA21		General Hindi II (Basic) Hindi Prose, Poem & Story (Advanced)	5	3	SD| ENT| EMP	GLO	25	75	100
	II	JBLEB22/ JBLEA22	Language II	Part II – English for Academic and Social Interaction (Basic) Critical Reading and Reflective Writing (Advanced)	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100
III	I	JBLT31	Language I	இடைக்கால இலக்கியமும் இதழியலும்	5	3	SD	GLO	25	75	100
		JBLA31		Classical Arabic Prose	5	3	SD| ENT| EMP	GLO	25	75	100
		JBLHB31/ JBLHA31		General Hindi III (Basic) Hindi Literature & Letter writing (Advanced)	5	3	SD| ENT| EMP	GLO	25	75	100
	II	JBLEB32/ JBLEA32	Language II	Part II – Workplace English: Foundations of	5	3	SD| ENT|	REG| NAT|	25	75	100

				English Communication Skills (Basic) English for the Corporate World (Advanced)			EMP	GLO			
IV	I	JBLT41	Language I	பண்டைய இலக்கியமும் நாட்டுப்புறப் பாடல்களும்	5	3	SD	GLO	25	75	100
		JBLA41		Hadeeth	5	3	SD| ENT| EMP	GLO	25	75	100
		JBLHB41/ JBLHA41		General Hindi IV (Basic) Computer and Hindi (Advanced)	5	3	SD| ENT| EMP	GLO	25	75	100
	II	JBLEB42/ JBLEA42	Language II	Part II – Professional Communication Skills (Basic) Strategic Communication for Global Careers (Advanced)	5	3	SD| ENT| EMP	REG| NAT| GLO	25	75	100

Curriculum Cell Recommendations

CIA MARKS EVALUATION REFORMS (2025-26)

CIA COMPONENTS FOR UG & PG (THEORY)

CIA SPLIT FOR UG	Marks	CIA SPLIT FOR PG	Marks
Test Average	15	Test Average	15
Attendance	5	Attendance	5
Quiz I Year / Assignment II Year / Seminar III Year	2.5	Seminar	2.5
Classroom participation	2.5	Classroom participation	2.5
Total	**25**	**Total**	**25**
Note: Conduct two internal tests for each course			

CIA COMPONENTS FOR UG & PG (PRACTICAL)

CIA SPLIT FOR UG & PG	Marks
Test Average	15
Record	5
Attendance	5
Total	**25**
Note: Conduct two internal tests for each course	

Evaluation criteria for e-Quiz

e-Quiz	No. of Questions : 20 MCQs
Game-based software application	2.5 Marks
Google Forms	
ERP software	
Note: Conduct the e-quiz anyone mode of the above method. One e-quiz assessments for each course	

Evaluation criteria for Assignment -UG I Year & II Year

Assignment	2.5 Marks
Scrapbook preparation	
Model making	
Poster making	
Case study with certificate	

Note: Anyone mode of the above method & one assignment for each course

Evaluation criteria for Seminar PG I & II Year, UG III Year

Seminar	2.5 Marks
Video making	
Audio integration with PPT	
YouTube upload	
Note: Anyone mode of the above method & one seminar for each course	

Evaluation criteria for Classroom participation - All UG & PG classroom participation

Classroom Participation	2.5 Marks
Extempore activity	
Group discussion	
Tutorial learning	
Note: Anyone mode of the above method	