

MAZHARUL ULOOM COLLEGE (AUTONOMOUS)

(Established & Managed by the Ambur Muslim Educational Society)

Accredited by NAAC with Grade 'A' CGPA 3.23 in Cycle 3

Affiliated to Thiruvalluvar University, Vellore

Ambur 635802 (Tirupattur District)



COURSE STRUCTURE & SYLLABUS (For the students admitted from year 2025-2026 onwards)

Programme: BCA

Course : Computer Applications

At the end of the B.C.A Programme, the student will:

Program Outcomes (POs)	
PO Code	Program Outcome Statement
PO1	Core Knowledge and Interdisciplinary Understanding: Demonstrate a coherent understanding of the field of computer applications, its fundamental principles, specialized areas, and its integration with related disciplines.
PO2	Professional and Technical Expertise: Acquire procedural and practical knowledge for diverse professional roles such as software development, research, teaching, and public service, including the ability to adapt to emerging trends in computer applications.
PO3	Problem Solving and Application of Computing Principles: Apply computer application skills, mathematical modeling, and computing methodologies to analyze and solve a wide range of well-defined and open-ended problems across various domains.
PO4	Experimental Skills and Data Interpretation: Plan, conduct, and interpret experiments or investigations using appropriate programming languages and tools, and draw conclusions by correlating with relevant Computer Science theories
PO5	Communication and Collaboration: Demonstrate effective communication and interpersonal skills, including analytical reading, clear presentation of ideas, teamwork, and the ability to engage with diverse audiences.
PO6	Ethics, Sustainability, and Professional Conduct: Exhibit professional integrity and ethical behavior, recognize intellectual property rights, address environmental and sustainability concerns, and promote a safe and responsible working and learning environment.

After the successful completion of the programme, the students are expected to

Program Specific Outcomes (POs)	
PSO Code	Program Specific Outcome Statement
PSO1	Develop critical and logical thinking skills, along with a strong foundation in computer science principles, software tools, and programming approaches to effectively solve theoretical and real-world problems in mathematics, statistics, and interdisciplinary domains.
PSO2	Demonstrate the ability to identify, evaluate, and utilize relevant information efficiently for problem-solving and research, while being prepared for higher studies and innovation in computing and applied sciences.
PSO3	Acquire essential technical competencies, communication skills, creativity, and awareness of societal and global issues to enhance employability, contribute to internships and projects, and adapt to evolving technological environments.

Cognitive Levels of Learning

The cognitive domain, is the first and most common hierarchy of learning objectives (Bloom, 1956). It focuses on the acquisition and application of knowledge and is widely used in the educational setting. It aims to develop the mental skills and the acquisition of knowledge of the individual. The cognitive domain encompasses of six categories which include remembering, understanding, applying, analyzing, evaluating and creating.

Level	Definition	Key Actions
K1 : Remembering	Ability to recall or recognize facts, terms, basic concepts, or answers without necessarily understanding them.	Retrieve, Memorize, Repeat, Define, Identify, Recognize
K2 : Understanding	Comprehending the meaning of information, interpreting or translating knowledge into your own words.	Explain, Describe, Summarize, Interpret, Paraphrase
K3 : Applying	Using knowledge in new situations, such as solving problems or applying theories to real-world situations.	Use, Demonstrate, Implement, Calculate, Practice
K4 : Analyzing	Breaking information into parts to explore understandings and relationships; identifying motives or causes.	Compare, Contrast, Categorize, Distinguish, Examine, Organize
K5 : Evaluating	Making judgments based on criteria and standards, often involving checking and critiquing.	Judge, Critique, Justify, Assess, Prioritize, Recommend
K6 : Creating	Putting elements together to form a new coherent whole or original product.	Design, Develop, Invent, Compose, Construct, Generate

Department of Computer Applications

SYLLABUS AND SCHEME OF EXAMINATIONS – III & IV SEMESTER

Sem	Course Code	Part	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
Semester III		I	Language–I (Tamil / Urdu)	Urdu-III / Tamil-III	6	3	25	75	100
		II	English	English-III	6	3	25	75	100
		III	Core-V	OOPs with Java Programming	5	5	25	75	100
		III	Core-VI	Practical: OOPs with Java Programming Lab	5	5	25	75	100
		III	Elective–III	a) Data Base Management System	5	3	25	75	100
				b) Cyber Security					
		IV	Skill Enhancement Course (SEC) - IV	Design and Analysis of Algorithms with Data Structures	1	1	25	75	100
		IV	Skill Enhancement Course (SEC) - V	Data Science Programming Lab	2	2	25	75	100
		IV	Compulsory	Environmental Studies	2	2	25	75	100
	Total				32	24	800		800
Semester IV		I	Language–II (Tamil / Urdu)	Urdu-IV / Tamil-IV	6	3	25	75	100
		II	English	English-IV	6	3	25	75	100
		III	Core–VII	Foundations of Artificial Intelligence	5	5	25	75	100
		III	Core–VIII	Practical: Artificial Intelligence Programming Lab	5	5	25	75	100
		IV	Elective–IV	a) Full Stack Development	6	3	25	75	100
				b) Block Chain Technology					
		IV	Skill Enhancement Course (SEC) - VI	Indian Knowledge Systems in Computing and Digital Technologies	2	2	25	75	100
		IV	Skill Enhancement Course (SEC)- VII	Data Visualization Lab	2	2	25	75	100
	Total				32	23	700		700

Internship / Industrial Training (Summer vacation at the end of IV semester activity)

The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III		Core – V	5	5	25	75	100
Course Title		OOps with Java Programming					

Learning Objectives	
LO1	Understand the fundamentals of Java programming, including program structure, Java Virtual Machine (JVM), tokens, operators, expressions, and command-line arguments.
LO2	Apply decision-making, branching, and looping constructs to develop logical and efficient Java programs.
LO3	Design and implement object-oriented applications using classes, objects, constructors, methods, arrays, interfaces, and packages.
LO4	Develop robust Java applications using multithreading concepts and exception handling mechanisms for concurrent and error-free execution.
LO5	Create and execute Java applets by understanding applet architecture, life cycle, HTML integration, and web-based deployment techniques.

SYLLABUS		
Unit	Contents	Hours
I	Overview of Java Language: Introduction-Java Program Structure - Java Tokens - Java Statements - Implementing a Java Program - Java Virtual Machine - Command Line Arguments- Operators and Expressions: Introduction - Arithmetic Operators - Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operator - Bitwise Operators - Special Operators.	15
II	Decision Making and Branching: Introduction - Decision Making with If Statement -Simple If Statement - The If...Else Statement - Nesting of If...Else Statements - The Else If Ladder - The Switch Statement -The ?: Operator. Decision Making and Looping: Introduction - while Statement - do Statement - for statement. Classes, Objects and Methods: Introduction - Defining a Class - Methods Declaration - Creating Objects - Accessing Class Members - Constructors - Method Overloading.	15
III	Arrays, Strings and Vectors: Introduction - One-dimensional Arrays - Creating an Array - Two-dimensional Arrays - Interfaces: Multiple Inheritance: Introduction - Defining Interfaces - Extending Interfaces - Implementing Interfaces - Accessing Interface Variables. Packages - Java API Packages - Using System Packages - Creating Packages - Accessing a Package - Adding a Class to a Package	15
IV	Multithreaded Programming: Introduction - Creating Threads - Extending the Thread Class - Stopping and Blocking a Thread - Life Cycle of a Thread - Using Thread Methods - Thread Exceptions. Managing Errors and Exceptions: Introduction - Types of Errors - Exceptions - Syntax of Exception Handling Code - Multiple Catch Statements - Using finally Statement - Throwing Our Own Exceptions.	15
V	Applet Programming: Introduction - How Applets differ from Applications – Preparing to write Applets - Building Applet Code - Applet Life Cycle - Creating an Executable Applet - Designing a Webpage - Applet Tag - Adding Applet to HTML File - Running the Applet.	15

Text Book(s):

1. E.Balagurusamy (2015), <i>Programming with Java - A Primer</i> , 7 th Edition, McGraw Hill Company, India. 2. P.Rizwan Ahmed(2023), <i>Java Programming</i> , 3 rd Edition, Margham Publications, Chennai. India.
Reference Book(s):
1. Debasish Jana. (2008). <i>Java and Object-Oriented Programming Paradigm</i> , Prentice Hall of India Private Limited, New Delhi. 2. Y. Daniel Liang. (2010). <i>Introduction to Java Programming</i> , 7 th Edition, Pearson Education India 3. Dr. Somasundaram. (2013). <i>Introduction to Java Programming</i> , 1 st Edition, Jaico Publishing House, India.
Web Resource(s):
1. https://javabeginnerstutorial.com/core-java-tutorial 2. http://docs.oracle.com/javase/tutorial/ 3. https://www.coursera.org/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Develop Java programs using operators, expressions, decision-making statements, and looping constructs to solve computational problems.	K1,K2
CO2	Apply object-oriented programming principles by designing classes, creating objects, implementing methods, constructors, and utilizing method overloading techniques.	K2,K3,K4
CO3	Design modular Java applications using arrays, interfaces, packages, and reusable programming components.	K3,K4
CO4	Implement multithreaded applications and exception handling mechanisms to develop reliable, concurrent, and robust Java programs.	K3,K4,K5
CO5	Create and deploy Java applets by integrating applet programming concepts with web technologies and graphical user interfaces.	K3,K4,K5,K6

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes(PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

MeanOverallScore	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III		Core–VI	5	5	25	75	100
Course Title		Practical: OOPs with Java Programming Lab					

Learning Objectives	
LO1	
LO2	
LO3	
LO4	
LO5	

SYLLABUS	
Contents	Hours
Write a Java program for the following - To print all the prime numbers between two limits - To reverse the digits of the given number and check whether the given number is palindrome or not. - To print the Pascal triangle. - To count odd and even numbers in the given array of numbers. - To transpose the given matrix. - To find sum of elements in the array. - To calculate volume of three shapes implementing Method Overloading concept. - To perform String Manipulation: - String length - String concatenation - Finding a character at a particular position - String comparison - To perform string operations using String Buffer class: - Length of a string - Reverse a string - Delete a substring from the given string - To prepare student mark sheet using Single Inheritance concept. - To prepare an EB bill of a customer using Multilevel Inheritance concept. - To perform arithmetic operations using package. - To prepare a pay bill of an employee using Interface concept. - To implement a multi-thread application that has two threads by generating odd and even numbers. - To implement a multi-thread application which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2 - To demonstrate the use of following exceptions: - ArithmeticException - NumberFormatException - ArrayIndexOutOfBoundsException - NegativeArraySizeException - To handle User defined Exception. - To simulate a traffic light in Applet. - To draw our national flag in the AppletViewer screen	75

20. To draw basic shapes using Applet (Line, Rectangle, Oval, Arc).	
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Text Book(s):

1. E.Balagurusamy (2015), *Programming with Java - A Primer*, 7th Edition, McGraw Hill Company, India.
2. P.Rizwan Ahmed(2023), *Java Programming*, 3rd Edition, Margham Publications, Chennai. India.

Reference Book(s):

1. Debasish Jana. (2008). *Java and Object-Oriented Programming Paradigm*, Prentice Hall of India Private Limited, New Delhi.
2. Y. Daniel Liang. (2010). *Introduction to Java Programming*, 7th Edition, Pearson Education India
3. Dr. Somasundaram. (2013). *Introduction to Java Programming*, 1st Edition, Jaico Publishing House, India.

Web Resource(s):

1. <https://javabeginnerstutorial.com/core-java-tutorial>
2. <http://docs.oracle.com/javase/tutorial/>
3. <https://www.coursera.org/>

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

RelationshipMatrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											

	Correlation	e.g. High / Medium
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3 – Strong, 2- Medium, 1- Low

MeanOverallScore	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	CourseCode	Course Category	Hours / Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
III		Elective -III					
Course Title	a) Data Base Management System						

Learning Objectives	
LO1	
LO2	
LO3	
LO4	
LO5	

SYLLABUS		
Unit	Contents	Hours
I	Database Basics, Software Analysis and Design, Data Flow Diagram and ER Model: Introduction – Database System – Characteristic of Database Management System – Database Management System Architecture – Database Models – System Development Life Cycle – Entity Relationship Model (ER Model).	
II	Relational Algebra and Normal Forms: Relational Database Model – Structure of Relational Model – Keys – Relational Algebra – Normalization – Functional Dependency – First Normal form – Second Normal Form – Third Normal form – Boyce-Codd Normal Form – Fourth Normal Form.	
III	SQL Basics, Functions, Subquery and Joins: Introduction – Data Retrieval – Single Row Functions – Group Functions – Set Functions – Subquery – Joins. Data Manipulation Language, Objects, Constraints and Security in Oracle: Introduction – The Insert Statement – The Update Statement – The Delete Statement – Transaction Control Language – Defining Constraints.	
IV	Oracle PL/SQL Basics: Introduction - PL/SQL Basics - PL/SQL Structure. Function, Procedure and Package: Introduction – Subprograms – Functions – Procedures	
V	Oracle Exception Handler, Database Triggers and Implicit Cursor: Introduction – Exception Handler – Database Trigger – Implicit Cursor. Explicit and Advance Cursors: Introduction – Explicit Cursor – Loops in Explicit Cursor.	

Text Book(s):
1. Pranab Kumar Das Gupta and P. Radha Krishnan. (2013). <i>Database Management System Oracle SQL and PL/SQL</i>, 2nd Edition, PHI Learning Private Limited. 2. Dr.P.Rizwan Ahmed(2018) RDBMS using Oracle, Margham Publications, Chennai, India.
Reference Book(s):
1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan. (2020). <i>Database System Concepts</i>, 7th Edition, McGraw Hill International Publication. 2. Shio Kumar Singh. <i>Database Systems</i>, 2nd Edition, Pearson publications. 3. Ramez Elmasri, Shamkant B. Navathe. (2016). <i>Fundamentals of Database Systems</i>, 7th Edition, Pearson Education Pvt. Ltd, India.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
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<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	CourseCode	Course Category	Hours / Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
III		Elective -III					
Course Title		b) Cyber Security					

Learning Objectives	
LO1	
LO2	
LO3	
LO4	
LO5	

SYLLABUS		
Unit	Contents	Hours
I	Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authenticate Access Control and Cryptography - Web—User Side - Browser Attacks - Web Att Targeting Users - Obtaining User or Website Data - Email Attacks	
II	Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.	
III	Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.	
IV	Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - DataMining - Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies- Where the Field Is Headed	
V	Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security	

Text Book(s):
- William Stallings & Lawrie Brown, <i>Computer Security: Principles and Practice</i>, 5th Edition, Pearson, 2024 - Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, <i>Security in Computing</i>, 5th Edition , Pearson Education , 2015

Reference Book(s):
1. George K.Kostopoulos, Cyber Space and Cyber Security, CRC Press, 2013. 2. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology andAutomation edited, Springer International Publishing Switzerland 2015 3. Nelson Phillips and Enfinger Steuart, —Computer Forensics and Investigationsl, Cengage Learning, New Delhi, 2009
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III		SEC-4					

Course Title	Design and Analysis of Algorithms with Data Structures
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Learning Objectives	
LO1	
LO2	
LO3	
LO4	
LO5	

SYLLABUS		
Unit	Contents	Hours
I	Introduction: Basic Design and Analysis techniques of Algorithms, time and space complexity, Correctness of Algorithm - Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.	
II	Arrays: Single and Multi-dimensional Arrays, Sparse Matrices. Searching Techniques and Complexity Analysis: Linear and Binary search, Medians & Order Statistics.	
III	Sorting Techniques: Elementary sorting techniques-Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Advanced Sorting techniques-Radix Sort, Quick Sort	
IV	Linked Lists: Singly, Doubly and Circular Lists, Representation of Stack and Queue as Linked Lists. Stacks and Queues: Implementing stack using array and linked list, Prefix, Infix and Postfix expressions	
V	Trees: Introduction to Tree as a data structure; Binary Trees, Binary Search Tree – Binary Tree Traversals. Graph- Representation of Graph- Types of graph- Applications of graphs	

Text Book(s):
1. Cormen T.H., Leiserson Charles E., Rivest Ronald L., Stein Clifford, Introduction to Algorithms, PHI Learning Pvt. Ltd., 2009, 3rd Edition. 2. P.Rizwan Ahmed, C++ and Data Structure, Margham Publications, Chennai. India.
Reference Book(s):
1. Goodrich Michael T., Tamassia Roberto, Goldwasser Michael H., <i>Data Structures and Algorithms in Java</i>, Wiley India Pvt. Ltd., 2014, 6th Edition. 2. Lafore Robert, <i>Data Structures and Algorithms in Java</i>, Sams Publishing, 2003, 2nd Edition. 3. Sedgewick Robert, Wayne Kevin, <i>Algorithms</i>, Addison-Wesley, 2011, 4th Edition. 4. Carrano Frank M., Henry Timothy M., <i>Data Structures and Abstractions with Java</i>, Pearson Education, 2018, 5th Edition. 5. Horstmann Cay S., <i>Big Java: Early Objects</i>, Wiley, 2019, 7th Edition.
Web Resource(s):

1. https://open.umn.edu/opentextbooks/textbooks/621
2. https://introducs.philinelabs.net/
3. https://opendatastructures.org/
4. https://algs4.cs.princeton.edu/

Course Outcomes		
Uponsuccessfulcompletionofthiscourse,thestudentwillbeableto:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

RelationshipMatrix:

Course Outcomes (COs)	ProgramOutcomes (POs)						ProgramSpecificOutcomes (PSOs)				MeanScoreof COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
MeanOverallScore											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

MeanOverallScore	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	CourseCode	Course Category	Hours / Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
III		SEC-5					
Course Title		Data Science Programming Lab					

Learning Objectives	
LO1	
LO2	

LO3	
LO4	
LO5	

SYLLABUS	
Contents	Hours
1. Read a CSV file and display the first 10 records. 2. Load an Excel file and display the column names and dataset information. 3. Convert a JSON file into a DataFrame and display the data. 4. Identify missing values in a dataset and replace them with appropriate values. 5. Identify and remove duplicate records from a dataset. 6. Perform data type conversion and rename selected columns in a dataset. 7. Filter records based on a given condition and sort the dataset. 8. Create new columns using existing data and apply suitable functions. 9. Perform GroupBy operations and compute aggregate functions such as sum, mean, and count. 10. Merge two datasets using a common key and concatenate datasets. 11. Visualize data using Matplotlib by creating line chart, bar chart, histogram, and pie chart. 12. Visualize data using Seaborn by creating boxplot, heatmap, and pairplot. 13. Perform DateTime operations and compute rolling mean on time-series data. 14. Perform statistical analysis and detect outliers using the IQR method. 15. Export a DataFrame into CSV and Excel file formats. 16. Normalize numerical data in a dataset. 17. Convert categorical data into numerical format using encoding techniques. 18. Perform random sampling and slicing operations on a dataset. 19. Generate a summary report of a dataset using descriptive statistics. 20. Linear Regression using Python	

Text Book(s):
1. Wes McKinney, <i>Python for Data Analysis</i>, O'Reilly Media, 2017, 2nd Edition. 2. Jake VanderPlas, <i>Python Data Science Handbook</i>, O'Reilly Media, 2016.
Reference Book(s):
1. Wes McKinney, <i>Python for Data Analysis</i>, O'Reilly Media, 2017. 2. Al Sweigart, <i>Automate the Boring Stuff with Python</i>, No Starch Press, 2019.
Web Resource(s):
1. https://pandas.pydata.org/docs/ 2. https://numpy.org/doc/ 3. https://matplotlib.org/stable/tutorials/

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV		Core-VII					
Course Title		Foundations of Artificial Intelligence					

Learning Objectives

LO1	
LO2	
LO3	

LO4	
LO5	

SYLLABUS		
Unit	Contents	Hours
I	Introduction : Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.	
II	Problem Solving Methods Problem solving Methods – Search Strategies – Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games	
III	Knowledge Representation First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining – Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering – Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information	
IV	Software Agents Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems	
V	Applications: AI applications – Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving	

Text Book(s):
1. Elaine Rich, Kevin Knight (2008), Shivsankar B Nair, Artificial Intelligence, Third Edition, Tata McGraw Hill Publication 2. P.Rizwan Ahmed, Artificial Intelligence, Margham Publications, Chennai, 2012
Reference Book(s):
1. Russel S, Norvig P (2010), Artificial Intelligence : A Modern approach,Third Edition, Pearson Education 2. Dan W Patterson (2007), Introduction to Artificial Intelligence and Expert System, Second Edition, Pearson Education Inc. 3. Jones M(2006), Artificial Intelligence application Programming, Second Edition, Dreamtech Press 4. Nilsson (2000), Artificial Intelligence : A new synthesis, Nils J Harcourt Asia Pvt Ltd.
Web Resource(s):
1. https://www.geeksforgeeks.org/artificial-intelligence/ 2. https://www.geeksforgeeks.org/ai-algorithms/ 3. https://ai-literate.online/

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV		Core-VIII					
Course Title		Artificial Intelligence Programming Lab					

Learning Objectives

LO1	
LO2	
LO3	

LO4	
LO5	

SYLLABUS	
Contents	Hours
1. Demonstrate basic problem-solving using Breadth-First Search on a simple grid. 2. Implement Depth-First Search (DFS) on a small graph. 3. Solve the Water Jug Problem using Breadth First Search (BFS). 4. Implement a Hill Climbing search to find the peak in a numeric dataset. 5. Apply the A* Search algorithm to find the shortest path in a 4x4 grid. 6. Implement the Minimax search algorithm for a 2-player game using a game tree with 3 plies. 7. Use backtracking to solve the N-Queens problem. 8. Solve a Constraint Satisfaction Problem (CSP) such as Sudoku using constraint propagation. 9. Apply optimization techniques to find the maximum value in a list. 10. Represent and evaluate propositional logic expressions using Python. 11. Implement forward chaining for rule-based inference in a simple knowledge base. 12. Implement backward chaining for goal-based reasoning in a rule system. 13. Represent family relationships using First Order Predicate Logic in Python. 14. Demonstrate unification process in logical inference using simple examples. 15. Implement a simple intelligent agent using rule-based decision making. 16. Simulate goal-based and utility-based agent behavior in a decision-making environment. 17. Develop a multi-agent communication system using message passing. 18. Implement a simple negotiation model between two software agents. 19. Build a basic rule-based expert system for weather classification. 20. Perform Natural Language Processing (NLP) tasks using Python NLTK: • Tokenization • Stop word removal • Stemming • POS tagging • Chunking • Named Entity Recognition (NER)	

Text Book(s):
1. Elaine Rich, Kevin Knight (2008), Shivsankar B Nair, Artificial Intelligence, Third Edition, Tata McGraw Hill Publication 2. P.Rizwan Ahmed, Artificial Intelligence, Margham Publications, Chennai, 2012
Reference Book(s):
1. Russel S, Norvig P (2010), Artificial Intelligence : A Modern approach, Third Edition, Pearson Education 2. Dan W Patterson (2007), Introduction to Artificial Intelligence and Expert System, Second Edition, Pearson Education Inc. 3. Jones M(2006), Artificial Intelligence application Programming, Second Edition, Dreamtech Press 4. Nilsson (2000), Artificial Intelligence : A new synthesis, Nils J Harcourt Asia Pvt Ltd.
Web Resource(s):

1. <https://www.geeksforgeeks.org/artificial-intelligence/>
2. <https://www.geeksforgeeks.org/ai-algorithms/>
3. <https://ai-literate.online/>
4. <https://www.reliancejio.ai/>

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV		Elective-VII					
Course Title		a) Full Stack Development					

Learning Objectives

LO1	Understand the fundamentals of full stack web development, including client-server architecture and modern web technologies
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LO2	Develop backend applications using Node.js and Express.js for handling server-side logic and APIs.
LO3	Design and manage databases using MongoDB, including basic CRUD operations and schema modeling
LO4	Build interactive user interfaces using React, including components, state, and API integration.
LO5	Integrate frontend, backend, and database to develop complete full stack (MERN) applications.

SYLLABUS		
Unit	Contents	Hours
I	Understanding Web Development – Client–Server Architecture – User, Browser, Web Server, Backend Services – HTTP/HTTPS – MVC Architecture – Introduction to Full Stack Development – Overview of MERN Stack – Basics of JavaScript (ES6+) – Introduction to Asynchronous Programming (Promises, Async/Await).	
II	Introduction to Node.js – Installation and Setup – Node.js Modules – Node Package Manager (npm) – File System (Basic I/O) – Creating Simple Node.js Applications – Events and Event Loop (overview) – Creating Basic HTTP Server – Handling Requests and Responses.	
III	Introduction to NoSQL and MongoDB – MongoDB Atlas Setup – Database, Collections, Documents – Basic CRUD Operations – Introduction to Mongoose – Schema and Model – Connecting MongoDB with Node.js – Simple Database Applications.	
IV	Introduction to Express.js – Setting up Express Application – Routing (GET, POST, PUT, DELETE) – Middleware (basic concept) – Handling Request and Response – Building Simple REST APIs – Connecting Express with MongoDB.	
V	Introduction to React – Creating React Applications – Components – Props and State – React Hooks (useState, useEffect) – Handling Forms – Fetching Data from APIs – Basic Routing (React Router) – Integration with Backend APIs	

Text Book(s):

1. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019
2. Ethan Brown, *Web Development with Node and Express*, O'Reilly Media, Second Edition, 2019.

Reference Book(s):

1. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
2. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018
3. Alex Banks and Eve Porcello, *Learning React*, O'Reilly Media, Second Edition, 2020.
4. David Herron, *Node.js Web Development*, Packt Publishing, Fifth Edition, 2020.

Web Resource(s):

1. <https://nodejs.org/en/docs>
2. <https://expressjs.com/>

3. https://developer.mozilla.org/en-US/docs/Web/JavaScript
4. https://www.mongodb.com/docs/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Explain the architecture and workflow of full stack web applications.	
CO2	Develop server-side applications using Node.js and Express.js	
CO3	Implement database operations using MongoDB and integrate with backend applications.	
CO4	Build dynamic frontend applications using React and handle user interactions.	
CO5	Design and develop a basic full stack web application using the MERN stack.	

RelationshipMatrix:

Course Outcomes (COs)	ProgramOutcomes (POs)						ProgramSpecificOutcomes (PSOs)				MeanScoreof COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
MeanOverallScore											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

MeanOverallScore	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	CourseCode	Course Category	Hours / Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
IV		Electgive –VII					
Course Title		b) Block Chain Technology					

Learning Objectives	
LO1	
LO2	

LO3	
LO4	
LO5	

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Blockchain Technology: Overview of blockchain concepts, decentralized systems, and consensus algorithms, Blockchain types: public, private, and consortium, Cryptography fundamentals for blockchain	
II	Blockchain Development Platforms and Tools: Introduction to blockchain development frameworks (e.g., Ethereum, Hyperledger), Setting up the blockchain development environment, Smart contracts and programming languages (e.g., Solidity)	
III	Blockchain Security and Privacy: Blockchain security challenges and attacks, Cryptographic techniques for securing blockchain transactions, Privacy and anonymity considerations in blockchain systems	
IV	Smart Contracts and Decentralized Applications (DApps): Smart contract development and testing, Interacting with smart contracts using web interfaces and APIs, Building and deploying decentralized applications (DApps)	
V	Blockchain Applications and Industry Use Cases: Blockchain applications in finance, supply chain, healthcare, and other domains, Regulatory and legal considerations for blockchain adoption, Evaluating the potential impact of blockchain on various industries	

Text Book(s):
1. "Mastering Blockchain: Unlocking the Power of Crypto currencies, Smart Contracts, and Decentralized Applications" by Imran Bashir. 2. "Blockchain Basics: A Non-Technical Introduction in 25 Steps" by Daniel Drescher
Reference Book(s):
1. <i>Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World</i> by Don Tapscott and Alex Tapscott. 2. <i>Ethereum and Solidity: The Complete Developer's Guide</i> by Dr. Gavin Wood. 3. <i>Hyperledger Fabric in Production: Architecture, Concepts, and Implementation of Enterprise Blockchain Solutions</i> by Matt Zand, Xun (Brian) Wu, and Mark Anthony Morris.
Web Resource(s):
1. https://www.geeksforgeeks.org/blockchain-technology/ 2. https://docs.soliditylang.org/ 3. https://ethereum.org/en/developers/docs/ 4. https://www.hyperledger.org/use/fabric 5. https://www.useweb3.xyz/

Course Outcomes

Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Understand the underlying concepts and principles of blockchain technology.	
CO2	Design and develop blockchain applications using appropriate frameworks and tools.	
CO3	Analyze and evaluate the security and privacy aspects of blockchain systems	
CO4	Apply smart contracts and decentralized applications (DApps) in blockchain development.	
CO5	Explore the potential use cases and implications of blockchain technology in different industries	

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV		SEC					
Course Title		Indian Knowledge Systems in Computing and Digital Technologies					

Learning Objectives	
LO1	
LO2	
LO3	
LO4	
LO5	

SYLLABUS		
Unit	Contents	Hours
I	Foundations of Indian Knowledge Systems in Computing: Meaning and scope of IKS – Sources: Vedas, Upanishads, Siddhanta texts – Contributions of ancient India to science and knowledge – Knowledge classification in Indian tradition – Relevance of IKS in computing and digital technologies	
II	Indian Mathematics and Computational Foundations: Ancient Indian mathematicians: Aryabhata, Brahmagupta, Bhaskara – Concept of zero and number system – Decimal and place value system – Algorithms in Indian mathematics – Pingala's binary system (Chandahsastra) – Combinatorics concepts	
III	Logic and Reasoning Systems in IKS: Nyaya logic system – Panchavayava syllogism – Indian approaches to reasoning and inference – Rule-based logical structures – Comparison with modern computational logic and decision systems	
IV	Scientific Traditions and Systems Thinking in IKS: Ancient Indian astronomy and computational models – Ayurveda and structured knowledge systems – Pattern recognition in traditional knowledge – Symbolic communication methods – Systems thinking in Indian philosophy	
V	Applications of IKS in Modern Computing: IKS and Artificial Intelligence concepts – Data patterns and knowledge representation – Ethical computing based on Dharma – Digital preservation of knowledge – Case studies on Indian contributions to computing and science	

Text Book(s):
1. Kapil Kapoor and Michel Danino (2019), <i>Indian Knowledge System</i>, D.K. Printworld, New Delhi. 2. U. C. Gupta (2009), <i>Indian Mathematics and Astronomy: Some Landmarks</i>, Indian National Science Academy, New Delhi.
Reference Book(s):
1. S. Chatterjee and D. Datta, <i>An Introduction to Indian Philosophy</i>, University of Calcutta 2. Debiprasad Chattopadhyaya (1977), <i>Science and Technology in Ancient India</i>, Firma KLM Pvt. Ltd., Calcutta. 3. . Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R.N. (2022), <i>Introduction to Indian Knowledge System: Concepts and Applications</i>, PHI Learning, New Delhi.

Web Resource(s):	
• https://iks.aicte-india.org/ (Indian Knowledge Systems Division, AICTE) • https://iks.iith.ac.in/ (Indian Knowledge Systems Cell, IIT Hyderabad) • https://www.iitg.ac.in/ciks/ (Centre for Indian Knowledge Systems, IIT Guwahati) • https://ndl.iitkgp.ac.in/ (National Digital Library of India) • https://shodhganga.inflibnet.ac.in/ (Shodhganga – Indian research repository)	

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV		SEC					
Course Title		Data Visualization Lab					

Learning Objectives

LO1	
LO2	
LO3	
LO4	
LO5	

SYLLABUS	
Contents	Hours
1. Create a Bar Chart to represent student marks in different subjects and identify the highest scorer. 2. Construct a Pie Chart to show the percentage distribution of students across different departments. 3. Develop a Line Chart to analyze monthly sales data and identify trends over a year. 4. Create a Column Chart to compare sales performance of different products. 5. Design an Area Chart to represent growth in website traffic over time. 6. Prepare a Stacked Bar Chart to show category-wise sales contribution across regions. 7. Construct a Combo Chart to compare revenue and profit using dual axes. 8. Generate a Histogram to analyze the distribution of student exam scores. 9. Create a Scatter Plot to study the relationship between study hours and marks obtained. 10. Apply Conditional Formatting (Heatmap) to visualize variations in sales data across regions and months. 11. Create a Pivot Table and Pivot Chart to summarize and visualize large datasets. 12. Design an Interactive Dashboard using charts and slicers for sales analysis. 13. Add a Trendline to a dataset and perform forecasting for future values. 14. Construct a Box and Whisker Plot to analyze the distribution of marks across different classes. 15. Develop an Interactive Chart using dropdown (Data Validation) to switch between datasets dynamically.	

Text Book(s):
1. Wayne L. Winston. (2019). <i>Microsoft Excel Data Analysis and Business Modeling</i>, Microsoft Press, USA. 2. Michael Alexander and Richard Kusleika. (2018). <i>Excel 2019 Bible</i>, Wiley India Pvt. Ltd., New Delhi.
Reference Book(s):
1. Dick Kusleika. (2015). <i>Data Visualization with Excel Dashboards and Reports</i>, Wiley, USA. 2. Cole Nussbaumer Knafllic. (2015). <i>Storytelling with Data: A Data Visualization Guide for Business Professionals</i>, Wiley, USA. 3. Juliet Clark. (2020). <i>Practical Data Visualization with Excel</i>, Packt Publishing Ltd., Birmingham, UK.
Web Resource(s):
1. https://support.microsoft.com/excel 2. https://learn.microsoft.com/en-us/training/browse/?products=excel 3. https://www.excel-easy.com/ 4. https://trumpexcel.com/

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1		
CO2		
CO3		
CO4		
CO5		

Relationship Matrix:

Course Outcomes (COs)	Program Outcomes (POs)						Program Specific Outcomes (PSOs)				Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1											
CO2											
CO3											
CO4											
CO5											
Mean Overall Score											
Correlation											e.g. High / Medium

3 – Strong, 2- Medium, 1- Low

Mean Overall Score	Correlation
<1.5	Low
≥1.5 and <2.5	Medium
≥2.5 High	High