Holy Cross College (Autonomous), Nagercoil

Accredited with A^{++} by NAAC - V cycle – CGPA 3.53

Nagercoil, Kanyakumari District, Tamil Nadu.

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SYLLABUS FOR UNDERGRADUATE PROGRAMME

TEACHING PLAN
EVEN SEMESTER
2025 -2026

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Vision

To establish a centre of excellence in Artificial Intelligence and Data Science that promotes innovation, sustainability, and social transformation by developing professionals and leaders with strong ethical values to tackle global issues for a balanced and sustainable future.

Mission

To provide quality education through the use of advanced tools, promote a culture of collaboration, and encourage customer-oriented innovations that bridge academia and industry, making a significant contribution to societal improvement.

Programme Educational Objectives (PEOs)

PEOs	Upon completion of B.A/B.Sc. degree programme, the graduates will be able to	Mission addressed
PEO 1	apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	**M1 & M2**
PEO 2	inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services.	**M2, M3, M4 & M5**
PEO 3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	**M3, M4, M5 & M6**

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	PEOs addressed
PO 1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	**PEO 1**
PO 2	create innovative ideas to enhance entrepreneurial skills for economic independence.	**PEO 2**
PO 3	reflect upon green initiatives and take responsible steps to build a sustainable environment.	**PEO 2**
PO 4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	**PEO 1 & PEO 3**
PO 5	communicate effectively and collaborate successfully with peers to become competent professionals.	**PEO 2 & PEO 3**
PO 6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	**PEO 2 & PEO 3**
PO 7	participate in learning activities throughout life, through self-paced and self-directed learning to develop knowledge and skills.	**PEO 1 & PEO 3**

Programme Specific Outcomes (PSOs)

PSOs	Upon completion of the B.Sc Artificial Intelligence and Data Science, the graduates will be able to:	Mapping with POs
PSO – 1	evolve AI and Data Science based domain knowledge and skills to pursue advanced studies in the field and integrate these techniques with emerging technologies.	**PO 1**
PSO - 2	develop innovative ideas in AI and data science to enhance entrepreneurial and employability skills for real-world challenges.	**PO 2**
PSO – 3	cultivate versatile skills for problem-solving, technical proficiency, effective communication, and community engagement through self-directed activities.	**PO 4 & PO 7**
PSO - 4	communicate and collaborate proficiently to become competent AI professionals, while addressing biases, and upholding data privacy regulations.	**PO 5 & PO 6**
PSO - 5	reflect on green initiatives and leverage AI to address economic challenges while promoting sustainable development.	**PO 3**

Teaching Plan

Department : **Artificial Intelligence and Data Science**
Class : **II B. Sc Artificial Intelligence and Data Science**
Title of the Course : **Core Course II: Python Programming.**
Semester : **II**
Course Code : **IU242CC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242CC1	**4**	1	-	-	**5**	**5**	**75**	**25**	**75**	**100**

Objectives

1. To understand and identify, important libraries in Python, and explain best practices and idiomatic expressions for writing clean and efficient Python code
2. To develop proficiency in core Python scripting elements and build applications.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	Cognitive level
1	remember fundamental python syntax and basic data types, and understand the concepts.	**K1&K2**
2	analyze and apply functions, control statements, strings, lists and dictionaries in python programming	**K3&K4**
3	demonstrate the concept of object, class inheritance and polymorphism in Python.	**K2**
4	apply user defined functions and classes in python.	**K3**
5	develop programming skills to solve real time computational problems	**K3**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** - Analyse

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Methods	E Resources	Assessment/ Evaluation Methods
I	**Introduction To Computing**								
	1.	Python, Data Types, Expressions Introduction about Python Programming	2	1	K1(R)	Introductory session about data types and methods of interactive shell compilation in python	Inquiry-Based Learning, Case studies	Video Lectures, Notes/Slides	Word Cloud on Algorithms, CIA I
	2.	Running Code in the Interactive Shell Input Processing and output	2		K1(R)	Flipped Classroom	Gamified Quiz	Interactive PPT	Quiz using Slido, CIA I
	3.	Input Processing and output Editing - Saving and Running a Script.	2		K2(U)	Concept Explanations	Concept-based discussion, Problem-solving sessions using real-world applications.	JVM Compiler	Slip Test on Simple programs, CIA I
	4.	Data Types - String Literals – Escape Sequences	2	1	K2(U)	Interactive PPT	Mind mapping-Infographics	Interactive PPT	Quiz using Slido, CIA I
	5.	String Concatenation Variables and the Assignment Statement	2		K2(U)	Syntax Explanations	Peer Code Review	JVM Compiler	Exercises using variables, CIA I

	6.	Numeric Datatypes and Character Sets	1		K3(A)	Demonstration Code Walkthrough	Syntax based learning	PPT & JVM Compiler	Write the syntax for I/O operations, CIA I
	7.	Arithmetic Expressions and Mixed-Mode Arithmetic and Type Conversions.	1		K2(U), K3(A)	Logical Thinking	Think-Pair-Share Mind Mapping	Interactive PPT	Problem solving questions, CIA I
II	**Control Structures**								
	1.	Functions and Modules: An Introduction	2	1	K1(R)	Lecture using Chalk and talk	Scenario Based Learning	Classpoint PPT	Evaluation through short test, CIA I
	2.	Calling Functions - The math Module - The Main Module	2		K2(U)	Lecture with examples	Bug Hunt Activities	IDLE, Notes	List some applications of calling ideas, CIA I
	3.	Program Format and Structure and Running a Script from a Terminal Command Prompt	2	1	K2(U)	Lecture using videos	Case based Learning	IDLE, Notes	Write the syntax and semantics for running a script, CIA I
	4.	Iteration - for loop - Selection - Boolean Type - Comparisons - and Boolean Expressions	2	1	K3(A)	Syntax Explanations with examples	Code Completion Activities	Interactive ppt	Create a program using conditional operator, CIA I
	5.	If else statements-one way selection statements-multi way selection statements	2		K3(A)	Syntax Explanations	Code Completion Activities	PPT	Create programs using loops, CIA I
	6.	Logical Operators and Compound Boolean Expressions	2		K2(U)	Syntax Explanations	Code Tracing Exercises	Class point	Debug the given

									snippets, CIA I
	7.	Short-Circuit Evaluation and Testing Selection Statements	2		K2(U)	Explanations with examples	Completion Activities	Interactive PPT	Debug the given snippets, CIA I
	8.	Conditional Iteration - while loop	2		K2(U)	Lecture using Chalk and talk	Scenario Based Learning	PPT	Develop programs using while, CIA I
III	**Arrays and Strings**								
	1.	Strings-Accessing and Substrings in Strings	1		K2(U)	PPT	Concept Based Learning	PPT using Nearpod	Slip Test, CIA I
	2.	String Methods	2	1	K1(R)	Syntax Explanations	Concept Based Learning	PPT	Create programs using String methods, CIA I
	3.	Text Files - Text Files and Their Format	2		K4(An)	Flipped Classroom	Scenario Based Learning	Presentations using Nearpod	Create Text files , CIA I
	4.	Writing Text to a File Writing Numbers to a File	2	1	K4(An)	Lecture using videos, Code Tracing	Project Based Learning	PPT Using Gamma	Practice Exercises, CIA II
	5.	Strings - Defining a string - Initialization of strings- Reading and writing a string	2		K3(A)	Blended Learning	Code Puzzle Solving	Interactive PPT	MCQ Using Nearpod, CIA II
	6.	Reading Text from a File - Reading Numbers from a File and	2	1	K3(A)	Syntax Explanations, Visual Simulations	Project Based Learning	Class point PPT	Create programs using string manipulation functions in files CIA II

	7.	Accessing and Manipulating Files and Directories on Disk	2		K3(A)	Syntax Explanations	Scenario Based Learning	Presentations using NearPod	Practice Exercises, CIA I
IV		**Functions and Pointers**							
	1.	Lists - List Literals and Basic Operators	2	1	K2(U)	Constructivist Learning	Concept Mapping, Code Development	Self-made Videos, PPT	Short summary, CIA II
	2.	Replacing an Element in a List	2		K3(A)	Contextual Learning	Live Coding Practice	Self-made Videos, PPT	Create a snippet using function, CIA II
	3.	List Methods for Inserting and Removing elements	2	1	K3(A)	Computational Learning	Error Spotting Exercises	Class point PPT	Evaluation through short test, CIA II
	4.	Mutator Methods and the Value None -Aliasing and Side Effects	2		K4(An)	PPT, Programming Demo	Pair Programming Trace Worksheets	PPT	Create a mutator functions with aliasing functions, CIA II
	5.	Equality and Tuples Defining simple functions-parameter Arguments-return statements	1	1	K3(A)	Guided Discovery, Hands-on Lab Sessions	Real Life Analogies, Debugging Sessions	Interactive PPT, Notes	Exercises to create programs using Tuples, CIA II
	6.	Boolean Functions and main function	1		K4(An)	Analytical Study	Mini Projects	Self-made videos	Evaluation through short test, CIA II
	7.	Dictionaries-Dictionary Literals-Adding keys and replacing values-Accessing keys.	1		K4(An)	PPT, Programming Demo	Pair Programming Trace Worksheets	PPT	Create a program using Dictionaries, CIA II

	8.	Removing Keys and Traversing a Dictionary.	1		K3(A)	Computational Learning	Error Spotting Exercises	Class point PPT	Evaluation through short test, CIA II
V	**Structures and File Management**								
	1.	Design with Functions and Design with Classes: Design with Functions and Design with Classes	1	1	K1(R)	Case-Based Teaching, Experiential Learning	Real Life Modeling, Coding with a twist	Class point PPT	True/False Assessment, CIA II
	2.	Functions as Abstraction Mechanisms	1		K3(A)	Contextual Learning	Code Debugging Activity	PPT	Evaluation through exercises, CIA II
	3.	Problem Solving with Top-Down Design	1	1	K3(A)	Live Debugging, Error Spotting Activities	Pointer Matching Puzzles	Online Tutorials and Notes	Evaluation through short test, CIA II
	4.	Design with Recursive Functions and Managing a Program's Namespace	1		K4(An)	Syntax Explanations	Code Refactoring Challenge	Interactive PPT	MCQ, CIA II
	5.	Design with classes: Objects and Classes -	1	1	K3(A)	Experiential Learning	Employee Database Simulation	YouTube Lecture Videos	Develop a simple class program, CIA II
	6.	Data Modelling and Structuring Classes with Inheritance and Polymorphism	1		K2(U)	Interactive ppt, Analogical Pedagogy	Debugging	PPT Using Nearpod	Quiz Using Slido, CIA II

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (Em/ En/SD): 1. Implement basic Python Programs using loops.

2. Lists and Dictionaries Exercises

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Professional Ethics

Activities related to Cross Cutting Issues: Nil

Assignment: 1. Control structures in Python

2. Inheritance and Polymorphism (Last date of submission 10-01-2026)

Seminar Topic: String methods

Sample questions (minimum one question from each unit)

Part A

1. List. append () method can be used to add an element to the end of a list? **Say True or False.**

2. Which of the following data types is immutable in Python?
   a) List b) Dictionary c) Set d) Tuple

3. What will be the output of the following code?

```
x = [1, 2, 3]
y = x append (4)
print(x)
```

   a) [1,2,3,4] b) [1,2,3] c) [1,2,3,4,4] d) Error

4. Which of the following is used to define a function in Python?
   a) function() b) fun() c) def d) lambda

5. Which feature of object-oriented design helps model real-world entities effectively?
   a) Recursive functions b) Polymorphism
   c) Top-down design d) Flat namespaces

Part B

1. Explain the concept of type conversion in Python with examples.
2. What is the purpose of the if-else statement in Python? Provide a basic example.
3. Differentiate between for loop and while loop in Python.
4. Describe the use of the math module in Python. List two functions from the module and their uses.
5. Explain string slicing in Python with an example.

Part C

1. Describe the process of reading and writing text files in Python. Explain with examples.
2. Explain control flow statements with examples.
3. Illustrate the concept of polymorphism in Python.
4. What are dictionaries in Python? Explain.
5. Explain the concept of top-down design and its significance in function-based programming.

Dr. S. Immaculate Shyla
Head of the Department

Dr. Sruthy B S
Course Instructor

Teaching Plan

Department : **Artificial Intelligence and Data Science**
Class : **I B. Sc Artificial Intelligence and Data Science**
Title of the Course : **Core Lab Course II: Python Programming Lab**
Semester : **II**
Course Code : **IU242CP1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241CP1	-	1	4	-	5	5	75	25	75	100

Objectives

1. To understand the basics of Python programming.
2. To understand the high-performance programs, designed to build up the real proficiency.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	Cognitive level
1.	remember fundamental python syntax and basic data types, and describe the concepts.	**K1&K2**
2.	analyse and apply functions, control statements, strings, lists and dictionaries in python programming	**K3&K4**
3.	demonstrate the concept of object, class inheritance and polymorphism in Python	**K2**
4.	apply user defined functions and classes in python.	**K3**
5.	develop programming skills to solve real time computational problems K3	**K3**

K1 - Remember**; K2** - Understand; **K3** – Apply; **K4 -** Analyse

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Methods	E Resources	Assessment/ Evaluation Methods
1	Implementation of Basic Python programs.	6	7	K2(U)	Case based Learning	Software Demonstration	IDLE &JVM Compiler	Performance
2	Simple computational problems using operators.	6		K2(U)	Lecture using Chalk and talk	Syntax based learning	Interactive PPT, JVM Compiler	Observation
3	Programs using list and list comprehensions.	6		K2(U)	Concept Explanations	Code Tracing	JVM Compiler	Viva voce
4	Program using Sets.	8	8	K3(A)	Demonstration	Peer Code Review	IDLE& JVM Compiler	Identify and fix bugs
5	Implementation of Polymorphisms in Python.	8		K3(A)	Visualization	Peer Code Review	JVM Compiler	Short Coding snippets
6	Implementation of Program using Dictionary.	6	8	K3(A)	Demonstration & Code Walkthrough	Syntax based learning	PPT & JVM Compiler	Performance
7	Program using Functions and Strings in Python.	6		K2(U),K3 (A)	Logical Thinking	Think-Pair-Share	PPT & JVM Compiler	Model test
8	Implementation of basic file operations and Inheritance in Python.	6		K3(A)	Demonstration	Scenario Based Learning	IDLE & JVM Compiler	Evaluation through short exercises.

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (Em/ En/SD): 1. Implement basic Python Programs.
2. Sets Processing Exercises
3. Mini Projects

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Nil

Activities related to Cross Cutting Issues: Nil

Assignment:1. Simple Operations in Python

2. Dictionary handling (Last Date for Submission: (14-02-2025)

Sample questions

1. Create a program to display your details using python programming.
2. Develop a program using sets for associative law.
3. Implement a sudoku using I/O.
4. Keep track of stock items, quantities, and prices using files.
5. Create a bar chart using python libraries.

Dr. S. Immaculate Shyla
Head of the Department

Dr. Sruthy B S
Course Instructor

Teaching Plan

Department : **Artificial Intelligence & Data Science**
Class : **I B.Sc Artificial Intelligence & Data Science**
Title of the Course : **Elective Course II: Discrete Mathematics**
Semester : **II**
Course Code : **IU242EC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242EC1	3	1	-	-	3	4	60	25	75	100

Learning Objectives

1. To impart the knowledge of fundamental concepts in probability to solve problems.
2. To understand graph algorithms and representations to solve real-world AI problems.

Course outcomes

On the successful completion of the course, student will be able to:		
1.	gain a deep understanding of functions and their role in problem solving.	**K1 & K2**
2.	understand the basic principles of counting, including the product, sum rules, and apply combinatorial techniques to solve problems in various contexts.	**K2 & K3**
3.	acquire knowledge of the theory of probability and multiplication law of probability.	**K1 & K2**
4.	apply the concept of Baye's theorem and compute mathematical expectation.	**K2 & K3**
5.	design and implement graph-based solutions to AI problems using appropriate data structures and algorithms.	**K2 & K3**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** - Analyse; **K5-** Evaluate

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**FUNCTIONS**								
	1	Introduction- Types of functions	1	1	K1(R) & K2(U)	Introductory session	In-class discussions	Open Text books - Introduction to Discrete Mathematics	Questioning, recall steps, concept definitions, CIA I
	2	Classification of functions- Algebraic function- Transcendental function	2		K2(U)	Collaborative learning	Group activities	Lecture Notes	Evaluation through short test, CIA I
	3	Composition of functions – Property - Examples	2	1	K3(Ap)	Peer teaching	Explaining concepts, answering questions from peers	You Tube videos	Slip Test, concept explanations, CIA I.
	4	Identity function	2		K2(U)	Flipped classroom	Group activities	NPTEL lectures	Quiz using Google Forms, CIA I.
	5	Inverse of a function - Property	2	1	K3(Ap)	Collaborative learning	Team-based learning	Digital Libraries & Databases - Google Scholar	Open Book Test, CIA I

II	**COMBINATORICS**								
	1	Introduction - The Basics of counting Principles - Product rule - Sum Rule - Examples	1	1	K1(R) & K2(U)	Introductory session, Lecturing	Think-pair-share	Open Text books – Discrete Mathematics	Recall steps, questioning, concept definitions, CIA I
	2	Permutations - Examples	2		K3(Ap)	Problem-based learning	Brainstorming	SWAYAM courses	Group discussion, Quiz using Kahoot, CIA I
	3	Combination - Examples	2	1	K2(U) & K3(Ap)	Inquiry-based learning	Formulating questions	Video lectures	Class test, CIA I
	4	Permutations with repetition - Examples	2		K2(U) & K3(Ap)	Flipped classroom	Group activities	Video lectures	Multiple-choice questions, CIA I
	5	Circular permutation - Examples	2	1	K3(Ap)	Peer Teaching	Answering questions from peers	You Tube Videos	Short-answer conceptual questions, Peer review, CIA I
III	**DISCRETE PROBABILITY**								
	1	Introduction - Sample Space	1	1	K1(R) & K2(U)	Active learning	Discussions	Video Lectures	Recall steps, Multiple choice questions, CIA I
	2	Event - Exhaustive event - Favourable event - Mutually	2		K2(U)	Inquiry-based learning	Formulating questions	Open Access Learning	Quiz using Quizizz, CIA I

		exclusive events - Equally likely events - Independent events						Platform- Brilliant.org	
	3	Probability - Axioms of probability – Theorem on probabilities - Examples	2	1	K3(Ap)	Problem-based learning	Online problem sets	You Tube Videos	Assignment, CIA II
	4	Conditional property - Multiplication law of probability - Examples	2	1	K3(Ap)	Lecturing	Think-pair-share	NPTEL Lectures	Oral test, CIA II
	5	Multiplication law of probability for independent events - Extension of multiplication law of probability - Examples	2		K2(U) & K3(Ap)	Flipped classroom	In-class discussions	Websites - MIT Open Course Ware	Group discussion, CIA II
IV	**DISCRETE PROBABILITY**								
	1	Total probability - Examples	3	1	K2(U)	Introductory session, Lecturing	Think-pair-share	You Tube videos	Quiz on Total probability, CIA II
	2	Baye's theorem - Examples	3	1	K3(Ap)	Flipped classroom	Group activities	NPTEL Lectures	Observation note, CIA II

	3	Mathematical expectations - Examples	3	1	K3(Ap)	Problem-based learning	Think-pair-share	You Tube Videos	Group discussion, CIA II
V	**GRAPH THEORY**								
	1	Introduction - Graph - Undirected graph - Directed graph	1	1	K2(U)	Lecturing	Think-pair-share	Websites – Open Text book Library	Class Test, CIA II
	2	Multi graph - Pseudo graph - Simple graph - General graph - Examples	2		K2(U) & K3(Ap)	Inquiry-Based learning	Formulating questions	*Video Lectures*	Brainstorming, CIA II
	3	Degree of a vertex - Finite graph- Order of a graph - Size of a graph	2	1	K2(U)	Blended learning	Online discussions	NPTEL lectures	Group discussion, Multiple Choice Questions, CIA II
	4	Null graph - Isolated graph - Regular graph - Isomorphic graphs	2	1	K2(U)	Flipped classroom	In-class discussions	Free Text book – Internet Archive	Quiz on regular graph, CIA II
	5	Matrix representation of graphs - Adjacency matrices - Incidence matrix - Subgraph - Weighted graph – Examples	2		K3(Ap)	Problem-based learning	Group discussions	NPTEL lectures	Oral test, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (Em / En /SD): Solve the problems in Mathematical expectations

Assignment: Probability (Last date to submit 21-02-2026)

Sample questions

Part A

1. A function which consists of trigonometric functions, inverse circular functions, exponential functions, logarithmic functions, hyperbolic functions and inverse hyperbolic functions are called _____. **(K1-R, CO 1)**
2. How many different bit strings are there of length seven? **(K2-U, CO 2)**
3. Any subset of the sample space is called _____. **(K2-U, CO 3)**
   (a) probability (b) outcome (c) random experiment (d) event
4. State True or False: If $E_1, E_2, \ldots, E_n$ is a set of exhaustive and mutually exclusive events and A is another event associated with E_i then $P(A) = \sum P(E_i)P(A/E_i)$. **(K2-U, CO 4)**
5. A graph which allows more than one edge to join a pair of vertices is called a _____. **(K2-U, CO 5)**
   (a) multi graph (b) simple graph (c) general graph (d) finite graph

Part B

1. Prove that composition of function is associative. **(K2-U, CO 1)**
2. Each user on a computer system has a password which is six to eight characters long, where each character is an uppercase letter or a digit. Each password must contain at least one digit. How many possible passwords are there? **(K3-Ap, CO 2)**
3. What is the probability of having a Jack and a Queen when two cards are drawn from a pack of 52? **(K3-Ap, CO 3)**
4. A coin is tossed until a tail appears. What is the expectation and variance of the number of tosses? **(K3-Ap, CO 4)**
5. Write the matrix representation of graphs. **(K2-U, CO 5)**

Part C

1. Prove that the necessary and sufficient conditions for the function $f: A \rightarrow B$ to be invertible is that f is one-to-one and onto. **(K2-U, CO 1)**
2. Determine the number of integer solution of the equation $x_1 + x_2 + x_3 + x_4 = 32$ where
   (a) $x_i \geq 0, i = 1,2,3,4 \; or \; 1 \leq i \leq 4$ (b) $x_i \geq 0, 1 \leq i \leq 4$ (c) $x_1, x_2 \geq 5 \; and \; x_3, x_4 \geq 7$ (d) $x_1, x_2, x_3 > 0 \; and \; 0 < x_4 \leq 25$. **(K3-Ap, CO 2)**
3. Two dice are thrown. Let A be the event that the sum of the points on the faces is odd and B is the event that at least one number is 1. Find the probability of (i) $A \cup B$ (ii) $\bar{A} \cap \bar{B}$ (iii) A|B (iv) B|A (v) $\bar{A} \cup \bar{B}$. **(K3- , CO 3)**
4. State and prove Baye's theorem. **(K2-U, CO 4)**
5. Prove that the sum of the degrees of the vertices of a graph G is equal to twice the number of edges in G. Also prove that the number of vertices of odd degree in a graph is always even. **(K3-Ap, CO 5)**

Head of the Department
Dr. S. Immaculate Shyla

Course Instructor
Dr. C.Jenila

Teaching Plan

Department : **Artificial Intelligence and Data Science**
Class : **I UG**
Title of the Course : **NME II: Understanding Internet**
Semester : **II**
Course Code : **IU242NM1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242NM1	1	1	-	-	2	2	30	25	75	100

Objectives

1. To understand and gain knowledge of internet mass medium.
2. To study the various features of internet technology, demographic and psychographic description of internet audiences, issues related to cybercrime and cyber security.

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO – 1	understand the basic concept of network and HTML.	PSO- 1	K1(R) & K2 (U)
CO – 2	understand the basics of WWW and web browsers	PSO- 2	K2(U) & K3(A)
CO – 3	describe the security hash function and concepts of security methods.	PSO- 2	K2(U) & K3(A)
CO – 4	solve problems involving malware.	PSO- 3	K3(A) & K4(An)
CO – 5	apply algorithm for secure network.	PSO- 3	K2(U) & K3(A)

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** - Analyse

Teaching plan

Total Contact hours: 30 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment	Cognitive level	Pedagogy	Student centric Methods	E-Resources	Assessment/ Evaluation
I	**Introduction to Internet**								
	1.	Working and history of the internet- Uses of internet - World Wide Web (WWW)	1	1	K1(R)	Introductory session	Fundamentals Through Exploration	videos	Overview CIA I
	2.	Web Client- Web Browser- Webpage – Website	1		K2(U)	PPT	Reflection & Extension	PPT	Simple definitions CIA I
	3.	Search Engine- Difference between network and internet - Advantages and Disadvantages of the Internet	1		K2(U)	Video Lecture	Fundamentals Through Exploration	Online videos	Terminology Recall CIA I
	4.	Application Software and Programming Languages – Application Software - Packaged Software Products (Off-the- Shelf Products).	1		K2(U)	PPT	Inquiry-Based Introduction	Notes	Different technologies recall CIA I
II	**WWW and Web Browsers**								

	1.	WWW-Evolution of Web-Basic Elements of WWW-Web Browsers-Search Engines-Search Criteria.	1	1	K2(U)	Video Lecture	Flipped or Discovery-Based Learning	videos	Evaluation through short test CIA I
	2.	Web Publishing: Web Publishing-Web Page Design.	1		K3(Ap)	Demonstration	Wrap-Up Reflection	PPT	Map knowledge CIA I
	3.	Email: E-Mail Basics- E-Mail System-E-Mail Protocol-E-Mail Addresses-Structure of an E-Mail Message	1		K2(U)	Lecture usingvideos	Collaborative Simulation	Online videos	Brain Storming CIA I
	4.	E-Mail Clients & Servers- Mailing List- E-Mail Security.	1		K4(An)	PPT	Flipped or Discovery-Based Learning	Notes	Quiz CIA I
III	**Digital Transformation**								
	1.	Data (High Value Commodity) - Digital Transformation in Business - Features of Digital Transformation	1	1	K1(R)	PPT	Evidence Handling Relay	Online videos	Recall steps CIA I

	2.	Banking and Financial Services Industry (BFSI) - Human Resource Management	1		K2(U)	Lecture using Chalk and talk	Collaborative Simulation	Notes	MCQ CIA I
	3.	Healthcare - Big Data Analytics in Healthcare	1		K4(An)	Demonstration	Flipped or Discovery - Based Learning	Youtube videos	Slip Test CIA II
	4.	Virtual Reality Wearable medical devices.	1		K4(An)	Lecture using videos	Problem-Based Scenario	Class point	Short Summary CIA II
IV	**Cyber Security**								
	1.	IT Assets - Risk and Vulnerabilities	1		K2(U)	Lecture using Chalk and talk	Contextual learning	videos	Short summary CIA II
	2.	Computer Security Types - Fundamental Principles of Security - Physical Safety and Security	1	1	K1(R)	Lecture using videos	Constructivist learning	PPT	Concept explanation CIA II
	3.	Access Control - Biometric Access Control - Network Security - AAA Server	1		K3(A)	Demonstration	Experimental tools	Online videos	Recall Steps CIA II
	4.	Firewall – Malware – Spyware – Adware – Spamware – Virus – Ransomware	1		K2(U)	Lecture using videos	Evidence Handling Relay	Notes	Group Discussion CIA II
	5.	Worms					Flipped or	YouTube videos	Evaluation

			1	1	K2(U)	PPT	Discovery-Based Learning		through short test CIA II
	6.	Trojan Horse	1		K2(U)	Lecture using interactive PPT	Wrap-Up Reflection	Class Points	Short summary CIA II
V	**Computer Virus**								
	1.	Computer Virus: Types of Computer Viruses - Antivirus	1		K2(U)	Interactive PPT	Flipped or Discovery-Based Learning	Interactive PPT	Short summary CIA II
	2.	Digital Signature - Cyber Crime – Hacking – Phishing Spam e-mails - Attack using Malware	1	1	K2(U)	Demonstration	Flipped or Discovery-Based Learning	Online videos	Brain Storming CIA II
	3.	ATM Skimming – Ransom ware	1		K2(U)	Video	Wrap-Up Reflection	PPT	Quiz CIA II
	4.	Fake News	1		K4(An)	Demonstration	Collaborative Simulation	Interactive notes	Short Summary CIA II
	5.	Deep fake	1		K3(A)	PPT	Flipped or Discovery-Based Learning	PPT	Case Study CIA II
	6.	Cyber bullying.	1		K4(An)	Lecture using Videos	Inquiry-Based Introduction	Online videos	Case Study CIA II

Course Focussing on Employability/Entrepreneurship/Skill Development: **Skill Development**

Activities (Em/ En/**SD**):

Create a website on your name with two web pages i) About Me ii) My Hobbies

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Nil

Activities related to Cross Cutting Issues: Nil

Assignment:

1. History of Internet its advantages and disadvantages.
2. Viruses vs Worms vs Trojan Horse. (Last date of submission 05-1-2026)

Seminar Topics:

1. Viruses, Cyber Bullying, Deep Fake, Case Study

Sample questions (minimum one question from each unit)

Part A

1. What does WWW stand for?
2. What protocol is commonly used for sending email?

   a) HTTP b) FTP c) SMTP d) IMAP
3. Which technology is most associated with analyzing large sets of data to find patterns and insights?

   a) Virtual reality b) Big data analytics c) Manual spreadsheets d) Physical data archiving
4. Biometric access control includes using facial recognition or fingerprints for security. State True or False.
5. Deep fakes are always easy to identify due to their poor quality. State True or False

Part B

1. What is the difference between a network and the internet?
2. Define an email protocol and list two examples.
3. How has digital transformation affected the banking and financial services industry (BFSI)?
4. What is the primary purpose of a firewall in network security?

5. What is ATM skimming, and how does it affect consumers?

Part C

6. Discuss the various advantages and disadvantages of the internet and their impact on society.
7. What measures can be taken to ensure email security, and why is this important in today's digital communication?
8. Discuss the role of big data analytics in modern healthcare, highlighting its importance and examples of its use in improving patient outcomes.
9. Describe various types of malware (such as spyware, adware, ransomware, viruses, worms, and Trojans) and their impacts on computer systems
10. Explore the ethical and security implications of deep fake technology in the context of cyber security and social media.

Dr. S. Immaculate Shyla
Head of the Department

Dr. Sruthy B S
Course Instructor

Teaching Plan

Department : **Artificial Intelligence and Data Science**
Class : **I B. Sc Artificial Intelligence and Data Science**
Title of the Course : **Skill Enhancement Course I : Quantitative Aptitude**
Semester : **II**
Course Code : **IU242SEC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242SEC1	1	1	-	-	2	2	**30**	**25**	**75**	**100**

Objectives

1. To develop skill to meet the competitive examinations for better job opportunity.
2. To enrich their knowledge and to develop their logical reasoning thinking ability.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	Cognitive level
1.	understand the basic concepts of numbers.	**K1 & K2**
2.	apply the concept of percentage, profit and loss.	**K3**
3.	solve problems using distance and time.	**K3**
4.	analyze the concepts of discount and probability.	**K4**
5.	solve the problems easily with short cut methods.	**K3**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** – Analyze

Teaching plan

Total Contact hours: 30 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Methods	E Resources	Assessment/ Evaluation Methods
I									
	1.	Numbers -HCF and LCM of numbers	1	1	K1(R)	Chalk & talk with stepwise explanation	Peer solving of number problems	IndiaBix	Problem-solving tests, CIA I
	2.	Decimal fractions - Simplification- - Average-Problems on Numbers.	1		K1(R)	Demonstration of shortcut methods	Think–Pair–Share for simplification questions	IndiaBix	Short Test, CIA I
	3.	Problems on Divisibility Rules - Finding Units Digit for a Complex Calculation -	1		K2(U)	Solving model problems	Gamification	IndiaBix	Slip Test on Divisibility rules, CIA I
	4.	Square roots and cube roots	1		K2(U)	Solving model problems	Puzzle Based Learning	TalentBattle	Group Tasks, CIA I
	5.	Finding Reminders - Problems on Prime Factorization and Decimal Fractions	1		K2(U)	Demonstration of shortcut methods	Quick mental-math exercises	TalentBattle	Exercises, CIA I
II									

	1.	Problems on Ages - Surds and Indices - percentage	2	1	K1(R)	Group activities on percentage	Peer learning & collaborative solving	CareerRide	Evaluation through short test, CIA I
	2.	Profits and loss - ratio and proportion- partnership	1		K2(U)	Group activities on ratios	Testbook – MCQs	CareerRide	Short Test, CIA I
	3.	Problems on unitary methods Problems on alternate days and wages	1		K2(U)	Board-based step-by-step problem solving	Brainstorming & puzzle-based activities	CareerRide	Short Test, CIA I
	4.	Problems on chain-rule.	1		K3(A)	Case-based questions	Peer learning & collaborative solving	CareerRide	Short Test, CIA I
III									
	1.	Time and work - pipes and cisterns - Time and Distance	1	1	K3(A)	Diagrammatic Explanations	Testbook – MCQs	IndiaBix	Slip Test, CIA I
	2.	Problems on trains - Boats and streams	3		K3(A)	Worked Examples Method	Brainstorming & puzzle-based activities	IndiaBix	Slip Test, CIA I
	3.	Simple interest - compound interest	3		K3(A)	Concept-Formula Based	Testbook – MCQs	IndiaBix	Short Test, CIA I
	4.	Area-Volume and surface area	3	1	K3(A)	Use of Visual Representations	Individual practice worksheets	IndiaBix	Short Test, CIA II
	5.	Problems on circular tracks, races and games.	2	1	K3(A)	Error analysis teaching	Individual practice worksheets	IndiaBix	MCQ , CIA II
IV									

	1.	Permutation and combination	2	1	K2(U)	Solving model problems	Brainstorming & puzzle-based activities	TalentBattle	Short summary, CIA II
	2.	Probability-True Discount-Bankers Discount	2		K4(An)	Demonstration of shortcut methods		TalentBattle	Class test, CIA II
	3.	Height and Distances-Odd man out & Series	2	1	K4(An)	Board-based step-by-step problem solving	Brainstorming & puzzle-based activities	TalentBattle	Evaluation through short test, CIA II
	4.	Problems on linear arrangement	2		K4(An)	Peer teaching of shortcuts	Testbook – MCQs	IndiaBix	Assignment, CIA II
	5.	Problems on circular arrangement	2	1	K3(A)	Step by Step Problem Solving	Testbook – MCQs	IndiaBix	Team Work, CIA II
	6.	Problems when repetitions are allowed - Problems on selections.	2		K4(An)	Board-based step-by-step problem solving	Peer learning & collaborative solving	TalentBattle	Evaluation through short test, CIA II
V									
	1.	Calendar - Clocks	2	1	K1(R)	Solving model problems	Quiz-based learning	IndiaBix	True/False Assessment, CIA II
	2.	Problems on stocks and shares - Line graphs.	2		K4(An)	Demonstration of shortcut methods	Individual practice worksheets	IndiaBix	Evaluation through exercises, CIA II

	3.	Data representation - Tabulation	2	1	K4(An)	Board-based step-by-step problem solving	Quiz-based learning	IndiaBix	Evaluation through short test, CIA II
	4.	Data Interpretation	2		K4(An)	Use of Visual Representations	Quiz-based learning	IndiaBix	MCQ, CIA II
	5.	Bar Graphs-Pie Charts	2	1	K4(An)	Error analysis teaching	Peer learning & collaborative solving	TalentBattle – Graph MCQs	Class test, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (Em/ En/SD): 1. Group Discussion on Data Interpretation problems.
2. Analyze the problems on circular tracks, races and games.

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Nil
Activities related to Cross Cutting Issues: Nil

Assignment: 1. Exercise problems on finding square roots and cube roots.

2. Exercise problems on finding area and volume (Last Date for Submission: 12-01-2026)

Seminar Topic: Line Graphs

Sample questions (minimum one question from each unit)

Part A

1. Find the HCF of 24 and 36.
2. The cube root of 1000 is_____.

   a) 5 b) 10 c) 15 d) 20
3. A train moving at 60 km/hr covers how much distance in 1 hour?

   a) 30 km b) 60 km c) 90 km d) 120 km
4. The number of permutations of 4 distinct objects is:

   a) 4 b) 8 c) 12 d) 24
5. The formula for Simple Interest is:

   a) SI = P×R b) SI = P×T c) SI = PRT d) SI = P×R×T / 100

Part B

6. Find the LCM of 18, 24, and 30 using prime factorization.
7. Find the sum of all odd numbers upto 100.
8. A trader sells an article for ₹960 at a loss of 20%. Find the cost price.
9. A and B can complete a work in 10 and 15 days respectively. Find the time taken if they work together.

10. A train 120 m long runs at 54 km/hr. How long will it take to cross a pole?

Part C

11. Simplify: i) 1605 x 1605 ii) 1398 x 1398
12. A, B, and C invest in a business in the ratio 4:5:6. At the end of the year, the total profit is ₹1,50,000. Find each partner's share.
13. A train 150 m long passes a platform 300 m long in 30 seconds. Find its speed and the time taken to cross a 200 m bridge.
14. A man rows 15 km downstream in 3 hours and upstream 9 km in 3 hours. Find the speed of the boat and speed of the stream.
15. From the following data, draw a pie chart:

    Science – 45 students

    Arts – 30 students

    Commerce – 25 students

Dr. S. Immaculate Shyla
Head of the Department

Dr. S. Immaculate Shyla
Course Instructor

Teaching Plan

Department : **Artificial Intelligence and Data Science**
Class : **II B. Sc Artificial Intelligence and Data Science**
Title of the Course : **Core Course IV : Machine Learning Techniques**
Semester : **IV**
Course Code : **IU244CC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU244CC1	**4**	1	-	-	**5**	**5**	**75**	**25**	**75**	**100**

Objectives

1. To facilitate the basics of machine learning concepts.
2. To learn to build a machine learning model from the scratch.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	Cognitive level
1.	explain fundamental machine learning concepts.	**K1 & K2**
2.	implement machine learning algorithms such as linear regression, decision trees, and neural networks using Python and relevant libraries.	**K3**
3.	analyze datasets to preprocess, visualize, and extract meaningful patterns for model training and evaluation.	**K4**
4.	evaluate and compare the performance of different machine learning models using appropriate metrics such as accuracy, precision, and recall.	**K5**
5.	design and optimize machine learning models for real-world applications such as classification, regression, clustering, and recommendation systems.	**K6**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** – Analyze; **K5** – Evaluate; K6- Create

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Methods	E Resources	Assessment/ Evaluation Methods
I	**Introduction to Machine Learning**								
	1.	Machine Learning: Introduction- Human Vs Machine Learning	2	1	K1(R)	Brainstorming session	Inquiry-Based Learning, Algorithm Sketching	Video Lectures, Notes/Slides	Word Cloud on HL Vs ML, CIA I
	2.	Well posed Learning Problem	2		K1(R)	Lecture using Chalk and talk	Software Demonstration Gamified Quiz	Interactive PPT	Quiz using Slido, CIA I
	3.	Types of Machine Learning- Supervised- Unsupervised- Reinforcement	2		K2(U)	Concept Explanations	Concept-based discussion	PDF	Slip Test on ML Types, CIA I
	4.	Comparison- Types of ML	1	1	K4(An)	Interactive PPT	Mind mapping- Infographics	Interactive PPT	Quiz using Slido, CIA I
	5.	Applications of Machine Learning	2		K2(U)	Poster Presentations about ML applications	Case study analysis (ML applications)	PPT	Short Test, CIA I
	6.	Languages/Tools in Machine Learning	2	1	K3(A)	Demonstration	Syntax based learning	PPT & Cocalc virtual platform	Simple exercises, CIA I
	7.	Challenges in Machine Learning	1		K2(U), K3(A)	Logical Thinking	Think-Pair-Share Mind Mapping	Interactive PPT	Problem solving

									questions, CIA I
II	**Feature Engineering**								
	1.	Introduction- Feature Engineering	2	1	K1(R)	Lecture using Chalk and talk	Scenario Based Learning	Classpoint PPT	Evaluation through short test, CIA I
	2.	Transformation- Feature- Subset Selection	2		K2(U)	Lecture with examples	Problem Solving	Turbo C, Notes	Slip test, CIA I
	3.	Importance of Statistical Tools in Machine Learning	2	1	K2(U)	Instructor-led demonstrations of ML tools	Case based Learning	Turbo C, Notes	Short Test, CIA I
	4.	Concept of Probability Random variables	1	1	K3(A)	Demonstration of feature engineering in Python	Data exploration activity in groups	Interactive ppt	Problem Sets, CIA I
	5.	Bernoulli- Binomial Distributions- Poisson- Gaussian Distributions	3		K3(A)	Whiteboard derivations of distributions	Peer teaching on distributions	PPT	Online Quizzes, CIA I
	6.	Multiple Random Variables- Sampling Distributions- Hypothesis testing	2		K2(U)	Lectures with real datasets	Data exploration activity	Classpoint	Mini Exercises, CIA I
III	**Supervised Learning**								
	1.	Introduction	1	1	K2(U)	Brainstorming	Concept Based Learning	PPT using Nearpod	Slip Test, CIA I
	2.	Regression- Linear regression	3		K1(R)	Code demonstrations using Colab	Concept Based Learning	PPT	Create programs for regression, CIA I
	3.	Classification: Decision trees	2		K4(An)	Flipped Classroom	Scenario Based Learning	Presentations using NearPod	Practice Exercises, CIA I

	4.	k-Nearest Neighbours- Support Vector Machine- Logistic regression	2	1	K4(An)	Lecture using videos, Code Tracing	Project Based Learning	PPT Using Gamma	Practice Exercises, CIA II
	5.	Random Forest- Artificial Neural Network: Introduction- Perceptrons	2	1	K3(A)	Blended Learning	Problem Solving	Interactive PPT	MCQ Using Nearpod, CIA II
	6.	Multi-layer networks- Back propagation	2		K3(A)	Visual Simulations	Project Based Learning	Colab	Model Building Assignment, CIA II
IV	**Unsupervised Learning**								
	1.	Introduction- Supervised vs Unsupervised	2	1	K2(U)	Visual explanations	Infographics	Self-made Videos, PPT	Short summary, CIA II
	2.	Application of Unsupervised Learning	2		K3(A)	Contextual Learning	Live Coding Practice	Self-made Videos, PPT	List out the applications of UL, CIA II
	3.	Clustering Analysis, K-means clustering	2	1	K3(A)	Computational Learning	Error Spotting Exercises	Classpoint PPT	Evaluation through short test, CIA II
	4.	Hierarchical clustering- Association Rule	2		K4(An)	Programming Demo for Association Rules	Pair Programming Trace Worksheets	PPT	MCQ, CIA II
	5.	Dimension reduction: Principal Component Analysis	2	1	K3(A)	Guided Discovery, Hands-on Lab Sessions	Real Life Analogies, Debugging Sessions	Interactive PPT, Notes	E Quiz, CIA II
	6.	Linear Discriminant Analysis	2		K4(An)	Analytical Study	Mini Projects	Self-made videos	Evaluation through short test, CIA II
V	**Preparing to Model**								

	1.	Introduction- Machine Learning Activities	2	1	K1(R)	Demonstration of full ML workflow	Capstone mini-project in teams	Classpoint PPT	True/False Assessment, CIA II
	2.	Basic type of data in Machine Learning	2		K3(A)	Contextual Learning	Code Debugging Activity	PPT	Evaluation through exercises, CIA II
	3.	Exploring Structure of Data- Data Quality and Remediation	2	1	K3(A)	Live Debugging, Error Spotting Activities	Cross Word Puzzles	Online Tutorials and Notes	Evaluation through short test, CIA II
	4.	Data Preprocessing	2		K4(An)	Error Analysis Sessions- Kaggle datasets	Capstone mini-project in teams	Interactive PPT	MCQ, CIA II
	5.	Modelling and Evaluation: Selecting a model- Training a model- Model Representation	2	1	K3(A)	Experiential Learning	Capstone mini-project in teams	YouTube Lecture Videos	Assignment on Training a Model, CIA II
	6.	Evaluating Performance of a model	2		K2(U)	Interactive ppt, Analogical Pedagogy	Debugging	PPT Using Nearpod	Quiz Using Slido, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (Em/ En/SD): 1. Implement Python Libraries
2. Train a Model using Machine Learning techniques

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Professional Ethics

Activities related to Cross Cutting Issues: Nil

Assignment: 1. Applications of Machine Learning

2. Principal Component Analysis (Last Date for Submission: 12-01-2026)

Seminar Topic: Types of Machine Learning

Sample questions (minimum one question from each unit)

Part A

1. Supervised learning requires_____.
   a) Labelled data b) Unlabelled data c) Reinforcement signals d) None
2. Bernoulli distribution has_____ outcomes.
   a) Two outcomes b) Infinite outcomes c) No outcomes d) None
3. Backpropagation updates its weights. Say True or False.
4. K-means uses_____.
5. Train-test split ratio commonly_____.

Part B

6. Describe the types of machine learning with suitable diagrams.
7. Explain feature engineering and its importance.
8. Write notes on Random Forest.
9. Explain association rule mining.
10. Explain cross-validation.

Part C

11. Discuss in detail the major challenges in ML and ways to overcome them.
12. Explain Poisson, Gaussian, Bernoulli, and Binomial distributions in detail.
13. Explain backpropagation with mathematical expressions.
14. Discuss applications of clustering in real domains.
15. Compare different evaluation metrics.

Dr. S. Immaculate Shyla
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Course Instructor

Teaching Plan

Department : **Artificial Intelligence and Data Science**
Class : **I B. Sc Artificial Intelligence and Data Science**
Title of the Course : **Core Lab Course IV: Machine Learning Lab**
Semester : **IV**
Course Code : **IU244CP1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU244CP1	-	1	4	-	5	5	75	25	75	100

Objectives

1. To introduce the basic concepts and techniques of machine learning.
2. To apply machine learning to learn, predict and classify the real-world problems.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	Cognitive level
1.	understand the basic concepts and techniques of Machine Learning and the need of Machine Learning techniques in real-world problems.	**K1&K2**
2.	apply Machine Learning to learn, predict and classify the real-world problems in the Supervised Learning paradigms as well as discover the Unsupervised Learning paradigms of Machine Learning.	**K3**
3.	analyze the concept of Reinforcement Learning and Ensemble Methods	**K4**
4.	evaluate performance of the Machine Learning algorithms.	**K5**
5.	design Artificial Neural Networks of Supervised Learning for the selected problems.	**K6**

K1 – Remember; **K2-** Understand; **K3**- Apply; **K4** – Analyze; **K5** - Evaluate; **K6** - Create

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Methods	E Resources	Assessment/ Evaluation Methods
1	Implementation of Python Basic Libraries such as Statistics, Math, Numpy and Scipy.	5	5	K2(U)	Case based Learning	Demonstration	Python IDLE, Colab	Performance
2	Implementation of Python Libraries for ML application such as Pandas and Matplotlib.	5		K2(U)	Demonstration	Syntax based learning	Python IDLE, Colab	Observation
3	Creation and Loading different types of datasets in Python using the required libraries. i. Creation using pandas ii. Loading CSV dataset files using Pandas iii. Loading datasets using sklearn	5		K3(A)	Concept Explanations	Code Tracing	Python IDLE, Colab	Viva voce
4	Write a python program to compute Mean, Median,	5	5	K3(A)	Demonstration	Peer Code Review	Python IDLE, Colab	Identify and fix bugs

	Mode, Variance, Standard Deviation using Datasets.							
5	Implement Dimensionality reduction using Principal component Analysis method on IRIS dataset.	5		K3(A)	Visualization	Peer Code Review	Python IDLE, Colab	Short Coding snippets
6	Write a program to demonstrate the working of the decision tree based ID3 algorithm by considering a dataset.	5	3	K3(A)	Demonstration & Code Walkthrough	Concept Explorations	Python IDLE, Colab	Performance
7	Consider a dataset, use Random Forest to predict the output class. Vary the number of trees as follows and compare the results: i. 20 ii. 50 iii. 100 iv. 200 v. 500	5		K2(U),K3 (A)	Logical Thinking	Think-Pair-Share	Python IDLE, Colab	Model test
8	Write a Python program to implement Simple Linear Regression and plot the graph.	5		K6(C)	Demonstration	Scenario Based Learning	Python IDLE, Colab	Evaluation through short exercises.
9	Write a Python program to implement Simple	5		K3(A)	Demonstration &	Syntax based learning	Python IDLE, Colab	Performance

	Linear Regression for iris using sklearn and plot the confusion matrix.				Code Walkthrough			
10	Build KNN Classification model for a given dataset. Vary the number of k values as follows and compare the results: i. 1 ii. 3 iii. 5 iv. 7 v. 11	5		K2(U),K3 (A)	Logical Thinking	Think-Pair-Share	Python IDLE, Colab	Model test
11	10. Implement Support Vector Machine for a dataset and compare the accuracy by applying the following kernel functions: i. Linear ii. Polynomial iii. RBF	5	2	K6(C)	Demonstration	Scenario Based Learning	Python IDLE, Colab	Evaluation through short exercises.
12	Write a python program to implement K-Means clustering Algorithm. Vary the number of k values as follows and compare the results: i. 1 ii. 3 iii. 5	5		K6(C)	Demonstration	Peer Code Review	Python IDLE, Colab	Evaluation through short exercises.

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (Em/ En/SD): 1. Implement basic Python Programs
2. Linear Regression- Exercises
3. Mini Projects

Course Focussing onCross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Nil

Activities related to Cross Cutting Issues: Nil

Assignment:1. Python Libraries- Exercises

2. Bubble Sort Algorithm (Last Date for Submission: (10-02-2026)

Sample questions

Implement Using Python

1. Validate email format using basic string rules.
2. Build a contact book using dictionary (add/search/delete).
3. Convert Roman numerals to integers.
4. Extract all unique words from a paragraph and list them alphabetically.
5. Create a simple password strength checker.
6. Build a command-line to-do list application (add, update, delete).

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Head of the Department

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Course Instructor

Teaching Plan

Department : **Artificial Intelligence and Data Science**
Class : **II B. Sc Artificial Intelligence and Data Science**
Title of the Course : **Elective Course IV: Human Computer Interaction**
Semester : **IV**
Course Code : **IU244EC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243EC1	4	1	-	-	3	4	**60**	**25**	**75**	**100**

Objectives

1. To learn the foundation of Human Computer Interaction.
2. To learn the guidelines for user interface.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	Cognitive level
1	to understand the basics of HCI.	**K1&K2**
2	design effective HCI for individuals and persons with disabilities.	**K3**
3	assess the importance of user feedback.	**K4**
4	explain the HCI implications for designing multimedia / ecommerce / e-learning Web sites.	**K4**
5	develop meaningful user interface.	**K3**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** – Analyze.

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Methods	E Resources	Assessment/ Evaluation Methods
I	**Foundation of HCI**								
	1.	Introduction and Overview: Concept of HCI	1	1	K1(U)	Introductory session about Data Structures, Real Time applications	Inquiry-Based Learning, Case Studies	Video Lectures, Notes/Slides	Menti meter-Word Cloud, CIA I
	2.	I/O Channels-Memory	2		K2(R)	Flipped Classroom	Gamified Quiz	Interactive PPT	Quiz using Slido, CIA I
	3.	The computer-Device-Memory	2		K2(U)	Concept Explanations	Concept-based discussion	Notes/Slides	Slip Test, CIA I
	4.	Processing a networks-Metaphor	2		K2(U)	Syntax Explanations	Mind mapping-Infographics	Interactive PPT	Quiz using Slido, CIA I
	5.	Frameworks-Ergonomics-styles-elements	2		K2(U)	Simulation Tasks	Peer Code Review	PPT	Exercises CIA I
	6.	Paradigms-Personna-Case studies.	2		K3(A)	Demonstration , Code Walkthrough	Syntax based learning	PPT	Hands on training CIA I
II	**Design & Software Process**								
	1.	Interactive Design: Basics –process	1	1	K1(R)	Lecture using Chalk and talk	Scenario Based Learning	Classpoint PPT	Evaluation through short test, CIA I
	2.	scenarios –	2		K2(U)	Lecture with examples	Code Development	Notes	List some applications

		navigation – compatibility design							of navigations CIA I
	3.	Iteration and prototyping.	2		K3(A)	Lecture Method	Mathematical Equations-Solve	Notes	Exercises, CIA I
	4.	HCI in software process: Software life cycle – usability engineering	2		K3(A)	Lecture Method	Mathematical Equations-Solve	Notes	Software cycles with eg CIA I
	5.	Prototyping in practice (Wireframe, Low Fidelity)	1	1	K1(R)	Concept Explanations	Scenario Based Learning	PPT	List some applications CIA I
	6.	design rationale- - Design rules: principles, standards, guidelines, rules.	2		K2(U)	Syntax Explanations	Code Development for Queue operations	Classpoint	Debug the given snippets, CIA I
III	**MODELS AND THEORIES HCI Models**								
	1.	Cognitive models: Socio-Organizational issues	1	1	K2(U)	PPT	Concept Based Learning	PPT using Nearpod	Slip Test, CIA I
	2.	Stakeholder requirements	1		K1(R)	Syntax Explanations	Concept Based Learning	PPT	Question raising CIA I
	3.	Communication models	2		K4(An)	Flipped Classroom	Scenario Based Learning	Presentations using NearPod	Model creation CIA I
	4.	Testing and its types- When to test?	2		K4(An)	Lecture using videos, Code Tracing	Project Based Learning	PPT	Exercises, II CIA
	5.	Testing methods	2	1	K3(A)	Blended Learning	Code Puzzle Solving	Interactive PPT	MCQ Using Nearpod, II CIA
	6.	Think Aloud Test Protocol.	1		K3(A)	Syntax Explanations,	Project Based Learning	Class point PPT	Create programs

						Visual Simulations			using Linked List, II CIA
	7.	Collaboration model	1		K3(A)	Lecture Method	Scenario Based Learning	Class point	List out the collaboration models, II CIA
IV	**INTERFACE DESIGN PRINCIPLES**								
	1.	Elements of GUI	1	1	K2(U)	Constructivist Learning	Concept Mapping, Code Development	Self made Videos, PPT	Short summary, II CIA
	2.	General Principles	1		K3(A)	Contextual Learning	Live Coding Practice	Self made Videos, PPT	Create a snippet for general principlesII CIA
	3.	User Centred Design	1		K3(A)	Computational Learning	Error Spotting Exercises	Classpoint PPT	Evaluation through short test,II CIA
	4.	Design - Interface Design Principles-	1	1	K4(An)	PPT, Programming Demo	Pair Programming Trace Worksheets	PPT	Construct a design interface,II CIA
	5.	Schneiderman's 8 Principles	2		K3(A)	Guided Discovery, Hands-on Lab Sessions	Real Life Analogies, Debugging Sessions	Interactive PPT, Notes	Quiz Using Slido,II CIA
	6.	Nielsen Norman Usability Heuristic	2		K4(An)	Demonstration	Mini Projects	Notes/Slides	Evaluation through short test,II CIA
	7.	Donald Norman Principles.	2		K3(A)	Analytical Study	Comparative Study	Interactive PPT	Create code for Norman principles, II CIA
V	**WEB INTERFACE DESIGN**								
	1.	Designing Web Interfaces	1	1	K1(R)	Case-Based Teaching,	Real Life Modelling,	Class point PPT	Quiz , II CIA

						Experiential Learning	Coding with a twist		
	2.	Drag & drop, Direct Selection	2		K3(A)	Contextual Learning	Code Development Activity	PPT	Evaluation through exercises, II CIA
	3.	Contextual Tools	2		K3(A)	Hands on Practice	Tools implementation	Simulation using Visual go	Evaluation through short test, II CIA
	4.	Overlays, Inlays and Virtual Pages	1		K4(An)	Syntax Explanations	process of lays in pages	Interactive PPT	MCQ, II CIA
	5.	Process Flow – Emerging Technologies in HCI-	2	1	K3(A)	Experiential Learning	Emerging Database Simulation	You tube Lecture Videos	Develop a simple process flow, II CIA
	6.	Challenges in HCI- Case Studies.	2		K2(U)	Interactive ppt, Analogical Pedagogy	Simulate case studies	PPT Using Nearpod	Quiz Using Slido, II CIA

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (Em/ En/SD): 1. List out the applications of HCI
2. Prototype Models

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Nil

Activities related to Cross Cutting Issues: Nil

Assignment:1. Nielsen Norman Usability Heuristic

2. Think Aloud Test Protocol. (Last Date for Submission: 10-01-2026)

Seminar Topic: Contextual Tools

Sample questions (minimum one question from each unit)

Part A

1. 1.Which cognitive model predicts the time taken to perform low-level tasks like keystrokes and mouse movements?

a) Mental Model b) KLM Model c) GOMS Model d) Cognitive Walkthrough

2. Schneiderman's Golden Rule "Reduce short-term memory load" refers to:

a) Using consistent icons b) Providing undo options c) Avoiding the need to remember complex commands
d) Giving warnings for errors

3. Think Aloud Protocol is mainly used for:

a) Performance testing b) Usability evaluation c) Security testing d) Functional testing

4. Overlays in web design refer to:
a) Hidden menus inside pages b) Content that appears on top of the existing page
c) Separate virtual pages d) Background elements

5. Which one is NOT a Nielsen Norman Usability Heuristic?

a) Visibility of system status b) Error prevention c) Allow easy reversal of actions
d) Match between system and real world

Part B

1. Explain the components of the GOMS model with an example**.**
2. Describe Socio-Organizational issues that influence HCI system design.
3. Write a short note on Think Aloud Test Protocol and its types.
4. What are Overlays, Inlays, and Virtual Pages in Web Interface Design? Explain with examples.
5. Explain any six of Schneiderman's 8 Golden Rules of Interface Design.

Part C

1. Discuss various cognitive models used in HCI such as Mental Models, GOMS, and Norman's 7 Stages of Action.
2. Explain different testing methods used in HCI.
3. Describe in detail Nielsen Norman's 10 Usability Heuristics.
4. Discuss in depth the principles of Web Interface Design.
5. Explain drag & drop, direct selection and contextual tools.

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