KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF INFORMATION TECHNOLOGY (UG)

Certificate Programme in Artificial Intelligence and MachineLearning

CURRICULUM AND SCHEME OF EXAMINATIONS

(2022 - 2023 onwards)

DEPARTMENT OF INFORMATION TECHNOLOGY

Vision:

- To achieve excellent standards of quality education by keeping pace with rapidly changing technologies.
- To create technical manpower of global standards with capabilities of accepting new challenges in Information Technology.
- Integral Formation and Empowerment of students for social transformation through Information Technology.

Mission:

- To provide outstanding education and training to our graduate students for their productive careers in industry, academia, and government.
- To impart quality and value based education to raise satisfaction level of all stakeholders.
- To empower students with academic excellence, knowledge and training.
- To enable critical thinking among students towards development in IT with reference to social transformation.
- To apply new developments in Information Management and provide all possible support to promote research & development.
- To serve as a platform whereby the student enrich their personalities to assume greater responsibilities.

PROGRAMME OUTCOME (PO)

PO1	To Understand the meaning, purpose, scope, stages, applications, and effects of AI.
PO2	To analyze and understand machine learning concepts and range of problems that can be handled by machine learning.
PO3	To develop various real time applications using latest technologies and programming languages.
PO4	To understand concept of knowledge representation and predicate logic and transform the real-life information in different representation.
PO5	To implement deep learning algorithms, understand neural networks, and traverse the layers of data abstraction which will empower you to understand data like never before.

PROGRAMME SPECIFIC OUTCOME (PSO)

On successful completion of this programme you will have knowledge and understanding of:

PSO1 An ability to apply scientific and technological principles underlying Artificial Intelligence.

PSO2 An ability to apply current techniques, skills, Specialist tools and techniques used to design, analyze, implement and verify AI systems.

PSO3 An ability to apply design and development principles in the construction of software systems of varying complexity.

PSO4 An ability to use knowledge in various domains to identify real world problems and hence to provide solution to new ideas and innovations.

PSO5 Use different machine learning techniques to design AI machine and enveloping applications for real world problems.

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CERTIFICATE PROGRAMME IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (Six Months)

CURRICULUM & SCHEME OF EXAMINATION

[APPLICABLE TO THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2022-2023 & ONWARDS]

Semester	Subject code	Title of the Paper	Instruction Hours / Cycle	Exam. Marks			Duration of Exam (hrs)	Credits
				CIA	ESE	Total		
	22CAI101	**Core Paper 1** - Python with Data Science	3	50	50	100	3	2
	22CAI102	**Core Paper 2** -Machine Learning	3	50	50	100	3	2
	22CAI103	**Core Paper 3** – Artificial Intelligence & Knowledge Representation	3	50	50	100	3	2
	22CAI1CL	**Core Practical 1 –** Programming Lab- Python with Data Science	3	50	50	100	3	2
		Total	12	-	-	400	-	8

Part-wise Total Marks:

SUBJECT	MARKS	TOTAL CREDITS
Core Theory	300	6
Core Practical	100	2

CIA – Continuous Internal Assessment

ESE – End –of- Semester Examination

50% CIA is applicable to all subjects for both Theory and Practical.

CAI- 2

Components of Continuous Internal Assessment (50 Marks)

Components		Marks	Total
Theory			
CIA I	75	(75+75) converted to 30	50
CIA II	75		
Problem based Assignment**		10	
Attendance		5	
Others*		5	
Practical			
CIA Practical		(50) converted to 30	50
Observation Notebook		15	
Attendance		5	

* Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop/Conference Participation. Presentation of Papers in Conferences, Quiz, Report/Content writing. Etc.

****** Two Assignments to be given. (Each 5 marks).

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

(K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating)

CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 20	A (Answer all)	20 x 1 = 20	MCQ-10/ Fill ups-5/ One word-5	75**
K2 – K5 Q21 to 28	B (5 out of 8)	5 x 5= 25	Short Answers	
K2 – K5 Q29 to 33	C (3 out of 5)	3 x 10 = 30	Descriptive / Detailed	

****For ESE 75 marks converted to 50 marks.**

ESE Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments	45	50
K4	Record Work	05	
K5			

CAI- 3

Sub. Code: 22CAI101

Programme Code: 12	**CERTIFICATE PROGRAMME IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Title of the Paper: Core Paper 1 – Python with Data Science			
Batch	Hours / Week	Total Hours	Credits
2022-2023	**3**	**45**	**2**

Course Objectives

1. To demonstrate the use of built-in objects of Python
2. To implement numerical programming, data handling through NumPy Modules.
3. To Visualize through MatplotLib modules.
4. To Manipulate Pandas Data Frame.

Course Outcomes (CO)

K1 to K5	CO1	Implement the concepts lists, tuples and dictionaries
	CO2	Understand the use of built-in objects of Python
	CO3	Implement numerical programming, data handling through NumPy Modules
	CO4	Applying MatplotLib modules on data sets for visualization
	CO5	Manipulating Pandas Data Frame and Summarize Data

Syllabus

Unit I **(9 Hours)**

INTRODUCTION TO PYTHON: Introduction - Python Overview - Getting Started with Python -Operators - Tuples - Creating Tuples - Accessing values in Tuples - Tuples are Immutable - Tuple Assignment - Tuples as Return Values - Variable Length Argument Tuples - Basic Tuple Operations. Built-in Tuple Functions.

Unit II **(9 Hours)**

DICTIONARIES: Creating a Dictionary - Accessing values in a Dictionary - Updating Dictionary - Deleting elements from dictionary - Operations in dictionary. **CLASSES AND OBJECTS**: Overview of OOP - Class Definition - Creating Objects - Objects as arguments - Objects as Return Values - Inheritance - Method Overriding - Data Encapsulation - Data Hiding. **EXCEPTION**: Built-in exceptions - Handling exceptions - Exception with arguments - User defined exceptions.

Sub. Code: 22CAI101

Unit III **(9 Hours)**

USING NUMPY: Basics of NumPy - Computation on NumPy - Aggregations-Computation on Arrays-Comparisons, Masks and Boolean Arrays-Fancy Indexing-Sorting Arrays-Structured Data: NumPy's Structured Array.

Unit IV **(9 Hours)**

DATA MANIPULATION WITH PANDAS: Introduction to Pandas Objects-Data indexing and Selection-Operating on Data in Pandas-Handling Missing Data-Hierarchical Indexing - Combining Data Sets - Aggregation and Grouping-Pivot Tables-Vectorized String Operations - Working with TimeSeries High Performance Pandas-eval() and query().

Unit V **(9 Hours)**

VISUALIZATION AND MATPLOTLIB: Basic functions of matplotlib - Simple Line Plot, Scatter Plot-Density and Contour Plots-Histograms, Binnings and Density-Customizing Plot Legends, Colour Bars-Three-Dimensional Plotting in Matplotlib.

Teaching Methods:

Chalk and Talk, Smart Class Room, Powerpoint Presentation, Seminar, Quiz & Discussion

Text Books:

1. E. Balagurusamy, (2017), **Problem Solving and Python Programming**, McGraw-Hill, First Edition. (UNIT I & II).
2. Jake VanderPlas,(2016), **Python Data Science Handbook** - Essential Tools for Working with Data, O'ReilyMedia,Inc,

Reference Books:

1. Allen B. Downey, (2016), **Think Python: How to Think like a Computer Scientist**, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016.

2. Robert Knell, (2013), **Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and programming in R**, Amazon Digital South Asia Services Inc, Richard Cotton. Learning R, O'Reilly Media.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	S	H	M	S
CO3	H	S	H	S	H
CO4	S	S	H	S	H
CO5	S	H	H	S	M

S – Strong **H** – High **M** – Medium **L** – Low

CAI- 6

Sub. Code: 22CAI102

Programme Code:12	**CERTIFICATE PROGRAMME IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Title of the Paper: Core Paper 2 – Machine Learning			
Batch	Hours / Week	Total Hour	Credits
2022-2023	**3**	**45**	**2**

Course Objectives

1. To explain about the types of machine learning.
2. To learn and understand the concept of neural networks
3. To understand classification and clustering techniques
4. To understand evolutionary models

Course Outcomes (CO)

K1 to K5	CO1	Understand the basic techniques and types of machine learning
	CO2	Build neural networks using algorithms
	CO3	Implement applications with clustering and classification techniques
	CO4	Analyze tree and probabilistic models
	CO5	Understand evolutionary models

Syllabus

Unit I **(9 Hours)**

INTRODUCTION TO MACHINE LEARNING: Learning - Types of Machine Learning - Supervised Learning - The Brain and the Neuron - Design a Learning System - Perspectives and Issues in Machine Learning - Concept Learning Task - Concept Learning as Search - Finding a Maximally Specific Hypothesis - Version Spaces and the Candidate Elimination Algorithm - Linear Discriminants - Perceptron - Linear Separability - Linear Regression.

Unit II **(9 Hours)**

NEURAL NETWORKS: Neural Networks - threshold logic units - linear machines - networks of threshold learning units - Training of feed forward networks by back propagations - neural networks vs. knowledge-based systems.

Sub. Code: 22CAI102

Unit III **(9 Hours)**

TREE & PROBABILISTIC MODEL: Tree and Probabilistic Models – Learning with Trees – Decision Trees – Constructing Decision Trees, Probability and Learning – Data into Probabilities – Basic Statistics.

Unit IV **(9 Hours)**

COMPUTATIONAL LEARNING: Computational Learning theory, mistake bound analysis, sample complexity analysis, VC dimension, Occam learning, accuracy and confidence boosting.

Unit V **(9 Hours)**

UNSUPERVISED LEARNING: Unsupervised Learning: Clustering, mixture models, k-means clustering,hierarchical clustering, and distributional clustering, Reinforcement learning.

Teaching Methods:

Chalk and Talk, Smart Class Room, Powerpoint Presentation, Seminar, Quiz & Discussion

Text Books:

1. Stephen Marsland (2014), **Machine Learning - An Algorithmic Perspective**, 2nd Edition, Chapman and Hall/CRCMachine Learning and Pattern Recognition Series.
2. Bishop C. (2006). **Pattern Recognition and Machine Learning.** Berlin: Springer-Verlag.
3. Ethem Alpaydin (2014), **- Introduction to Machine Learning 3e** (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press.

Reference Books:

1. Tom M Mitchell,(2013) **Machine Learning**, 1st Edition, McGraw Hill Education.
2. Ethem Alpaydin,(2014), **Introduction to Machine Learning** , MIT Press, 3rd Edition.
3. Andreas, C. Muller & Sarah Guido, **Introduction to Machine Learning with Python A guide for datascientists**.
4. Peter Flach, Machine Learning,(2012) **The Art and Science of Algorithms that Make Sense of Data**, 1st Edition,Cambridge University Press.

CAI- 8

Sub. Code: 22CAI102

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	S	H	S	S
CO3	S	H	H	S	H
CO4	S	S	S	S	M
CO5	S	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

CAI- 9

Sub. Code: 22CAI103

Programme Code : **12**	**CERTIFICATE PROGRAMME IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Title of the Paper: Core Paper 3 – Artificial Intelligence & Knowledge Representation			
Batch	Hours / Week	Total Hours	Credits
2022-2023	**3**	**45**	**2**

Course Objectives

1. To understand concepts of Artificial Intelligence and characteristics of intelligent agents
2. To learn the different search strategies in AI
3. To understand various knowledge representation techniques
4. To understand the concepts of Planning and uncertainty
5. To learn the concepts of learning in AI

Course Outcomes (CO)

K1 to K5	CO1	Understand the characteristics of intelligent agents
	CO2	Understand and implement the Informed search strategies
	CO3	Able to Represent a problem using first order logic.
	CO4	Apply the Baye's rule to solve the problem
	CO5	Analyze the different learning systems to solve a given problem.

Syllabus

Unit I **(9 Hours)**

INTRODUCTION: Introduction - Foundations of AI - History of AI - Intelligent agent - Types of agents - Structure - Problem solving agents - AI programming languages - Introduction to LISP and PROLOG - Uninformed search strategies - Breadth first search – Uniform cost search - Depth first search - Depth limited search - Bidirectional search -Searching with partial Information.

Unit II **(9 Hours)**

SEARCHING TECHNIQUES: Informed search - Strategies - A* Heuristic function - Hill Climbing - Simulated Annealing - Constraint Specification problem - Local Search in continuous space - Genetic algorithm - Optimal decisions in games - Pruning - Imperfect decisions -Alpha - Beta pruning - Games that include an element of chance.

Sub. Code: 22CAI103

Unit III **(9 Hours)**

KNOWLEDGE REPRESENTATION*:* Knowledge based agent - The Wumpus world environment - Propositional logic - Inference rules - First-order logic - Syntax and semantics - Situation calculus - Building a knowledge base - Electronic circuit domain - Ontological Engineering -Forward and backward chaining - Resolution - Truth maintenance system.

Unit IV **(9 Hours)**

PLANNING AND UNCERTAINTY: Planning - Representation of planning - Partial order planning - Planning and acting in real world - Acting under uncertainty - Bayes's rules - Semantics of Belief networks Inference in Belief networks.

Unit V **(9 Hours)**

LEARNING: Learning from observation - Inductive learning - Decision trees - Explanation based learning - statistical Learning methods - Reinforcement Learning Case Study: Chat bot System.

Teaching Methods:

Chalk and Talk, Smart Class Room, Powerpoint Presentation, Seminar, Quiz & Discussion

Text Books:

1. Stuart J.Russel, Peter Norvig,(2009), **Artificial Intelligence A Modern Approach**, 3rd Edition, Pearson Education.
2. Elaine Rich, Kevin Knight,(2009), **Artificial Intelligence**, 3rd Edition, Tata McGraw Hill.

Reference Books:

1. M.Tim Jones, (2008), **Artificial Intelligence: A Systems Approach (Computer Science)**, Jones and BartlettPublishers, Inc., 1st Edition.
2. David L. Poole and Alan K. Mackworth,(2010), **Artificial Intelligence: Foundations of Computational Agents**, 2ndEdition, Cambridge University Press.
3. Wolfgang Ertel,(2017), **Introduction to Artificial Intelligence**, 1st Edition, Springer.

CAI- 11

Sub. Code: 22CAI103

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	S	H	S	S
CO3	S	H	H	S	H
CO4	S	S	S	S	M
CO5	S	S	H	S	S

S – Strong **H** – High **M** – Medium **L** – Low

CAI- 12

Sub. Code: 22CAI1CL

Programme Code : **12**	**CERTIFICATE PROGRAMME IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Core Practical 1 –Programming Lab - Python with Data Science			
Batch	Hours / Week	Total Hours	Credits
2022-2023	**3**	**45**	**2**

Course Objectives

1. To gain knowledge about the concepts of Built-in functions and User-defined functions.
2. To understand the concepts of Numpy and Pandas.
3. To learn Python Programming and Key Python Libraries related to AI.
4. To implement classification, clustering and regression algorithms in Python.
5. To develop programs using Matplotlib.

Course Outcomes (CO)

K3 to K5	CO1	Implement the concepts of built-in functions in python programming.
	CO2	Implement various machine learning algorithms using python programming.
	CO3	Understand the basics of Matplotlib.
	CO4	Analyze the concept of Decision Tree.
	CO5	Implement the concepts of Numpy and Pandas.

List of Practical Programs

1. Write a program to implement Breadth First Search Traversal.
2. Write a program to remove punctuations from the given string.
3. Write a program to sort the sentence in alphabetical order.
4. Write a program to implement Tic-Tac-Toe game using python
5. Write a program to implement linear regression.
6. Write a program to find Mean, Median and mode using Numpy.
7. Write a Machine learning program to demonstrate the working of the decision tree based ID3algorithm. Use an appropriate data set for building the decision tree and apply this knowledgeto classify a new sample.

Sub. Code: 22CAI1CL

8. Write a program to implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Guidelines to the distribution of marks for Practical Examinations:

Two Questions will be given for each student. (3 Hours / 50marks)

Record: 5 marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	10
Execution & Modifications	5	5

Teaching Methods:

Presentation and Program Demonstration using Projector

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	H
CO4	S	S	S	S	S
CO5	S	S	S	S	H

S – Strong **H** – High **M** – Medium **L** – Low