KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF INFORMATION TECHNOLOGY (UG)

Certificate Course in Artificial Intelligence and Machine Learning

CURRICULUM AND SCHEME OF EXAMINATIONS

(2021 - 2022 onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Coimbatore – 641029

Vision:

Developing the total personality of every student in a holistic way by adhering to the principles of Swami Vivekananda and Mahatma Gandhi.

Mission:

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education.

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	**T**o 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, analyse, 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.

KONGUNADU ARTS AND SCIENCE COLLEGE [AUTONOMOUS]
COIMBATORE - 641 029.

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

CURRICULUM & SCHEME OF EXAMINATION

[APPLICABLE TO THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2021-2022 &ONWARDS]

Semester	Subject code	Title of the Paper	Instruction Hours / Cycle	Exam. Marks			Duration of Exam (hrs)	Credits
				CIA	ESE	Total		
	21CAI101	**Core Paper I** - Python and R Programming	3	25	75	100	3	2
	21CAI102	**Core Paper II** -Machine Learning	3	25	75	100	3	2
	21CAI103	**Core Paper III** – Artificial Intelligence & Knowledge Representation	3	25	75	100	3	2
	21CAI1CL	**Core Practical I –** Python and R Programming Lab	3	40	60	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
25% CIA is applicable to all subjects. 40% CIA for Practicals.

CAI- 2

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate

1. Theory Examination - Part I, II & III

(i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 to K2 Q 1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K2 to K5 Q 11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 to K5 Q 16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

2. Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments & Record Work	50	60
K4		10	
K5			

Components of Continuous Internal Assessment (CIA)

Components			Marks	Total
Theory	CIA I	75	(75+75 = 150/10)	25
	CIA II	75	15	
Assignment / Seminar			5	
Attendance			5	
Practical	CIA Practical		25	40
Observation Notebook			10	
Attendance			5	

CAI- 3

QUESTION PAPER PATTERN for CIA and ESE

Theory

Max Marks: 75 **Time: 3Hrs**

Section A (10 x 1 = 10 marks)

Q.No. 1 to 10: Multiple choice type alone with four distractors each.

Section B (5 x 5 = 25 marks)

Q.No. 11 to 15: Either or / short notes type questions (one question 'a' or 'b' from each unit).

Section C (5 x 8 = 40 marks)

Q.No. 16 to 20: Either or / essay type questions (one question 'a' or 'b' from each unit).

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21CAI101

Programme Code :12		**CERTIFICATE COURSE IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Course Code: 21CAI101		**Core Paper I – Python and R Programming**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	**I**	**3**	**45**	**2**

Course Objectives

1. To introduce the fundamentals of Python Programming.
2. To import the knowledge of Lists, Tuples, Files and Directories.
3. To expose the student sot the fundamental concepts of R Programming.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concept of operators, data types, Looping statements in python programming.
	CO2	Understanding the structures of list, tuples, maintaining dictionaries and exception handling.
	CO3	Applying the concept of functions data frames and tables using R programming.
	CO4	Analyzing the concept of classes and graphics using R programming.
	CO5	Evaluate a program incorporating all the python and R programming from a statistical perspective.

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:

21CAI101

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.

Unit III **(9 Hours)**

Introducing to R - R Data Structures - Help Functions in R - Declarations - Common Vector Operations - Filtering - Creating matrices - Matrix Operations - Applying Functions to Matrix Rows and Columns.

Unit IV **(9 Hours)**

Creating Data Frames - Matrix-like operations in frames - merging Data frames - Applying functions to Data Frames - Factors and Tables - Factors and levels - Common Functions used with factors - Working with tables - Other factors and table related functions - Control statements - Arithmetic and Boolean operators and values.

Unit V **(9 Hours)**

S3 Classes - S4 Classes - Managing your objects - Input/output - accessing keyboard and monitor - reading and writing files - accessing the internet - String Manipulation - Graphics - Creating Graphs - Customizing Graphs - Saving Graphs to files.

Teaching Methods:

Smart Class Room / Powerpoint Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Book:

1. E. Balagurusamy, (2017), **Problem Solving and Python Programming**, McGraw-Hill, First Edition. (UNIT I & II).
2. Norman Matloff, (2011), **The Art of R Programming: A Tour of Statistical Software Design**, No Starch Press. (UNIT III & IV).
3. Jared P. Lander, (2013), **R for Everyone: Advanced Analytics and Graphics**, Addison-Wesley Data & Analytics Series. (UNIT V).

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.
1. Robert Knell, (2013), **Introductory R: A Beginners Guide to Data Visualisation, 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	S	S
CO3	S	H	H	S	H
CO4	S	S	S	S	M
CO5	H	S	M	S	M

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

CAI- 7

21CAI102

Programme Code :12		**CERTIFICATE COURSE IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Course Code: 21CAI102		**Core Paper II – Machine Learning**		
Batch	Semester	Hours / Week	Total Hour	Credits
2021-2022	**I**	**3**	**45**	**2**

Course Objectives

1. To explain about the basics of machine learning.
2. To introduce students to the concepts and techniques of Machine Learning.
3. To expose about tree and unsupervised learning.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
	CO2	Understand the strengths and weaknesses of many popular machine learning approaches.
	CO3	Analyze the inference and learning algorithms for the hidden Markov model.
	CO4	Apply the concepts of computational learning theory and dimensionality reduction.
	CO5	Evaluate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

Syllabus

Unit I **(9 Hours)**

Introduction to Learning: ML Fundamentals - Algorithmic models of learning, Learning classifiers, functions, relations, grammars, value functions.

Unit II **(9 Hours)**

ML- Models: Parameter Estimation, sufficient statistics, decision trees, neural networks, support vector machines, Bayesian networks.

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.

21CAI102

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:

Smart Class Room / Powerpoint Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Book:

1. Bishop, C. (2006). **Pattern Recognition and Machine Learning. Berlin: Springer-Verlag**.
2. Ethem Alpaydin (2014), **- Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)**, Third Edition, MIT Press.

Reference Books:

1. Russel, S. And Norving, P. (2003). **Artificial Intelligence: A Modern Approach**. 2nd Edition, New York: Prentice-Hall.

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	H	H	S	M

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

21CAI103

Programme Code :		**CERTIFICATE COURSE IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Course Code: 21CAI103		**Core Paper III – Artificial Intelligence & Knowledge Representation**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	**I**	**3**	**45**	**2**

Course Objectives

1. To expose the student sot the fundamental concepts of Artificial Intelligence and its applications.
2. To introduce the concepts of Knowledge Representation and AI concepts.
3. To apply basic principles of AI in solutions that requires problem solving.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the fundamental understanding of the history of artificial intelligence (AI) and its foundations.
	CO2	Understanding about the basic concepts of Software agents ad representation of knowledge.
	CO3	Analyze the various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
	CO4	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
	CO5	Evaluate and apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

Syllabus

Unit I **(9 Hours)**

Introduction - Definition - Future of Artificial Intelligence - Characteristics of Intelligent Agents - Typical Intelligent Agents.

Unit II **(9 Hours)**

Problem Solving Methods - Search Strategies - Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations.

Unit III **(9 Hours)**

Knowledge Representation - First Order Predicate Logic - Prolog Programming - Unification - Forward Chaining - Backward - Chaining - Resolution - Knowledge Representation.

21CAI103

Unit IV **(9 Hours)**

Software Agents - Architecture for Intelligent Agents - Agent Communication - Negotiation and Bargaining.

Unit V **(9 Hours)**

AI Applications - Language Models - Information Retrieval - Information Extraction - Natural Language Processing - Machine Translation.

Teaching Methods:

Smart Class Room / Powerpoint Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Books:

1. S. Russell and P. Norvig (2009), **—Artificial Intelligence: A Modern Approach**, Prentice Hall, Third Edition.
2. Bratko (2011) - **Prolog: Programming for Artificial Intelligence**, Fourth Edition, Addison-Wesley Educational Publishers Inc.,

Reference Books:

1. M. Tim Jones (2008), - **Artificial Intelligence: A Systems Approach**, Jones and Bartlett Publishers Inc.First Edition.
2. Nils J. Nilsson (2009), - **The Quest for Artificial Intelligence**, Cambridge University Press, 2009.

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	M	S	H	M

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

21CAI1CL

Programme Code :		**CERTIFICATE COURSE IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**		
Course Code: 21CAI1CL		**Core Practical I – Python and R Programming Lab**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	**I**	**3**	**45**	**2**

Course Objectives

1. To gain knowledge about the concepts of python programming.
2. To understand the concepts of Built-in functions and User-defined functions.
3. To develop programs using String functions.

Course Outcomes (CO)

K3 to K5	CO1	Implement the concepts of built-in functions in python programming.
	CO2	Analyze the use control structures in python programming.
	CO3	Understand the basic concepts and techniques of Machine Learning.
	CO4	Implement the basics in R programming in terms of constructs, control statements, string functions.
	CO5	Implement R Programming to conduct analytics on large real-life datasets.

List of Practical Programs

1. Write a program in various machine learning algorithms in Python.
2. Write a python program to sort a given sequence: String, List and Tuple.
3. Write a program to find Deep Learning & AI using Python.
4. Write a program to find Operators on Factors in R.
5. Write a program to generate a Graph in R using AI concept.
6. Write a Machine learning program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
7. 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.

8. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

Guidelines to the distribution of marks for Practical Examinations:

Two Questions will be given for each student. (3 Hours / 60 marks)

Record: 10 marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	10	10
Program Coding	10	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	S	S	H
CO4	H	S	M	S	H
CO5	S	H	S	M	H

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