COURSE STRUCTURE
AND
DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

For
B. TECH MINOR PROGRAMME
(Applicable for the batches admitted from 2020)

VAAGDEVI COLLEGE OF ENGINEERING
(Autonomous)
Bollikunta, Warangal-506 005
Telangana State, India.

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

S. No.	Course Code	Year/ Semester	Title of the Course	L	T	P	Credits
1	MCAIML01	III/I	Foundations of Artificial Intelligence	3	0	0	3
2	MCAIML02	III/I	Artificial Intelligence Lab	0	0	3	1.5
3	MCAIML03	III/II	Artificial Intelligence Applications	3	0	0	3
4	MCAIML04	IV/I	Machine Learning or Deep Learning	4	0	0	4
5	MCAIML05	IV/I	Machine Learning Laboratory or Deep Learning Laboratory	0	0	3	1.5
6	MCAIML06	IV/II	Natural Language Processing	3	0	0	3
7	MCAIML07	IV/II	Mini Project	0	0	0	2
			Total Credits	**13**	**0**	**6**	**18**

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
FOUNDATIONS OF ARTIFICIAL INTELLIGENCE
(MCAIML01**)**

B. Tech: III / I SEMESTER **L/ T/P/C**
3/ 0 / 0/3

Course Objectives:

- To review and strengthen important mathematical concepts required for AI & ML.
- Introduce the concept of learning patterns from data and
- Develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.

UNIT - I
Defining Artificial Intelligence, Defining AI techniques, Using Predicate Logic and Representing Knowledge as Rules, Representing simple facts in logic, Computable functions and predicates, Procedural vs Declarative knowledge, Logic Programming,

UNIT - II
Mathematical foundations: Matrix Theory and Statistics for Machine Learning. Idea of Machines learning from data, Classification of problem – Regression and Classification, Supervised and Unsupervised learning.

UNIT - III
Linear Regression: Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Gradient Decent in practice.

UNIT - IV
Logistic Regression: Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Overfitting.

UNIT - V
Discussion on clustering algorithms and use-cases centered around clustering and classification.

Course Outcomes: After completion of course, students would be able to:

CO-1: Understand Artificial Intelligence and the techniques used in it.
CO-2: Describe the Mathematical Foundations and Statistics.
CO-3: Evaluate and represent the different models.
CO-4: Interpret the results of the different ML techniques.
CO-5: Design and implement various Algorithms in a range of Real-world Applications.

TEXT BOOKS:

1. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 1st Edition 2011.
2. Yuxi (Hayden) Liu, “Python Machine Learning by Example”, Packet Publishing Limited, 2017.

REFERENCE BOOKS:

1. Anindita Das Bhattacharjee, "Practical Workbook Artificial Intelligence and SoftComputing for beginners, Shroff Publisher-X team Publisher.
2. Tom Mitchell, Machine Learning, McGraw Hill, 2017.
3. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2011.
4. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2011.

Online Resources:

1. Artificial Intelligence, https://swayam.gov.in/nd2_cec20_cs10/preview.

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
ARTIFICIAL INTELLIGENCE LAB
(MCAIML02**)**

B. Tech: III/I SEMESTER **L/T/P/C**
0/0/3/1.5

Course Objectives:

- To review and strengthen important mathematical concepts required for AI & ML.
- Introduce the concept of learning patterns from data and
- Develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.

Week-1: Basic programs in Python to get familiarize various programming structures.

Week-2: Implementation of logical rules in Python.

Week-3 to 5: Using any data apply the concept of:
a. Linear regression
b. Gradient decent
c. Logistic regression.

Week-6: Perform and plot overfitting in a data set.

Week-7: Implementation of KNN classification algorithm.

Week-8: Implementation of k-means clustering algorithm.

Week-9: Explore statistical methods for machine learning.

Course Outcomes:
After completion of course, students would be able to:

CO-1: Define the structure and components of a Python program.
CO-2: Learn how to write loops and decision statements in Python.
CO-3: Learn how to design and program Python applications.
CO-4: Develop the ability to write database applications in Python. And implement machine learning Algorithms in Python.

VAAGDEVI COLLEGE OF ENGINEERING
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ARTIFICIAL INTELLIGENCE APPLICATIONS
(MCAIML03**)**

B. Tech: III / II SEMESTER **L/ T/P/C**
4/ 0/ 0/4

Course Objective:

- To give deep knowledge of AI and how AI can be applied in various fields to make the life easy.

UNIT – I
Linguistic aspects of natural language processing, A.I. And Quantum Computing, Applications of Artificial Intelligence (AI) in business.

UNIT – II
Emotion Recognition using human face and body language, AI based system to predict the diseases early, Smart Investment analysis, AI in Sales and Customer Support.

UNIT – III
Robotic Processes Automation for supply chain management.

UNIT - IV
AI-Optimized Hardware, Digital Twin i.e. AI Modelling, Information Technology &Security using AI.

UNIT - V
Recent Topics in AI/ML: AI/ML in Smart solutions, AI/ML in Social Problems handling, Block chain and AI.

Course Outcomes:
After completion of course, students would:

CO-1: Understand NLP and quantum computing Based on AI.
CO-2: Be Familiar with the different applications of AI.
CO-3: Interpret RPA's use in SCM.
CO-4: Correlate the AI and solutions to modern problem.
CO-5: Decide when to use which type of AI technique.

TEXT BOOKS:
1. Sameer Dhanrajani, AI and Analytics, Accelerating Business Decisions, John Wiley &Sons.
2. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.

REFERENCE BOOKS:
1. Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark, 2018. 2. Homo Deus: A Brief History of Tomorrow by Yuval Noah Harari, 2017.

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
MACHINE LEARNING
(MCAIML04**)**

B. Tech: IV/ I SEMESTER **L/ T/P/C**
4/ 0/ 0/4

Pre-requisites: Programming for Problem solving.

Course Objectives:
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses
- To understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research.

UNIT-I
The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. Binary classification and related tasks: Classification, Scoring and ranking. (Text Book 1- page no: 1-80)

UNIT- II
Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. Concept learning: The hypothesis space, Paths through the hypothesis space. (Text Book 1- page no: 81-127)

UNIT-III
Models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. Rule models: Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First order rule learning. (Text Book 1- page no: 129-156)

UNIT-IV
Linear models: The least-squares method, The Perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data. (Text Book 1- page no: 194-218, 262-297).

UNIT- V
Getting Started with R: Installing R, Running R, The Comprehensive R Archive Network, Getting Help in R, Packages in R. Essentials of the R Language: Calculations, Logical Operations, Vectors and Subscripts, Matrices and arrays, Random numbers, Sampling and shuffling, loops and repeats, List, Data Input, Data Frames, Graphics. (Text Book 2- page no: 1 - 242).

Course Outcomes:

After the completion of this course the students should be able to :

- **CO-1:** Explain the theory underlying machine learning
- **CO-2:** Learn beyond binary classification.
- **CO-3:** Recognize and implement various genetic algorithms.
- **CO-4:** Construct algorithms to learn tree, to learn linear, non-linear models and Probabilistic models.
- **CO-5:** Able to analyze the data using R Programming.

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. The R Book. Second Edition. Michael J. Crawley. 3. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai BenDavid, Cambridge. 2. Machine Learning in Action, Peter Harington, 2012, Cengage. ***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

MACHINE LEARNING LAB
(MCAIML05**)**

B. Tech: IV/ I SEMESTER **L/ T/P/C**
0/0/3/1.5

Pre-requisites: Python Programming.

Course Objectives:
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses
- To understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research.

LAB EXPERIMENTS:

Week-1:
Write a program to create and combine data frames to get whole data.

Week-2:
Write a program to demonstrate data visualization based on user requirement.

Week-3:
Write a program to predict data on Insurance Fraud Detection based on given past historical data.

Week-4:
Write a program for finding the most specific hypothesis based on a given set of training data samples. Read the data from .csv file

Week-5:
Write a program to represent each document as a vector uses term frequency to identify commonly used terms that help classify the documents from various documents

Week-6:
Write a program to derive knowledge from a given dataset using Decision Support System.

Week-7:
Write a program to predict the future data based on past data (take past data as a data set)

Week-8:
Write a program to implement Bayes theorem for support vector machine

Week-9:
Experiment on “To demonstrate least-square method”.

Week-10:

a) Write a R program to Create Pie-Chart.
b) Write a R Program to Demonstrate Scatterplots.

Week-11:

a) Write a R Program to Create Line Chart.
b) Write a R Program to Create Multiple Line Chart.

Week-12: Write a R Program to Create Histograms.

Week-13: Write a R Program to Create Boxplots.

Week-14: Write a R Program to Create Bar Charts.

Course Outcomes:

After the completion of this course the students should be able to:

CO-1: Explain the theory underlying machine learning
CO-2: Learn beyond binary classification.
CO-3: Recognize and implement various genetic algorithms. And construct algorithms to learn tree, linear, non-linear models and Probabilistic models.
CO-4: Able to analyze the data using R Programming.

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. The R Book. Second Edition. Michael J. Crawley. 3. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai BenDavid, Cambridge. 2. Machine Learning in Action, Peter Harington, 2012, Cengage. ***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
NATURAL LANGUAGE PROCESSING
(MCAIML06**)**

B. Tech: IV/ II SEMESTER **L/T/P/C**
3/0/0/3

Prerequisites: Data structures, Theory of Computation and probability theory.

Course Objectives:
- Introduce to some of the problems and solutions of NLP.
- Understand relation to linguistics and statistics.
- Learn Semantic Parsing software.

UNIT - I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNIT - II
Syntax Analysis: Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT - III
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV
Predicate- Argument Structure, Meaning Representation Systems, Software.

UNIT - V
Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

Course Outcomes:
After the completion of this course the students should be able to:

CO-1:	Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
CO-2:	Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
CO-3:	Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
CO-4:	Able to design, implement, and analyze NLP algorithms
CO-5:	Able to design different language modelling Techniques.

TEXT BOOKS:
1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

REFERENCE BOOK:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.