SCHOOL OF ENGINEERING

Dayananda Sagar University
School of Engineering
Department of Computer Science and Engineering

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Course Code	:		**Credits**	:	04
Hours / Week	:	03 Hours	**Total Hours**	:	39(L) + 26(P) Hours
L–T–P-J	:	3–0–2-0			

Course Learning Objectives:

This Course will enable students to:

1. Understand the basic concepts and techniques in Artificial Intelligence.
2. Explore different forms of learning and Artificial Neural Networks.
3. Formulate machine learning problems corresponding to different applications.
4. Evaluate the performance of various models generated from data
5. Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teachers can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture methods, but different *types of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, note taking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**08 Hours**

INTRODUCTION: What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI

INTELLIGENT AGENTS: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

(Text Book 1: Chapter 1, 2)

UNIT – II	**08 Hours**

SOLVING PROBLEMS BY SEARCHING: Problem-Solving Agents, Example Problems

LOGICAL AGENTS: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic **LEARNING FROM EXAMPLES:** Forms of Learning ***(Text Book 1: Chapter 3 : 3.1, 3.2, Chapter 7: 7.1, 7.3, 7.4, Chapter 19: 19.1)*** **ANN:** Introduction, The Perceptron, Training Perceptron, Learning Boolean Functions, Multilayer Perceptron, Learning Time, Deep Learning ***(Text Book 2: Chapter 11 : 11.1 – 11.5, 11.12 , 11.13***

UNIT – III	**08 Hours**
REGRESSION: Overview of Supervised Learning-Introduction, Variable Types and Terminology, Model Selection and the Bias–Variance Trade-off, Regression – Linear, Non-Linear, Univariate, Multivariate ***(Text Book 3: Chapter 2 – 2.1, 2.2, 2.9, Chapter 3 – 3.2, 3.2.3, Chapter 4 – 4.4.1, 4.4.2, Chapter 6 – 6.3, C12- 12.2, Chapter 13- 13.3.1, 13.3.2)*** **CLASSIFICATION:** Classification - Logistic Regression, Naïve Bayes, K Nearest Neighbour, SVM, Decision Tree ***(Text Book 2: Chapter 9 – 9.1, 9.2.1, 9.3)***	

UNIT – IV	**08 Hours**
CLUSTERING: Cluster Analysis - Proximity Matrices, Dissimilarities Based on Attributes, Clustering Algorithms, K-means, Gaussian Mixtures as Soft K-means Clustering, Hierarchical Clustering. ***(Text Book 3: Chapter14)*** **ENSEMBLE METHODS:** Ensemble – Voting, Bagging, Boosting, AdaBoosting, Gradient Boosting, Random Forest. ***(Text Book 2: Chapter 17 – 17.4, 17.6, 17.7, Text Book 3: Chapter 10 – 10.4, 10.10.2, Chapter 15 – 15.1, 15.2, 15.3)***	

UNIT – V	**07 Hours**
DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS: Introduction, basic principles of experimental design, Guidelines for Machine Learning Experiments, Cross-Validation and Resampling Methods, Measuring Classifier Performance, Interval Estimation, Hypothesis Testing, ANOVA. ***(Text Book 2:Chapter* 19 – 19.1, 19.4, 19.5, 19.6, 19.7, 19.8, 19.9, 19.12)**	

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	Understand the foundations of AI and comprehend the concepts of intelligent agents.	L2
2	Model perceptron to learn Boolean functions.	L3
3	Develop solutions for regression and classification problems using supervised learning algorithms with the given dataset.	L3
4	Apply clustering algorithms and ensemble methods to solve	L3

	problems.	
5	Evaluate the performance of machine learning algorithms	L3
6	Develop models in python to solve complex problems using ML algorithms and analyze the model performance.	L4

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1												3
CO2	2	2												3
CO3	3	2												3
CO4	2	2												3
CO5	2	2												3
CO6	3	3	3	2	3				3	3	2	2	2	3

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

Note: To achieve a thorough comprehension and in-depth knowledge of theoretical principles for topics on regression, classification and neural network, students are encouraged to refer the textbook authored by Christopher M Bishop. (Text book 1 in Reference books)

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach, Pearson Education Press, Fourth Edition.
2. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press, Third Edition.
3. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, The Elements of Statistical Learning, Second Edition, Springer.

REFERENCE BOOKS:

1. Christopher M Bishop. Pattern recognition and Machine Learning, Springer
2. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press.
3. Thomas M. Mitchell, Machine Learning, McGraw- Hill, Inc. New York

E-Resources:

1. https://www.kaggle.com/learn/intro-to-machine-learning
2. https://learn.microsoft.com/en-us/training/modules/introduction-to-machine-learning/
3. https://onlinecourses.nptel.ac.in/noc22_cs29/preview

Dayananda Sagar University
School of Engineering
Department of Computer Science and Engineering

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion.
2. Demonstration of solutions to a problem through programming.

MACHINE LEARNING LABORATORY

Total Contact Hours: 26

Following are experiments to be carried out using Python:

1. Data Collection and Preprocessing
2. Exploratory Data Analytics
3. Univariate and Multivariate Linear Regression
4. Logistic Regression
5. Decision Tree Classification
6. Naïve Bayes Classification
7. K Nearest Neighbour Classification
8. SVM
9. K Means Clustering
10. Random Forest
11. XGBoost
12. Mini Project

****

Dayananda Sagar University
School of Engineering
Department of Computer Science and Engineering

COMPUTER NETWORKS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Course Code	:		**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P-J	:	3–0–0-0			

Course Learning Objectives:

This Course will enable students to:

1. **Understand** the basic principles of computer networking and how computer network hardware and software operate.
2. **Evaluate** the operation and performance of practical data link protocols using the principles of framing, error detection and correction.
3. **Apply** the principles of network layer design to the analysis and evaluation of routing algorithms, congestion control techniques, internetworking and addressing.
4. **Investigate** the basic transport layer facilities and essentials of transport. protocol
5. **Describe** the working of various application layer protocols.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teachers can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture methods, but different *types of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, note taking, annotating, and roleplaying.
3. Show ***Video/Animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

SCHOOL OF ENGINEERING

Dayananda Sagar University
School of Engineering
Department of Computer Science and Engineering

UNIT – I	**08 Hours**
INTRODUCTION Uses of Computer Networks, Types of Computer Networks ,Network Technology, from Local to Global, Examples of Networks , Network Protocols, Reference Models , Standardization **Text Book (1.1 to 1.7 Pg. nos. -1-74)**	
UNIT – II	**08 Hours**
THE PHYSICAL LAYER Guided Transmission Media, Wireless Transmission, Using the Spectrum for Transmission, From Waveforms to Bits, Communication Satellites. **Text Book (2.1- to 2.4, 2.8 Pg. nos. - 90-130, 176 - 184)**	
UNIT – III	**08 Hours**
THE DATA LINK LAYER Data Link Layer Design Issues, Error Detection and Correction , Elementary Data Link Protocols , Improving Efficiency. **THE MEDIUM ACCESS CONTROL SUB LAYER** The Channel Allocation Problem, Multiple Access Protocols. **Text Book(3.1 to 3.4 , 4.1 to 4.2.1 Pg. nos.: 202 - 238, 268 - 276)**	
UNIT – IV	**08 Hours**
THE NETWORK LAYER Network Layer Design Issues, Routing Algorithms in a Single Network, The Network Layer in the Internet. **Text Book (5.1, 5.2: 5.2.1 to 5.2.6, 5.7: 5.7.1 to 5.7.3. Pg. nos.: 360 – 384, 441-470)**	
UNIT – V	**08 Hours**
THE TRANSPORT LAYER The Transport Service, Elements of Transport Protocols, **THE APPLICATION LAYER** DNS — The Domain Name System , Electronic Mail , WWW, Streaming Audio and Video **Text Book (6.1-6.1.3, 6.2 ,7: 7.1.1 to 7.1.5, 7.2:7.2.1, 7.3:7.3.1, 7.4:7.4.1 to 7.4.2 Pg. No 501- 509, 513-536, 613-629, 632-635,650-653, 682-687)**	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course, the student will be able to:		
1	**Understanding** the basic concepts of data communications including the key aspects of networking Network Technology, from Local to Global, Examples of Networks , Network Protocols	L2