

WEST BENGAL COUNCIL OF HIGHER SECONDARY EDUCATION
SYLLABUS FOR CLASS XI AND XII
SUBJECT : ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Course Objectives :

The objectives of this course are:

- To impart knowledge about basic computer fundamentals and programming environments required for implementing Artificial Intelligence (AI) systems.
- To enable the students to understand the history of AI and the basic principles of modern AI.
- To enable students to learn the informed and uninformed search methods, and a simple evolutionary algorithm for solving problems.
- To enable students to understand the fundamentals of knowledge representation, building of simple knowledge-based systems, and to apply knowledge representation and reasoning
- To enable the students to understand important machine learning (ML) algorithms used for improving various components of an AI agent
- To enable the students to understand the uses of AI and ML in various applications.
- To enable the student to understand ethics in AI
- To gain practical experience in developing various AI and ML models

Course outcomes:

Upon successful completion of this course, the student shall be able to:

- Demonstrate an understanding of the history of AI and its foundations.
- Apply basic principles of AI in problem-solving that require perception, knowledge representation, inference, and learning.
- Demonstrate awareness and a fundamental understanding of various applications of AI and Machine Learning techniques in real-world problem solving.
- Demonstrate proficiency in developing various real-world AI and ML applications using the latest programming languages and software tools.
- Demonstrate an ability to share in discussions of AI and ML, its current scope and limitations, and its impact on society.

CLASS – XI : SEMESTER – I

SUBJECT: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AIDS)-THEORY

FULL MARKS: 35

CONTACT HOURS: 60 Hours

| UNIT NO. | SUB UNIT | TOPICS | CONTACT HOURS | MARKS |
|------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|
| Unit-1 Computer Fundamentals (16) | 1A | History of computer, generation of computers, classification of computers, block diagram of a basic Computer system-a visual representation of its fundamental components (CPU unit, input unit, output unit, memory unit input) and their functions, various input and output devices, Basic computer architecture, Storage Devices -primary and secondary storage devices | 5 | 3 |
| | 1B | Bit, Byte and Word, Number System (Base, Binary, Decimal, Octal, Hexadecimal), Conversion of number systems, Boolean logic, Logic Gates, canonical form, combinational circuit design(with simple examples), ASCII code. Basic computer architecture -data flow between CPU, Memory and I/O device, Interconnection of computer units via system buses, Registers-various important registers within CPU, Control unit-how it instructs ALU and registers, and I/O devices, Simple examples showing how ALU works. Basic instruction format, basic steps of instruction cycle and their brief description. | 10 | 5 |
| | 1C | Concept of Algorithm and Flowchart(with simple examples), Basics of Computer Programming (three levels: high level language, assembly language, machine language, definition and block diagrams), Overview of Compiler and Interpreter (definition and mention name of major compiled (e.g., C, C++) and interpreted languages (e.g., Python), Overview of procedural and object oriented programming (key features and just the basic differences, mention names of some popular procedural (e.g., BASIC, FORTRAN, C) and object oriented programming languages (e.g., C++, Java, Python). | 8 | 5 |
| | 1D | Overview of Software (system software and application software with examples (mention names only), Definition of Operating System and functions (mention names of some popular operating systems like Windows, Linux, Android, etc). Networking of machines (overview of LAN, MAN, WAN, Internet, Wifi etc), types of computer (workstation, desktop, Smartphone, embedded system, etc.), | 5 | 3 |

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| Unit -2 Introduction to Python Programming (14) | 2a | Basics of Python programming (with a simple 'hello world' program, process of writing a program, running it, and print statement), Concept of class and object, Data-types (integer, float, string), Notion of a variable, Operators (assignment, logical, arithmetic etc.), accepting input from console, conditional statements (If else and Nested If else), Collections (List, Tuple, Sets and Dictionary), Loops (For Loop, While Loop & Nested Loops), Iterator, String and fundamental string operations (compare, concatenation, sub-string etc.), Function, Recursion. | 10 | 5 |
| | 2B | Overview of linear and non-linear data structure (definition, schematic view and difference), array (1D, 2D and its relation with matrix, basic operations: access elements using index, insert, delete, search), stack-concept of LIFO, basic stack operations and their implementations using basic python code (use user-defined functions for stack operations), queue-concept of FIFO, basic queue operations and their implementations using basic python code(use user-defined functions for queue operations), use of List methods in python for basic operations on array, stack and queue, overview of NumPy library and basic array operations (arrange(), shape(), ndim(), dtype() etc.), binary tree (definition and schematic view only) . | 10 | 6 |
| | 2C | Time complexity - Big-oh and Big-omega notation only, Linear search and binary search algorithm, sorting algorithm (bubble sort only) | 4 | 3 |
| Unit- 3 Introduction to Linear Algebra and Vector Algebra | 3 | Basic matrix operations like matrix addition, subtraction, multiplication, transpose of matrix, identity matrix. Distance function, Euclidean norm, distance between two points in 2D and 3D and extension of idea to n dimensions. A brief introduction to vectors, unit vector, normal vector, Euclidean space, real n -dimensional space, dot product of vectors | 8 | 5 |

NB : Additional 10 hours for Remedial and/or Tutorial classes

CLASS – XI : SEMESTER – II

SUBJECT: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AIDS)-THEORY

FULL MARKS: 35

CONTACT HOURS: 60 Hours

| UNIT NO. | SUB UNIT | TOPICS | CONTACT HOURS | MARKS |
|------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|
| Unit -4 Statistics and Probability (6) | 4 | Basic statistics - measures of dispersion, range, quartile deviation, mean deviation-for simple series and for frequency distribution, standard deviation- for simple series and for frequency distribution, variance, Standard deviation of composite group, median and mode, Pearson Correlation Coefficient, distance functions-Euclidean distance. Probability theory- random experiment, event, mutually exclusive event, impossible and certain event, complementary event, equally likely events, sample space- discrete and continuous, mathematical definition of probability, probability distribution, combining events- Event complement and union, Joint probabilities and the law of total probability, Conditional probabilities, Conditional and joint probability tables, independence, and Bayes' Rule. Random variables and discrete distributions- The geometric distribution, The Bernoulli distribution, The binomial distribution, Continuous random variables- probability density functions, normal or Gaussian distribution | 12 | 6 |
| Unit -5 Introduction to AI & DS (6) | 5A | Definitions of AI, Four main approaches to AI (Acting Humanly, Thinking Humanly, Acting Rationally, Thinking Rationally), History of AI, various real world applications of AI. Relation among AI, Machine Learning and Deep Learning. | 5 | 3 |
| | 5B | Definition of data science. Difference between Data Science and Artificial Intelligence. Data Science life cycle. Difference between quantitative and qualitative data. | 5 | 3 |

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| <p>Unit -6 Intelligent Agent (5)</p> | <p>6</p> | <p>Intelligent Agents- definition of an agent, definition of intelligent agent, A block diagram depicting agent's interaction with the environment through sensors and actuators, agent terminology- Performance measure, Behavior/action of an agent, Percept, Percept sequence, Agent function (Illustrating these terms using vacuum cleaner agent example), examples of some AI agents (robots, software agent(softbot), Autonomous spacecraft, Internet book shopping agent, etc.), rational agent, autonomous agent, Agent's environment, Structure of an AI Agent(Architecture + Agent programs), types of agents (block diagram and short description only) - simple reflex agent, model based reflex agent(state based), goal based agent, utility based agent, learning agent.</p> | <p>10</p> | <p>5</p> |
| <p>Unit -7 Solving Problem by Searching (12)</p> | <p>7</p> | <p>State Space Search Why search is important to an intelligent agent, modeling the search as state space search for a goal-based agent, State space search-what is an state, atomic representation vs factored representation of states, Formal representation of state space, Formulating search problem as state space search, formulating 8-puzzle problem and tic-tac-toe as state space search problems.</p> <p>Uninformed search a) Breadth first search b) Depth first search</p> <p>Informed search a) Heuristic search strategy with tic tac toe example b) Greedy best-first search c) A* search - basic idea only(without proof)</p> <p>Search in complex environments a) Local beam search b) Hill climbing (<i>only basic idea with a small example</i>) c) Simulated Annealing (<i>No algorithm, Only basic idea</i>) d) Evolutionary algorithms and search(<i>basic idea with a small example</i>)- Purpose of evolutionary algorithms, an example of applying an evolutionary algorithm to a simple search problem and illustrating the terminology such as Initial Population, Fitness Function, Selection, Crossover, Mutation.</p> | <p>18</p> | <p>12</p> |

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| <p style="text-align: center;">Unit -8 Knowledge Representatio n and Propositional Logic (8)</p> | <p>The main components of a Knowledge-based agent(basic idea only, no technical details): Knowledge base, Steps performed by a Knowledge-based agent to take an action, Difference between problem solving agent and Knowledge-based agent. knowledge presentation language- Logic-based Representation.</p> <p>Propositional logic propositional logic, logic as expressions, truth table, conjunction, disjunction, syllogism, tautology, De Morgan's theorem. Use of logic to derive conclusions with practical examples, Statements as logical propositions, Atomic and compound propositions, Negation, conjunction and disjunction as NOT, AND and OR, Implication and Biconditional statements, Truth table as a way of proving propositions, Commutativity and Associativity and Distributive rules, De Morgan's theorem, Practical examples to infer meanings from statements. Basic concept of Inference (With Simple examples), Answer Extraction system (With Simple examples)</p> | <p>10</p> | <p>6</p> |
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NB : Additional 10 hours for Remedial and/or Tutorial classes

CLASS: XI

SUBJECT: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE(AIDS)-PRACTICAL

FULL MARKS: 30

CONTACT HOURS: 60 HOURS

| SL NO | TOPICS | CONTACT HOURS | MARKS |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|
| 1. Computer Fundamentals [No marks] | | | |
| 1 | Visit to Computer Lab and familiarization with computers and peripherals and different networking devices (e.g., modem, switch, router). Opening of the CPU box/cabinet and identification of different parts (e.g., Motherboard, CPU/Processor, RAM, Hard Disk, power supply). | 6 | 0 |
| 2. Introduction to Python Programming [20 Marks] | | | |
| 2a | Introduction to installation and running of python codes with hello world and simple accessing user inputs from console examples. Menu driven arithmetic calculator Simple logical and mathematical programs (e.g., printing patterns, Conversion of binary to decimal and vice versa, Computing GCD of two numbers, Finding prime numbers, Generating Fibonacci sequence, Computing factorial –iterative and recursive etc.) Finding max, min, avg, sum, length of a list. Use of basic string methods like upper(), lower(), count(), find(), join(), replace(), split() etc. Calculating Euclidean distance between two vectors using a python program without using any library. Consider a table of data about n persons with two attributes-age and income and find Pearson correlation coefficient using a python program. Do not use any ready -to-use library function that directly accepts the data table and produces the output. | 16 | 8 |

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| 2b | Use of Python List methods for Stack and Queue implementation, for examples, append() and pop() Use of NumPy array methods: arrange(), shape(), ndim(), size(), add(), subtract(), multiply(), divide(), mat() etc. Use of NumPy matrix multiplication methods: dot(), matmul(), multiply() etc. | 6 | 7 |
| 2c | Linear search and binary search in an array Bubble sort in an array | 4 | 5 |
| 3. Foundation for AI [3 Marks] | | | |
| 3 | Generation of random numbers in python following a Gaussian distribution and filling up random arrays Introduction to matplotlib to plot arrays as histograms Computation of mean, median and mode(for simple series and for frequency distribution) Plotting Gaussian distribution with a given mean and standard deviation | 10 | 5 |
| 4. Solving Problem by Searching (basic principles and example based understanding) [12 Marks] | | | |
| 4 | Implementing 8-puzzle problem using DFS and BFS Use of class to denote state of a problem, example board state of tic tac toe Expansion of possible states from a given state with all possible moves Score function of each state and selection of highest score or least cost at each level, i.e. making game tree Implement Simulated Annealing using Python | 18 | 5 |

NB : Additional 10 hours for Remedial and/or Tutorial classes

CLASS – XII : SEMESTER – III

SUBJECT: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AIDS)-THEORY

FULL MARKS: 35

CONTACT HOURS: 60 Hours

| UNIT NO. | SUB UNIT | TOPICS | CONTACT HOURS | MARK S |
|------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------|
| Unit -1 First order predicate logic (4) | 1 | Predicate, Quantifier, Universal Quantifier and Existential quantifier with simple examples, Simple concept of Unification (without details of MGU), Well-formed formula, translating English sentences to predicate logic(with simple examples), conversion to clause form (With Simple examples), Basic concept of Inference (With Simple examples), resolution in first order logic (With Simple examples) | 8 | 4 |
| Unit -2 Uncertainty Management (2) | 2 | Handling Uncertain Knowledge , Uncertainty and Rational decision, Probabilistic Reasoning, Bayes Rule, Conditional probability , Probabilistic inference using Bayes rule | 4 | 2 |
| Unit -3 Data Visualization (10) | 3 | Need for data visualization. Key Data Visualization Techniques (with suitable examples): Line plots, Bar plots, Histograms, Box plots, Scatter plots, Bubble plot, Treemaps, Heatmaps, Word clouds, Geospatial maps. Visualizing two-dimensional data with pair-wise scatter plots. Key Techniques in 3D Data Visualization: 3D Scatter Plots, 3D Surface Plots, contour plots. A brief introduction to data visualization platforms -Tableu and Google Chart | 16 | 10 |

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| <p align="center">Unit-4 Introduction to Machine Learning (5)</p> | 5A | <p>Definition of machine learning, Difference between traditional programming and Machine Learning, Applications of machine learning</p> <p>Types of Machine Learning (Supervised, Unsupervised, Semi-supervised and reinforcement learning), Linear Regression with one variable(feature), Hypothesis representation, Concept of hypothesis space, Concept of training examples, Concept of cost/loss function , Squared Error cost function, Normal method for finding the values of the parameters for the Linear Regression model with one variable , Gradient descent algorithm for minimizing Squared Error cost function to find the values of the parameters for the Linear Regression model with one variable, Effect of learning rate, Importance of feature scaling (min-max normalization. Define feature or attribute with Some examples, Types of features(continuous, categorical), Representation of training examples with multiple features, Regression with multiple variables (features) and its hypothesis representation, Formula for finding the values of the parameters for the Linear Regression model with multiple features (Mention formula only, no mathematical derivation for multivariate regression), Polynomial Regression(basic concept only).</p> | 10 | 5 |
| <p align="center">Unit -5 Supervised Learning (14)</p> | 5A | <p>Difference between regression and classification, Examples of some real world classification problems, Linear classification and threshold classifier, Concept of misclassification error, accuracy. Concept of input space and linear separator, Drawback of threshold classifier, Logistic regression model (without derivation), Use of logistic function in defining hypothesis function for logistic regression model, Probabilistic interpretation of the logistic regression model's output, Use of logistic regression model in binary classification task, Multi-class classification using One vs. all strategy.</p> | 14 | 10 |
| | 5B | <p>Measuring performance of machine learning algorithms: confusion matrix, true positive, true negative, false positive, false negative, error, accuracy, precision, recall, F-measure, sensitivity and specificity, K-fold cross validation</p> | 8 | 4 |

NB : Additional 10 hours for Remedial and/or Tutorial classes

CLASS – XII : SEMESTER – IY

SUBJECT: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AIDS)-THEORY

FULL MARKS: 35

CONTACT HOURS: 60 Hours

| UNIT NO. | SUB UNIT | TOPICS | CONTACT HOURS | MARKS |
|-----------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|
| Unit -6 Supervised Learning (10) | 6 | Probabilistic classifier: Basics of Bayesian Learning, Conditional independence, Naive Bayes classifier. Applications of Naive Bayes Classifier to sentiment classification task, add-one smoothing. Instance based learning or lazy learning: K-nearest neighbor classifier, curse of dimensionality | 20 | 10 |
| Unit -7 Unsupervised Learning (5) | 7 | What is unsupervised learning? Difference between supervised and unsupervised learning, What is clustering? Difference between clustering and classification, Why do we use clustering in an unsupervised learning technique? , Some examples of real world application of clustering, K-means clustering algorithm and its drawback. Simple use cases | 12 | 5 |

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| <p>Unit -8 Artificial Neural Network (17)</p> | <p>8</p> | <p>Biological motivation for Artificial Neural Networks(ANN), A simple mathematical model of a neuron (McCulloch and Pitts(1943)), Concept of activation function: threshold function and Sigmoid function, Perceptron as a linear classifier, perceptron training rule, Implementation of basic Boolean functions of two inputs using threshold perceptron, Equation of a linear separator in the input space, Representational power of perceptrons, Training unthresholded perceptron using Delta rule(with derivation) , What is the need for hidden layers ? - XOR example. Why do we need non-linearity in ANN?, Network structures: feed forward networks and recurrent networks (basic concept only). Training multiplayer feed-forward neural networks using Back propagation algorithm (Concepts only and no derivation), Generalization, overfitting, and stopping criterion, overcoming the overfitting problem using a set of validation data. An Illustrative example of an ANN architecture for handwritten digit recognition (Only input representation, output representation and a block diagram of the network), Need for automatic feature learning, difference between the conventional feed-forward neural networks and CNN, role of convolution layer and fully connected layer in CNN, function of pooling layer in CNN. An example of 2D convolution, a block diagram illustrating CNN applied to handwritten digit recognition task</p> | <p>26</p> | <p>17</p> |
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| Unit -9 Ethics in Large Language Models (LLM) | 9 | Brief introduction to ethics in Large Language Models(LLM), for example, GPT, ChatGPT. | 2 | 3 |
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NB : Additional 10 hours for Remedial and/or Tutorial classes

CLASS: XII

SUBJECT: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AIDS)-PRACTICAL

FULL MARKS: 30

CONTACT HOURS: 60 HOURS

| SL NO | TOPICS | CONTACT HOURS | MARKS |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|
| 1. Data Visualization Techniques [Marks 5] | | | |
| 1 | Introduction to plotly library in python and plotting different types of plot using the library refer this (https://plotly.com/python/plotly-express/) 1D Histogram of four attributes of the IRIS dataset, 2D Histogram(considering the IRIS dataset, plot 2D histogram of petal length and width), Box Plots (Considering the IRIS dataset, show the Box plots of attributes for IRIS attributes and species) , Plot the Pie chart, showing the distribution of IRIS flowers (use IRIS dataset), Scatter Plots for each pair of attributes of the IRIS dataset, Heatmap, Word clouds, Geospatial maps. | 8 | 5 |
| 2. Introduction to Machine Learning [6 Marks] | | | |
| 2a | Introduction to python libraries like scipy and statsmodel to various basic codes Revisit matrix operations using scipy (basic matrix operations of addition, subtraction, multiplication, transpose), Using Scipy for advanced matrix operations - inverse. Write a python program to find the values of the parameters for the regression model with multiple features (using only formula for normal method). | 6 | 3 |
| 2b | Generation of random (x, y) pairs where $y = f(x) + d$ (d varies from -r to +r, a random value), f being a linear function, Linear regression or line fitting of the data, Optimizing the function using gradient descent, Plotting the steps using matplotlib | 6 | 3 |
| 3. Supervised Learning [10 Marks] | | | |

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| 3a | <ul style="list-style-type: none"> ● Building linear regression-based threshold classifier and testing the model on Diabetes Data set downloadable from UCI Machine Learning Repository ● Building Logistic regression model for binary classification of Diabetes Data. Vary learning rate and verify the impact of learning rate on classification performance. ● Introduction to the IRIS dataset, building a logistic regression for multi-class classification and testing the model on the IRIS dataset downloadable from UCI Machine Learning Repository ● Building K-nearest neighbor classifier and testing on the IRIS dataset downloadable from UCI Machine Learning Repository (Use Scikit-learn open source data analysis library for implementing the models) | 18 | 7 |
| 3b | <p>Building a naive Bayes classifier for sentiment analysis (Use Scikit-learn open source data analysis library)</p> | 6 | 3 |
| 4. Unsupervised Learning [3 Marks] | | | |
| 4a | Using Scikit-learn library to use the K-means algorithm for clustering IRIS data and its visualization | 6 | 3 |
| 5. Artificial Neural Network [6 marks] | | | |
| 5a | <ul style="list-style-type: none"> ● Using MLP from Scikit learn library, develop a handwritten digit recognition model using MLP and MNIST dataset ● Using CNN from keras library, develop a handwritten digit recognition model using CNN and MNIST dataset ● Compare the performance of the MLP based model and the CNN based model for the handwritten digit recognition task | 10 | 6 |

NB : Additional 10 hours for Remedial and/or Tutorial classes

SUBJECT: ARTIFICIAL INTELLIGENCE and DATA SCIENCE (AIDS)

Class XI TOTAL Theory MARKS: 70

- **Class XI SEMESTER 1 TOPICS: [MCQ] MARKS: 35 [1 MARK PER QUESTION]**

| Unit | Topic | Marks allotted |
|------|-------------------------------------------------|----------------|
| 1 | Computer Fundamentals | 16X1=16 |
| 2 | Introduction to Python Programming | 14X1=14 |
| 3 | Introduction to Linear Algebra & Vector Algebra | 5X1=5 |

- **Class XI SEMESTER 2 TOPICS: [Short Answer Questions , Descriptive Questions] MARKS: 35**

| Unit | SHORT ANSWER TYPE QUESTIONS (2 marks) | DESCRIPTIVE TYPE QUESTIONS (3/4/5 marks) | TOTAL |
|-----------------------------------------------------|---------------------------------------|------------------------------------------|-----------|
| 4 : Statistics & Probability | | 2X3=6 | 6 |
| 5: Introduction to AI and DS | 3X2=6 | | 6 |
| 6: Intelligent Agents | 1x2=2 | 1X3=3 | 05 |
| 7: Solving Problem by Searching | 1X2=2 | 5x2=10 | 12 |
| 8. Knowledge Representation and Propositional Logic | | 3x2=6 | 6 |
| TOTAL | 10 | 25 | 35 |

Class XII TOTAL Theory MARKS: 70

- **Class XII SEMESTER 1 TOPICS: [MCQ] MARKS: 35 [1 MARK PER QUESTION]**

| Unit | Topic | Marks allotted |
|------|----------------------------------|----------------|
| 1 | First order predicate logic | 4X1=4 |
| 2 | Uncertainty Management | 2X1=2 |
| 3 | Data Visualization | 10X1=10 |
| 4 | Introduction to Machine Learning | 5x1=5 |
| 5 | Supervised learning | 14x1=14 |

- **Class XII SEMESTER 2 TOPICS: [Short Answer Questions , Descriptive Questions] MARKS: 35**

| Unit | SHORT ANSWER TYPE QUESTIONS (2 marks) | DESCRIPTIVE TYPE QUESTIONS (3/4/5 marks) | TOTAL |
|------------------------------|---------------------------------------|------------------------------------------|-----------|
| 6. Supervised Learning | 1X2=2 | 1x5=5 1x3=3 | 10 |
| 7. Unsupervised Learning | 1x2=2 | 1x3=3 | 5 |
| 8. Artificial Neural Network | 3X2=6 | 1X5=5 2x3=6 | 17 |
| 9. Ethics in AI | - | 1X3=3 | 03 |
| TOTAL | 10 | 25 | 35 |