

# **Artificial Intelligence**

**(One year Certificate Course)**

## **SEMESTER - I**

**AI 101 Artificial and Computational Intelligence**

### **UNIT 1**

**Scope of AI: Games, theorem Proving, Natural language Processing; Vision & speech**

**processing, Robotics, Expert Systems; AI techniques-Search, Knowledge, Abstraction.**

### **UNIT 2**

**Problem Solving: State space search, Control Strategies (Depth first search, Breadth first search,**

**Production systems). Problem Characteristics (Decomposable, ignorable, recoverable, predictable).**

**Use of Heuristics: Hill climbing; Best first search; A\* algorithm: Admissibility; AND/OR graph -**

**AO\*; Constraint satisfaction (Cryptarithmic, Waltz Line Labelling).**

**Game Playing: Minimax search; Alpha-Beta pruning.**

### **UNIT 3**

**Knowledge Representation: Predicate Logic (Well-formed formulas, quantifiers, Prenex Normal**

**Form, Skolemization, Unification, modus ponens, Resolution refutation-various strategies).**

**Rule-Based Systems: Forward reasoning: Conflict resolution; Backward reasoning: Structured**

**Knowledge Representations: Semantic Net; slots, inheritance; Frames-exceptions and defaults-**

**attached predicates.**

### **UNIT 4**

**Natural Language Processing: Syntactic analysis, Top down and bottom-up parsing, Augmented**

**Transition Networks, Semantic analysis, case grammar**

**UNIT 5**

**Learning: Concept of learning, learning automation; The Genetic algorithm; Learning by**

**induction; Neural Networks, Perceptrons – Learning algorithm, Backpropagation Network.**

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**TEST BOOKS:**

**1. Elaine Rich, Kevin Knight & S. B. Nair, “Artificial Intelligence”, 3rd Edition, McGraw Hill**

**Education, 2017**

**2. Stuart J. Russell & Peter Norvig, “Artificial Intelligence: A Modern Approach”, 4th Edition,**

**Pearson Education, 2022.**

**REFERENCE BOOKS:**

**1. Introduction to AI & Expert System: Dan W.Patterson, PHI.**

**2. Artificial Intelligence by Luger (Pearson Education)**

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**Artificial Intelligence-1st Sem**

**SEMESTER I**

**AI 102 Python Programming**

**UNIT 1**

**INTRODUCTION DATA, EXPRESSIONS, STATEMENTS**

**Introduction to Python and installation, data types: Int, float, Boolean, string, and list; variables,**

**expressions, statements, precedence of operators, comments; modules, functions-- function and its**

**use, flow of execution, parameters and arguments.**

## **UNIT 2**

### **CONTROL FLOW, LOOPS**

**Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained**

**conditional**

**(if-elseif-else); Iteration: while, for, break, continue**

## **UNIT 3**

### **FUNCTIONS, ARRAYS**

**Fruitful functions: return values, parameters, local and global scope, function composition,**

**recursion; Strings: string slices, immutability, string functions and methods, string module; Python**

**arrays, Access the Elements of an Array, array methods.**

## **UNIT 4**

### **LISTS, TUPLES, DICTIONARIES**

**Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list**

**parameters, list comprehension; Tuples: tuple assignment, tuple as return value, tuple**

**comprehension;**

**Dictionaries: operations and methods, comprehension**

## **UNIT 5**

### **FILES, EXCEPTIONS, MODULES, PACKAGES**

**Files and exception: text files, reading and writing files, command line arguments, errors and**

**exceptions, handling exceptions, modules (datetime, time, OS , calendar, math module), Explore**

**packages.**

**TEXTBOOKS:**

**1 Reema Thareja," Python Programming using a problem-solving approach",  
Oxford**

**University,2019**

**2. Dr. R. Nageswara Rao," Core Python Programming", 2**

**ND Edition, Dreamtech**

**Publication,2018**

**REFERENCE BOOKS:**

**1. Kenneth A. Lambert &Cengage," Introduction to Python",2**

**nd Edition,2019**

**2. Sheetal Taneja and Naveen Kumar," Python Programming a Modular Approach",  
First**

**Edition , Pearson,2017**

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**Artificial Intelligence-1**

**st Sem**

**SEMESTER-I**

**AI 103 Computer Oriented Statistical Techniques**

**UNIT 1**

**Probability Theory: Sample Spaces- Events - Axioms – Counting – Conditional  
Probability and**

**Bayes' Theorem – The Binomial Theorem – Random variable and distributions:  
Mean and Variance**

**of a Random Variable-Binomial-Poisson-Exponential and Normal distributions.**

## **UNIT 2**

**Sampling Distributions & Descriptive Statistics: The Central Limit Theorem, distributions of the**

**sample mean and the sample variance for a normal population, Sampling distributions (Chi-Square,**

**t, F, z).**

## **UNIT 3**

**Curve Fitting and Principles of Least Squares- Regression and Correlation.**

**Tabular data- Power and the computation of sample size- Advanced data handling - Multiple**

**regression- Linear models- Logistic regression- Rates and Poisson regression - Nonlinear curve**

**fitting.**

## **UNIT 4**

**Density Estimation- Recursive Partitioning- Smoothers and Generalised Additive Models- Survivals**

**Analysis- Analyzing Longitudinal Data- Simultaneous Inference and Multiple Comparisons- Meta-**

**Analysis- Principal Component Analysis Multidimensional Scaling -Cluster Analysis.**

## **UNIT 5**

**Test of Hypothesis- Testing for Attributes -Mean of Normal Population - One-tailed and two-tailed**

**tests, F-test and Chi-Square test - Analysis of variance ANOVA - One-way and two-way**

**classifications.**

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**TEXTBOOKS:**

**1. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 4th edition, Academic Press; 2009.**

**2. H.C Taneja, "Statistical Method for engineering & Sciences", Willey publications.2019**

**REFERENCE BOOKS:**

**1. S. C. Gupta and V.K.Kapoor, " Fundamentals of Mathematical Statistics", 20th Edition, Sultan**

**Chand and Sons, 2020**

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**Artificial Intelligence- 1st Sem**

**SEMESTER-I**

**AI 104 Artificial Intelligence Lab**

**PRACTICAL**

**1 Installation of gnu-prolog, Study of Prolog (gnu-prolog), its facts, and rules.**

**2 Write simple facts for the statements and querying it.**

**3 Write a program for Family-tree.**

**4 Write Program for Monkey-banana Problem.**

**5 Write a program which behaves a small expert for medical Diagnosis.**

**6 Write programs for computation of recursive functions like factorial Fibonacci numbers, etc.**

**7 Write program to solve 5-queens problem.**

**8 Write a Program for water jug problem.**

**9 Write a program for travelling salesman program.**

**10 Case study of standard AI programs like Mycin and AI Shell**

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## **Artificial Intelligence-2nd Sem**

### **SEMESTER - II**

#### **AI 201 Natural Language Processing**

##### **UNIT 1**

**Introduction to NLP: Introduction and Application, NLP Phases, Difficulty of NLP including**

**ambiguity; Spelling error and Noisy Channel Model; Concept of Parts of speech and Formal**

**Grammar of English**

##### **UNIT 2**

**Language Modeling: N-gram and Neural Language Model Language Modelling with N-gram,**

**Simple N-gram Models, smoothing (Basic Techniques), Evaluating language models; Neural**

**Network basics, Training; Neural Language Model, Case study: application of neural language**

**model in NLP system development.**

##### **UNIT 3**

**Parts of Speech tagging: basic Concept; tag set; Early approach: Rule-based and TBL; POS Tagging**

**using HMM, POS Tagging using maximum Entropy model**

##### **UNIT 4**

**Pursuing Basic Concept, Top-down, and Bottom-up parsing, Treebank, Syntactic Parsing, CKY**

**parsing,**

**Statically parsing Basic: Probabilistic Context free grammar, Probabilistic CKY Parsing PCFGs**

##### **UNIT 5**

**Semantics: Vector Semantics; word and Vector; measuring similarity; Semantics with dense vector;**

**SVD and Latent Semantic Analysis; Embedding from prediction, SKIP Gram and CBOW, Concept**

**of word sense; Introduction to WorldNet.**

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**TEXTBOOKS:**

**1. Siddiqui T, Tiwary U. S, " Natural language processing and Information retrieval", Oxford**

**Publication, 2008**

**2. Bharati A, Sangal R., Chaitanya V, " Natural language processing a Paninian perspective", PHI,**

**2000**

**REFERENCE BOOKS:**

**1. James A., " Natural language Understanding" 2e, Pearson Education, 1994**

**2. Ela Kumar, "Natural Language Processing", Willy**

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**Artificial Intelligence-2**

**nd Sem**

**SEMESTER - II**

**AI 202 Machine Learning**

**UNIT 1**

**Introduction- overview of machine learning- Different forms of learning- Generative learning-**

**Gaussian parameter estimation- maximum likelihood estimation- MAP estimation- Bayesian**

**estimation- bias and variance of estimators- missing and noisy features- nonparametric density**



**estimation- applications- software tools.**

## **UNIT 2**

**Classification Methods-Nearest neighbour - Decision trees- Linear Discriminant Analysis- Logistic**

**regression – Perceptron - large margin classification- Kernel methods- Support Vector Machines.**

**Classification and Regression Trees.**

## **UNIT 3**

**Graphical and sequential models- Bayesian networks- conditional independence - Markov random**

**fields- inference in graphical models- Belief propagation- Markov models- Hidden Markov models-**

**decoding states from observations- learning HMM parameters.**

## **UNIT 4**

**Clustering Methods - Partitioned based Clustering - K-means - K-medoid; Hierarchical Clustering -**

**Agglomerative – Divisive - Distance measures; Density based Clustering -DBScan; Spectral**

**clustering**

## **UNIT 5**

**Neural networks- the perceptron algorithm- multilayer perceptron's- back propagation nonlinear**

**regression- multiclass discrimination- training procedures- localized network structure-**

**dimensionality reduction interpretation.**

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### **TEXTBOOKS:**

**1. S. Sridhar and M. Vijayalakshmi, “Machine Learning”, Oxford University Press, 2021.**

**2. Mark E. Fenner, "Machine Learning with Python for Everyone", Pearson Education, 2020**

**REFERENCE BOOKS:**

- 1. Alpaydin, 'Introduction to Machine Learning', Prentice Hall of India, 2006.**
- 2. K. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.**
- 3. Tom M Mitchell, "Machine Learning, First Edition", McGraw Hill Education, 2017**

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**Artificial Intelligence-2nd Sem**

**SEMESTER - II**

**AI 203 Data Mining**

**UNIT 1**

**Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data**

**Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database**

**or a Data Warehouse System, and Issues in Data Mining. Data Pre-processing: Need for Pre-**

**processing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction,**

**Discretization, and Concept Hierarchy Generation.**

**UNIT 2**

**Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data**

**Model, Data Warehouse Architecture, Data Warehouse Implementation, Usage of Data Warehousing**

**Online Analytical Processing and Mining Data Cube Computation: Efficient Methods for simple**

**Data Cube Computation (Full Cube, Iceberg Cube, Closed Cube and Shell Cube),**

### **UNIT 3**

**Mining Frequent Patterns, Associations and Correlations: Basic Concepts, The Apriori algorithm for**

**finding frequent itemsets using candidate generation, Generating association rules from frequent**

**itemsets, Mining frequent itemsets without candidate generation, Mining various kinds of**

**Association Rules, Correlation Analysis.**

### **UNIT 4**

**Classification and Prediction: Description and comparison of classification and prediction, preparing**

**data for Classification and Prediction Classification by Decision Tree Induction, Bayesian**

**Classification, Rule-Based Classification, Classification by Backpropagation, Prediction, Linear and**

**non-linear regression, Evaluating the accuracy of a classifier or a predictor**

### **UNIT 5**

**Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods,**

**k-means, and k-medoid methods, CLARINS, Agglomerative and divisive hierarchical clustering,**

**chameleon dynamic modeling, DBSCAN, Grid-based clustering method: STING, Conceptual**

**Clustering, Constraint-Based Cluster Analysis, Outlier Analysis. Trends and Applications of Data**

**Mining**

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**TEXTBOOKS:**

**1. Jiawei Han, Micheline Kamber, and Jian Pei, " Data Mining: Concepts and Techniques", 3rd**

**Edition, Morgan Kaufmann Publishers, ELSEVIER.**

**2. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar," Introduction to Data Mining", Pearson**

**Education.**

**REFERENCE BOOKS:**

**1. Paulraj Ponnaiah," Data Warehousing Fundamentals "; student Edition, Wiley**

**2. Arun K Pujari," Data Mining Techniques", 2nd edition, Universities Press.**

**3. Pudi and P. Radha Krishna," Data Mining", Oxford University Press.**

**4. A.B.M Shawkat Ali and S.A.Wasimi," Data Mining: Methods and Techniques", Cengage**

**Learning.**

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**Artificial Intelligence-2nd Year**

**SEMESTER-I**

**AI204 Project Work**

**PROJECT WORK:**

**Students have to make a Project of any of the above-given papers on Artificial Intelligence.**