JAMSHEDPUR WOMEN'S UNIVERSITY
CERTIFICATE COURSE IN ARTIFICIAL INTELLIGENCE
(1 Year Programme)
ADMISSION INFORMATION

INTRODUCTION

Artificial Intelligence can be seen as the intelligence of machines through which they try to mimic human intelligence. Artificial Intelligence is an emerging technology that has the ability to change how we interact with the world around us. With the increasing scope of Artificial Intelligence and Machine Learning in India, machines could be trained in certain circumstances to decide on their own. The scope of Artificial Intelligence in India is still in the adoption stage but slowly it is being used to find smart solutions to modern problems in almost all the major sectors such as Agriculture, Healthcare, Education and Infrastructure, Transport, Cyber Security, Banking, Manufacturing, business, Hospitality, Entertainment. Artificial Intelligence is a classic example of disruptive technology, as it has affected on, we go on about doing our daily work.

Sl.No.	Information	Dates
1.	Eligibility for Admission	Bachelor Degree with any stream, Preference Given to B.Sc. Physics, B.Sc. Chemistry, B.Sc. Math (with mathematics at 10+2 level) or BCA/B.Sc. (Computer Application) / B.Sc.(Information Technology) with 45% Marks
2.	Fee structure	Rs 25,000 /- Per semester
3.	Course Duration	2 Semesters

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Introduction

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Sl.No	Information	Dates
1	Eligibility for Admission	Bachelor Degree with any stream, Preference given to B.Sc.(Physics), B.Sc.(Chemistry), B.Sc. (Mathematics) at 10+2 level or B.C.A/B.Sc.(Computer Application/B.Sc.(Information Technology) with 45% marks
2	Fee Structure	Rs. 25,000/- Per Semester
3	Course Duration	2 Semester (1 Year)

Syllabus

The framework of the Artificial Intelligence Certificate course structure

Year	Sem	Code	Paper	Full marks	Mid Sem	End Sem	credit	Pass Marks
1st Year	1st	AI 101	Artificial and Computational Intelligence	100	30	70	4	45
		AI 102	Python Programming	100	30	70	4	45
		AI 103	Computer Oriented Statistical Techniques	100	30	70	4	45
		AI 104	Artificial Intelligence LAB	50	25 Internal	25	2	24
	2nd	AI 201	Natural Language Processing	100	30	70	4	45
		AI 202	Machine Learning	100	30	70	4	45
		AI 203	Data Mining	100	30	70	4	45
		AI 204	Project Work	50	25 Internal	25	4	24

(Proposed for 2022-2023)

Note: E: External, I: internal, P: practical

Artificial Intelligence-1st Sem

Semester - I

AI 101Artificial and Computational Intelligence
Full Marks: 30 (MSE) +70 (ESE) 100 Time: 3 hrs.

Pass Marks: 45Instructions to question setter and examinee

This paper will be of 70 marks and divided into three groups:

Group A: This group Consist of 10 multiple choice question of 2 marks each (10 x 2=20 marks) from the entire syllabus uniformly

Group B: This group Consists of 6 questions out of which 4 are to be answered, each carrying 5 Marks (4x 5 = 20).

 Group C: This group Consists of 4 questions, out of which 2 are to be answered each, carrying 15 marks (2 x 15= 30).

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 (Cryptoarithmetic, 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 pones, 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.

TEST BOOKS:

1. Elaine Rich, Kevin Knight & S. B. Nair, "Artificial Intelligence", 3rd Edition, Mc-Graw 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)

Artificial Intelligence-1st Sem
Semester I

AI 102 Python Programming
Full Marks: 30 (MSE) +70 (ESE) 100 Time: 3 hrs. Pass Marks: 45
Instructions to question setter and examinee

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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", 2ND Edition, Dreamtech Publication,2018

REFERENCE BOOKS:

1. Kenneth A. Lambert &Cengage," Introduction to Python",2nd Edition,2019
2. Sheetal Taneja and Naveen Kumar," Python Programming a Modular Approach", First Edition , Pearson,2017

Artificial Intelligence-1st Sem

Semester-I

AI 103 Computer-Oriented Statistical Techniques
Full Marks: 30 (MSE) +70 (ESE) 100 Time: 3 hrs. Pass Marks: 45
Instructions to question setter and examinee

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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.

TEXTBOOKS:

1. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 4thedition, 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

Artificial Intelligence-1st Sem

Semester-I

AI 104 Artificial Intelligence Lab
Full Marks: 25 (MSE) +25 (ESE) 50, Time: 3 hrs., Pass Marks: 24

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

Artificial Intelligence-2nd Sem

Semester - II

AI 201 Natural Language Processing
Full Marks: 30 (MSE) +70 (ESE) 100 Time: 3 hrs. Pass
Marks: 45 Instructions to question setter and examinee

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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 od 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.

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

Artificial Intelligence-2nd Sem
Semester - II
AI 202 Machine Learning

Full Marks: 30 (MSE) +70 (ESE) 100

Time :3 hrs

Pass Marks: 45 Instructions to question setter and examinee

This paper will be of 70 marks and divided into three groups:

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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.

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

Artificial Intelligence-2nd Sem

Semester - II

AI 203 Data Mining

Full Marks: 30 (MSE) +70 (ESE) 100 Time: 3 hrs. Pass Marks:

45Instructions to question setter and examinee

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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

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.

Artificial Intelligence-2nd Year

Semester-I

AI204 Project Work

Full Marks: 25 (MSE) +25 (ESE) 50, Time: 3 hrs., Pass Marks: 24

PROJECT WORK:

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