GANPAT UNIVERSITY

FACULTY OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications	**Branch/Spec.**	Computer Application
Semester	II	**Version**	1.0.0.0
Effective from Academic Year	2024-25	**Effective for the batch Admitted in**	June 2024
Subject Code	P12A5AIR	**Subject Name**	Artificial Intelligence and Robotics

Teaching scheme						**Examination scheme (Marks)**			
(Per week)	**Lecture (DT)**		**Practical (Lab.)**		**Total**		**CE**	**SEE**	**Total**
	L	TU	P	TW					
Credit	2	0	2	0	4	Theory	40	60	100
Hours	2	0	4	0	6	Practical	20	30	50

Objective:

- The objective of the course is to basic concepts of artificial intelligence (AI) principles and approaches.
- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning.
- To describe the strengths and limitations of various state-space search algorithms, and choose the appropriate algorithm.
- To understand the basic concepts associated with the design and functioning and applications of Robots To study about the drives and sensors used in Robots

Pre-requisites:

- Data Structure, Basic probability theory and Statistics, Knowledge of programming language.

Course Outcomes :

- **1 = Slight (Low); 2 = Moderate (Medium); 3 = Substantial (High); "-" = No Correlation**

Name of CO	**Description**
CO1	Explain AI concepts, intelligent agents, and system architectures.
CO2	Apply Prolog programming for knowledge representation and logical problem solving.
CO3	Analyze search algorithms and robotic kinematics for solution optimization.
CO4	Evaluate actuators, sensors, and control strategies in intelligent robots.

Mapping of CO and PO

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	2	–	–	–	1
CO2	3	3	2	3	1	–	–	1
CO3	2	3	3	2	1	–	1	1
CO4	2	3	3	2	1	–	2	1

Content:		
Unit	**Section – I**	**Hrs**
1	**Introduction to Artificial Intelligence:** Brief History, Intelligent Systems, Categorization of Intelligent Systems, Components of AI Program, Foundations of AI, Sub-areas of AI, Applications, Development of AI Languages. **Intelligent Agents:** Rational Agents, Mapping from Sequences to Actions, Properties of Environments, Structure of Intelligent Agents, **Types of Agents:** Simple Reflex Agents, Goal Based Agents, Utility Based Agents.	7
2	**Prolog Programming language:** Introduction, Prolog Program, Control Strategy of Prolog, Programming Techniques in Prolog, List Manipulation in Prolog, System Predicate, Cut, Effect of Rule and Goal Orders, Structuring of Data in Prolog, Recursive Data Types in Prolog, SystemDefined Predicates.	8
	Section – II	
3	**Uninformed Search Strategies:** Breadth-First Search, Uniform Cost Search, Depth-First Search, Analysis of Search Methods, **Informed Search Strategies:** Heuristic Functions, Best-First Search, Greedy Search, A* Algorithm, Optimal Solution by A* Algorithm. **Introduction to Robotics:** Classification, Components, Characteristics, Applications. Robotics Kinematics, Position Analysis, Robots as Mechanisms, Matrix Representation, Transformation Matrices, Forward and Inverse Kinematics.	8
4	**Actuators:** Characteristics of Actuating Systems, Actuating Devices and Control, Use of Reduction Gears, Comparison Of Hydraulic, Electric, Pneumatic Actuators, Hydraulic Actuators. **Sensors:** Sensor Characteristics, Description of Different Sensors, Vision Sensors, Force Sensors, Proximity Sensors, Tilt Sensors, **Robot Controls:** Point to Point Control, Continuous Path Control, Intelligent Robot, Control System for Robot Joint, Control Actions, Feedback Devices.	9

Practical Content:
List of programs specified by the subject teacher based on above mentioned topics.

Text Books:	
1	Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI, Pearson Education.
2	Prolog Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
3	Saeed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia, 2001.
4	John J. Craig, “Introduction to Robotics”, 3rd Edition Addison Wesley publication

Reference Books:	
1	Artificial Intelligence – Structures and Strategies for Complex Problem Solving , George F Luger, Addison Wesley, Fifth Edition
2	Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition.

MOOC/Certification Courses:	
1	https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2	https://www.edx.org/learn/artificial-intelligence
3	https://in.coursera.org/specializations/ai-foundations-for-everyone

Question Paper Scheme:

University Examination Duration: 3 Hours

Note for Examiner: -

(I) Questions 1 and 4 are compulsory with no options.

(II) Internal options should be given in questions 2, 3, 5 and 6.

SECTION – I

Q.1 –8 Marks

Q.2 –11 Marks

Q.3 –11 Marks

SECTION - II

Q.4 –8 Marks

Q.5 –11 Marks

Q.6 –11 Marks