Mukesh Patel School of Technology Management and Engineering
Computer Engineering Department

Course Policy

Course Name - (Code): Artificial Intelligence (AI) – (703CO0C008)

<table>
<tr><td>Program and Semester: MCA, Semester - II</td><td>Pre-requisite Course: Programming Languages, Data Structures.</td></tr>
<tr><td>Academic Year: 2024-25</td><td>Credit Details:
<table>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>H</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>3</td><td>4</td></tr>
</table>
</td></tr>
<tr><td>Name of Course Faculty: Dr. Pravin Shrinath

Program: MCA
Contact Details: 9167658212

Office Hours: 9 am to 5 pm</td><td>Faculty associated with the course: -
1.
2.</td></tr>
<tr><td colspan="2">Pre-Course Activity:
Using GenAI, explore the following:

1. Different AI algorithms and tools
2. Application developing

Identify how this course will help you in your career goals.</td></tr>
<tr><td colspan="2">Course link:</td></tr>
</table>

1 Introduction to the Course

1.1 Importance of the course

Its importance lies in making our lives easier. These technologies are a great asset to humans and are programmed to reduce the human effort as much as possible. They tend to possess the capability to work in an automated fashion. Therefore, manual intervention is the last thing that could be asked for or seen while operating parts associated with this technology. This course is highly applied in many scientific and engineering disciplines. Artificial intelligence find

many applications in a diverse range of disciplines (natural language processing, computer vision, robotics, speech processing etc.)

1.2 Objective of the Course

To impart knowledge of the fundamental theories, methods and techniques in the field of Artificial Intelligence and to design and develop AI systems.

1.3 Pre-requisite

- Data Structure and Algorithms
- Programming for Problem Solving.

2 Course Outcomes (CO) and mapping with Program Outcomes (PO)

2.1 Course Outcomes

After successful completion of the course, a student will be able to-

1. Explain agents and environment in AI
2. Apply various heuristic and searching strategies to solve problems in the AI domain.
3. Design knowledge base using expert systems and game playing.
4. Implement supervised and unsupervised learning approaches to solve problems in AI domain.

2.2 CO-PO Mapping

	PO 1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO10	PO 11	PO12
CO1	√	√										
CO2			√	√								
CO3	√				√	√	√			√		
CO4										√		√

Green- medium mapping ***Blue- high mapping***

3 Syllabus, Pre-class activity and References

3.1 Teaching and evaluation scheme

Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**	**Theory (3 Hrs, 100 Marks)**
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

3.2 Syllabus

Unit	Description	Duration
1	Introduction to Artificial Intelligence Definitions of AI, Applications of Artificial Intelligence, Concept of Modeling, Inference and Learning. Introduction to Machine learning and Deep learning as a subset of AI. Intelligent agents, concept of rationality, structure of agents, Environment, Properties of task environment. Real world Examples of agents and environments.	**04**
2	Solving problems by Searching Problem solving agents, searching for solutions. Uninformed Search: Breadth first search, Depth first search, Uniform cost search Informed Search: Informed search strategies, Greedy Best First Search, A* search, Hill climbing, problems with hill climbing such as Local Maxima, Plateau, Ridge, Genetic Algorithm. Adversarial Search: Introduction to the Domain of a game, optimal decisions in games, minimax algorithm, Alpha-beta pruning.	**07**
3	Knowledge Representation Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution.	**06**
4	Constraint satisfaction Problem (CSP) Constraint satisfaction problems, Backtracking search for CSPs, variables and value ordering, propagating information through constraints, Intelligent backtracking, Local search for CSP. Case study on CSP.	**05**
5	Learning Inductive learning, Types of learning, supervised - decision trees classification, unsupervised learning – Kmeans clustering.	**05**
6	Expert system Definition, model, characteristics, architecture, development process, limitations, examples of expert systems.	**03**
	Total hours	**30**

3.3 Pre-class activity

Outline for preliminary study to be done for each unit will be provided prior to commencement of each unit. Preliminary study material (video links, presentation, notes etc) will be made available on the student portal. Students are expected to go through this material before attending the upcoming session. It is expected that the students put in at least two hours of self-

study for every one hour of classroom teaching. During the lecture session, more emphasis will be given on in-depth topics, practical applications and doubt solving.

3.4 References

Text Books:

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3rd edition, 2016.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert System", PHI, 2015.

Reference Books:

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd edition, Tata Mc-Graw Hill, 2015.
2. Patrick H. Winston, "Artificial Intelligence", 3rd edition, Addison Wesley, 1993(Classic)
3. Nils J. Nilson, "Principles of Artificial Intelligence", Narosa Publication, 1997.
4. Robert J. Schalkolf, "Artificial Intelligence: An Engineering Approach", Mc-Graw Hill, 1990 (Classic)
5. David W. Rolston, "Principles of Artificial Intelligence and Expert System Development", Mc-Graw Hill, 1988 (Classic)
6. Giarratano and Riley, "Expert System Principles and Programming", 3rd edition, PWS publishing company, 1998 (Classic)

4 Laboratory details

Knowledge of Python programming for laboratory exercise is a prerequisite. Students are expected to recall the fundamental theory concepts relevant to the exercise to be performed in the upcoming laboratory.

The following 10 exercises problem statement will form the submission for laboratory coursework.

Sr. No.	Week No.	List of Lab Exercises	Mapped CO
1	1	Implementation / simulation of Artificial Intelligent Agents 1. Simple reflex agent 2. Model Based reflex agent	CO1
2	2	Implementation / simulation of Artificial Intelligent Agents 1. Goal based agent 2. Utility based agent **Course project discussion and finalization.**	CO1
3	3	Implementation of Uniform Search strategy (Greedy Best First Search) to solve real world problem	CO2

4	4	Implementation of heuristic search algorithm (A* search algorithm) to solve real world problem	CO2
5	5	Implement N queen problem using Hill climbing search	CO2
6	6	**Review of course project : presentation by each group**	
7	7	Create knowledge base for the given statements and answer the query using backward chaining and resolution	CO3
8	8	Solve water jug problem using Pruning Technique	CO3
9	9	Implementation of decision tree based classification problem.	CO4
11	11	**Review of course project : presentation by each group**	
12	12	Implementation of clustering algorithm to solve real life problem.	CO4
13	13	Implementing an Expert System to diagnose a Medical disease.	CO3
14	14	**Viva based on syllabus.**	
15	15	Project Evaluation	

Note: For every experiment, input values are given during experiment and student need to test input against output values. Groups will be prepared and tasks will be assigned to each group, which will be nothing but a new problem statement. These are indicative lab exercise and may change time to time.

5 Assessment Policy

5.1 Component wise Continuous Evaluation Internal Continuous Assessment (ICA) and Term End Examination (TEE)

Assessment Component	**ICA (50 Marks)**				**TEE (100 marks) (Marks scaled to 50)**
	Class Test - 1 andClass Test - 2	**Lab Performance**	**Viva**	**Implementation of project (Group activity)**	
Marks	10 + 10	10	10	10	50
Weightage	40%	20%	20%	20%	100%

5.2 Assessment Policy for Internal Continuous Assessment (ICA)

1. Class test 1 and 2 (20 Marks)

a. Two class tests will be conducted as per the academic calendar.
b. It may be conducted online/ offline for 10 marks each

2. Team Work Marks

a. Lab performance evaluation (10 marks)

a. Lab experiments
   i. Continuous assessment for laboratory experiments will be conducted. There are 10 practical each carrying weightage of 10 marks. At the end of the course, average of total marks will be taken to obtain marks out of 10.
   ii. Discussion of your work with your peers is allowed. However, each student is expected to submit his/her original work. Submissions which are very similar will be marked zero. Assessment of the lab work will be carried out based on parameters like timely completion of lab work file, understanding of the experiment performed, originality in the work, involvement of the student, regularity, discipline etc. during the session. There is a 30% penalty on late submission.

b. Viva on syllabus (10 marks)

Viva will be conducted on entire syllabus to see the basic understanding of the subject. Also, students will be tested for oral explanation strength / expressive ability.

c. Project Presentation (10 marks)

i. Students need to make group of 2-4 members.
ii. Identify problem statement for the relevant domain.
   - Use of AI algorithm for solving real world problem, application of AI as natural language ex: text classification, sentiment analysis, text extraction & summarization, market intelligence.
iii. Get the topic approval
iv. Implement the project
v. Assessment will be based on the algorithm used to implement the problem, results obtained, originality, understanding and publication.

4.3 Assessment Policy for Term End Examination (TEE)

A written examination of 100 marks for 3 hours will be conducted for the course as per the academic calendar.

5. Lesson Plan

Session No.	Topics	Mapped CO	Reference
11th July 2022 –Term I Commences			
1	**UNIT 1:** Introduction to Artificial Intelligence: Definitions, Problems of AI,	CO1	TB1
2	AI technique. Intelligent Agents, Agents & environment,	CO1	TB1
3	Nature of environment, structure of agents	CO1	TB1
4	Goal based agents, utility based agents, learning agents.	CO1	TB1
5	**UNIT 2:** Problem Solving agent, searching for solutions. searching for solutions; uniform search strategies: breadth first search, depth first search, Uniform cost search	CO2	TB1
6	comparing uniform search strategies, Informed Search: Informed search strategies, Greedy Best First	CO2	TB2
7	Greedy best-first search, A* search, AO* search	CO2	TB2
8	Hill climbing, problems with hill climbing such as Local Maxima, Plateau, Ridge, Genetic Algorithm.	CO2	TB1
9	Adversarial Search: Introduction to the Domain of a game, optimal decisions in games,	CO2	TB1
10	minimax algorithm,	CO2	TB1
11	Alpha-beta pruning.	CO2	TB2
12	**UNIT 3:** Knowledge Representation Propositional logic,	CO3	TB2
13	Theory of first order logic,	CO3	TB2
14	Inference in First order logic,	CO3	TB2
15	Forward & Backward chaining,	CO3	TB2
16	Forward & Backward chaining,	CO3	TB1
17	Resolution	CO3	TB2
18	**UNIT 4:** Constraint satisfaction Problem (CSP) Backtracking search for CSPs,	CO3	TB2
19	Variables and value ordering,	CO3	TB2
20	propagating information through constraints,	CO2	TB1

21	Intelligent backtracking, Local search for CSP.	CO2	TB1
22	Case study on CSP	CO3	TB1
23	**UNIT 5:** Learning Inductive learning,	CO4	TB1
24	Types of learning, supervised - decision trees classification,	CO4	TB2
25	decision trees classification,	CO4	TB2
26	unsupervised learning – K-means clustering	CO4	TB2
27	– K-means clustering	CO4	TB2
28	**UNIT 6:** Definition, model, characteristics,	CO3	TB1
29	architecture, development process, limitations	CO3	TB1
30	Applications of expert systems.	CO3	TB1

6 Teaching-learning methodology

Faculty will make a group of 2-3 students for any group based activity such as class participation, project, presentation etc. Lecture session will be conducted as follows-

1. **Lectures:**
   - Outline for preliminary study to be done for each unit will be provided prior to commencement of each unit.
   - Deeper concepts and applications will be explained through Presentation and Video Lectures.
   - Numerical problems based on concept will be solved during the session on *smart board* or *MS OneNote.*
   - Give Some home assignments design: such as design of reasoning system for the shape matching of objects, knowledge base design for a small expert system for real application, application of AI areas in natural language processing etc

7 Active learning techniques

Following active learning techniques will be adopted for the course.

1. **Muddiest topic:** Faculty will find out the least understood point/topic in the session. This topic is then further explained to ensure that it is understood well.

2. **Blended Learning:** Students will be introduced to the topic at home while the in-depth topics, applications and numerical problems will be discussed by the faculty in the lecture session. Outline for preliminary study to be done for each unit will be provided prior to commencement of each unit. Preliminary study material (video links, presentation, notes etc) will be made available on the student portal.

3. **Frame a question: S**tudent will be asked to design and frame their own questions pertaining to the topic being taught. The idea is to stimulate students' curiosity, engage the students in collaborative teaching and learning, and motivating students to develop deeper understating of the topic.

    - Frame questions for each unit of the course: At the beginning of each using, the faculty will create a new page in *OneNote Class Notebook* in collaborative section where every student will post his/her question.

4. **Discussion class:** student will identify difficult topic and discussion class will be planned accordingly.

5. **Think Pair share:** Topic will be shared among group of students and finally it will be presented after discussion.

8. Course Material

Following course material is uploaded on the student portal: (give student portal link)

- Course Policy
- Lecture Notes
- Videos lectures
- Lecture Presentations
- List of Books
- Video lectures link
- Assignments

9. Course Outcome Attainment

Following means will be used to assess attainment of course learning outcomes.

- Use of formal evaluation components of continuous evaluation, assignments, semester end examination
- Informal feedback during course conduction

10. Academic Integrity Statement

Students are expected to carry out assigned work under Internal Continuous Assessment (ICA) independently. Copying in any form is not acceptable and will invite strict disciplinary action. Evaluation of corresponding component will be affected proportionately in such cases. Plagiarism detection software will be used to check plagiarism wherever applicable. Academic integrity is expected from students in all components of course assessment.