Course Code:	Course Title	Credit
CSC604	Artificial Intelligence	3

Prerequisite: Discrete Mathematics, Data Structures	
Course Objectives:	
1	To conceptualize the basic ideas and techniques underlying the design of intelligent systems.
2	To make students understand and Explore the mechanism of mind that enables intelligent thought and action.
3	To make students understand advanced representation formalism and search techniques.
4	To make students understand how to deal with uncertain and incomplete information.
Course Outcomes: At the end of the course, the students will be able to	
1	Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
2	Ability to choose an appropriate problem solving method and knowledge representation technique.
3	Ability to analyze the strength and weaknesses of AI approaches to knowledge– intensive problem solving.
4	Ability to design models for reasoning with uncertainty as well as the use of unreliable information.
5	Ability to design and develop AI applications in real world scenarios.

Module		Content	Hrs
1		**Introduction to Artificial Intelligence**	**4**
	1.1	Introduction, History of Artificial Intelligence, Intelligent Systems: Categorization of Intelligent System, Components of AI Program, Foundations of AI, Sub-areas of AI, Applications of AI, Current trends in AI.	
2		**Intelligent Agents**	**4**
	2.1	Agents and Environments, The concept of rationality, The nature of environment, The structure of Agents, Types of Agents, Learning Agent.	
	2.2	Solving problem by Searching: Problem Solving Agent, Formulating Problems, Example Problems.	
3		**Problem solving**	**10**
	3.1	Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS), Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Methods: Greedy best first Search, A* Search, Memory bounded heuristic Search.	
	3.2	Local Search Algorithms and Optimization Problems: Hill climbing search Simulated annealing, Genetic algorithms.	
	3.3	**Adversarial Search:** Game Playing, Min-Max Search, Alpha Beta Pruning	
4		**Knowledge and Reasoning**	**12**
	4.1	Knowledge based Agents, Brief Overview of propositional logic, First Order Logic: Syntax and Semantic, Inference in FOL, Forward chaining, backward Chaining.	
	4.2	Knowledge Engineering in First-Order Logic, Unification, Resolution	

	4.3	Uncertain Knowledge and Reasoning: Uncertainty, Representing knowledge in an uncertain domain, The semantics of belief network, Simple Inference in belief network	
5		**Planning and Learning**	**5**
	5.1	The planning problem, Planning with state space search, Partial order planning, Hierarchical planning, Conditional Planning.	
	5.2	Learning: Forms of Learning, Theory of Learning, PAC learning. Introduction to statistical learning (Introduction only) Introduction to reinforcement learning: Learning from Rewards, Passive Reinforcement Learning, Active reinforcement Learning	
6		**AI Applications**	**4**
	6.1	1. Introduction to NLP- Language models, Grammars, Parsing 2. Robotics - Robots, Robot hardware, Problems Robotics can solve 3. AI applications in Healthcare, Retail, Banking	

Textbooks:	
1	Stuart J. Russell and Peter Norvig, "***Artificial Intelligence: A Modern Approach***", Fourth Edition" Pearson Education, 2020.
2	Saroj Kaushik, "***Artificial Intelligence***", Cengage Learning, First edition, 2011
3	George F Luger, "***Artificial Intelligence***" Low Price Edition, Fourth edition, Pearson Education.,2005
References:	
1	Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
2	Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication
3	Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson Education.
4	Elaine Rich and Kevin Knight, "***Artificial Intelligence***", Third Edition, McGraw Hill Education,2017.

Assessment:	
Internal Assessment:	
Assessment consists of two class tests of 20 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 40% syllabus is completed. Duration of each test shall be one hour.	
End Semester Theory Examination:	
1	Question paper will comprise a total of six questions.
2	All question carries equal marks
3	Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4	Only Four questions need to be solved.
5	In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105078/
2	https://thestempedia.com/blog/simple-ai-and-machine-learning-projects-for-students-and-beginners/
3	https://nptel.ac.in/courses/106/105/106105079/

Lab Code	Lab Name	Credit
CSL604	Artificial Intelligence Lab	1

Prerequisite: Discrete Mathematics, Data Structure	
Lab Objectives:	
1	To realize the basic techniques to build intelligent systems
2	To apply appropriate search techniques used in problem solving
3	To create knowledge base for uncertain data
Lab Outcomes: At the end of the course, the students will be able to	
1	Identify languages and technologies for Artificial Intelligence
2	Understand and implement uninformed and informed searching techniques for real world problems.
3	Create a knowledge base using any AI language.
4	Design and implement expert systems for real world problems.

Suggested List of Experiments (programming in python)	
Sr. No.	**Title of Experiment**
1	One case study on AI applications published in IEEE/ACM/Springer or any prominent journal.
2	Assignments on State space formulation and PEAS representation for various AI applications
3	Program on uninformed search methods.
4	Program on informed search methods.
5	Program on Game playing algorithms.
6	Program for first order Logic
7	Planning Programming
8	Implementation for Bayes Belief Network
Note: Any other practical covering the syllabus topics and subtopics can be conducted. The programming assignment for First order logics could be in the form of a mini project	

Term Work:	
1	Term work should consist of a minimum of 8 experiments.
2	Journal must include at least 2 assignments on content of theory and practical of "Artificial Intelligence"
3	The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.
4	Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks)
Oral & Practical exam: Based on the entire syllabus of CSC604: Artificial Intelligence	