SEMESTER S5

AI ALGORITHMS LAB

(Common to CA/AI)

Course Code	**PCCAL507**	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	**ESE Marks**	50
Credits	2	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Practical

Course Objectives:

1. To implement and optimize search and game algorithms.
2. To write programs for constraint satisfaction and scheduling problems.
3. To enable the learners to build and evaluate machine learning and expert systems.

Expt. No.	Experiments
1	Implement basic search strategies 8-puzzle problem *
2	Implement variants of hill-climbing and genetic algorithms. *
3	Implement A* Algorithm *
4	Implement Mini-Max algorithm for game playing (Alpha-Beta pruning) *
5	Solve constraint satisfaction problems *
6	Implement Forward Chaining Algorithm *
7	Implement Naïve Bayes Models. *
8	The airline scheduling problem, where the objective is to schedule flights to maximize resource utilization while minimizing delays. Key factors include aircraft availability, crew schedules, and airport slot times. Constraints involve regulatory requirements, maintenance schedules, and airport capacities.
9	In a timetabling problem, variables are the classes or exams to be scheduled. Constraints include avoiding scheduling conflicts, ensuring that no two classes occur at the same time for a given student and meeting room availability. Possible values are the time slots and locations for each class.
10	Write a program to build and train a decision tree classifier using a library (e.g., scikit-learn). Evaluate the model using metrics such as accuracy and confusion matrix. Discuss pre-processing steps, training process, and performance evaluation.
11	Implement a Sudoku solver using backtracking or constraint propagation techniques. Describe how constraints are checked and how the algorithm searches for a valid solution.

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	Provide examples of how the solver handles different Sudoku puzzles. *
12	Develop a simple expert system using a tool or language of your choice (e.g., Prolog, Python with an expert system library). Implement the system for a given problem and test its performance. *
13	Develop a program to construct a pruned game tree using Alpha-Beta pruning. Take the sequence, [5, 3, 2, 4, 1, 3, 6, 2, 8, 7, 5, 1, 3, 4] of MINIMAX values for the nodes at the cutoff depth of 4 plies. Assume that branching factor is 2, MIN makes the first move, and nodes are generated from right to left.
14	Implementation of Knowledge representation schemes *
15	Implement local search algorithms for CSP *
16	Implement travelling salesman problem *

Course Assessment Method
(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Internal Examination	Total
5	25	20	50

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End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

- ***Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.***
- ***Endorsement by External Examiner:*** *The external examiner shall endorse the record*

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply Search Algorithms to Solve Complex Problems	**K3**
CO2	Develop and Optimize Constraint Satisfaction Solutions.	**K3**
CO3	Implement and Evaluate Machine Learning Models	**K3**
CO4	Build and Test Expert Systems.	**K3**
CO5	Utilize Advanced Optimization Techniques	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									3
CO2	3	3	3									3
CO3	3	3	3									3
CO4	3	3	3									3
CO5	3	3	3									3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Introduction to AI and ES	Dan W. Patterson	Pearson	1/e, 2007
2	Artificial Intelligence	Kevin Night, Elaine Rich, and Nair B	McGraw Hill	3/e, 2018
3	Artificial Intelligence by Example	Dennis Rothman	Packt	1/e, 2018
4	Artificial Intelligence	Patrick H. Winston	Pearson	3/e, 2006

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://youtu.be/yMcZvZayJUA
2	https://youtu.be/ZOvRZ7UJMjk https://youtu.be/dtGRmhZ6Cuo
3	https://youtu.be/a2tqR2eUlek https://youtu.be/il20Q5tXp-A
4	https://youtu.be/0oqhN5tvLgA https://youtu.be/i3L4G1ZO7_E

Continuous Assessment (25 Marks)

1. **Preparation and Pre-Lab Work (7 Marks)**
   - Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
   - Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.
2. **Conduct of Experiments (7 Marks)**
   - Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
   - Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
   - Teamwork: Collaboration and participation in group experiments.
3. **Lab Reports and Record Keeping (6 Marks)**
   - Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
   - Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

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4. **Viva Voce (5 Marks)**
   - Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**
   - Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
   - Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.

- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

2. Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

3. Result with Valid Inference/Quality of Output (10 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

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5. Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted