



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

EXPERT SYSTEMS								
Semester: VI CSE (AI&ML)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACAD16	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisites: Applied Artificial Intelligence								

I. COURSE OVERVIEW:

Expert systems will provide knowledge to develop concepts and skills associated with the problems that are classified in to required intelligent solutions. These problems require solution strategies that use searching, pattern matching, knowledge representation, machine learning, reasoning, uncertainty, and the ability to perform “common sense” processing. Expert systems are important to note that modern AI approaches, including machine learning and deep learning, have also become increasingly prevalent for solving complex problems.

II. COURSES OBJECTIVES:

The students will try to learn:

- I. Expert systems using various techniques, including frames, rules, semantic networks, and production rules.
- II. The optimal and imperfect decisions, alpha-beta pruning, logical agents using propositional and first-order logic, and inference mechanisms in first-order logic.
- III. Basic probability notation and axioms, utilizing Bayes' rule for probabilistic reasoning, and developing the ability to make informed decisions under uncertain conditions.
- IV. The concepts of expert systems tools and Applications to solve complex problems and make informed decisions.

III. COURSE OUTCOMES:

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

- CO1 Interpret the basic concepts of Expert systems, comparison, evaluation of Characteristics, Knowledge of Expert systems to provide a comprehensive understanding of the fundamental principles underlying expert systems.
- CO2 Explain the Study of representing knowledge, Reasoning and design a knowledge-based system to develop effective knowledge-based systems.
- CO3 Apply reasoning and decision making in uncertain world to make informed choices and navigate complex scenarios with varying degrees of unpredictability.
- CO4 Identify the goals and objectives of expert systems to define the intended outcomes and functionalities of AI systems.
- CO5 Construct the plans and methods for generating knowledge to establish systematic approaches and framework.
- CO6 Utilize the concepts of expert systems tools and Applications to enable effective development, implementation, and utilization.

IV. COURSE CONTENT:

MODULE - I: Basic Concepts of Expert Systems (09)

Introduction to Expert Systems: Definition and Brief history of Expert systems, Features of an expert system, Organization of Expert System, Characteristics, Prospector, Knowledge Representation in expert systems.

MODULE - II: Depths of Intelligent Decision-Making (10)

Knowledge and Reasoning: Adversarial search, Optimal and imperfect decisions, Alpha, Beta pruning, Logical agents, Propositional logic, first order logic, Syntax and semantics, Using first order logic, Inference in first order logic.

MODULE - III: Uncertain Knowledge and Reasoning: Navigating the Seas of Probability (10)

Uncertain Knowledge and Reasoning: Uncertainty, Acting under uncertainty.

Baye's rule – Basic probability notation, Axioms of probability, Probabilistic reasoning, Making simple decisions.

MODULE – IV: Planning and Learning Dynamics (10)

Planning And Learning: Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic domains – Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

MODULE –V: Unveiling MYCIN, EXPERT, OPS5, and ROSIE (09)

Expert Systems Tools & Applications: Skeletal System- MYCIN, EXPERT, General Purpose System- OPS5, ROSIE, Applications of Expert systems.

V. TEXTBOOKS:

1. Donald A. Waterman, 'A Guide to Expert Systems', Pearson Education.
2. Stuart Russel and Peter Norvig, 'Artificial Intelligence A Modern Approach', Second Edition, Pearson Education, 2003 / PHI

VI. REFERENCE BOOKS:

1. George F. Luger, 'Artificial Intelligence – Structures and Strategies for Complex Problem Solving', Fourth Edition, Pearson Education, 2002.
2. Elain Rich and Kevin Knight, 'Artificial Intelligence', Second Edition Tata McGraw Hill, 1999.

VII. ELECTRONICS RESOURCES:

1. <https://www.umsi.edu/~joshik/msis480/chapt11.htm#:~:text=Application%20areas%20include%20classification%2C%20diagnosis,planning%2C%20and%20generation%20of%20options.&text=The%20strength%20of%20an%20ES,heuristics%20about%20the%20system's%20domain.>
2. https://www.youtube.com/watch?v=l0CRFuA0m_8
3. https://www.youtube.com/watch?v=o0GFC6c_k4g
4. <https://www.youtube.com/watch?v=eVTBSEZLIzY>

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)