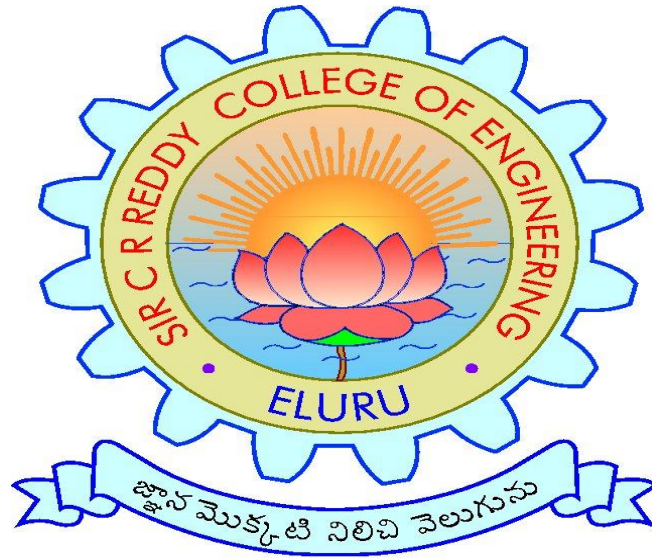


**SIR C.R.REDDY COLLEGE OF ENGINEERING, ELURU**

**DEPARTMENT OF INFORMATION TECHNOLOGY**

**LESSON PLAN**



**SUBJECT: IT 4.1.5 ARTIFICIAL INTELLIGENCE**

**CLASS: 4/4 B.Tech., I SEMESTER, A.Y.2017-18**

**INSTRUCTOR: Dr. S. KRISHNA RAO**

**SIR C R REDDY COLLEGE OF ENGINEERING**  
**DEPT. OF INFORMATION TECHNOLOGY**

**PROGRAMME : B.Tech**  
**SEMESTER : IV -I Semester**  
**Academic YEAR: 2014-15**

Course: IT 4.1.5 Artificial Intelligence

Instructor: Dr. S.Krishna Rao

**Course Contents**

Category of Course	Course Title	Course Code	Credits- 4 C	Theory Paper
Departmental Elective - IT 4.1.5	Artificial Intelligence	IT 4.1.5	L-3 T-1	Max.Marks-70 Duration-3hrs.

**Course objectives:**

- [1]. To study and understand the concepts of Artificial Intelligence.
- [2]. Introduce and apply various knowledge representation techniques.
- [3]. To study and analyze various methods of solving Symbolic and statistical reasoning problems using Artificial Intelligence.
- [4]. Introduce and practice the concepts of planning and Expert Systems.

Students who have successfully completed this course will have full understanding of the following concepts

**Course Outcomes for Artificial Intelligence :**

- Understand the basic Artificial Intelligence algorithms to solve the real world problems.

- Analyze various knowledge representation techniques.
- Apply various knowledge representation techniques to solve Symbolic and statistical reasoning problems.
- Design systems that utilize artificial intelligence techniques.

**ONLINE REFERENCES:**

1. <http://library.thinkquest.org/2705/>
2. <http://www-formal.stanford.edu/jmc/whatisai/>
3. [http://en.wikipedia.org/wiki/Artificial\\_intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence)
4. <http://ai.eecs.umich.edu/>
5. [http://www.cee.hw.ac.uk/~alison/ai3notes/subsection2\\_6\\_2\\_3.html](http://www.cee.hw.ac.uk/~alison/ai3notes/subsection2_6_2_3.html)
6. <http://starbase.trincoll.edu/~ram/cpsc352/notes/heuristics.html>
7. [http://www.macs.hw.ac.uk/~alison/ai3notes/section2\\_4\\_3.html](http://www.macs.hw.ac.uk/~alison/ai3notes/section2_4_3.html)
8. <http://www.rbjones.com/rbjpub/logic/log019.htm>
9. [http://www.cs.odu.edu/~jzhu/courses/content/logic/pred\\_logic/intr\\_to\\_pred\\_logic.html](http://www.cs.odu.edu/~jzhu/courses/content/logic/pred_logic/intr_to_pred_logic.html)
10. [http://www.macs.hw.ac.uk/~alison/ai3notes/chapter2\\_5.html](http://www.macs.hw.ac.uk/~alison/ai3notes/chapter2_5.html)

**Prerequisite** : Data structures, programming practices

**Internal Assessment Details:**

Attendance: 5 Marks

Internal Test 1& 2: 15 Marks

Assignment-1: 5 Marks

Assignment-2: 5 Marks

Total: 30 Marks

**IT 4.1.5                      Elective- I ARTIFICIAL INTELLIGENCE                      Credits:4**

**Instruction:    3 Periods & 1 Tut /week                      Sessional Marks: 30**

**University-Exam : 3 Hours                      Univ-Exam Marks:70**

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Introduction to Artificial Intelligence, Artificial Intelligence Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics

Heuristic Search Technologies

Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means Endo Analysis

Predicate Logic

Proof with Backward Chaining, Resolution, question answering.

Representing Knowledge Using Rules:

Procedural Vs Declarative knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge

Symbolic Reasoning with uncertainty

Non-monotonic Reasoning, Dependency – Directed Backtracking TMS.

Statistical Reasoning with Bayes Theorem, certainty Factors & Rule Based System, DS- Theory.

Weak & Strong Slot Filler Structures

Semantic nets, Frames, Conceptual dependencies, Scripts

Planning

Block world, Components of a Planning System, Goal State Planning, Non Linear Planning, Hierarchical Planning.

Natural Language Processing

Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing.

Expert Systems

Representing and Using Domain Knowledge, Expert Systems Shells, Explanation

Text Books:

1. Artificial Intelligence, Rich E & Knight K – Tata Mcgrahill (1991)
2. Introduction to Artificial Intelligence & Expert Systems, Paterson. PHI

**SIR C R REDDY COLLEGE OF ENGINEERING :: ELURU**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**COURSE SCHEDULE**

**The schedule for the whole course/subject is :**

<b>Unit No</b>	<b>Description of the Chapter</b>	<b>Description of the Topics</b>	<b>Total no of periods (L+T)</b>
1	Problems and search	Introduction to AI, AI techniques, Defining problem as State space search, water jug problem	7+3
2	Heuristic Search Techniques	Generate and Test alg., Hill Climbing alg., Best -first search alg., Constraint satisfaction alg., Means-Ends-Analysis,	7+3
3	Knowledge Representation Issues Using Predicate Logic	Introduction of Predicate Logic, Logic Representation, Instance and Is a relationship, Unification Algorithm, Procedural vs Declarative knowledge	5+1
4	Representing knowledge using Rules	Logic programming, Prolog programming, Forward vs backward reasoning,	6+2
5	Symbolic Reasoning Under Uncertainty	Symbolic Reasoning Under Uncertainty concepts, Non-Monotonic Reasoning systems	4+1
6.	Statistical Reasoning	Bayes Theoram, Demster- Shefer theoram	4+1
<b>7.</b>	Weak-Slot Filler Stuctures	Matching, complex and appropriate matching, conflict	6+2

		resolution, control knowledge	
8.	Strong-Slot Filler Structures	Conceptual dependency, scripts, Frames, Semantic Nets	6+2
9.	Goal Stack Planning	Goal stack planning components, Blocks world example	4+1
10.	Natural Language Processing	Natural language processing, top down and bottom up approaches	4+1
11.	Expert Systems	Expert systems and architecture	3+1

Total no of instructional periods available for the course : 75 periods

Total no of estimated periods : 75 periods

**Signature of the H.O.D**

**Signature of the Faculty**

**Date:**

	<b><u>LECTURE PLAN</u></b>
DEPARTMET	INFORMATION TECHNOLOGY
NAME OF LECTURER	Dr.S.Krishna Rao

<b>Sl.No</b>	<b>Topics to be covered</b>	<b>No. of Lecture hours</b>	<b>Teaching method</b>	<b>Program Outcomes</b>
1	Definition of AI, scope	1	BB	a,c
2	AI techniques	1	BB	a,c
3	Problem, Problem spaces and search	1	BB	a,b,c
4	Problem as state space search	1	BB	a,b,c
5	Production systems	1	BB	b,c,d
6	Problem characteristics	1	BB	b,c,d
7	Water jug problem	1	BB	b,c,d
8	Tutorial-Turing machines	1	PPT with LCD	b,c,d
9	Search techniques	1	BB	b,c,d
10	Generated and test alg.	1	BB	b,c,d
11	Hill climbing alg.	1	BB	b,c,d,e
12	Steepest ascent alg.	1	BB	b,c,d,e
13	Tutorial on Hill climbing Alg.	1	BB	b,c,d,e
14	Best-first search-A* alg.	1	BB	b,c,d,e
15	AO* alg.	1	BB	b,c,d,e
16	Problem reduction alg.	1	BB	b,c,d,e
17	A*&AO* alg.	1	PPT with	b,c,d,e

			LCD	
18	Tutorial on -A*&AO* alg.	1	BB	b,c,d,e
19	Constraint satisfaction	1	BB	b,c,d,e
20	Examples on Constraint satisfaction	1	BB	b,c,d,e
21	Means-end-analysis	1	BB	b,c,d,e
22	Means-End-Analysis	1		b,c,d,e
23	Exercises on Means-end-analysis & constraint satisfaction	1	BB	b,c,d,e
24	Knowledge representation techniques	1	BB	b,c,d,e
25	issues in knowledge representation	1	BB	b,c,d,e
26	Approaches in knowledge representation	1	BB	b,c,d,e
27	Predicate logic	1	BB	b,c,d,e
28	Algorithm on Predicate Logic	1	PPT with LCD	b,c,d,e
29	Tutorial	1		b,c,d,e
30	Representation of facts in logic	1	BB	b,c,d,e
31	Instance and Is a relationship	1	BB	b,c,d,e
32	Computable functions and predicates	1	BB	b,c,d,e
33	Resolution techniques	1	BB	b,c,d,e
34	Tutorial	1	PPT with	b,c,d,e



			LCD	
35	Unification algorithms	1	BB	b,c,d,e
36	Examples on unification algorithm	1	BB	b,c,d,e
37	Procedural vs declarative knowledge	1	BB	b,c,d,e
38	Ex. On Knowledge representation	1	BB	b,c,d,e
39	Introduction to Logic programming	1	BB	b,c,d,e
40	Prolog programming	1	BB	b,c,d,e
41	Forward vs backward reasoning	1	BB	b,c,d,e
42	Examples	1	BB	b,c,d,e
43	Matching techniques	1	BB	b,c,d,e
44	Complex and appropriate matching	1	BB	b,c,d,e
45	Conflict resolution	1	BB	b,c,d,e
46	Control knowledge	1	BB	b,c,d,e
47	Tutorial on knowledge using rules	1	BB	b,c,d,e
48	Symbolic reasoning under uncertainty	1	PPT with LCD	b,c,d,e
49	Non monotonic reasoning	1	BB	b,c,d,e
50	Truth maintenance systems	1	BB	b,c,d,e
51	Strong slot filler structures	1	BB	b,c,d,e

52	Tutorial	1	BB	b,c,d,e
53	Conceptual dependency	1	PPT with LCD	b,c,d,e
54	Scripts	1	BB	b,c,d,e
55	Examples on CD and scripts	1	BB	b,c,d,e
56	Weak slot filler structures	1	BB	b,c,d,e
57	Semantic nets	1	BB	b,c,d,e
58	Partitioned semantic nets	1	BB	b,c,d,e
59	Frames	1	BB	b,c,d,e
60	Introduction to planning	1	BB	b,c,d,e
61	Goal stack planning	1	BB	b,c,d,e
62	Blocks-world problem	1	BB	b,c,d,e
63	Expert systems	1	BB	b,c,d,e
64	Natural language processing	1	BB	b,c,d,e
65	Tutorial on NLP &Expert systems	1	PPT with LCD	b,c,d,e
	<b>Expected Total classes</b>	<b>65</b>		

**Unit wise questions (short and essay)**  
**ARTIFICIAL INTELLIGENCE**

**Unit Wise Question Bank**

**1. Introduction to AI**

**Short Answer Questions**

1. Write the Definition of Artificial Intelligence and intelligence
2. List the different tasks in AI?
3. What is use of AI techniques?
4. What are the Applications of AI?

**Essay Questions**

1. Explain various problems that come under AI tasks?
2. Explain AI techniques used to solve AI Problems?

**2. Problems, Problem Spaces, and Search**

**Short Answer Questions**

1. What important points to be considered to solve a particular problem?
2. Define State Space search?
3. How to apply a rule?
4. Define production system?
5. What are the requirements of good control strategy?
6. What is meant by Heuristic search? Define Heuristic function?
7. Give the examples for ignorable, Recoverable, Irrecoverable Problems.

**Essay Questions**

1. Explain Water Jug Problem by applying State space search?
2. Explain good requirement of a control strategy with example?
3. Explain problem characteristics?
4. Explain production system characteristics?
5. For each of the following types of problems, try to describe a good heuristic function?
  - (a) Blocks world
  - (b) Theorem proving
  - (c) Chess

### **3. Heuristic Search Techniques**

#### **Short Answer Questions**

1. Write the algorithm for Generate - and - Test method.
2. In which situation the Steepest Ascent Hill Climbing algorithm may fail to find a solution?
3. What is local maximum, plateau, and ridge?
4. What is best first search?
5. Give the example for and-Or graphs?
6. What are the two main steps in Constraint Satisfaction?

#### **Essay Questions**

1. Explain steepest Ascent Hill climbing algorithm.
2. Explain Means Ends Analysis algorithm.
3. Explain A\* algorithm.

### **4. Using Predicate Logic**

#### **Short Answer Questions**

1. What are computable functions?
2. what is Resolution proof procedure
3. What is conjunctive normal form?
4. Define Horn Clause?
5. How to eliminate existential quantifiers?
6. What is importance of Unification Algorithm?
7. What is predicate logic(Nov 2010)
8. How can resolution be used to show that a sentence is valid?
9. What is refutation?
10. What is a clause form?
11. Explain question and answering in AI system.

#### **Essay Questions**

1. Assume the following facts:

Steve only likes easy  
courses. Science  
courses are hard

All the courses in the basketweaving  
department are easy. BK301 is a  
basketweaving course.

Represent these facts in predicate logic.

Use resolution to answer the question, "What course would Steve like?"

2. Explain how a general WFF in predicate calculus can be converted into a clause form.
- 3.a) Discuss various issues related to knowledge representation  
b) Explain how resolution technique can be used in predicate logic
- 4.a) "some medicines are dangerous if taken in excessive amount"  
Translate the sentence into predicate logic and then to clause form.  
b) Describe semantic net and frames with suitable examples.
- 5.a) Explain unification algorithm with an example  
b) Discuss backward chaining Algorithm with an example .

## **5. Representing Knowledge Using Rules**

### **Short Answer Questions**

1. What is procedural knowledge?
2. What is declarative knowledge?
3. Write the differences between procedural and declarative knowledge
4. What is the difference between logic representation and PROLOG representation?
5. Give the example for structural similarity in rules in matching with variables?
6. Define control knowledge.

### **Essay Questions**

1. Explain logic programming PROLOG
2. Explain Forward Reasoning and Backward Reasoning.
3. Explain Complex and Approximate Matching.
4. Explain Conflict Resolution
5. Explain control knowledge

## **6. Symbolic Reasoning with Uncertainty**

### **Short Answer Questions**

1. What is monotonicity and nonmonotonicity? Differentiate between them.
2. Give an example for no monotonic reasoning system.
3. What is Abduction?
4. What is closed world Assumption?
5. What are the limitations of closed world Assumption?
6. What is Bayes theorem?
7. What are the disadvantages of Bayes theorem?

## **Essay Questions**

1. What are the key issues we need to consider when dealing with nonmonotonic reasoning system.
2. Explain approaches that support nonmonotonic reasoning system.
3. What is Default reasoning. Explain the different approaches to deal with nonmonotonic system. What are the disadvantages.
4. Differentiate nonmonotonic logic and default logic.
5. Explain Abduction with an example
6. Explain inheritance with an example
7. What is minimalist reasoning? What are the two kinds of minimalist reasoning?
8. Explain Dependency directed backtracking with an example.
9. What is TMS? Explain the architecture of the problem solver With a TMS. Explain with an example.
10. What is Certainty factor? Explain Certainty factor related with rule based systems .
11. Explain DS theory.

## **7. Weak & Strong Slot Filler Structures**

### **Short Answer Questions**

1. Define Semantic Nets
2. Define Partitioned Semantic Nets
3. What is frame .Give an example for frame.
4. Construct Semantic Net representation for the following
  - (a) Pompeian(Marcus), Blacksmith(Marcus)
  - (b) Mary gave the green flowered vase to her favorite cousin.
5. Write the components of a script.
6. Write set of primitive acts of Conceptual Dependency.

### **Essay Questions**

1. Construct partitioned semantic net for the following
  - a)every batter hit a ball
  - b) All the batters like the pitcher
2. Write a script for Restaurant
- 3 Write a script for going to movie
4. Show a CD representation of a sentence John begged Mary for a

pencil

## **8. Planning**

### **Short Answer Questions**

1. What is planning?
2. Write the components of a planning
3. What is the difference between Constraint posting search and State Space Search.
4. What is ABSTRIPS APPROACH?

### **Essay Questions**

1. Explain components of a planning system
2. Explain Goal Stack planning
3. Write the Algorithm for nonlinear planning.
4. Explain Hierarchical planning

## **9. Natural Language Processing**

### **Short Answer Questions**

1. What is syntactic processing?
2. What is Semantic processing?
3. What is Discourse processing?
4. What is pragmatic processing?
5. Write the steps in the natural language processing?
6. What is morphological analysis
7. Write NLP applications.

### **Essay Questions**

1. Explain important steps in the processing of Natural Languages?
2. Write about augmented transition networks and explain case grammar theory?
3. Discuss semantic analysis.

## **10. Expert Systems**

### **Short answer Questions**

1. Explain the characteristics of Mycin.
2. What is an Expert System?
3. What is meant by expert system shell?
4. What are the characteristic features of an expert system?

5. What is Rule based system?
6. Write short notes on knowledge base.

### **Essay Questions**

1. Briefly describe the basic architecture of a typical expert system, mentioning the purpose of each of the main components.
2. What is an expert system? Explain the components of an expert system.
3. Explain Rule based system.
4. What is the need of Explanation system in expert system?