BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
K. K. BIRLA GOA CAMPUS
INSTRUCTION DIVISION
SECOND SEMESTER 2016-2017
Course Handout(Part II)

Date: 16.02.2017

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No : CS F407

Course Title : ARTIFICIAL INTELLIGENCE

Instructors : RAMPRASAD JOSHI (rsj@goa.bits-pilani.ac.in)

WebSite

photon lms

Objective

To introduce the problems and techniques in Artificial Intelligence with its historical development, and provide foundations for developing applications.

Scope

The course covers the dual aspects of practical problem solving methodologies for an intelligent agent and the corresponding theoretical constructs. While the former part requires applications of all the known classes of algorithmic techniques, the latter attempts at establishing the theoretical basis for the plausibility or evaluation of the solutions thus obtained. Various techniques for state-space search, strategy-based games, and soft computing, thus, both hard and soft computing aimed at enabling computers "behave" like humans will be discussed. At the same time, the formal tools needed for knowledge representation will be covered and the yet incomplete and fragmented theory of knowledge including methods and formalisms for reasoning under uncertainty and incomplete knowledge will be introduced. Some aspects of machine learning are also to be introduced. The assignments will constitute the application of some of the methods covered in the course. Thus the course will provide the platform for understanding the basic paradigms involved in designing intelligent softwares. The course holds the promise of amusement and challenging tasks.

Text Book: T1. Stuart Russell and Peter Norvig, *Artificial Intelligence A Modern Approach*. Prentice Hall, Edition 2 or 3, any.

Reference Books Many, many. They will be suggested in the class from time to time, though their relevance to exams is never direct.

Course Plan:

Lecture Modules

No.	Scope	Learning Objectives
I	**Problem-solving**	To understand the difficulty of solving AI problems; study how different search techniques can be used efficiently.
II	**Heuristic Search Techniques**	To understand the different heuristic search techniques.

III	**Knowledge and Reasoning**	To understand the formal methods for representing and reasoning about knowledge, and application using LISP
IV	**Reasoning under Uncertainty**	To understand some approaches for reasoning about uncertainty
V	**Soft Computing and Learning**	Application of all the foregoing, to practical problems and machine learning

Lecture Schedule

Lecture	Module	Topic	Reading
1	-	**Introduction** to AI, background, related field	-
2	**I**	Agents and environments	T1 3.1
3		A problem solving agent: example	T1 3.2
4		Solution extraction by search:notations,defn.	Notes
5, 6		Uninformed search strategies	T1 3.3,3.4
7, 8	**II**	**Heuristic search**, A* algorithm	T1 4.1,4.2
9		Benefits of heuristic search: example	Notes
10		Constraint Satisfaction Problems	T1 5.1—5.4
11, 12		Adversarial search: **game** trees	T1 6.1—6.3
13		Evolutionary Computation techniques	Notes, T1 4.4
14	**III**	**Knowledge Representation**: Introduction	Notes
15		Propositional logic: formal system	T1 7.4
16,17		Resolution principle, Refutation trees	T1 7.5
18		Propositional inference, SAT-solver	T1 7.6
19		First-order logic: syntax, semantics	T1 8.2
20,21		Knowledge Representation in LISP	R1 15, Notes
22		Expressivity of first-order logic	T1 8.3
23,24		Unification in first-order logic	T1 9.2
25		General Resolution	T1 9.5
26		Answer extraction from Resolution refutation	Notes
27,28		Unification and Resolution in LISP	Notes
29	**IV**	Reasoning under **Uncertainty**	T1 13.1,13.2,
30-31		Bayesian reasoning, Bayes' Theorem	T1 13.3-8
32-33		Making simple decisions under uncertainty	T1 16, Notes
34-35		Making Complex decisions under uncertainty	T1 17, Notes

36-40	**V**	Soft Computing	T1 Part IV, Notes

Evaluation Scheme

Component	**Mode**	**Duration**	**Date**	**Weightage**
Test 1	Open Book	60 min	See the ID/ARC TimeTable	**20%**
Test 2	Closed Book	60 min	"	**30%**
Comprehensive	Partly Open Book	3 hours	"	**50%**

Chamber Consultation: By appointment. While using email, you may want to confirm that p and s are different letters.

Notices: All notices concerning this course will be first **announced in the class** (regular and extra if any), then, **depending on the need**, put up on photon. Attempt will be made to reach the enrolled students via e-mail, but both the on-line modes are only for quick communication; **reliance on the class announcements is advised**.

Makeup Policy: Unless the Institute tells me otherwise in particular cases, no make up is needed or useful.

Instructor-in-charge
CS F407