



Department of Information Technology		LP: IT18601
B.E/B.Tech/M.E/M.Tech : B.Tech	Regulation: 2018	Rev. No: 00
PG Specialisation : --		Date: 07.01.2021
Sub. Code / Sub. Name : IT18601 – COMPUTATIONAL INTELLIGENCE		
Unit : I		

**PROBLEM SOLVING METHODS**

**Unit Syllabus:** Problems, Problem Spaces and Search - problem characteristics -production system characteristics-Heuristic Search Techniques – Generate and Test- Hill Climbing- Best First Search- Problem Reduction-Constraint Satisfaction Problems – Game Playing – Minimax procedure - Alpha-Beta Pruning

**Objective:**

- To understand the concepts of Artificial Intelligence
- To learn the methods of solving problems using Artificial Intelligence

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to AI - Problem Formulation : Defining the Problem as a state space search for Water Jug problem	1 - Ch 1 ; Pg 1 – 30 3- Ch 1; Pg 1-7	PPT/Online
2	Problem characteristics	1 - Ch 1 ; Pg 36-43	PPT/Online
3	Production System and its Characteristics	1 - Ch 2 ; 30 – 36,40-43	PPT/Online
4	Heuristic Search Techniques : Generate-and-Test, Hill Climbing and its variants and Simulated Annealing	1 - Ch 3 : Pg 50 – 57 6 – Ch 4; Pg 111-115	PPT/Online
5	Best-First Search : OR Graphs	1 - Ch 3; Pg 57-59	PPT/Online
6	Best-First Search : A* algorithm	1 - Ch 3; Pg 59 – 64 6 - Ch 4 ; 95 – 100	PPT/Online
7	Problem Reduction : AND-OR graphs, AO* algorithm	1 - Ch 3; Pg 64 – 68	PPT/Online
8	Constraint satisfaction Problem: Cryptarithmic problem	1 - Ch 3; Pg 68-72 6 - Ch 5 ; 137 – 141	PPT/Online
9	Game playing : Overview, Minimax search procedure, Alpha-beta pruning	1 - Ch 12; Pg 231 – 240 6 -Ch 6; 165 & 167-171	PPT/Online
10	Tutorial on Cryptarithmic problem		PPT/Online
11	Tutorial on Game playing		PPT/Online
12	Tutorial on alpha-beta pruning		PPT/Online
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 minutes



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Unit : II

### KNOWLEDGE REPRESENTATION

**Unit Syllabus :** Knowledge representation-Using Predicate logic- Representing Simple Facts- Representing Instance – Computable Functions and Predicates -Resolution, Knowledge Inference – Backward chaining, Forward chaining

#### Objective:

- To represent knowledge for problem solving using various logic
- To infer knowledge using various techniques

Session No *	Topics to be covered	Ref	Teaching Aids
13	Knowledge Representation Issues : Representations and Mappings	1 - Ch 4 ; Pg 79 –82	PPT/Online
14	Approaches to Knowledge representation	1 - Ch 4 ; Pg 82-86	PPT/Online
15	Knowledge representation using Predicate logic	1 - Ch 5 ; Pg 98 – 99	PPT/Online
16	Representing simple facts in logic	1 - Ch 5 ;Pg 99-103 3- Ch 4; Pg 49-60	PPT/Online
17	Representing Instance and ISA relationships	1 - Ch 5 ; Pg 103-105	PPT/Online
18	Computable Functions and Predicates	1 - Ch 5 ; Pg 105-108	PPT/Online
19	Predicate logic : Resolution	1 - Ch 5 ; Pg 108-124 6 – Ch 9; Pg 295-306	PPT/Online
20	Knowledge Inference using Forward chaining	6 – Ch 9; Pg 280-287	PPT/Online
21	Knowledge Inference using Backward chaining	6 – Ch 9; Pg 287-290	PPT/Online
22	Tutorial on Predicate logic		PPT/Online
23	Tutorial on Resolution		PPT/Online
24	Tutorial on Knowledge Inference		PPT/Online

**Content beyond syllabus covered (if any): Propositional Logic**



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Unit : III

## DATA MINING

**Unit Syllabus:** Fundamentals – Data reduction – Classification - Decision tree Induction – Learning - Supervised Learning – Unsupervised Learning – Reinforcement Learning – Associations- Frequent Itemset Mining Methods, Clustering- Partitioning methods - Hierarchical methods- Data Mining Applications

### Objective:

- To understand the fundamentals and various concepts of data mining.

Session No *	Topics to be covered	Ref	Teaching Aids
25	Fundamentals- Type of data, Pattern types, technologies	2 - Ch 1; Pg 1-21	PPT/Online
26	Data reduction-Wavelet Transforms, PCA, Regression, Histograms, Sampling	2 - Ch 3; Pg 99-111	PPT/Online
27	Classification - Decision tree Induction- Attribute Selection, Tree Pruning	2 - Ch 8; Pg 330-350	PPT/Online
28	Learning - Supervised Learning – Unsupervised Learning	Internet	PPT/Online
29	Reinforcement Learning	Internet	PPT/Online
30	Associations- Frequent Itemset Mining Methods- Apriori algorithm	2 - Ch 6; Pg 248-264	PPT/Online
31	Clustering- Partitioning methods- k-Means, k-Medoids	2 - Ch 10; Pg 451-457	PPT/Online
32	Clustering- Hierarchical methods- Agglomerative, BIRCH, Chameleon	2 - Ch 10; Pg 457-470	PPT/Online
33	Data Mining Applications	2 - Ch 13; Pg 607-618	PPT/Online
34	Tutorial on Classification		PPT/Online
35	Tutorial on Associations		PPT/Online
36	Tutorial on Clustering		PPT/Online

Content beyond syllabus covered (if any):



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Unit : IV

**EXPERT SYSTEMS**

**Unit Syllabus :** Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition -Meta knowledge, Heuristics. , Expert systems shells- Typical expert systems - MYCIN, DART, XCON

**Objective:**

- To introduce the concepts of Expert Systems with case studies for various applications.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Expert systems : Introduction and Characteristics	3- Ch 15; Pg 326-330	PPT/Online
38	Architecture of expert systems	3 - Ch 15 ;Pg 330 – 347	PPT/Online
39	Roles of expert systems	3- Ch 15; Pg 326-330	PPT/Online
40	Knowledge Acquisition- Meta knowledge, Heuristics	1- Ch 20; Pg 427- 429	PPT/Online
41	Expert systems shells	1- Ch 20; Pg 424 – 427	PPT/Online
42	Architecture of MYCIN Expert system	3- Ch 15; Pg 326-330	PPT/Online
43	Knowledge Acquisition in MYCIN Expert	Internet	PPT/Online
44	Architecture and Knowledge Acquisition of DART Expert system	Internet	PPT/Online
45	Architecture and Knowledge Acquisition of XCON Expert system	3- Ch 15; Pg 326-330	PPT/Online
46	Tutorial on Expert systems		PPT/Online
47	Tutorial on MYCIN		PPT/Online
48	Tutorial on DART, XCON		PPT/Online

**Content beyond syllabus covered (if any):**

\* Session duration: 50 mins



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Unit : V

#### ADVANCED TOPICS

**Unit Syllabus :** Evolutionary Computation- Genetic Algorithms –Crossover- Mutation, Genetic programming ; Evolutionary Programming- Operators- Parameters- Implementations; Neural Networks – Multi layer Feed Forward Neural Network-Applications of Neural Networks- Fuzzy Systems- Fuzzy Sets – Fuzzy Logic and Reasoning – Creating a bot – Weather Monitoring bot

#### Objective:

- To introduce the advanced concepts of Computational Intelligence

Session No *	Topics to be covered	Ref	Teaching Aids
49	Evolutionary Computation - Introduction	4 – Ch 8; Pg 127-141	PPT/Online
50	Genetic Algorithms –Crossover- Mutation	4 – Ch 9; Pg 143-156	PPT/Online
51	Genetic programming	4 – Ch 10; Pg 177-184	PPT/Online
52	Evolutionary Programming- Operators- Parameters- Implementations	4 – Ch 10; Pg 187-206	PPT/Online
53	Neural Networks – Multi layer Feed Forward Neural Network	6- Ch 20; Pg 744-748	PPT/Online
54	Applications of Neural Networks	1- Ch 18; Pg 396-399	PPT/Online
55	Fuzzy Systems- Fuzzy Sets	4 – Ch 20; Pg 453-463	PPT/Online
56	Fuzzy Logic and Reasoning	4 – Ch 21; Pg 465-472	PPT/Online
57	Creating a bot – Weather Monitoring bot	5 – Ch 22; Pg 485-520	PPT/Online
58	Tutorial on Genetic Algorithms		PPT/Online
59	Tutorial on Neural Networks		PPT/Online
60	Tutorial on Fuzzy Systems		PPT/Online
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 mins





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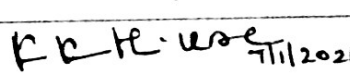

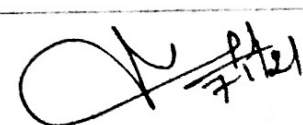
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3. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007.
4. Andries .P. Engelbrecht, Computational Intelligence: An Introduction, 2nd Edition, John Wiley & Sons, 2012
5. [https://en.wikipedia.org/wiki/Wikipedia:Creating\\_a\\_bot](https://en.wikipedia.org/wiki/Wikipedia:Creating_a_bot)
6. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 3rd Edition, 2009

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\* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD