Detailed Syllabus
Lecture-wise Breakup

Course Code **NBA Code**	18B12CS424 C440	**Semester Odd**	**Semester** VII **Session** 2022-23 **Month from July to December**
Course Name	Algorithm Analysis and Artificial Intelligence		
Credits	**3**	**Contact Hours**	**3-1-0**

Faculty (Names)	**Coordinator(s)**	Dr. Gaurav Kumar Nigam (J128) / Prof. Satish Chandra (J62)
	Teacher(s) (Alphabetically)	Dr. Gaurav Kumar Nigam (J128) / Prof. Satish Chandra (J62)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C401-12.1	Analyse algorithm's time complexities (Master's method, Recursion tree and substitution method- Sorting and Searching algorithms)	Analyse Level (Level 4)
C401-12.2	Propose solutions for real life computing problems using greedy, divide & conquer, and dynamic programming techniques.	Create Level (Level 6)
C401-12.3	Apply informed and uninformed searching algorithms(A*, Hill Climbing and Simulated Annealing) in AI related problems.	Apply Level (Level 3)
C401-12.4	Solve constraint satisfaction problems and adversarial search algorithms	Create Level (Level 6)
C401-12.5	Apply inference mechanisms(propositional logic , first order predicate logic, and probabilistic reasoning)	Apply Level (Level 3)
C401-12.6	Design and simulate Genetic Algorithms for Optimization.	Create Level (Level 6)

Sr.	**Module**	**Chapters**	**Lectures**
1.	Introduction	Time Complexity analysis: Master's Method. Divide and Conquer methods: Insertion Sort, Merge Sort, Quick Sort	06
2.	Divide and Conquer and Greedy Algorithms	Strassen's Matrix multiplication , Knapsack Problem; Coin change Problem; Huffman Coding; Activity Selection; Minimum Spanning tree etc.	09
3.	Dynamic Programming Algorithms	Knapsack Problem; Coin change Problem; Matrix chain Multiplication, Longest common subsequence etc.	05
4.	Artificial Intelligence : Problem Spaces and Problem Solving by search	State Spaces, Uninformed search strategies (BFS, DFS, DLS, IDS, Bidirectional search),Informed Search & exploration (A*,Heuristic, Local search algorithms, online search agents)	07
5.	Constraint satisfaction problems	Constraint satisfaction problems (backtracking, variable and value ordering, local search), Adversarial Search (games, alpha beta pruning, elements of chance, state of art games)	06
6.	Propositional Logic	Knowledge based agents, PL, FOPL, Syntax and semantics, use, knowledge engineering) , Inference in FOPL(Propositional vs First order inference	06
7.	Uncertainty	Probabilistic reasoning, Bayesian rule, Bayesian network, Inference, Reasoning over time	03

8.	Genetic Algorithms	Travelling Salesman Problem,Knapsack Problem	01
		Total number of Lectures	**43**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25(Attendance-10Quiz/Assignments/Presentations/Mini-Project- 15)
Total	**100**

Project based learning: Each student understood on the application of Artificial Intelligence for algorithmic optimization. They presented the application by a power-point presentation. It can help improve the efficiency of the real life projects in the real world IT organizations.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc.

TEXT BOOKS

1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 3rd Edition, 2009
2.	Artificial Intelligence – A modern approach by Stuart Russel and Peter Norvig, PHI, 2008.
REFERENCE BOOKS Journals, Reports, Websites etc. in the IEEE format	
3.	Artificial Intelligence Review: An International Science and Engineering Journal, Springer
4.	Nunes de Castro, Leandro, " Nature-Inspired Computing Design, Development, and Applications" IGI Global, 31-May-2012 - 435 pages
5.	Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008
6.	Knuth, The art of Computer Programming Volume 1, Fundamental Algorithms, Addison-Wesley Professional; 3 edition,1997
7.	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978