BMEE407L	Artificial Intelligence	L	T	P	C
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Pre-requisite	**BMAT202L, BMAT202P, BMEE211L**	**Syllabus version**			
		1.0			

Course Objectives

1. To provide basic understanding on Artificial Intelligence with its sub-sets.
2. To impart knowledge of search algorithm, logics, reasoning and uncertainty.
3. To introduce the basic concepts of machine learning and its application in mechanical engineering.

Course Outcome

At the end of the course, the student will be able to

1. Translate the characteristics of artificial intelligence and its sub-sets.
2. Implement appropriate algorithm for problem solving by searching.
3. Construct the logical agents and familiar in the application of fuzzy in AI.
4. Design the decision making algorithm with the reasoning of uncertainties.
5. Develop machine learning programs based on supervised, unsupervised and reinforcement learning.
6. Experiment the benefit of neural network in deep learning.
7. Apply machine learning approach to solve problems related to mechanical engineering.

Module:1	**Foundation of AI**	**4 hours**
Introduction – Foundations of AI – Evolution of AI – Intelligent Agents: Agents and environments, Concept of rationality, structure of agents – Structure of Knowledge based system - Risks and Benefits of AI.		
Module:2	**Problem-solving by searching**	**6 hours**
Uninformed search: Breath first search, Depth first search, iterative deepening – Heuristic search: Greedy search, A*search – Adversarial search: Minimax search, alpha-beta-pruning.		
Module:3	**Logic (Knowledge, reasoning and planning)**	**8 hours**
Propositional Logic – First Order Logic – Inference in First Order Logic – Knowledge representations – automated planning. Fuzzy: Fuzzy sets, operation and properties, Feature of membership functions, fuzzification and defuzzification, Fuzzy logic rules based system.		
Module:4	**Reasoning with uncertainty**	**6 hours**
Quantifying uncertainty – Probabilistic reasoning – Making Simple Decisions – Making Complex Decisions – Multiagent decision making.		
Module:5	**Machine Learning**	**6 hours**
Supervised learning: Decision trees, linear regressing and classification, and support vector machine – Unsupervised: Clustering, dimensionality reduction, Principal component analysis – Reinforcement: Passive and active reinforcement learning.		
Module:6	**Deep Learning**	**7 hours**
Simple feedforward networks – Computation graph for deep learning – Convolution neural networks – Learning algorithms – generalization – Recurrent Neural Networks - Deep reinforcement learning.		
Module:7	**Use cases**	**6 hours**
AI in manufacturing process: Materials characterization and machine process – AI in logistics and supply chain management – Prediction of mechanical system failure – diagnostic system – Human-in-loop for Machine human collaborative task.		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Books

1.	Russell S, Norvig P, Artificial Intelligence - A Modern Approach, 2021, 4th edition, Prentice Hall.

2.	Ivan Vasilev, Advanced Deep Learning with Python: Design and implement advanced next-generation AI solutions using TensorFlow and PyTorch, 2019, 1st edition, Packt Publishing Ltd.		
Reference Books			
1.	Bishop C. M, Pattern Recognition and Machine Learning, 2011, 2nd edition, Springer.		
2.	Nilsson N.J, Artificial Intelligence: A New Synthesis, 1998, 1st edition, Morgan Kaufmann.		
Mode of Evaluation: CAT / Written assignment / Quiz / FAT /			
Recommended by Board of Studies	09-03-2022		
Approved by Academic Council	No. 65	Date	17-03-2022