



Kot Bhalwal, Jammu



Model Institute of Engineering
& Technology (Autonomous)
Course Handout

COURSE HANDOUT

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (MCSE201)

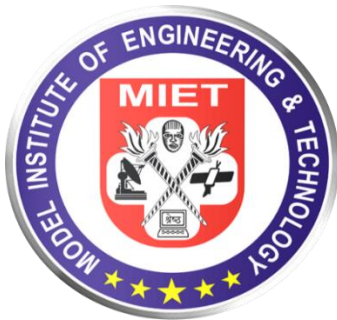
ME-2ND SEMESTER

ACADEMIC YEAR (2024-25)

Dr Surbhi Gupta

Assistant Professor

Department of Computer Science and Engineering



Department of Computer Science and Engineering

Model Institute of Engineering & Technology (Autonomous)

Kot Bhalwal, Jammu - 181122

www.mietjmu.in

Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1



Please Do Not Print Unless Necessary



Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
MCSE-201	Artificial Intelligence and Machine Learning	PCC	3	3	0	0	25	75	100

COURSE OUTCOMES

At the end of the course the student will be able to:	
CO201.1	Design and implement intelligent solutions to classification, regression and clustering problems
CO201.2	Design and implement various deep learning algorithms in a range of real-world applications.
CO201.3	Understand various knowledge representation techniques.

Unit-I

Introduction to Artificial Intelligence and Machine Learning: Basic questions of AI, history of AI, State of the art, Symbolic AI: Decision trees, symbolic computation (medical diagnosis), Generalization Theory, Statistical learning, sample complexity, proof of learnability of finite hypothesis class.

(08 Hours)

Unit-II

Law of Variable Proportions: Optimization: Sample complexity of python programs, optimization SVMs / linear classification, The perceptron, margin, proof of convergence, mathematical optimization, convexity, introduction to convex analysis, constrained optimization, Gradient Descent, proof of convergence example: learning SVM with SGD, Stochastic optimization: Stochastic estimation of the gradient, stochastic gradient descent.

(08 Hours)

Unit-III

Introduction to Deep Learning: Deep nets, Non-convex optimization, Training via backpropagation algorithm, Neural nets for image recognition, Convolutional architectures, Deep nets, Regularization strategies.

(06 Hours)

Unit-IV

Knowledge representation: Bayesian Networks: Definition of probabilistic Bayesian nets, Modelling via Bayes nets, Inferences, Markov Chain Monte Carlo: The sampling problem, simple sampling methods, Markov chains, stationarity, ergodicity, The MCMC algorithm, Hidden Markov Models: Temporal models, application to text tagging, Viterbi decoding algorithms.

(08 Hours)

Unit-V

Reinforcement learning: Game playing, Search, A* heuristic, Reinforcement learning, Markov Decision Process, Markov chains, Markov Reward processes, Ergodic theory reminder, Dynamic programming, The Bellman equation, value iteration, Policy iteration, Q-learning, function approximation, TD learning, policy gradient.

(08 Hours)

Textbooks

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Pearson	4 th (2022)
2.	Deep Learning	Ian Goodfellow, Yoshua Bengio, Courville	MIT Press	1 st (2016)



Reference Books

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Hands-On Machine Learning with Scikit-Learn and TensorFlow	Aurélien Géron	O'Reilly Media	2 nd (2019)

COURSE PLAN

Unit-I Introduction to Artificial Intelligence and Machine Learning

S.No	Topics	Recommended Books
1	Basics of AI	Book 1, Ch.1
2	history of AI	Book 1, Ch.1
3	State of the art	Book 1, Ch.1
4	Symbolic AI: Decision trees	Book 1, Ch.4,5
5	symbolic computation (medical diagnosis)	Book 1, Ch.4,5
6	Generalization Theory	Book 2, Ch.2,3
7	Statistical learning	Book 2, Ch.2
8	sample complexity	Book 2, Ch.2

Unit-II Optimization

9	optimizing linear classification models	Book 2, Ch.4,5
10	Perceptron algorithm	Book 2, Ch.4,5
11	optimization	Book 2, Ch.4,5
12	Gradient Descent optimization	Book 2, Ch.4,5
13	SVM using SGD	Book 2, Ch.4,5
14	principles of Stochastic Gradient Descent	Book 1, Ch.5

Unit-III Introduction to Deep Learning

15	Basics of deep neural networks	Book 2, Ch.6
16	Multi-layered architecture of neural networks	Book 2, Ch.6
17	Advantages of convolutional architectures	Book 2, Ch.6
18	Applications of CNN	Book 2, Ch.9
19	Real-world Applications of CNN	Book 2, Ch.9
20	Concept of regularization	Book 2, Ch.9
21	Effects of Dropout	Book 2, Ch.7

Unit-IV Knowledge representation

22	Bayesian Networks: probabilistic Bayesian nets	Book 2, Ch.3
23	Modelling via Bayes nets Inferences	Book 2, Ch.3
24	Markov Chain Monte Carlo: The sampling problem	Book 1, Ch.4
25	simple sampling methods	Book 1, Ch.5
26	Markov chains	Book 1, Ch.4
27	The MCMC algorithm, Hidden Markov Models: Temporal models	Book 1, Ch.4

Unit-V Reinforcement learning

28	Game playing	Book 1, Ch.1
29	A* heuristic Search	Book 1, Ch.1
30	Reinforcement learning	Book 1, Ch.5
31	Markov Decision Process, Markov chains, Markov Reward processes	Book 1, Ch.4



32	Ergodic theory reminder	Book 1, Ch.5
33	Dynamic programming,	Book 1, Ch.5
34	The Bellman equation, value iteration	Book 1, Ch.5
35	Policy iteration, Q-learning	Book 1, Ch.5
36	Function approximation, TD learning, policy gradient	Book 1, Ch.5

ADDITIONAL WEB RESOURCES

1.	MOOC: Introduction to AI https://www.coursera.org/learn/introduction-to-ai
2.	NPTEL: Video lectures on Artificial Intelligence by Prof. Mausam, Department of Computer Science and Engineering, IIT Delhi https://onlinecourses.nptel.ac.in/noc22_cs56/preview

GRADING AND ASSESSMENT

- **Sessional Test:** 15 marks
- **Assignment:** 5 marks
- **Attendance:** 5 marks
- **Final Examination:** 75 marks

COURSE POLICIES

- **Attendance:** Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity:** MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions:** Assignments and projects must be submitted by the specified timelines.

FACULTY INFORMATION

- **Office Hours**
Monday (12:05 PM - 12:55 PM)
Thursday (12:05 PM - 12:55 PM)
- **Contact Information**
surbhi.cse@mietjammu.in