DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE & Affiliated to Anna University, Chennai)
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PERAMBALUR-621212, TAMILNADU, INDIA.
Website: www.dsengg.ac.in

# COURSE PLAN (2025-2026)

| | | | | |
|---|---|---|---|---|
| **Name of the Faculty** | | | | |
| **Designation/Department** | **AP/ECE** | | | |
| **Course Code/Name** | **U23ITT62/ ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** | | | |
| **Year/Section/Department** | **III/ECE/A** | | | |
| **Credits Details** | **L:3** | **T:0** | **P:0** | **C:3** |
| **Total Contact Hours Required** | **45** | | | |

**Syllabus:**

| **UNIT I** | **PROBLEM SOLVING** | **No. of Periods 9** |
|---|---|---|
| Introduction to AI - AI Applications -Problem solving agents – search algorithms – uninformedsearchstrategies–Heuristicsearchstrategies–Localsearchandoptimizationproblems– adversarialsearch– constraint satisfaction problems(CSP). | | |

| **UNIT II** | **PROBABILISTIC REASONING** | **No. of Periods 9** |
|---|---|---|
| Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks –exact inference in BN –approximate inference in BN –causal networks. | | |

| **UNIT III** | **SUPERVISED LEARNING** | **No. of Periods 9** |
|---|---|---|
| Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier– Support vector machine, Decision Tree, Random forests. | | |

| **UNIT IV** | **ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING** | **No. of Periods 9** |
|---|---|---|
| Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization. | | |

| **UNIT V** | **NEURAL NETWORKS** | **No. of Periods 9** |
|---|---|---|
| Perceptron- Multilayer perceptron, activation functions, network training–gradient descent optimization – stochastic gradient descent, error back propagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyper parameter tuning, batch normalization, regularization, dropout. | | |

**Objective:**

- To introduce problem-solving agents, search algorithms, and optimization in AI.
- To explore probabilistic reasoning, Bayesian networks, and inference techniques.
- To understand supervised learning, including linear regression and classification models.
- To study ensemble techniques, unsupervised learning, and instance-based learning methods.
- To explore neural networks, perceptrons, and deep learning techniques.

**Text Book:**

T1.StephenMarsland,"MachineLearning:AnAlgorithmicPerspective,"SecondEdition",CRCPress, 2014

T2.EthemAlpaydin,"IntroductiontoMachineLearning",MITPress,FourthEdition,2020.

**Reference Book:**

R1. ChristopherM.Bishop,"PatternRecognitionandMachineLearning",Springer, 2006.

R2. TomMitchell,"MachineLearning",McGrawHill,3rdEdition,1997

R3.MehryarMohri,AfshinRostamizadeh, AmeetTalwalkar,"FoundationsofMachineLearning", Second Edition, MIT Press, 2012, 2018.

**Website:**

W1:https://www.youtube.com/watch?v=E5jVBqe59EE&list=PLAXUYU7PbJhhg1jaU2gasFmh4FlMXvq-P

W2:https://www.youtube.com/watch?v=N0GkSJz-7_U&list=PLP51mg8l86gLMa4aM73HbsaBfQ6pYXuLc

W3:https://youtu.be/xtOg44r6dsE

W4:https://www.youtube.com/watch?v=7uwa9aPbBRU&list=PLTDARY42LDV7WGmlzZtYw9pemyPrKNUZ

W5:https://www.youtube.com/watch?v=zxagGtF9MeU&list=PLblh5JKOoLUIxGDQs4LFFD--41Vzf-ME1

**Online Mode of Study (if Any):**

**NPTEL details can be listed.**

- https://onlinecourses.nptel.ac.in/noc24_cs88/preview
- https://onlinecourses.nptel.ac.in/noc24_ce107/preview

**Course Plan:**

| Topic Number | Topic | Reference Detail | Page Number | Mode of teaching | Number of Periods Required | Cumulative Period |
|---|---|---|---|---|---|---|
| **UNIT – I** | **PROBLEM SOLVING** | | | | | **9** |
| **1** | Introduction to AI | T1 | 19 - 45 | BB | 1 | 1 |
| **2** | AI Applications | T1 | 49 – 52 | BB | 1 | 2 |
| **3** | Problem solving agents | T1, W1 | 54-89 | BB | 1 | 3 |
| **4** | search algorithms | T1 | 89 - 94 | PPT | 1 | 4 |
| **5** | Un informed search strategies | T1 | 95- 102 | BB | 1 | 5 |
| **6** | Heuristic search strategies | T1,R1 | 103 – 122 | BB | 1 | 6 |
| **7** | Local search and optimization problems | T1 | 128 -152 | PPT | 1 | 7 |
| **8** | Adversarial search | T1 | 192 - 219 | BB | 1 | 8 |
| **9** | constraint satisfaction problems(CSP). | T1 | 169-183 | BB | 1 | 9 |
| **Outcome of Unit I:**<br>At the end of unit, Students should be able to<br>**CO1:** Use appropriate search algorithms for problem solving. | | | | | | |
| **UNIT – II** | **PROBABILISTIC REASONING** | | | | | **9** |
| **10** | Acting under uncertainty | T1 | 403-406 | BB | 1 | 10 |
| **11** | Bayesian inference | T1 | 415-417 | BB | 1 | 11 |
| **12** | naïve bayes models | T1,R2 | 420-422 | PPT | 1 | 12 |
| **13** | Probabilistic reasoning | T1 | 479-503 | BB | 1 | 13 |
| **14** | Bayesian networks | T1 | 503-514 | BB | 1 | 14 |
| **15** | Bayesian networks | T1 | 503-514 | BB | 1 | 15 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **16** | exact inference in BN | T1 | 445-453 | BB | 1 | 16 |
| **17** | approximate inference in BN | T1 | 453-467 | PPT | 1 | 17 |
| **18** | causal networks | T1, W2 | 467-471 | BB | 1 | 18 |

**Outcome of Unit II:**
At the end of unit, Students should be able to
**CO2:** Explain reasoning under uncertainty.

| **UNIT – III** | **SUPERVISED LEARNING** | | | | | **9** |
|---|---|---|---|---|---|---|
| **19** | Introduction to machine learning – Linear Regression Models | T2 | 1-22 | BB | 1 | 19 |
| **20** | Least squares, single & multiple variables, | T2 | 23-48 | BB | 1 | 20 |
| **21** | Bayesian linear regression, gradient descent, | T2 | 48-90 | PPT | 1 | 21 |
| **22** | Linear Classification Models | T2 | 90-105 | BB | 1 | 22 |
| **23** | Discriminant function | T2, W3 | 105-125 | BB | 1 | 23 |
| **24** | Probabilistic discriminative model - Logistic regression | T2 | 95-135 | BB | 1 | 24 |
| **25** | Probabilistic generative model | T2 | 135-175 | PPT | 1 | 25 |
| **26** | Naive Bayes, Maximum margin classifier | T2,R3 | 243-270 | BB | 1 | 26 |
| **27** | Support vector machine, Decision Tree, Random forests. | T2 | 213-270 | BB | 1 | 27 |

**Outcome of Unit III:**
At the end of unit, Students should be able to
**CO3:** Understand supervised learning models.

| UNIT – IV | ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING | | | | | 9 |
|---|---|---|---|---|---|---|
| **28** | Combining multiple learners: Model combination schemes, | T2, W4 | 533-539 | PPT | 1 | 28 |
| **29** | Voting, | T2 | 539-540 | BB | 1 | 29 |
| **30** | Ensemble Learning | T2,R3 | 540-550 | BB | 1 | 30 |
| **31** | bagging, boosting, stacking, Unsupervised learning | T2 | 550-562 | PPT | 1 | 31 |
| **32** | K-means | T2, W4 | 165-171 | BB | 1 | 32 |
| **33** | Instance Based Learning | T2 | 171-175 | BB | 1 | 33 |
| **34** | KNN | T2 | 189-200 | BB | 1 | 34 |
| **35** | Gaussian mixture models | T2 | 175-188 | BB | 1 | 35 |
| **36** | Expectation maximization | T2 | 200-216 | BB | 1 | 36 |

**Outcome of Unit IV:**
At the end of unit, Students should be able to
**CO4:** Understand ensemble and unsupervised models.

| UNIT – V | NEURAL NETWORKS | | | | | 9 |
|---|---|---|---|---|---|---|
| **37** | Perceptron- Multilayer perceptron | T2, W4 | 272-284 | BB / PPT | 1 | 37 |
| **38** | activation functions | T2 | 284-300 | BB / PPT | 1 | 38 |
| **39** | network training–gradient descent optimization | T2,R3 | 280-288 | BB / PPT | 1 | 39 |
| **40** | stochastic gradient descent | T2 | 289-295 | BB / PPT | 1 | 40 |
| **41** | error back propagation | T2 | 295-304 | BB / PPT | 1 | 41 |
| **42** | from shallow networks to deep networks | T2,W5 | 313-320 | BB / PPT | 1 | 42 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **43** | Unit saturation (aka the vanishing gradient problem) – ReLU | T2 | 325-333 | BB / PPT | 1 | 43 |
| **44** | hyper parameter tuning, | T2 | 340-350 | BB / PPT | 1 | 44 |
| **45** | Batch normalization, regularization, dropout. | T2 | 350-364 | BB / PPT | 1 | 45 |

**Outcome of Unit V:**
At the end of unit, Students should be able to
**CO5:** Explain deep learning neural network models.
**CO6:** Explain the concept of batch normalization and regularization.

**Course Outcome:**

At the end of course: Students should be able to do:
**CO1:** Use appropriate search algorithms for problem solving.

**CO2:** Explain reasoning under uncertainty.

**CO3:** Understand supervised learning models.

**CO4:** Understand ensemble and unsupervised models.

**CO5:** Explain deep learning neural network models.

**CO6:** Explain the concept of batch normalization and regularization.

**Course Outcome Vs Program Outcome Mapping:**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 |
| **CO 3** | 3 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 |
| **CO 4** | 3 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 3 | 3 | 3 |
| **CO 6** | 2 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 |
| **AVG** | 2.83 | 2.33 | 1.83 | 1.67 | 2.67 | 1 | 1 | 1 | 1.17 | 1 | 1 | 2.50 | 3 | 2.67 |

**Topic Beyond Syllabus**:

UNIT I: Problem Solving: Monte Carlo Tree Search (MCTS)
UNIT II: Probabilistic Reasoning: Dynamic Bayesian Networks (DBNs)
UNIT III: Supervised Learning: Bias-Variance Tradeoff
UNIT IV: Ensemble & Unsupervised Learning: Gradient Boosting Machines (GBM)
UNIT V: Neural Networks: Transfer Learning

**Internal Evaluation Components:**

| Webportal | Assignment | Components | Topic Number with Topic / Unit Details | Relevance to CO |
|---|---|---|---|---|
| Webportal 1 | -- | Assessment – I (60) | Unit I and II | CO 1 & CO2 |
| | 1 | Assignment – Handwritten (20) | 2. Explain the AI Applications / Unit I<br>9. Explain in details about the constraint satisfaction problems(CSP) / Unit I | CO 1 |
| | 2 | Assignment – Poster Presentation / PPT (20) | 15. Write briefly about the Bayesian networks in detail / Unit II<br>18. Describe the causal networks in detail. / Unit II | CO 2 |
| Webportal 2 | -- | Assessment – II (60) | Unit III and IV | CO3 & CO4 |
| | 3 | Seminar (20) | 25. Explain the Probabilistic generative model / Unit III<br>27. Write briefly about the Support vector machine / Unit III | CO3 |
| | 4 | Case Study Report (20) | 32. Write briefly about the K-means algorithm / Unit IV<br>34. Explain the KNN / Unit IV | CO4 |
| Webportal 3 | -- | Model Exam (75) | Unit I to V | CO1 to CO6 |
| | 5 | MCQ (15) | Unit I to V | CO1 to CO6 |
| | - | Course Attendance (10) | -- | -- |

**Submission Details:**

| Phase 1(Before AT 1) | | Phase 2 (Before AT 2) | | Phase 3 (Model) |
|---|---|---|---|---|
| **Assignment 1** | **Assignment 2** | **Assignment 3** | **Assignment 4** | **Assignment 5** |
| | | | | |

**Google Class Code Details: lma4sf57**

Class Name: **U23ITT62/ ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

**PLAN OF ASSESSMENT TEST –DISTRIBUTION OF MARKS:**

| TEST | CO- MARK WISE DISTRIBUTION | | | | | | BLOOM'S LEVEL MARK WISE DISTRIBUTION | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT-1 | CO1 | CO2 | CO3 | CO4 | CO5 | CO6 | BTL1 | BTL2 | BTL3 | BTL4 | BTL5 | BTL6 |
| | 37 | 23 | | | | | 20 | 27 | 13 | - | - | - |
| AT-2 | CO1 | CO2 | CO3 | CO4 | CO5 | CO6 | BTL1 | BTL2 | BTL3 | BTL4 | BTL5 | BTL6 |
| | | | 37 | 23 | | | 20 | 26 | 14 | - | - | - |
| MODEL | CO1 | CO2 | CO3 | CO4 | CO5 | CO6 | BTL1 | BTL2 | BTL3 | BTL4 | BTL5 | BTL6 |
| | 20 | 20 | 20 | 20 | 10 | 10 | 20 | 64 | 16 | - | - | - |

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**PRINCIPAL**