**Course:** B.Tech.                                           **Semester:** 6

**Prerequisite:** Data structure, automata and language theory, Mathematics and Python programming. |

**Rationale:** This course provides a broad introduction to Artificial Intelligence. AI techniques for search and knowledge representation also apply knowledge of AI planning and machine learning techniques to real-world problems.

**Teaching and Examination Scheme**

| Teaching Scheme | | | | | Examination Scheme | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Lecture Hrs/Week | Tutorial Hrs/Week | Lab Hrs/Week | Hrs/Week | Credit | Internal Marks | | | External Marks | | |
| | | | | | T | CE | P | T | P | |
| 3 | 0 | 0 | - | 3 | 20 | 20 | - | 60 | - | 100 |

**SEE** - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

**Course Content**                                         **W** - Weightage (%) , **T** - Teaching hours

| Sr. | Topics | W | T |
|---|---|---|---|
| 1 | **Introduction to Machine Learning:** <br> Introduction to Machine Learning – Learning Paradigms – PAC learning – Basics of Probability – Version Spaces, <br> **Machine Learning in Practice:** <br> Data collection – Preprocessing (Missing values, Normalization, Adopting to chosen algorithm etc.,) – Outlier Analysis (Z-Score) - Model selection & evaluation – Optimization of tuning parameters – Setting the environment – Visualization of results | 20 | 9 |
| 2 | **Supervised Learning – I:** <br> Linear and Non-Linear examples – Multi–Class & Multi-Label classification – Linear Regression – Multilinear Regression – Naïve Bayes Classifier – Decision Trees – ID3 – CART – Error bounds | 15 | 6 |
| 3 | **Supervised Learning - II:** <br> K-NN classifier – Logistic regression – Perceptrons – Single layer & Multi-layer – Support Vector Machines – Linear & Non-linear, Semi-Supervised Learning. | 25 | 9 |
| 4 | **Unsupervised Learning:** <br> Clustering basics (Partitioned, Hierarchical and Density based) - K-Means clustering – K-Mode clustering – Self organizing maps – Expectation maximization – Principal Component Analysis, Reinforcement Learning | 20 | 8 |
| 5 | **Evaluation Metrics:** ROC Curves, Evaluation Metrics, Significance tests – Error correction in Perceptrons, <br> **Ensemble Learning:** Bagging and Boosting (Random forests, Adaboost, XG boost inclusive) | 20 | 11 |

**Reference Books**

| | |
|---|---|
| 1. | **Ethem Alpaydin,"Introduction to Machine Learning‖, MIT Press, Prentice Hall of India, Third Edition 2014. (TextBook)** |
| 2. | **Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning‖, MIT Press, 2012** |
| 3. | **Tom Mitchell, ―Machine Learning‖, McGraw Hill, 3rd Edition,1997.** |
| 4. | **Charu C. Aggarwal, ―Data Classification Algorithms and Applications‖, CRC Press, 2014.** |
| 5. | **Christopher M. Bishop, ―Pattern Recognition and Machine Learning‖, Springer 2011 Edition.** |

| Course Outcome |
|---|

| **After Learning the Course the students shall be able to:** |
|---|
| Expected Course Outcome:<br>At the end of the course, students will be able to<br>1. Understand, visualize, analyze and preprocess the data from a real-time source.<br>2. Apply appropriate algorithm to the data.<br>3. Analyze the results of algorithm and convert to appropriate information required for the real – time application.<br>4. Evaluate the performance of various algorithms that could be applied to the data and to suggest most relevant algorithm according to the environment. |