# GUJARAT TECHNOLOGICAL UNIVERSITY
## Bachelor of Engineering
### Subject Code: 3171105
**SUBJECT NAME:** Introduction of Artificial Intelligence
### SEMESTER: 7

**Type of course:**

**Prerequisite:** Basic knowledge of Mathematics, Statistics and Programming Skills

**Rationale:** Unlike the natural intelligence of humans, Artificial Intelligence is the field that demonstrate the machine intelligence which can imitate the human consciousness and emotions. This subject introduces the basic principles, techniques, and applications of Artificial Intelligence. It is helpful for developing both fundamental concepts such as search and knowledge representation. Define the meaning of Intelligence and explore various paradigms. Apply the machine learning concepts in real life problems.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | |
| L | T | P | C | ESE (E) | PA (M) | ESE (V) | PA (I) | |
| 2 | 0 | 2 | 3 | 70 | 30 | 30 | 20 | 150 |

**Contents:**

| Sr. No. | Contents | Hrs. |
|---|---|---|
| 1 | **Introduction to AI:** <br> Introduction of Artificial Intelligence, Historical backdrop, AI Problems, AI technique, production systems, problem characteristics, production systems characteristics. | 4 |
| 2 | **Problem Solving:** <br> Problem Solving by Searching, State-space Search techniques: Breadth first search, depth first search and Iterative deepening DFS. Heuristic search Techniques: Hill Climbing, Best-first search, Problem reduction, Constraint satisfaction. | 6 |
| 3 | **Finding Optimal Paths:** <br> Brute Force, Branch & bound, Algorithm A*, Admissibility of A*, Iterative Deepening A*, Recursive best first search | 6 |
| 4 | **Planning:** <br> Component of a Planning system, Forward state space planning, Backward state space planning, Goal stack planning, Plan space Planning, Hierarchical planning | 6 |
| 5 | **Game Tree search:** <br> Minimax, Alpha-beta, Heuristics in game tree search | 3 |
| 6 | **Natural Language Understanding** <br> Overview, mechanical translation, Grammars, Parsing techniques, Text generation, Natural language processing systems | 5 |

*w.e.f. AY 2018-19*

**Reference Books:**

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-GrawHill
2. A First course in Artificial Intelligence by Deepak Khemani , Mc-GrawHill
3. Handbook of Artificial Intelligence –preliminary edition by Avron Barr and Edward A. Feigenbaum, Stanford University
4. Artificial Intelligence - A Modern Approach 2nd ed - S. Russell, P. Norvig (Prentice-Hall, 2003)

**Course Outcome:**

After learning the course the students should be able to

- Understand the basics of Artificial Intelligence
- Use various search methods and algorithms for finding optimal cost solutions
- Understand various algorithms for planning
- Understand various Game Playing techniques
- Write python programs for NLP, ML and DL

**Laboratory Set-Up**

For AI and ML Lab Implementation – Suggested programming languages are R programming or Python

For AI , ML and DL – Suggested Code Editor – Jupiter Notebook
Python Programming Tool or Editor -  PyCharm (by JetBrains)

Suggested General Framework –  1)TensorFlow 2) Keras 3) Pytorch
For Neural Network Applications -Suggested Models – 1) Convoneural Neural Network (CNN)  for Image classification applications 2) Recurrent Neural Network (RNN ) for speech recognition applications
Sample Dataset: Kaggle (www.kaggle.com)
Supported Libraries (for Python): Pandas, NumPy, SciPy, Scikit-Learn, OpenCV, Google Vision, Matplotlib

**List of Experiments:**

1. Create a program using the Pandas, NumPy library that implements grouping, filtering, sorting, merging operations.

2. Create a program using a sample dataset(e.g. Housing, finance) to implement a decision tree algorithm.

3. Create a program to implement a backpropagation algorithm in python.

4. Create a program to implement a simple stock market prediction based on historical datasets.

5. Create a program using NumPy to implement a simple perceptron model.

6. Create a program to perform sentiment analysis on a textual dataset (Twitter feeds, E-commerce reviews).

7. Create a program using any machine learning framework like TensorFlow, Keras to implement a Linear regression algorithm.

8. Create a program using any machine learning framework like TensorFlow, Keras to implement a simple convolutional neural network.

9. Create a program using a convolutional neural network that identifies objects like water bottles, cap, books, etc using the webcam.

10. Create a program using any machine learning framework like TensorFlow, Keras to implement a Logistic regression algorithm.