

Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NMCD302	NATURAL LANGUAGE PROCESSING	3	0	0	3
Course Objective						
This course provides a comprehensive understanding of Natural Language Processing (NLP) techniques and their applications. Students will learn text processing, word vector representations, and language models, along with implementing and evaluating NLP tasks such as part-of-speech tagging, named entity recognition, sentiment analysis, question answering, and machine translation.						
Learning Outcomes						
Students will learn to apply NLP techniques to real-world problems and contribute to the development of intelligent language-based systems.						

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to NLP, Corpus, Text Preprocessing, Linguistic Properties of Words, POS Tagging, Parsing, Representation of Words, Performance Measures, Error Analysis.	6	The main outcome of this unit is to understand the fundamental concepts of natural language processing, text pre-processing techniques, and model performance measurement techniques.
2	Probability and NLP, N-Gram, Language Model, Joint Probability and Conditional Probability, Chain Rule, Markov Assumption, Data Sparsity, Smoothing Techniques, Naive Bayes Classifiers.	6	Students will understand fundamental probabilistic concepts in NLP. They will also learn data sparsity and Naive Bayes classifiers for text classification.
3	Distributed representation of words for NLP, Dimensionality Reduction, Document Similarity, Inverted Index, Word2Vec, CBOW, Skip-gram Model, GloVe, Hierarchical Softmax.	6	The main outcome of this unit is to develop the idea of word vector representations like Word2Vec and GloVe to NLP tasks.
4	Artificial Neural Networks, Multi-Layer Perceptron, Activation Functions, Model optimization, Recurrent Neural Networks (RNN), Backpropagation Through Time.	8	The main outcome of this unit is to develop the idea of building neural network models for sequential text data.
5	Long-Short Term Memory Networks, Gated Recurrent Unit, 1D Convolutional Layer, Language Model using RNN, Bidirectional RNNs, Multilayer RNNs.	8	Students will understand the functionality of LSTM, GRU, and 1D convolutional layers, with their applications in language modelling.
6	Applications of NLP: Sentiment Analysis, Named Entity Recognition, Query Processing, Neural Machine Translation, Spell Checker, Summarization.	8	This unit will help students to get the concepts of executing sentence classification, machine translation, and question answering tasks using NLP.
Total		42	

Text Books:

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing," 3rd Edition, Prentice Hall, 2020.
2. Yoav Goldberg, "Neural Network Methods for Natural Language Processing," 1st Edition, Morgan & Claypool Publishers, 2017.

Reference Books:

1. Charu C. Aggrawal, "Neural Networks and Deep Learning: A Textbook," Springer, 2018.
2. Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python," 1st Edition, O'Reilly Media, 2009.