CM 321	Natural Language Processing	L	T	P	Int.	Ext.	C
		3	-	-	30	70	3

Course Objectives:

The main objectives of this course are to:

1. Understand the Representation and Layers of NLP.
2. Represent the sentences as parse trees and describe NER and its challenges.
3. Use and create sentiment lexicons and Q & A.
4. Describe extractive Summarization in three generations and LLMs.

Course Outcomes:

After successful completion of the course, students will be able to:

CO 1. Explain the probabilistic formulation of POS tagging.
CO 2. Execute steps in top-down, bottom-up parsing and NER for example sentences.
CO 3. Analyze the semantic analysis, Question Answering of natural language sentences.
CO 4. Distinguish between extractive and abstractive summarization and LLMs.

Course Content:

UNIT – I	CO1	12 Periods
Introduction: Language and Linguistics, Ambiguity and Layers of NLP, Grammar, Probability, and Data, Generations of NLP. **Representation and NLP:** Ambiguity and Representations, Generation 1: Belongingness via Grammars, Generation 2: Discrete Representational Semantics, Generation 3: Dense Representations. **Shallow Parsing:** Part-of-Speech Tagging, Statistical POS Tagging, Neural POS Tagging, Chunking.		
UNIT – II	**CO2**	**12 Periods**
Deep Parsing: Linguistics of Parsing, Algorithmics of Parsing, constituency Parsing: Rule Based, Statistical Parsing, dependency Parsing, Neural Parsing. **Named Entity Recognition:** Problem Formulation, Ambiguity in Named Entity Recognition, Datasets, first Generation: Rule-Based Approaches, Second Generation: Probabilistic Models, Third Generation: Sentence Representations and Position-Wise Labelling. **Natural Language Inference:** Ambiguity in NLI, Problem Formulation, Datasets, First Generation: Logical Reasoning, Second Generation: Alignment, Third Generation: Neural Approaches.		
UNIT – III	**CO3**	**12 Periods**
Machine Translation: Introduction, Rule-Based Machine Translation, Indian Language Statistical Machine Translation, Phrase-Based Statistical Machine Translation, Factor-Based Statistical Machine Translation, Cooperative NLP: Pivot-Based Machine Translation, Neural Machine Translation. **Sentiment Analysis:** Problem Statement, Ambiguity for Sentiment Analysis, Lexicons for Sentiment Analysis, Rule-Based Sentiment Analysis, Statistical Sentiment Analysis,6 Neural Approaches to Sentiment Analysis, Sentiment Analysis in Different Languages. **Question Answering**: Problem Formulation, Ambiguity in Question Answering, Dataset Creation, Rule-based Q&A, Second Generation, third Generation.		

UNIT – IV	CO4	12 Periods
Conversational AI: Problem Definition, Ambiguity Resolution in Conversational AI, Rule-Based Approaches to Conversational AI, Statistical Approaches, Neural Approaches. **Summarization:** Ambiguity in Text Summarization, Problem Definitions, Early Work, Summarization Using Machine Learning. **Large Language Models:** Background, Ambiguity Resolution, Generative LLMs, Usage of LLMs.		

Learning Resources:

Text Book:

1. Natural Language Processing, Pushpak Bhattacharyya, Aditya Joshi, Wiley, 2023.

Reference Books:

1. Daniel Jurafsky and James H Martin, ”Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, 2nd Edition, 2008.
2. C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press. Cambridge, MA: 1999.

CM 322	Machine Learning	L	T	P	Int.	Ext.	C
		3	-	-	30	70	3

Course Objectives:

The main objectives of this course are to:

1. basic concepts and applications of machine learning.
2. supervised learning and its applications
3. unsupervised learning and its applications
4. multilayer perceptron's and kernel tricks

Course Outcomes:

After successful completion of the course, students will be able to:

CO 1. Apply the machine learning concepts to solve problems in real world.
CO 2. Design the solutions for supervised learning problems.
CO 3. Implement unsupervised learning algorithms.
CO 4. Design and develop recommendation system and handling the text data.

Course Content:

UNIT – I	CO1	12 Periods
Introduction To Machine Learning: Introduction to Analytics and Machine Learning, What is machine learning?, Why Use Machine Learning?, Examples of Applications, Types of Machine Learning Systems, Instance-Based Versus Model-Based Learning, Main Challenges of Machine Learning, Framework for Developing Machine Learning Models. **Linear Regression**: Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear Regression Model, Multiple Linear Regression.		
UNIT – II	**CO2**	**12 Periods**
Classification Problems: Classification Overview, Binary Logistic Regression, Credit Classification, Gain Chart and Lift Chart, Classification Tree. **Advanced Machine Learning:** Overview, Gradient Descent Algorithm, Scikit-Learn Library for Machine Learning, Advanced Regression Models, Advanced Machine Learning Algorithms		
UNIT – III	**CO3**	**12 Periods**
Clustering: Overview, How does clustering work?, K-Means Clustering, Creating Product Segment Using Clustering, Hierarchical Clustering. **Forecasting:** Overview, Components of Time-Series Data, Moving Average, Decomposing Time-Series, Auto-Regressive Integrated Moving Average Models.		
UNIT – IV	**CO4**	**12 Periods**
Recommender Systems: Overview, Associations Rules, Collaborative Filtering, Using Surprise Library, Matrix Factorization **Text Analytics:** Overview, Sentiment Classification, Naïve-Bayes Model for Sentiment Classification,Using TF-IDF vectorizer, Challenges of Text Analytics.		

Learning Resources:

Text Book:

1. Manaranjan Pradhan , U Dinesh Kumar, Machine Learning using Python, Wiley, 2019.

Reference Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019.
2. Ethem Alpaydin, Introduction to Machine Learning , MIT Press, Prentice Hall of India, Third Edition 2014
2. Tom Mitchell, Machine Learning, McGraw Hill, 1997.
3. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, The MIT Press, 2012

Web References :

1. https://www.w3schools.com/python/python_ml_getting_started.asp

2. https://www.geeksforgeeks.org/introduction-machine-learning-using-python/

3. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

4. https://pythonprogramming.net/machine-learning-tutorials/

5. https://machinelearningmastery.com/machine-learning-in-python-step-by-step/

CM 323	Soft Computing	L	T	P	Int.	Ext.	C
		3	-	-	30	70	3

Course Objectives:

The main objectives of this course are to:

1. Explain the principles and core components of these techniques.
2. Equip students with practical skills to apply soft computing techniques to real-world problems.
3. Independently analyze, model, and solve complex problems using soft computing methods.
4. Assess when and where soft computing approaches are most suitable and articulate their reasoning.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1. Understand the principles and concepts of soft computing, including fuzzy sets, neural networks, genetic algorithms =, and other related techniques.
CO2. Proficiency in designing, training and implementing neural networks, including feed forward and recurrent architectures.
CO3. Apply fuzzy logic, sets, and relations in decision making and control systems.
CO4. Apply genetic algorithms to optimization and search problems.

Course Content:

UNIT – I	CO1, C02	12 Periods
Introduction: Neural Networks, Application Scope of Neural Networks, Fuzzy Logic, Genetic Algorithm, Hybrid Systems, Soft Computing. **Artificial Neural Network:** An Introduction, Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of A.NNs, McCulloch-Pitts Neuron, Linear Separability, Hebb Network.		
UNIT – II	**CO1, CO3**	**12 Periods**
Supervised Learning Network: Introduction, perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neurons, Back propagation Network. **Un-Supervised Learning algorithms-** Introduction, Fixed Weight Competitive Nets, Kohonen Self-Organizing Feature Maps, Counter Propagation Networks		
UNIT – III	**CO1, CO3**	**12 Periods**
Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy Logic, Classical Sets, Fuzzy Sets. **Classical Relations and Fuzzy Relations:** Introduction, Cartesian Product of Relation, Classical Relation, fuzzy Relations, Tolerance and Equivalence Relations, Non interactive Fuzzy Sets.		
UNIT – IV	**CO1, CO4**	**12 Periods**
Genetic Algorithms: Introduction, Biological Background, Traditional Optimization and Search Techniques, Genetic Algorithm and Search Space, Generic Algorithm vs. Traditional Algorithms, Basic Terminologies in Genetic Algorithm, Simple GA, General Genetic Algorithm. **Operators in Generic Algorithm:** Encoding, Selection, Crossover, Mutation.		

Learning Resources:

Text Book:

1. Principles of Soft Computing by S. N. Sivanandan and S. N. Deepa, 2nd edition, Wiley India 2007.

Reference Books:

1. NEURAL NETWORKS, FUZZY LOGIC, AND GENETIC ALGORITHMS: SYNTHESIS ANDAPPLICATIONS (WITH CD-ROMby S. Rajasekaran and G. A. Vijayalakshmi Pai, PHI, 2013.
2. Soft computing and Intelligent Systems: Theory and Applications, by Naresh K. Sinha, Madan N. Gupta, Academic Press 2000.