Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MAT410	Natural Language Processing	8	3	0	0	3	5

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Elective
Course Level	Bachelor Degree
Objective	The course aims to provide an in-depth understanding of Natural Language Processing (NLP), exploring both foundational concepts and advanced techniques. It is designed to equip students with the theoretical knowledge and practical skills necessary to apply NLP in real-world applications, such as text classification, sentiment analysis, machine translation, and question-answering systems.
Content	ntroduction to NLP: Overview of NLP and its applications. Text Processing: Basic text preprocessing, tokenization, stemming, lemmatization. Language Models: N-grams, probabilistic models, neural network-based models. Part-of-Speech Tagging and Named Entity Recognition: Techniques and applications. Syntax and Parsing: Sentence structure analysis, dependency parsing. Semantics: Word embeddings, contextual embeddings (BERT, GPT). Machine Translation: Approaches to automatic translation, sequence-to-sequence models. Question Answering and Chatbots: Building systems that understand and generate human-like responses. Ethical Considerations in NLP: Bias, fairness, and implications of NLP technologies.
References	1- Speech and Language Processing, D. Jurafsky& J.H. Martin, https://web.stanford.edu/~jurafsky/slp3/ 3rd edition draft 2- Foundation of Statistical Natural Language Processing, C.D. Manning & H. Schütze, MIT Press, 2003 3- Natural Language Processing with Python, Steven Bird, Ewan Klein, and Edward Loper O'Reilly, 2009: http://www.nltk.org/book/ Supplementary Books: 4- Python 3 Text Processing with NLTK 3 Cookbook, Jacob Perkins, Packt Publishing, 2014 5- Applied Text Analysis with Python, Benjamin Bengfort, Tony Ojeda, Rebecca Bilbro, O'Reilly, 2018 6- Turkish Natural Language Processing, Kemal Oflazer, Murat Saraçlar, Springer, 2018 7- Neural Network Methods for Natural Language Processing, Yoav Goldberg, Morgan & Claypool, 2017

Theory Topics

Week	Weekly Contents
1	Introduction to NLP; history and applications.
2	Text processing basics; working with text data.
3	Language models; introduction to n-grams and probabilistic models
4	Advanced language models; introduction to neural networks in NLP.
5	Part-of-Speech tagging; understanding and implementing tagging algorithms.
6	Named Entity Recognition; techniques and tools.
7	Syntax and Parsing; analyzing sentence structure.
8	Semantics; exploring word embeddings and contextual embeddings.
9	Machine Translation; understanding and building translation models.

Week	Weekly Contents
10	Advanced topics in machine translation; exploring state-of-the-art models.
11	Question Answering and Chatbots; designing systems for interaction.
12	Ethical considerations in NLP; discussing bias, fairness, and social impact.
13	Group project presentations; applying what has been learned.
14	Course wrap-up; review and final exams.