

## INTRODUCTION to NATURAL LANGUAGE PROCESSING

## Syllabus

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
INTRODUCTION to NATURAL LANGUAGE PROCESSING	COE4212804	Spring Semester	3+0	3	6
<b>Prerequisites Courses</b>	VERİ YAPILARI				
<b>Recommended Elective Courses</b>	Proficiency in Python, Linear Algebra, Basic Probability and Statistics, Foundations of Machine Learning				
<b>Language of Instruction</b>	English				
<b>Course Level</b>	First Cycle (Bachelor's Degree)				
<b>Course Type</b>	Elective				
<b>Course Coordinator</b>	Prof.Dr. Selim AKYOKUŞ				
<b>Name of Lecturer(s)</b>	Prof.Dr. Selim AKYOKUŞ				
<b>Assistant(s)</b>					
<b>Aim</b>	Natural language processing (NLP) is a crucial technology in the era of information age. Exciting advancements in natural language processing (NLP) have recently emerged, enabling systems that can perform tasks such as text translation, question answering, and spoken conversations. This course aims to provide students with a foundational understanding of NLP, including standard frameworks, algorithms, and techniques used to solve various NLP problems. The curriculum will cover topics like language modeling, representation learning, text classification, sequence tagging, syntactic parsing, machine translation, and question answering, with a particular focus on recent deep learning approaches. Through this course, students will receive a comprehensive introduction to NLP concepts, methods, algorithms, applications and state-of-the-art methods research in deep learning for NLP.				
<b>Course Content</b>	This course contains; Introduction to Natural Language Processing (NLP),Lingustic Essentials, Regular Exp., Text Normalization, Edit Distance,N-gram Models,Machine Learning Basics, Text Classification, Naive Bayes and Logistic Regression,Vector Semantics and Dense Word Embeddings,Neural Networks and Neural Language Models,Sequence Labeling for Parts of Speech and Named Entities,Exam Week,RNNs and LSTMs,Transformers and Pretrained Language Models, Fine Tuning and Masked Language Models,Machine Translation, Question Answering and Information Retrieval,Chatbots and Dialogue Systems, Automatic Speech Recognition and Text-to-Speech,Context-Free Grammars, Constituency Parsing, Dependency Parsing, Logical Representations of Sentence Meaning,Review and Project Presentations.				
<b>Course Learning Outcomes</b>		<b>Teaching Methods</b>		<b>Assessment Methods</b>	
Decompose a real-world problem into subproblems in NLP, use existing natural language processing tools to conduct basic NLP, and identify potential solutions.		5		A, D	
Learn about the main uses of machine learning techniques and deep learning models in NLP.				A, D, E	
Explain state-of-the-art methods to tackle NLP sub-problems, such as text representation, representation learning techniques, text mining, language modeling, and similarity detection, and gain an understanding about the methods and metrics for various natural language processing tasks and applications.				A, D, E	
Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams, POS tagging, and parsing.				A, C, D	
Get familiarized with the terminology, a breadth of concepts and tasks in NLP.				A, E	
<b>Teaching Methods</b>	5: Demonstration				
<b>Assessment Methods</b>	A: Written Exam, C: Homework, D: Project / Design, E: Quiz				
<b>Lecture Schedule</b>					
<b>Sequence</b>	<b>Topics</b>	<b>Preliminary Preparation</b>			
1	Introduction to Natural Language Processing (NLP)	Ch 1			
2	Lingustic Essentials, Regular Exp., Text Normalization, Edit Distance	Ch 2			
3	N-gram Models	Ch 3			
4	Machine Learning Basics, Text Classification, Naive Bayes and Logistic Regression	Ch 4, 5			
5	Vector Semantics and Dense Word Embeddings	Ch 6			
6	Neural Networks and Neural Language Models	Ch 7			
7	Sequence Labeling for Parts of Speech and Named Entities	Ch 8			
8	Exam Week	Ch 1-8			
9	RNNs and LSTMs	Ch 9			
10	Transformers and Pretrained Language Models, Fine Tuning and Masked Language Models	Ch 10, 11			
11	Machine Translation, Question Answering and Information Retrieval	Ch 13, 14			
12	Chatbots and Dialogue Systems, Automatic Speech Recognition and Text-to-Speech	Sohbet Robotları ve Diyalog Sistemleri, Otomatik Konuşma Tanıma ve Metinden Konuşmaya			
13	Context-Free Grammars, Constituency Parsing, Dependency Parsing, Logical Representations of Sentence Meaning	Ch 17, 18, 19			
14	Review and Project Presentations				
<b>Evaluation Methods</b>		<b>Weight(%)</b>			
Midterm Exam		30			
General Exam		70			

Resources	
<ul style="list-style-type: none"> <li>- Speech and Language Processing, D.Jurafsky, J.H.Martin, 3rd Edition, Pearson-Prentice Hall.</li> <li>- Foundations of Statistical Natural Language Processing, C.D.Manning, H.Schütze, MIT Press, 2002.</li> <li>- Jacob Eisenstein, Introduction to Natural Language Processing, 2019.- Yoav Goldberg. A Primer on Neural Network Models for Natural Language Processing</li> <li>- Ian Goodfellow, Yoshua Bengio, and Aaron Courville. Deep Learning</li> <li>- Delip Rao and Brian McMahan. Natural Language Processing with PyTorch</li> <li>- Lewis Tunstall, Leandro von Werra, and Thomas Wolf. Natural Language Processing with Transformers</li> </ul>	