QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Artificial Intelligence Department

Study plan No.	**2021\2022**		**University Specialization**	**Artificial Intelligence**	
Course No.	**0142441**		**Course name**	**Natural Language Processing**	
Credit Hours	**3 hours**		**Prerequisite Co-requisite**	**Data Mining**	
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	☐ √ Mandatory requirements ☐ Elective requirements
Teaching style	☐ **Full online learning**		☐ **√ Blended learning**		☐ **Traditional learning**
Teaching model	☐ **2Synchronous: 1asynchronous**		☐ **√ 2 face to face: 1 synchronous**		☐ **3 Traditional**

Faculty member and study divisions information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**

Brief description

This course represents an introduction to the theory and practice of computational approaches to natural language understanding. The course will cover common parsing methods for sentences, discourse and dialogue. We will study state of the art symbolic techniques in deep and shallow language processing, as well as statistical models, acquired by both unsupervised and supervised machine learning from online linguistic resources. Students will have the opportunity to explore what they have learned in written and practical assignments. These assignments enable students to gain an understanding for the pervasiveness of language ambiguity at all levels and the problems this poses for automated language understanding and for the relative strengths and weaknesses of the various theories and engineering approaches to these problems.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Handbook of Natural Language Processing. Indurkhya, N. and Damerau, F.J. eds., 2010.			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1. Introduction to Natural Language Processing. Eisenstein, J., 2019. 2. Speech and Language Processing. Jurafsky, D., and Martin, J., 2nd edition, 2014. 3. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit. Bird, S., Klein, E. and Loper, E., 2009.			
Supporting websites				
The physical environment for teaching	☐ **√ Class room**	☐ labs	☐ **√ Virtual educational platform**	☐ Others
Necessary equipment and software	**Anaconda Python (Spyder) / Pycharm**			
Supporting people with special needs				
For technical support				

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Course learning outcomes (S= Skills, C= Competences K= Knowledge,)

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Understanding the concept of Natural Language Processing and its applications.	MK3
K2	Understanding the concept of linguistic analysis of text.	MK3
K3	Understanding the lexical and morphological analysis of text.	MK3
K4	Understanding the syntactic analysis of text.	MK3
K5	Understanding the semantic analysis of text.	MK3
K6	To know the knowledge resources used by NLP techniques and to understand the annotation process for a corpus.	MK3
	Skills	
S1	To use the main applications of Natural Language Processing (NLP).	MS3
S2	To start processing texts based on the linguistic analysis levels and the pre-processing steps of NLP.	MS3
S3	To apply the lexical analysis and morphological analysis processes for text processing.	MS3
S4	To apply the part of speech tagging and parsing processes for text processing.	MS3
S5	To use the named entity recognition, semantic class disambiguation, and word sense disambiguation processes for text processing.	MS3
S6	To create a new corpus/ corpora and annotate texts in the corpus/corpora.	MS3
	Competences	
C1	To apply the main concepts of Natural Language Processing (NLP) for problems solving in real life.	MC1
C2	To build smart applications based on Natural Language Processing (NLP) for processing huge amount of texts available online.	MC3
C3	To create Natural Language Processing (NLP) applications that match the requirements and needs of the labor market.	MC3

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
First exam	0	**0**	%20	0
Second / midterm exam	%30	**%30**	%20	30%
Participation / practical applications	0	**0**	10	30%
Asynchronous interactive activities	%30	**%30**	0	0
final exam	%40	**%40**	%50	40%

Note: Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style*	Reference **
1	**1. Introduction to Natural language processing (NLP) and classical approaches to NLP** Introduction to NLP The classical toolkit (Text Preprocessing • Lexical Analysis • Syntactic Parsing • Semantic Analysis • Natural Language Generation)	Lectures	Textbook1 Pages: 3-7
2	**2. Text Preprocessing of NLP** Introduction Challenges of Text Preprocessing Tokenization Sentence segmentation	Lectures	Textbook1 Pages: 9-27
3	**3. Lexical Analysis** Introduction Finite State Morphonology. Finite State Morphology	Lectures	Textbook1 Pages: 31-42
4	**3. Lexical Analysis (Continued)** “Difficult” Morphology and Lexical Analysis Paradigm-Based Lexical Analysis	Lectures	Textbook1 Pages: 42 - 54
5	**4. Syntactic Parsing** Introduction. Background The Cocke–Kasami–Younger Algorithm Parsing as Deduction	Lectures	Textbook1 Pages: 59 - 72
6	**4. Syntactic Parsing (Continued)** Implementing Deductive Parsing LR Parsing Constraint-Based Grammars Issues in Parsing	Lectures	Textbook1 Pages: 72-83
7	**5. Semantic Analysis** Basic Concepts and Issues in Natural Language Semantics Theories and Approaches to Semantic Representation	Lectures	Textbook1 Pages: 94 - 103
8	**5. Semantic Analysis (Continued)** Relational Issues in Lexical Semantics Fine-Grained Lexical-Semantic Analysis: Three Case Studies	Lectures	Textbook1 Pages: 103 - 113
9	**7. Corpus Creation** Introduction Corpus Size Balance, Representativeness, and Sampling	Lectures	Textbook1 Pages: 147-153
10	**7. Corpus Creation (Continued)** Data Capture and Copyright Corpus Markup and Annotation	Lectures	Textbook1 Pages: 153 -161

	Multilingual Corpora Multimodal Corpora		
11	**8. Treebank Annotation** Introduction Corpus Annotation Types Morphosyntactic Annotation Treebanks: Syntactic, Semantic, and Discourse Annotation	Lectures	Textbook1 Pages: 167 -176
12	**10. Part-of-Speech Tagging** Introduction The General Framework	Lectures	Textbook1 Pages: 205 - 208
13	**10. Part-of-Speech Tagging (Continued)** Part-of-Speech Tagging Approaches Other Statistical and Machine Learning Approaches	Lectures	Textbook1 Pages: 209 - 225
14	**14. Word Sense Disambiguation** Introduction Word Sense Inventories and Problem Characteristics	Lectures	Textbook1 Pages: 315-320
15	**14. Word Sense Disambiguation (Continued)** Applications of Word Sense Disambiguation Early Approaches to Sense Disambiguation Supervised Approaches to Sense Disambiguation	Lectures	Textbook1 Pages: 320-327
16	**Final Exam**		

*** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.**

**** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.**

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Homework 1 on chapter 1	1. Introduction to Natural language processing (NLP) and classical approaches to NLP	Understanding the concept of Natural Language Processing and its applications.
2	Homework 2 on chapter 2	2. Text Preprocessing of NLP	Understanding the concept of linguistic analysis of text.
3	Homework 3 on chapter 3	3. Lexical Analysis	Understanding the lexical of text.
4	Homework 4 on chapter 3	3. Lexical Analysis	Understanding the lexical and morphological analysis of text.
5	Homework 5 on chapter 4	4. Syntactic Parsing	Understanding the syntactic analysis of text.
6	Homework 6 on chapter 4	4. Syntactic Parsing	Understanding the syntactic analysis of text.
7	Homework 7 on chapter 5	5. Semantic Analysis	Understanding the semantic analysis of text.
8	Homework 8 on chapter 5	5. Semantic Analysis	Understanding the semantic analysis of text.
9	Homework 9 on chapter 7	7. Corpus Creation	To know the knowledge resources used by NLP techniques and to

			understand the annotation process for a corpus as well as to know how to create a new corpus.
10	Homework 10 on chapter 7	7. Corpus Creation	To know the knowledge resources used by NLP techniques and to understand the annotation process for a corpus as well as to know how to create a new corpus.
11	Homework 11 on chapter 8	8. Treebank Annotation	To know the knowledge resources used by NLP techniques and to understand the annotation process for a corpus as well as to know how to create a new corpus.
12	Homework 12 on chapter 10	10. Part-of-Speech Tagging	Understanding the syntactic analysis of text more deeply.
13	Homework 13 on chapter 10	10. Part-of-Speech Tagging	Understanding the syntactic analysis of text more deeply.
14	Homework 14 on chapter 14	14. Word Sense Disambiguation	Understanding the semantic analysis of text more deeply.
15	Homework 14 on chapter 14	14. Word Sense Disambiguation	Understanding the semantic analysis of text more deeply.
16	Final Exam		