1.	Course title	*Natural Language Processing*
2.	Course number	*1902918*
3.	*Credit hours (theory, practical)*	*3*
	Contact hours (theory, practical)	*0*
4.	Prerequisites/corequisites	-
5.	Program title	*Doctor of Philosophy in Computer Science*
6.	Year of study and semester (s)	-
7.	Final Qualification	*PhD in Computer Science*
8.	Other department (s) involved in teaching the course	*Artificial Intelligence Department*
9.	Language of Instruction	*English*
10.	Date of production/revision	*19th Feb 2023*
11.	Required/ Elective	*Elective*

12. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Dr. Majdi Sawalha
Office no. 221 *office hours: Sun (12:30)*
Phone no: University of Jordan Ext: 22618 *Mon & Wed (10:30 – 11:30)*
e-mail: sawalha.majdi@ju.edu.jo *Thr (15:30 – 16:30)*

13. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

14. Course Description:

As stated in the approved study plan.

This course is designed to introduce students to the fundamental concepts and ideas in natural language processing (NLP), and to get them up to speed with current research in the area. It covers syntactic, semantic and discourse processing models, emphasizing machine learning or corpus-based methods and algorithms. It also covers applications of these methods and models in syntactic parsing, information extraction, statistical machine translation, dialogue systems, and summarization. Research papers of high impact published recently in the literature will be provided as reading assignments.

15. *Course aims and outcomes:*

A- Aims:

The aim of this course is to investigate state-of-the-art research in the field of Natural Language Processing. The course will investigate syntactic, semantic, and discourse processing models, emphasizing machine learning or corpus-based methods and algorithms. It will also investigate the latest advances in the former topics for processing Arabic text. More discussions will include research papers of high impact published recently in the literature.

B- Intended Learning Outcomes (ILOs): *Upon successful completion of this course students will be able to:*

A. Knowledge and Understanding:

A1. Understand basic and advanced topics of Natural Language Processing.
A2. Understand the challenges of NLP in general.
A3. Discuss the challenges of NLP related to its applications in the Arabic language.
A4. Investigate the types of NLP Application Areas.

B. Subject-Specific Skills:

B1. Apply different NLP algorithms.
B2. Apply different NLP algorithms to process Arabic text.

C. Cognitive and Intellectual Skills:

C1. Design and implement NLP applications
C2. Design and implement NLP applications for processing Arabic text.

D. Transferable Skills:

D1. Work on groups to implement NLP application for Arabic text.
D2. Present solutions to assignments and projects in class.

16. Topic Outline and Schedule:

Topic	Week	ILOs	Program SOs[1]	TLA (teaching, learning and Assessment)
Introduction to NLP: • Challenges of NLP • Introduction to Python and NLTK	1	A1, A2, A3	1	[1]Chapter 1 [2] Introduction [4] Chapter 1
Corpus Construction **Language processing and Python**	2	A1, C1, D1	1, 2	[2] Chapters 3-3-2 & 3-3-3 [3] Chapters 1 & 2 [4]Chapter 2 Assignment 1

[1] The ABET outcomes

Morphological Analysis • Morphology • Morphological analysis techniques • Arabic Finite-State Morphological Analysis and • Generation • Arabic morphology using only Finite-State operations • NLTK Stemmers and Lemmatizers	3	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 8 [2] Chapter 3-2-1 [4] Chapters 2 & 3
Part-of-Speech Tagging • English Word Categories • Arabic Word Categories • Part-of-Speech tagging techniques • Arabic Part of Speech tagging categories and techniques • NLTK Part-of-Speech taggers	4	A1, A3, B1, B2, C1, C2, D1	1,2	[1] Chapter 7 [4] Chapter 5 Assignment 2
Syntactic Parsing • English sentence structure • Arabic sentence structure • Constituency Grammars • Analyzing Sentence Structure	5	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 12 [4] Chapter 8
Syntactic Parsing • Constituency Parsing • Building Feature Based Grammars	6	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 13 [4] Chapter 9 Assignment 3
Syntactic Parsing • Dependency Parsing • Applications of D • dependency parsing • The Quranic Arabic Corpus	7	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 14
Midterm exam	8			
Semantic Analysis • Dictionaries and Lexicons • Arabic Lexicons • Analyzing the Meaning of	9	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 15 [2] Chapters 3-3-1 & 3-4-10 [4] Chapter 10

Sentences				
Sense Disambiguation • Word Senses and Relations between senses • Word Sense Disambiguation	10	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 18
WordNets • WordNet: A Database of Lexical Relations • English WordNet • Global WordNet • Arabic WordNet	11	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 18 [2] Chapter 3-3-5 Assignment 4
Question Answering • Information Retrieval • IR-based Factoid QA • Knowledge-based QA	12	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 23 [2] Chapter 3-4-7
Chatbots and Dialogue Systems • Properties of Human Conversation • The Dialogue-State Architecture	13	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 24 [2] Chapter 3-4-7
Machine Translation • Classical MT • Statistical MT • Phrase-Based Translation Model • Alignment in MT • MT Evaluation	14	A1, A3, B1, B2, C1, C2, D1	1, 2	[1] Chapter 25
Students presentations	15	D2	1, 2	
Final Exam	16			

(Please mention instructors per topic if the course topics are being taught by more than one instructor)

17. Evaluation Methods and Course Requirements (Optional):

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Assignment	*Topic*	*Week*	*Weight*
Assignment 1	*Corpora construction*	*2*	*5*
Assignment 2	*Part-of-Speech Tagging*	*4*	*5*
Assignment 3	*Syntactic Parsing*	*6*	*5*
Assignment 4	*WordNet*	*11*	*5*
Presentation	*Selected topics*	*15*	*10*

18. Course Policies:

A- Attendance policies:

University Regulations

B- Absences from exams and handing in assignments on time:

University Regulations

C- Health and safety procedures:

University Regulations

D- Honesty policy regarding cheating, plagiarism, misbehavior:

University Regulations

E- Grading policy + Weighting (i.e. weight assigned to exams as well as other student work)

Mid term exam 30%

Assignments and Presentations: 30%

Final exam: 40%

F- Available university services that support achievement in the course:

Computer laboratories, data shows and JU e-learning system

G- Statement on Students with disabilities

Students with Disabilities: Students with disabilities who need special accommodations for this class are encouraged to meet with the instructor and/or their academic advisor as soon as possible. In order to receive accommodations for academic work in this course, students must inform the course instructor and/or their academic advisor, preferably in a written format, about their needs no later than the 4th week of classes.

19. Required equipment:

Hardware: PC or Laptop

Software: Python and NLTK

20. References:

A- Required book (s), assigned reading and audio-visuals:

[1] Dan Jurafsky and James H. Martin (2020) "Speech and Language Processing" 3rd edition

[2] (2019) محمد زكي خضر، محمد السعودي، **مجدي صوالحة**، سامي عبابنة، يوسف حمدان، مأمون حطاب "*دليل أبحاث حوسبة اللغة العربية*"، اللجنة الوطنية للنهوض باللغة العربية، مجمع اللغة العربية الأردني، الطبعة الأولى، عمّان – الأردن.

[3] J. Pustejovsky, A. Stubbs (2012) "Natural Language Annotation for Machine

Learning", First Edition, O'Reilly.

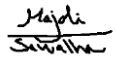
[4] Steven Bird, Ewan Klein, Edward Loper (2009) "Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit" 1st Edition, O'Reilly.

B- Recommended books, materials, and media:

21. Additional information:

Students must attend the whole lecture.
Students must participate in discussions and ask questions.
Homework should be done by students independently and will be asked at the exams.

Date: 19.02.2023

Name of Course Coordinator: **Dr. Majdi Sawalha** Signature: 

Head of curriculum committee/Department: ---------- Signature: ----------

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Head of Department: ---------- Signature: ----------

Head of curriculum committee/Faculty: ---------- Signature: ----------

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Dean: ---------- -Signature: ----------

Copy to:
Head of Department
Assistant Dean for Quality Assurance
Course File