

SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babeş-Bolyai University
1.2 Faculty	Faculty of Mathematics and Computer Science
1.3 Department	Department of Computer Science
1.4 Field of study	Computer Science
1.5 Study cycle	Bachelor
1.6 Study programme / Qualification	Computer Science/ Applied Computational Intelligence

2. Information regarding the discipline

2.1 Name of the discipline	Introduction to Natural Language Processing						
2.2 Course coordinator	Lecturer Ph.D. Lupea Mihaiela						
2.3 Seminar coordinator	Lecturer Ph.D. Lupea Mihaiela						
2.4. Year of study	3	2.5 Semester	2	2.6. Type of evaluation	C	2.7 Type of discipline	optional

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	1 lab+1 pr
3.4 Total hours in the curriculum	48	Of which: 3.5 course	24	3.6 seminar/laboratory	24
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					30
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					30
Tutorship					10
Evaluations					10
Practical project					27
3.7 Total individual study hours	127				
3.8 Total hours per semester	175				
3.9 Number of ECTS credits	7				

4. Prerequisites (if necessary)

4.1. curriculum	Formal languages, Data structures, Graphs Algorithms
4.2. competencies	Programming skills in a high level programming language

5. Conditions (if necessary)

5.1. for the course	
5.2. for the seminar /lab activities	<ul style="list-style-type: none"> Laboratory with computers; high level programming language environment (.NET or any Java environment a.s.o.)

6. Specific competencies acquired

Professional competencies	<ul style="list-style-type: none"> • Assimilation of mathematical concepts and formal models to understand, verify and validate software systems ; • Advanced ability to approach, model and solve phenomena and problems from natural language and economy using fundamental knowledge from mathematics and computer science; • Ability to approach and solve complex problems using various techniques of computational intelligence; • Proficient use of methodologies and tools specific to programming languages and software systems.
Transversal competencies	<ul style="list-style-type: none"> • Etic and fair behavior, commitment to professional deontology • Team work capabilities; able to fulfill different roles • Professional communication skills; concise and precise description, both oral and written, of professional results , negotiation abilities; • Antepreneurial skills; working with economical knowledge; continuous learning • Good English communication skills

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	<ul style="list-style-type: none"> • To introduce the basic principles, domains and tasks in Natural Language Processing (NLP) • To understand the current state of the art in order to realize an overview of a specific domain in NLP and to implement a NLP tool.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> • Apply and use formal models (logics, grammars, parsing), statistic models (HMM), artificial intelligence algorithms and techniques to solve different tasks at the syntactic level (POS-tagging, parsing, chunking), and semantic level (word sense disambiguation, document summarization, anaphora resolution) in Natural Language Processing domain.

8. Content

8.1 Course	Teaching methods	Remarks
Course 1. Natural Language Processing (NLP): stages, domains, applications.	Exposure: description, explanation, examples, debate, dialogue	
Course 2. -WordNet and RoWordNet - knowledge structure, semantic relations, lexical relations. - WordNetSimilarity tool and similarity measures for words.	Exposure: description, explanation, examples, debate, dialogue	
Course 3. Part of speech tagging. - part-of-speech tagging in English. - part-of-speech tagging in Romanian	Exposure: description, explanation, examples, debate, dialogue	
Course 4. Syntactic parsing - grammar rules for English - sentence level construction; - Cocke-Kasami-Yonger (CKY) algorithm;	Exposure: description, explanation, examples, debate, dialogue	

Course 5. Statistical parsing - Probabilistic Context-Free Grammars (PCFG); - Probabilistic CKY (Cocke-Kasami-Yonger) parsing of PCFGs.	Exposure: description, explanation, examples, debate, dialogue	
Course 6. Hidden Markov Model - Markov chains, Hidden Markov Model(HMM); - three canonical problems associated with HMM - the forward algorithm; Viterbi algorithm.	Exposure: description, explanation, examples, debate, dialogue	
Course 7. Word Sense Disambiguation - dictionary and graph-based approaches.	Exposure: description, explanation, examples, debate, dialogue	
Course 8. Document summarization - approaches based on clustering, graphs.	Exposure: description, explanation, examples, debate, dialogue	
Course 9. Anaphora resolution - Lapin and Lease algorithm - Mitkov's algorithm	Exposure: description, explanation, examples, debate, dialogue	
Course 10. Sentiment analysis - opinion mining in social media - emotion analysis in literature	Exposure: description, explanation, examples, debate, dialogue	
Course 11. Textual entailment	Exposure: description, explanation, examples, debate, dialogue	
Course 12. Written exam	Exposure: description, explanation, examples, debate, dialogue	

Bibliography

1. J.ALLEN : Natural language understanding, Benjamin/Cummings Publisher, 2nd ed., 1995.
2. E. CHARNIAK: Statistical language learning, MIT press, 1996.
3. B.CARPENTER: ALE: The attribute logic engine. User's guide. Carnegie Mellon University,1994.
4. D.FEHRER et al: Description logics for natural language processing. In Proc. of the 1994 Description Logic Workshop (DL'94), 1994.
5. H. HELBIG: Knowledge Representation and the Semantics of Natural Language, Springer, 2006.
6. D.JURAFSKY, J.MARTIN: Speech and language processing, Prentice Hall, 2000.
7. C.MANNING, H.SCHUTZE: Foundation of statistical natural language processing, MIT, 1999.
8. R. MITKOV(ed): The Oxford Handbook of Computational Linguistics, Oxford University Press, 2003.
9. D.TATAR: Inteligenta artificiala: demonstrare automata de teoreme, prelucrarea limbajului natural, Editura Albastra, Microinformatica, 2001.
10. D. TATAR: Inteligenta artificiala. Aplicatii in prelucrarea limbajului natural, Editura Albastra, Microinformatica, 2003, ISBN 973-650-100-01.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Working with WordNet, Romanian WordNet and WordNetSimilarity.	Explanation, dialogue, case studies	The seminar/lab is structured as 2 hours classes every second week
2. Working with dedicated parsers and taggers (Stanford, CST tools, Racai tools)	Explanation, dialogue, case studies	
3. Students' presentations of a NLP domain and a corresponding tool.	Dialogue, debate	
4. Students' presentations of a NLP domain and a corresponding tool.	Dialogue, debate	

5. Working with dedicated tools for summarization, anaphora, co-reference resolution, sentiment analysis.	Explanation, dialogue, case studies	
6. Students' presentations of the practical projects.	Dialogue, debate	
Bibliography 1. Rada Mihalcea: www.cs.unt.edu/~rada/downloads.html 2. Resurse lingvistice in limba romana: www.racai.ro		

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The course respects the IEEE and ACM Curricula Recommendations for Computer Science studies;
- The course exists in the studying program of all major universities in Romania and abroad;
- The optimization of the search on Web, the interfaces in natural language and the recent aspects of text mining need a good understanding of Natural Language Processing.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	- know the theoretical concepts of the domain;	Written exam	25%
10.5 Seminar/lab activities	- know to write an overview of a specific domain	Presentation of a NLP domain and a corresponding tool.	35%
	- be able to implement course algorithms	Practical project - implementation of a NLP tool based on the studied methods. Teams of 2-3 students	40%
10.6 Minimum performance standards			
➤ The final grade to be at least 5 (from a scale of 1 to 10).			

Date

29.04.2020

Signature of course coordinator

Lecturer Ph.D. Lupea Mihaiela

Signature of seminar coordinator

Lecturer Ph.D. Lupea Mihaiela

Date of approval

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Signature of the head of department

Lecturer Ph.D. Sterca Adrian