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	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1 lab
3.4 Total hours in the curriculum	36	Of which: 3.5 course	24	3.6 seminar/laboratory	12
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					10
Additional documentation (in libraries, on electronic platforms, field documentation)					10
Preparation for seminars/labs, homework, papers, portfolios and essays					15
Tutorship					4
Evaluations					10
Practical project					15

3.7 Total individual study hours	64
3.8 Total hours per semester	100
3.9 Number of ECTS credits	4

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	• Laboratory with computers; high level programming language environment (.NET or any Java environment a.s.o.)

6. Specific competencies acquired

Professional competencies	• 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	• Etic and fair behavior, committment 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 , negociation 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	• 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	• 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	

	Teaching methods	
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	20%
10.5 Seminar/lab activities	- know to write an overview of a specific domain	Presentation of a NLP domain and a corresponding tool.	40%
	- 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	Signature of course coordinator	Signature of seminar coordinator
22.04.2018	Lecturer Ph.D. Lupea Mihaiela	Lecturer Ph.D. Lupea Mihaiela

Date of approval

Signature of the head of department

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Prof. Ph.D. Andreica Anca