

## SYLLABUS

### 1. Information regarding the programme

1.1 Higher education institution	<b>Babeş Bolyai University</b>
1.2 Faculty	<b>Faculty of Mathematics and Computer Science</b>
1.3 Department	<b>Department of Computer Science</b>
1.4 Field of study	<b>Computer Science</b>
1.5 Study cycle	<b>Master</b>
1.6 Study programme / Qualification	<b>Computer Science/ Intelligent Systems</b>

### 2. Information regarding the discipline

2.1 Name of the discipline	<b>Computational Approaches for Natural Language Semantics</b>						
2.2 Course coordinator	<b>Lecturer Ph.D. Lupea Mihaiela</b>						
2.3 Seminar coordinator	<b>Lecturer Ph.D. Lupea Mihaiela</b>						
2.4. Year of study	<b>2</b>	2.5 Semester	<b>2</b>	2.6. Type of evaluation	<b>exam</b>	2.7 Type of discipline	<b>compulsory</b>

### 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
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					40
Additional documentation (in libraries, on electronic platforms, field documentation)					18
Preparation for seminars/labs, homework, papers, portfolios and essays					25
Tutorship					7
Evaluations					24
Other activities: individual project					25
3.7 Total individual study hours	139				
3.8 Total hours per semester	175				
3.9 Number of ECTS credits	7				

### 4. Prerequisites (if necessary)

4.1. curriculum	<ul style="list-style-type: none"> <li>the courses: <b>Knowledge Based Systems and Language Technology, Machine learning</b></li> </ul>
4.2. competencies	

### 5. Conditions (if necessary)

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

## 6. Specific competencies acquired

<b>Professional competencies</b>	<ul style="list-style-type: none"> <li>• Knowledge, understanding and use of theoretical concepts, tasks, applications at the semantic level of Natural Language Processing.</li> <li>• Apply and use statistic models, artificial intelligence algorithms (clustering, machine learning) and techniques (unsupervised, supervised) to solve different tasks at the semantic level (textual entailment, information retrieval, document summarization, text categorization and segmentation, machine translation) in NLP domain.</li> </ul>
<b>Transversal competencies</b>	<ul style="list-style-type: none"> <li>• Handling human language by computer needs a semantic approach of the natural language processing.</li> <li>• The web space is a semantic one and needs semantic applications as: text categorization, text clustering, concept/entity extraction, sentiment/opinion analysis, document summarization, and entity relation modeling.</li> </ul>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>• To provide the theoretical concepts and techniques for a computational approach of Natural Language Semantics.</li> <li>• To understand the current state of the art in Natural Language Processing in order to realize original research in NLP.</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>• To apply and use statistic models, artificial intelligence algorithms and techniques to solve different tasks at the semantic level (information retrieval, textual entailment, document summarization, text segmentation, text clustering, machine translation) in NLP domain.</li> </ul>

## 8. Content

8.1 Course	Teaching methods	Remarks
<b>1. Textual entailment (TE) as a step of text understanding. Validation of TE . RTE contests.</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>2. Textual entailment (TE) - methods and approaches</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>3. Text segmentation</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>4. Document summarization</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>5. Multi-document summarization</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>6. Information extraction- Named Entity Recognition (NER)</b>	Exposure: description, explanation, examples,	

	debate, dialogue	
<b>7. Information retrieval I</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>8. Information retrieval II</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>9. Text categorization, text clustering</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>10. Students' presentations of the theoretical paper</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>11. Machine translation</b>	Exposure: description, explanation, examples, debate, dialogue	
<b>12. Students' presentations of the practical project</b>	Debate, dialogue	

#### Bibliography

1. J.ALLEN : Natural language understanding, Benjamin/Cummings Publ. , 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. H. Helbig: "Knowledge Representation and the Semantics of Natural Language", Springer, 2006.
5. D.JURAFSKY, J.MARTIN: Speech and language processing, Prentice Hall, 2000.
6. C.MANNING, H.SCHUTZE: Foundation of statistical natural language processing, MIT, 1999.
7. (Editor) R. MITKOV: The Oxford Handbook of Computational Linguistics, Oxford University Press, 2003.
8. S.J.RUSSELL, P.NORVIG: Artificial intelligence. A modern approach, Prentice-Hall International, 1995.
9. D.TATAR: Inteligența artificială: demonstrare automată de teoreme, prelucrarea limbajului natural, Editura Albastra, Microinformatica, 2001.
10. D. TATAR: Inteligența artificială. Aplicații în prelucrarea limbajului natural, Editura Albastra, Microinformatica, 2003, ISBN 973-650-100-0

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Word similarity measures in WordNet	Explanation, dialogue, case studies	The seminar/lab is structured as 2 hours classes every second week
2. Students' presentations of a NLP domain and a corresponding tool	Explanation, dialogue, case studies	
3. Working with dedicated tools for NER	Explanation, dialogue, case studies	
4. Boolean model and vector space model in Information retrieval – a manual example	Explanation, dialogue, case studies	
5. Working with tools for machine translation	Explanation, dialogue, case studies	
6. Students' presentations of the practical project.	Explanation, dialogue, case studies	

#### Bibliography

1. Rada Mihalcea: [www.cs.unt.edu/~rada/downloads.html](http://www.cs.unt.edu/~rada/downloads.html)
2. Resurse lingvistice în limba română: [www.racai.ro](http://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 as a graduate course in some major universities in Romania and abroad;
- In the semantic web era, a growing number of semantic applications started to access and interoperate through the internet. Text mining, includes text categorization, text clustering, concept/entity extraction, sentiment analysis, document summarization, and entity relation modeling.

**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; - apply the course methods, algorithms in problem solving	Written exam	40%
10.5 Seminar/lab activities	- know to write an overview of a specific domain	Presentation of a NLP domain and a corresponding tool;	15%
	-know to synthesize and compare different approaches/results of the same studied subject.	Theoretical paper based on recent research papers in NLP domain;	20%
	-be able to implement course algorithms	Practical project - implementation of a NLP tool based on the studied methods	25%
10.6 Minimum performance standards			
➤ At least grade 5 (from a scale of 1 to 10) at all four evaluation stages.			

Date

10.05.2013

Signature of course coordinator

Lecturer PhD. Lupea Mihaiela

Signature of seminar coordinator

Lecturer PhD. Lupea Mihaiela

Date of approval

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Signature of the head of department

Prof.PhD. Pârv Bazil