COURSE DESCRIPTION

1. Program Information

1.1 University	**“Alexandru Ioan Cuza” of Iasi**
1.2 Faculty	**Computer Science**
1.3 Department	**Computer Science**
1.4 Study Domain	**Bachelor**
1.5 Study Cycle	**Computer Science**
1.6 Study Program / Qualification	

2. Course Information

2.1 Course Name			**Rule-based programming**				
2.2 Course Teacher			**Prof. Dan Cristea, PhD**				
2.3 Seminary Teacher			**Lecturer Ionut Pistol, PhD**				
2.4 Study Year	**3**	**2.5** Semester	**2**	**2.6** Evaluation	**E**	**2.7** Course Status*	**OB**

** OB – Compulsory / OP – Optional*

3. Total estimated hours (hours per semester and didactic activities)

3.1 Hours per week	4	in which: **3.2** course	2	**3.3** seminary/laboratory	2
3.4 Hours in curriculum	56	in which: **3.5** course	28	**3.6** seminary/laboratory	28

Time Distribution	hours
Manual study, Course support, Bibliography, and others	**16**
Supplementary Documentation in library, in electronic forums, and on the field	**16**
Seminaries/laboratories preparation, homeworks, reports, portfolios and essays	**16**
Tutoring	
Evaluation	**12 E**
Other activities (consultations per student)	**1 C**

3.7 Total hours individual study	**48**
3.8 Total hours per semester	**117**
3.9 Credits	**5**

4. Preconditions (if necessary)

4.1 Of Curriculum	Artificial Intelligence, Algorithms and Programming, Object oriented Programming, Java programming, Databases, Graph Algorithms, Probabilities and Statistics
4.2 Of Skills	High level programming, Developing and maintaining software systems, Design and maintenance of databases

5. Conditions (if necessary)

5.1 For Course Operation	Course room must have a video-projector, internet connection and a blackboard
5.2 For Seminary/Laboratory Operation	Laboratory room must have internet connection and a blackboard. Students need computers with Java and CLIPS.

6. Specific Skills Acquired

Professional Skills	C1. Concepts and models of rule-based programming and expert systems. C2. Skills of CLIPS programming. C3. Acquiring abilities for system development.
Transversal Skills	CT1. Organisation of activities aiming to accomplish a difficult task. CT2. Development phases from concept to implementation. CT3. Interrelationship and collaboration within a large team in the process of building a complex system.

7. Course Objectives (from the grid of specific skills acquired)

7.1 General Objectives	The course introduces the basic notions of rule-based programming and expert systems. It uses CLIPS (developed by NASA) as the rule-based engine.
7.2 Specific Objectives	Students are taught how to recognise problems that fit a rules-based solution, how to develop a solution in this paradigm and how to adapt a classical solution to one intended to be solved in the rule-based paradigm. Details of defining facts and rules in CLIPS are given, then the use of uni-field and multi-field variables, agenda, phases in the run of a rules-based engine, the RETE algorithm for updating agenda (firing and extinction of rules). Many examples are developed in an interactive manner, with the active participation of students.

8. General Description

8.1	**Course**	**Teaching Methods**	**Observations** (hours and bibliographic references)
1.	Introduction: a short overview of previous years projects, definitions of the rules-based paradigm and expert systems (ES), exemples of ES	PowerPoint presentation	2 h, D.Cristea (2002) Programare bazată pe reguli, Ed. Academiei
2.	Structure and components of a rule-based (RB) engine, facts and rules, cycles of a RB engine run	PowerPoint presentation	2 h, D.Cristea (2002) Programare bazată pe reguli, Ed. Academiei
3.	CLIPS programming: variables and their binding, selection of exemples	PowerPoint presentation, interactive development of programs	2 h, D.Cristea (2002) Programare bazată pe reguli, Ed. Academiei
4.	CLIPS programming: processing tree structures (computing right and bottom frontiers, the adjunction operation, BFS, DFS)	interactive development of programs	2h

5.	CLIPS programming: approaching recursivity (the Hanoi towers)	interactive development of programs	2h, D.Cristea (2002) Programare bazată pe reguli, Ed. Academiei
6.	CLIPS programming: implementing backtracking in RB programs (8 queens)	interactive development of programs	2h
7.	CLIPS programming: sorting (naïve, bubble, interleaving), how to deal with phases	interactive development of programs	2h
8.	The RETE algorithm, the significance of ordering patterns and actions in rules	PowerPoint presentation	2h, D.Cristea (2002) Programare bazată pe reguli, Ed. Academiei
9.	Fuzzy-CLIPS (fuzzy domains, fuzzy variables and values, definition of fuzzy functions, fuzzy rules - CRISP, FUZZY-CRISP and FUZZY-FUZZY, confidence factors and their combination, combining rules, the weight center defuzzification algorithm)	interactive black table presentation	2h, H.N. Teodorescu, M. Zbancioc, O. Voroneanu (2004) Sisteme bazate pe cunoștințe și aplicații. Ed. Performantica, Iași.
10.	Designing the project: a sentiment-based modelling of political developments (representation of sentiments as fuzzy variables and values, presentation of the Crimea episode, representation of actions, characters and of the Crimea annexation)	collective brainstorming, interactive design	2h
11.	Designing the project: a sentiment-based modelling of political developments (modelling a civic and political society: Ukraine)	collective brainstorming, interactive design	2h
12.	Designing the project: a sentiment-based modelling of political developments (modelling political decisions: Ukraine, Russia, EU and USA)	collective brainstorming, interactive design	2h
13.	Designing the project: a sentiment-based modelling of political developments (implementation hints)	collective brainstorming, interactive design	2h
14.	Designing the project: a sentiment-based modelling of political developments (final details for the realisation of the project)	collective brainstorming, interactive design	2h

Bibliography

Main references:

D.Cristea (2002) Programare bazată pe reguli, Ed. Academiei.

Supplementary references:

J. Giarratano and G. Riley (1989) Expert Systems. Principles and Programming, PWS-KENT Publishing, Boston.
H.N. Teodorescu, M. Zbancioc, O. Voroneanu (2004) Sisteme bazate pe cunoștințe și aplicații. Ed. Performantica, Iași.
Charles L. Forgy (1982) Rete: A Fast Algorithm for the Many PatternIMany Object Pattern Match Problem, Artificial Intelligence 19, 17-37, accessible here:
http://www.csl.sri.com/users/mwfong/Technical/RETE%20Match%20Algorithm%20-%20Forgy%20OCR.pdf

8.2	Seminary / Laboratory	Teaching methods	Observations (hours and bibliographic references)
1.	Expert systems: types and examples	Formulating the problem. Discussion and solution overview.	2h
2.	CLIPS: facts and rules	Formulating the problem. Discussion and solution overview.	2h
3.	CLIPS: patterns and wildcards	Formulating the problem. Discussion and solution overview.	2h
4.	CLIPS: rule priorities and the agenda	Formulating the problem. Discussion and solution overview.	2h
5.	CLIPS Object Oriented Language	Formulating the problem. Discussion and solution overview.	2h
6.	Fuzzy Clips	Formulating the problem. Discussion and solution overview.	2h
7.	Project work organisation	Formulating the problem. Discussion and solution overview.	2h
8.	Recapitulation	Formulating the problem. Discussion and solution overview.	2h
9.	Project work: standards and resources	Formulating the problem. Discussion and solution overview.	2h
10.	Project work: implementation and documentation	Formulating the problem. Discussion and solution overview.	2h
11.	Project work: implementation and documentation	Formulating the problem. Discussion and solution overview.	2h
12.	Project work: integration	Formulating the problem. Discussion and solution overview.	2h
13.	Project work: testing and evaluation	Formulating the problem. Discussion and solution overview.	2h
14.	Project work: final evaluation	Formulating the problem. Discussion and solution overview.	2h

Bibliography

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J. Giarratano and G. Riley (1989) Expert Systems. Principles and Programming, PWS-KENT Publishing, Boston.
H.N. Teodorescu, M. Zbancioc, O. Voroneanu (2004) Sisteme bazate pe cunostinte si aplicatii. Ed. Performantica, Iasi.

9. Course content synchronization with the expectations of the community representatives, professional associations and employers from the program domain

Applications such as diagnostic systems, help desks, ontologies for semantic web are just a few examples of industry-relevant topics discussed in the course of Rule-Based Programming.

10. Evaluation

Activity Type	**10.1 Evaluation criteria**	**10.2 Evaluation methods**	**10.3 The weight of each evaluation form (%)**
10.4 Course	Written exam at the end of the semester, short tests during courses. PC = (exam grade)x3 + course test points. Bonus (B1) for remarkable activity and solutions.	Written test	35%
10.5 Seminary/ Laboratory	Points accumulated from lab tasks (first 7 weeks) and work for a project (weeks 8-14). PL = total points for lab tasks (maximum 30) PP = total points for the project work (maximum 30) Bonus (B1) for remarkable activity and solutions.	6 weekly homeworks and 1 project assignment during the semester	65% (of which 50% is the project score)
10.6 Minimal performance standards			
Students will know the fundamentals of PBR domain such as the domain description and its objectives and working knowledge of knowledge representation, state space search, semantic inference networks, planning issues and . Students collaborate to implement a project which applies the concepts studied. seminar and laboratory activity - exercises and practical projects during the semester, final project; written test. To graduate a minimum of 50 points are required, accumulated from PC+PL+PP+B1+B2. Final grades are established using the formula: ROUND(PC+PL+PP+B1+B2). A student that takes the final written exam will receive a grade, otherwise he/she will be considered as absent. If the graduation criteria is not met the student will receive a grade equal or smaller than 4.			

Date	Course Teacher	Seminary/Laboratory Teacher
21.03.2018	Lecturer Dr. Cristea Dan	Lecturer Dr. Pistol Ionuț Cristian

Department Date of Approval

Director of the Department
Prof. Dr. Lucanu Dorel