SYLLABUS

1. Information regarding the programme

· morning for programs				
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			

2. Information regarding the discipline

2.1 Name of the	2.1 Name of the discipline Functional and Logic Programming						
2.2 Course coordinator Prof.Dr. Horia F. Pop							
2.3 Seminar coordinator				Prof.Dr. Horia F. P	ор		
2.4. Year of	2	2.5	3	2.6. Type of	C	2.7 Type of	Compulsory
study		Semester		evaluation		discipline	

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

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3.1 Hours per week	4	Of which: 3.2 cou	ırse	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	56	Of which: 3.5 cou	ırse	28	3.6 seminar/laboratory	28
Time allotment:						hours
Learning using manual, course sup	oport,	bibliography, cours	se no	otes		22
Additional documentation (in libraries, on electronic platforms, field documentation)					18	
Preparation for seminars/labs, homework, papers, portfolios and essays					27	
Tutorship					11	
Evaluations					16	
Other activities:					-	
3.7 Total individual study hours 94						

5.7 Total individual study hours	94
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	Fundamentals of Programming	
	 Mathematical Foundations of Computer Science 	
4.2. competencies	• Average programming skills in a high level programming language	

5. Conditions (if necessary)

5.1. for the course	 Students will attend the course with their mobile phones shut down Students will attend the course with their laptops shut down; students
	with special needs will discuss these at the beginning of the semester
5.2. for the seminar /lab	• Students will attend the lab with their mobile phones shut down
activities	• Laboratory with computers; high level declarative programming language environment (CLisp, SWIProlog)

6. Specific competencies acquired

6. Specific	competencies acquired
l es	C1.1 Adequate description of programming paradigms and specific language mechanisms, as
ona	well as identification of differences between semantic and syntactic aspects.
ssic	C1.3 Elaboration of adequate source codes and unitary testing of some components in a known
ofe	programming language, based on given design specifications.
Professional competencies	C1.5 Development of program units and elaboration of corresponding documentations.
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	CT1 Application of efficient and organized work rules, of responsible attitudes towards the
al	didactic-scientific domain, to creatively value one's own potential, with the respect towards the
irs?	principles and norms of professional etic.
sve	CT3 Use of efficient methods and techniques to learn, inform, research and develop the abilities
mp	to value the knowledge, to adapt to requirements of a dynamic society and to communicate in
Transversal competencies	Romanian language and in a language of international circulation.

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

7.1 General objective of the discipline	• Get accustomed with basic notions, concepts, theories and models of new programming paradigms (functional and logic programming)
7.2 Specific objective of the discipline	 Get accustomed with a programming language for each of these paradigms (Common Lisp and Turbo Prolog) Acquire the idea of using these programming paradigms based on the applications' necessities Assure the necessary base for approaching certain advanced courses Ability to apply declarative programming techniques to different real life problems Ability to model phenomena using declarative techniques Improved programming abilities using the declarative paradigm

8. Content

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	1 Course	Teaching methods	Remarks
1.	Basic elements of Prolog. Facts and rules in Prolog. Goals. The control strategy in Prolog. Variables and composed propositions. Anonymous variables. Rules for matching. The flow model. Sections of a Prolog program. Examples	Exposure: description, explanation, examples, discussion of case studies	
	The Prolog program. Predefined domains. Internal and external goals. Multiple arity predicates. The IF symbol (Prolog) and the IF instruction (other languages). Compiler directives. Arithmetic expressions and comparisons. Input/output operations. Strings	Exposure: description, explanation, examples, discussion of case studies	
3.	Backtracking. The backtracking control. The "fail" and "!"(cut) predicates. Using the "!" predicate. Type of cuts. The "not" predicate. Lists in Prolog. Recursion. Examples for backtracking in Prolog. Finding all solutions in the same time. Examples of predicates in Prolog. Non-deterministic predicates	Exposure: description, explanation, examples, discussion of case studies	
4.	Composed objects and functors. Unifying composed objects. Arguments of multiple types; heterogeneous lists. Comparisons for composed objects. Backtracking with cycles. Examples of recursive procedures. The stack frame. Optimization using the "tail recursion". Using the "cut" predicate in order to keep the "tail recursion".	Exposure: description, explanation, examples, discussion of case studies	
5.	Recursive data structures. Trees as data structures. Creating and traversing a tree. Search trees. The internal database of Prolog. The "database" section. Declaration of the internal database. Predicates concerning operations with	Exposure: description, explanation, examples, discussion of case studies	

10. Advanced issues of Backtracking in Prolog. Files Exposure: description, examples, programming and programming languages. 7. Programming introduction. The importance of the functional programming as a new programming methodology. History and presentation of LISP Exposure: description, examples, discussion of case studies 8. Basic elements in Lisp. Dynamic data structures. Syntactic and semantic rules. Functions' classification in Lisp. Primitive functions in Lisp. Basic predicates in Lisp. Exposure: description, examples, discussion of case studies 9. Predicates for lists; for numbers, Logic and arithmetic functions. Other interesting functions. Comparisons. Other interesting functions. Examples Exposure: description, examples, discussion of case studies 10. Symbol's managing. Other functions for lists' accessing. OBLIST and ALIST. Destructive functions. Comparisons. Other interesting functions. Examples Exposure: description, examples, discussion of case studies 11. Definitional mechanisms. The EVAL form. Functional forms; the functions FUNCALL and APPLY. LAMBDA expressions, LABFL explanation, examples, discussion of case studies Exposure: description, examples, discussion of case studies 12. Other elements in Lisp. Data structures. Macro-definitions. Optional arguments. Examples Exposure: description, examples, discussion of case studies 13. 14. Graded paper in Logic and Functional Programming Explanation, examples, discussion of case studies 14. Dirate elements in Lisp. Addison Wesley, New York, 1988. Explanation, examples, discussion of case studies	the intern	al database.		
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- 3. Product documentation: Turbo Prolog 2.0, Logic Explorer, Sicstus Prolog.
- 4. http://www.swi-prolog.org

8.3 Laboratory	Teaching methods	Remarks
Lab 1: Recursive algorithms in Pseudocode	Explanation, dialogue,	Problem given at lab 1
	testing data discussion,	and submitted at lab 1
	case studies	
Lab 2: Lists in Prolog	Explanation, dialogue,	Problem given at lab 1
	testing data discussion,	and submitted at lab 2
	case studies	
Lab 3: Trees in Prolog. Lists management in Prolog.	Explanation, dialogue,	Problem given at lab 2
	testing data discussion,	and submitted at lab 3
	case studies	
Lab 4: Backtracking in Prolog	Explanation, dialogue,	Problem given at lab 3
	testing data discussion,	and submitted at lab 4
	case studies	
Lab 4: Practical test in Prolog	Practical test	One hour
Lab 5: Recursive programming in Lisp	Explanation, dialogue,	Problem given at lab 4
	testing data discussion,	and submitted at lab 5
	case studies	
Lab 6: Recursive programming in Lisp	Explanation, dialogue,	Problem given at lab 5
	testing data discussion,	and submitted at lab 6
	case studies	
Lab 7: Using MAP functions in Lisp.	Explanation, dialogue,	Problem given at lab 6
	testing data discussion,	and submitted at lab 7
	case studies	
Lab 7: Practical test in Lisp	Practical test	One hour
Bibliography		

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- 9. Product documentation: Turbo Prolog 2.0, Logic Explorer, Sicstus Prolog.

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 content of the course is concordant with partial competencies for possible occupations from the Grid 1 RNCIS.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	 know the basic principle of the domain; apply the course concepts problem solving 	Written test in Logic and Functional Programming	60%
10.5 Seminar activities	- activity at seminaries	Evaluation of seminaries activity	BONUS 5%
10.6 Lab activities	- be able to implement course concepts and	Programs documentation and delivery	10%
	algorithms - apply techniques for different classes of programming languages	Practical test in Prolog (one hour at lab 4)	15%
		Practical test in Lisp (one hour at lab 7)	15%

10.7 Minimum performance standards

Each student has to prove that (s)he acquired an acceptable level of knowledge and understanding of the subject, that (s)he is capable of stating these knowledge in a coherent form, that (s)he has the ability to establish certain connections and to use the knowledge in solving different problems.

In order to pass the course, the following minimal criteria apply collectively: at least grade 5 (from a scale of 1 to 10) at the written test; at least grade 5 (from a scale of 1 to 10) computed as final grade average, attendance of at least 5 seminars and at least 6 labs as scheduled during the semester.

DateSignature of course coordinatorSignature of seminar coordinator

22.04.2023 Prof. Dr. Horia F. POP

Prof. Dr. Horia F. POP

Signature of the head of department

Date of approval

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Prof. Dr. Laura Dioșan