

SYLLABUS¹

1. Information about the Program

1.1 Higher education institution	Politehnica University of Timișoara
1.2 Faculty ² / Department ³	Automation and Computers/ Computers
1.3 Chair	-
1.4 Domain of study	Computers and Information Technology
1.5 Study level	Bachelor
1.6 Study programme / Qualification	Computers / engineer

2. Information about the Course

2.1 Course	Artificial Intelligence Basics						
2.2 Lecturer	Ș.I. dr. ing. Cosmin Cernăzanu-Glăvan						
2.3 Academic staff for seminars/labs							
2.4 Study year	3	2.5 Semester	6	2.6 Assessment type	E	2.7 Course type	Optional

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

3.1 Hours / week	4	of which:	3.2 lecture hours	2	3.3 seminar/lab hours	2
3.4 Total curriculum hours	108	of which:	3.5 lecture hours	28	3.6 seminar/lab hours	28
Time distribution						hours
Study using manuals, support materials, bibliography and notes						16
Supplementary documentation in library, speciality electronic platforms and on site						20
Supplementary preparation for seminars/labs, homeworks, reviews, portofolios and essays						16
Tutoring activities						7
Exams						3
Other						
3.7 Total - hours of individual study						52
3.8 Total - hours per semester						118
a. Credits						5

4. Prerequisites (if appropriate)

4.1 curriculum	<ul style="list-style-type: none"> Not applicable
4.2 competencies	<ul style="list-style-type: none"> Operarea cu fundamente științifice, ingineresti și ale informaticii

5. Conditions (if appropriate)

5.1 for lectures	<ul style="list-style-type: none"> Average or big classroom. Materials: laptop, whiteboard, projector
5.2 for seminars/labs	<ul style="list-style-type: none"> 15-20 PCs, Prolog, whiteboard

¹ Formularul corespunde Fișei Disciplinei promovată prin OMECTS 5703/18.12.2011 (Anexa3);

² Se înscrie numele facultății care gestionează programul de studiu căruia îi aparține disciplina;

³ Se înscrie numele departamentului căruia i-a fost încredințată susținerea disciplinei și de care aparține titularul cursului;

6. Specific competencies acquired

Professional competencies ⁴	<ul style="list-style-type: none"> • Operarea cu fundamente științifice, ingineresti și ale informaticii • Proiectarea componentelor hardware, software și de comunicații • Soluționarea problemelor folosind instrumentele științei și ingineriei calculatoarelor • Proiectarea sistemelor inteligente
Transversal competencies	<ul style="list-style-type: none"> • Comportarea onorabilă, responsabilă, etică, în spiritul legii pentru a asigura rezolvarea problemei • Demonstrarea spiritului de inițiativă și acțiune pentru actualizarea cunoștințelor profesionale, economice și de cultură organizațională

7. Objectives of the course (issued from the list of the competencies acquired)

7.1 Aim	<ul style="list-style-type: none"> • To acquire basics knowledge in artificial intelligence field.
7.2 Specific objectives	<ul style="list-style-type: none"> • Theoretical and practical approaches to provide an overview of the field of artificial intelligence with a focus on its specific methods: knowledge search and knowledge representation • Merge formalist orientation with a practical orientation (engineering) • Introduction of Prolog as a useful tool for both the formal specification and for solving specific problems of artificial intelligence.

8. Content

8.1 Lecture	Hours	Instruction methods
1. Introduction 1.1 Artificial Intelligence definitions 1.2 Intelligence, knowledge, reasoning 1.3 Logic predicates and Horn clauses. How the inference machine works.	2	Slide-based presentations, discussions, examples.
2. Elements of logic programming 2.1 Structure of a Prolog program 2.2 Standard domains 2.3 Querying the knowledge base 2.4 Prolog inference machine operation 2.5 Example	2	
3. Data structures 3.1 Compound objects 3.2 Recursion technique and recursive objects 3.3 Lists. Definitions. Features	4	

⁴ Aspectul competențelor profesionale va fi tratat cf. Metodologiei OMECTS 5703/18.12.2011. Se vor prelua competențele care sunt precizate în Registrul Național al Calificărilor din Învățământul Superior RNCIS (http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL) pentru domeniul de studiu de la pct. 1.4 și programul de studii de la pct. 1.6 din această fișă.

3.4 Basic operations with lists 3.5 Example		
4. Determinism and nondeterminism in knowledge bases 4.1 The issue 4.2 Action of the cutting element (!). 4.3 Building the If ... Then ... Else rules 4.4 Negations 4.5 Operation of read/write 4.5 Example	2	
5. Knowledge base 5.1 Characteristics of internal databases. 5.2 Method of asserting clauses in a database. 5.3 Collection of solutions 5.4 Generate and test technique. Basically an implementation of the technique 5.5 Solving logic riddles.	2	
6. The state space. Search techniques 6.1 The state space representation 6.2 Combinatorial techniques. Concepts. 6.3 Combinatorial techniques 6.4 Examples	4	
7. Learning techniques 7.1 Successor techniques type. Building procedures. 7.2 Knowledge representation in PROLOG. Standard objects. 7.3 Knowledge representation in PROLOG. Compound objects. 7.4 Using trees in solution representations 7.5 Conclusions	2	
8. Heuristic search techniques 8.1 Heuristic search. Principle search. 8.2 Heuristic estimator 8.3 Techniques for building heuristic estimators. 8.4 Heuristic Search Strategies (hill climbing, best first) 8.5 Use of trees for solutions representation 8.6 Conclusions	2	
9. Strategic games 9.1 Strategic game - Definitions 9.2 Structure of a game applications. 9.3 Strategy game. Choosing the best moves. Applications. 9.4 Strategy game. Minimax choice. Applications. 9.5 Strategy game. Choosing alfa_beta. Applications. 9.6 Evaluation functions 9.7 Game examples	4	
10. Expert systems 10.1 Expert Systems. Definition. Features. 10.2 Architecture of an expert system 10.3 Principle of operation 10.4 Knowledge representation by if-then rules. 10. 5 Inference in a knowledge base. Inference engines. 10.6 Uncertainty Knowledge 10.7 Examples	2	
References a) Michael Negnevitsky, Artificial Intelligence. A guide to Intelligent system. Addison-Wesley, 2005 b) Stuart J. Russell, Peter Norvig Artificial Intelligence. A modern approach. Prentice-Hall Third Edition 2010 c) S. Holban, Inteligență Artificială. Curs în format electronic, Ed. Politehnica,2010		
8.2 Seminar/lab	Hours	Instruction methods
Introduction to the SWI-Prolog	2	Short presentation, discussions, implementation
Knowledge representation in Prolog. Knowledge base.	2	
Recursion in knowledge bases	2	
Trees	2	
Lists	2	
Input/Output operations	2	
Checking dynamic data types	2	
Knowledge base techniques	2	
Generate and test	2	
State space search techniques (minimax)	2	
State space search techniques (Alpha / Beta)	2	

Strategic games	2	
References		
a) Michael Negnevitsky, Artificial Intelligence. A guide to Intelligent system. Addison-Wesley, 2005		
b) Stuart J. Russell, Peter Norvig Artificial Intelligence. A modern approach. Prentice-Hall Third Edition 2010		
c) S. Holban, Inteligență Artificială. Curs în format electronic, Ed. Politehnica,2010		

9. Correlation between the course content and the requirements of the specialists in the field and the expectations of the main employers

- Artificial intelligence concepts are important for understanding smart devices that exist, in present, in all industrial and household equipment.
- Most of the software have special interfaces that incorporate a large amount of "artificial intelligence"
- Most employers, especially those in the banking and mobile, must have advanced knowledge of artificial intelligence.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in final mark
10.4 Lecture	Solving simple problems of artificial intelligence	Written exam	20%
	Solving theoretical problems	Written exam	20 %
	Address artificial intelligence concepts in the context of a given problem	Written exam	10%
10.5 Seminar /labs	Solving specific problems in Prolog	Computer exam	45%
	Presence	Presence monitoring	5%
10.6 Minimal performance standards (minimal specific knowledge required for passing the exam, the means to assess mastering the specific knowledge)			
<ul style="list-style-type: none"> • Design and implementation of artificial intelligence problems of medium complexity • Medium level in the Prolog programming 			

11. International compatibility

- Stanford University - <http://ai.stanford.edu/>
- University of Helsinki <http://www.cs.helsinki.fi/u/tapasane/GameAI/>
- University of Toronto <http://web.cs.toronto.edu/research/groups/ai.htm>

Date	Signature of the course instructor	Signatures of the academic staff for seminars/labs
11.10.2013	Ș.I. dr. ing. Cosmin Cernăzanu-Glăvan	Ș.I. dr. ing. Cosmin Cernăzanu-Glăvan

Date of approval in the Department	Signature of the Department Director
	Prof. dr. ing. Vladimir Ioan CREȚU