SYLLABUS / FIŞA DISCIPLINEI

1. Information on the study programme / Date despre programul de studii

1.1. Institution / Instituția de învățământ superior	Universitatea de Vest din Timișoara
1.2. Faculty / Facultatea	Matematică și Informatică
1.3. Department / Departamentul	Computer Science (Informatică)
1.4. Study program field	Computer Science (Informatică)
1.5. Study cycle/ Ciclul de studii	Bachelor / licență
1.6. Study programme / Programul de studii / calificarea*	Computer Science / Informatică în limba engleză / Database administration / *Administrator baze de date - 252101; Computer network administration / Administrator de retea de calculatoare - 252301; Analyst / Analist - 251201; Research assistant in computer science / Asistent de cercetare în informatica - 214918; Teacher in secondary schools / Profesor în învatamântul gimnazial - 233002; Programmer / Programator - 251202; Software systems designers / Proiectant sisteme informatice - 251101*

2. Information on the course / Date despre disciplină

2.1. Title of the course / Denumirea disciplinei	Artificial Intelligence						
2.2. Teacher in charge of the course / Titularul activităților de curs	Lect. Dr. Popa Andreescu Horia-Emil						
2.3. Teacher in charge of the seminar / Titularul activităților de seminar	Lect. Dr. Popa Andreescu Horia-Emil						
2.4. Study year / Anul de studii	3	2.5. Semester / Semestrul	1	2.6. Examination type / Tipul de evaluare: E(xam)/C(olloquim)	E	2.7. Course type / Regimul disciplinei: M(andatory)/ E(lective)/ F(acultative)	MI

3. Estimated study time (number of hours per semester) /Timpul total estimat (ore pe semestru al activităților didactice)

3.1. Attendance hours per week / Număr de ore pe săptămână	4	out of which/ din care: 3.2 lecture/ curs	2	3.3. seminar/laborator	2
3.4. Attendance hours per semester / Total ore din planul de învățământ	56	out of which: 3.5 lecture / curs	28	3.6. seminar/laborator	28

Distribution of the allocated amount of time / Distribuția fondului de timp*	**hours/ ore**
Individual study /Studiu după manual, suport de curs, bibliografie și notițe	28
Supplementary documentation at library or using electronic repositories / Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate	14
Preparing for laboratories, homework, reports etc. /Pregătire seminarii/laboratoare, teme, referate, portofolii și eseuri	28
Exams / Examinări	6

Tutoring / Tutorat	
3.7. Total number of hours of individual study / Total ore studiu individual	83
3.8. Total number of hours per semester / Total ore pe semestru	135
3.9. Number of credits (ECTS) / Număr de credite	5

4. Prerequisites (if it is the case) / Precondiții (acolo unde e cazul)

4.1. curriculum / de curriculum	Programming 3/Algorithms
4.2. skills / de competențe	Mathematics basis and the ability to solve problems / Cunostinte elementare de matematica si abilitati de rezolvarea a problemelor

5. Requirements (if it is the case) / Condiții (acolo unde e cazul)

5.1. for the lecture / de desfășurare a cursului	Room with whiteboard and videoprojector/ Sala de curs cu tabla si videoproiector
5.2. for the seminar, laboratory / de desfășurare a seminarului/laboratorului	Laboratory with computers with Eclipse installed and possibility to install new packages in it/ Sala de laborator cu calculatoare cu Eclipse instalate si posibilitatea de a instala noi pachete in el

6. Acquired skills / Competențe specifice acumulate

Professional skills / Competențe profesionale	• Become familiar with various branches of Artificial Intelligence / Familiarizare cu diversele ramuri ale Inteligentei artificiale • Notions about the manner of designing an expert system / Notiuni despre modul de realizare al unui sistem expert • Notions about the manner of knowledge representation specific to Artificial Intelligence / Notiuni despre modurile de reprezentare a cunostintelor specifice Inteligentei Artificiale • The ability to solve complex problems / Abilitatea de a identifica metoda de rezolvare a unei probleme complexe • The ability to describe the algorithm and to analyse the correctness and efficiency of the algorithm / Abilitatea de a descrie algoritmic metoda si de a analiza corectitudinea si eficienta algoritmului
Transversal skills / Competențe transversale	• The ability to decompose a problem into subproblems / Abilitatea de descompune o problemă în sub-probleme

	• The ability to build complex structures starting from simple building blocks / Abilitatea de a construi structuri complexe pornind de la blocuri elementare • The development of an inquiring spirit and curiosity regarding the manner the computer programs are built / Dezvoltarea spiritului de cunoaştere şi curiozitate relativ la modul în care sunt realizate programele pentru maşinile de calcul

7. Objectives of the course / Obiectivele disciplinei (reieșind din grila competențelor specifice acumulate)

7.1. General objective / Obiectivul general al disciplinei	Combining the teoretical aspects with the practical ones in: problem solving in AI using heuristics; knowledge representation and reasoning; logical reasoning; pattern-oriented programming / Combinarea aspectelor teoretice cu cele practice in: rezolvarea problemelor in IA utilizand euristici; reprezentarea cunostintelor si rationament; rationamentul logic, programare orientata pattern-uri.
7.2. Specfic objectives / Obiectivele specifice	Applying the concepts previously developed for: problem solving, planning, games, constraints, machine learning, expert systems /Aplicarea conceptelor dezvoltate anterior in: rezolvarea problemelor, planificare, jocuri, constrangeri, invatare automata, sisteme expert

8. Content / Conținuturi*

8.1. Lecture / Curs	**Teaching strategies / Metode de predare**	**Remarks, details / Observații**
C1. Artificial Intelligence: definitions. History. Domains. Applications	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C2. Problem representation. Uninformed search algorithms.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C3. Blind search and heuristic algorithms.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)

C4. Search algorithms applied in games.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C5. Constraint Propagation	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C6. Planning	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C7. Knowledge types and representation modes. Logic. Procedural representation. Production rules.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C8. Knowledge representation based on inheritance – semantic networks, frames, object orinted representation.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C9. Reasoning. Logical reasoning.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C10. The architecture of expert systems. Rule based expert systems - how does the infference	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homew

engine works.		ork)
C11. Expert system frameworks (Clips, Jess). Pattern oriented programming.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C12. Natural language understanding.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C13. Machine learning.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
C14. Distributed AI. Multi-agent systems.	Lecture, conversation, illustration / Prelegere, conversatie, exemplificare	References/Referinte: 1) Russel S., Norvig P. – Artificial Intelligence – A Modern Approach, 2nd ed. Prentice Hall, 2003 2) Stuart Russel – Course slides (http://aima.cs.berkeley.edu/instructors.html#homework)
Recommended bibliography / Bibliografie		

8.2. Seminar, lab / Seminar, laborator	**Teaching/learning strategies / Metode de predare/ invățare**	**Remarks, details / Observații**
L1. Uninformed search algorithms in AI (hill-climbing, depth-first variants, breadth-first, iterativ deapening etc).	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	The students choose the first assignment theme and can get clarifications regarding their specific algorithm. Algorithms of the type from lectures 1 and 2 are presented. The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L2.Informed search algorithms: A*, heuristics.	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	The students choose the first assignment theme and can get clarifications regarding their specific algorithm. Algorithms of the type from lecture 3are presented. The teacher gives details/explains, answers to the students questions and

		checks/evaluates the way how the students have solved the exercises.
L3. Minmax algorithm , adversarial search algorithms.	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	The students choose the first assignment theme and can get clarifications regarding their specific algorithm. Algorithms of the type from lectures 4 and 5 are presented. The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L4. Individual work at the first project (A*, IDA* AO*, SMA*, minimax, alphabeta, CSP), implementation indications..	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	Case study on the student's first project. The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L5. Search algorithms projects presentation and evaluation Constraints programming.	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L6. Evolving algorithms.	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L7. Project evaluation and presentation for evolving algorithms	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	Presentation and defense of the evolving algorithms project by the students. The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L8. Introduction to CLIPS and JESS (inference engine, functioning cycle, ordered / unordered facts, rules). Deftemplate, LHS language (patterns)	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	1. J. Giarratano, G. Riley - Expert Systems: Principles and Programming, PWS Pbs. Comp., ITP, 4th edition, 2005 The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L9. RHS language (actions), small examples of expert systems	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	1. J. Giarratano, G. Riley - Expert Systems: Principles and Programming, PWS Pbs. Comp., ITP, 4th edition, 2005 The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.

L10. Embedded CLIPS	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L11. CLIPS/JESS project evaluation	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	Presentation and defense of the CLIPS project by the students. The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L12. Machine learning applications. Applications in computer vision.	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	Applications in computer vision of machine learning. The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L13. Natural language understanding applications.	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.
L14. Multiagent applications in JADE.	Questioning, dialogue, collaborative learning / Problematizare, dialog, învățare prin colaborare	Basic architecture of a JADE multi agent system. The teacher gives details/explains, answers to the students questions and checks/evaluates the way how the students have solved the exercises.

Recommended bibliography / Bibliografie

2. **S.Russel, P. Norvig - Artificial Intelligence. A Modern Approach, second edition, Prentice Hall, 2003**
3. S. Russel, Course slides, http://aima.cs.berkeley.edu/instructors.html#homework
4. M. Watson – Practical Artificial Intelligence Programming With Java 3rd ed., 2008
5. J. Giarratano, G. Riley - Expert Systems: Principles and Programming, PWS Pbs. Comp., ITP, 4th edition, 2005
6. CLIPS online documentation, http://clipsrules.sourceforge.net/OnlineDocs.html
7. Jess, the Rule Engine for the Java Platform, http://herzberg.ca.sandia.gov/jess/
8. Ernest Friedman-Hill - Jess in action. Java rule-based systems, Manning Publ. Co., 2003
9. N. J. Nilson - Artificial Intelligence. A New Synthesis, Morgan Kaufmann Eds., 1998
10. G. F. Luger, W. A. Stubblefield - Artificial Intelligence, Structures and Strategies for Complex Problem Solving, third edition, Addison Wesley, 1998
11. A. Hopgood, Intelligent Systems for Engineering and Scientist, second edition, CRC Press, 2001
12. J. Pearl - HEURISTICS. Intelligent search strategies for computer problem solving, Addison-Wesley, 1984
13. M. Negnevitsky - Artificial Intelligence. A Guide to Intelligent Systems, Addison Wesley, 2002
14. D. I. Carstoiu - Sisteme expert, Editura ALL Bucuresti, 1994
15. D. Dumitrescu - Principiile Inteligentei artificiale, Editura Albastra, Cluj-Napoca, 2002

9. Correlations between the content of the course and the requirements of the IT field / Coroborarea conținuturilor disciplinei cu așteptările reprezentanților comunității epistemice, asociațiilor profesionale și angajatorilor reprezentativi din domeniul aferent programului

The content is consistent with the structure of similar courses from other universities and covers the fundamental

aspects necessary in order to become familiar with issues and subdomains of Artificial Intelligence. The ability to identify, design, implement and analyze algorithms is essential for any activity in the field of computer science. The skills offered by this discipline are needed for an IT specialist to identify effective solutions for solving concrete problems, regardless of their domain and are justified by a resurgence of AI application in industry, e.g. in computer vision and machine learning. / Conţinutul este în concordanţă cu structura cursurilor similare de la alte universităţi şi acoperă aspectele fundamentale necesare familiarizării cu problematica proiectării şi analizei algoritmilor. Abilitatea de a identifica, proiecta, implementa și analiza algoritmi este esențială pentru orice activitate din domeniul informaticii. Competențele oferite de această disciplină sunt necesare unui specialist IT pentru a identifica soluții eficiente de rezolvare a unor probleme concrete, indiferent de domeniul specific de activitate si care sunt justificate de o resurgenta a aplicatiilor AI in industrie, de exemplu computer vision si machine learning.

10. Evaluation / Evaluare*

Activity / Tip de activitate	10.1. Evaluation criteria / Criterii de evaluare**	10.2. Evaluation methods / Metode de evaluare***	10.3. Weight in the averaged mark / Pondere din nota finală
10.4. Lecture / Curs	- Înţelegerea conceptelor de bază ale Inteligenţei Artificiale, ale algoritmilor specifici şi modurilor specifice de reprezentare a cunoștințelor - Înţelegerea şi modificarea unor secvenţe simple de cod		50%
	Eventual practical exam if the grade from the projects is less than 50% of the maximum grade from 10.5		Eventual 50%
10.5. Seminar/ lab	Solving and presentation of the individual projects 2-3 projects		50%
	- needed knowledge to pass the lab part: at least 50% from the maximum grade obtainable from projects - knowledge for 100% of the grade from 10.5 – completion, and knowing to explain their functioning for the 2-3 projects from the lab		
10.6. Minimal knowledge for passing / Standard minim de performanță			
The final grade is calculated as a weighted average of the grades given for the components specified in 10.4 and 10.5. The exam is passed if the average is at least 5 and the lab grade or the eventual oral exam grade is greater than 5 (not necessary that the theory grade to be greater than 5). At each exam sessions the grade is calculated by the same rule. Remark: The students may attend office hours (one hour / week according to the schedule set out at the beginning of the semester) where the teacher of the course and / or laboratory answers to the students questions and provides further explanations related to the course content, and to the applications from laboratories. / Nota finală se calculează ca medie ponderată a notelor acordate pentru componentele specificate la 10.4 și 10.5.			

Examenul se consideră promovat dacă media este cel puțin 5 si daca la laborator (sau la eventualul examen oral) nota este peste 5 (nu e necesar ca la examenul teoretic nota sa fie mai mare de 5) . La fiecare dintre sesiunile de examen (inclusiv cele de restanță și măriri) nota se calculează după aceeaşi regulă.

Obs: Studenții pot participa la orele de consultații (1 modul/săptămână conform planificării stabilite la începutul semestrului) în cadrul cărora titularul de curs și/sau seminar/laborator răspunde întrebărilor studenților și oferă explicații suplimentare legate de conținutul cursului, aplicațiile de la laborator și teme.

Date/ Data completării	Signature (lecture) /	Signature (seminar)
14.10.2016	Semnătura titularului de curs	Semnătura titularului de seminar

Signature (director of the department)
Semnătura directorului de departament
Conf.dr. Victoria Iordan