

CURRICULUM DESCRIPTION / FIŞA DISCIPLINEI

1. Program information / Date despre program

1.1 Higher education institution / <i>Instituția de învățământ superior</i>	West University of Timișoara / <i>Universitatea de Vest din Timișoara</i>
1.2 Faculty / Department / <i>Facultatea / Departamentul</i>	Mathematics and Informatics / <i>Matematică și Informatică</i>
1.3 Department / <i>Departamentul</i>	Informatics / <i>Informatică</i>
1.4 Study area / <i>Domeniul de studii</i>	Informatics / <i>Informatică</i>
1.5 Study cycle / <i>Ciclul de studii</i>	Masters / <i>Master</i>
1.6 Study program / Qualification / <i>Programul de studii / Calificarea</i>	Cybersecurity / Specialist in security-focused procedures and tools for information systems / <i>Securitate Cibernetică / Specialist în proceduri și instrumente de securitate a sistemelor informative</i>

2. Curriculum information / Date despre disciplină

2.1 Name of class / <i>Denumirea disciplinei</i>	Multi-agent Systems						
2.2 Teacher for lecture / <i>Titularul activităților de curs</i>	Lecturer dr. Gabriel Iuhasz						
2.3 Teacher for laboratory / <i>Titularul activităților de seminar</i>	Lecturer dr. Gabriel Iuhasz						
2.4 Year of study / <i>Anul de studiu</i>	1	2.5 Semester / <i>Semestrul</i>	2	2.6 Evaluation type / <i>Tipul de evaluare</i>	E	2.7 Type of class / <i>Regimul disciplinei</i>	M

3. Estimated total time (hours per semester for didactic activities) / Timpul total estimat (ore pe semestru al activităților didactice)

3.1 Hours per week / <i>Număr de ore pe săptămână</i>	3	of which / <i>din care:</i> 3.2 lecture / <i>curs</i>	2	3.3 seminary/laboratory / <i>seminar/laborator</i>	1
3.4 Hours in curriculum plan / <i>Total ore din planul de învățământ</i>	42	of which / <i>din care:</i> 3.5 lecture / <i>curs</i>	28	3.6 seminary/laboratory / <i>seminar/laborator</i>	14
Time distribution: / <i>Distribuția fondului de timp:</i>					hours / <i>ore</i>
Study time using the manual, lecture reading material, bibliography and notes / <i>Studiul după manual, suport de curs, bibliografie și notițe</i>					40

Suplimentary documentation inside a library, or online / on the field / <i>Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate / pe teren</i>	20
Seminary/laboratory preparation, homework, research paper, portfolios and essays / <i>Pregătire seminare / laboratoare, teme, referate, portofolii și eseuri</i>	20
Tutorship / <i>Tutoriat</i>	10
Exminations / <i>Examinări</i>	10
Other activities / <i>Alte activități</i>	
3.7 Total hours of individual study / <i>Total ore studiu individual</i>	100
3.8 Total hours per semester / <i>Total ore pe semestru</i>	142
3.9 Number of credits / <i>Numărul de credite</i>	5

4. Preconditions (where applicable) / Precondiții (acolo unde este cazul)

4.1 for curriculum / <i>de curriculum</i>	<ul style="list-style-type: none"> • AI, Intelligent Systems
4.2 for competencies / <i>de competențe</i>	<ul style="list-style-type: none"> • Java programming

5. Conditions (where applicable) / Condiții (acolo unde este cazul)

5.1 for lecture development / <i>de desfășurare a cursului</i>	Room with blackboard and video projector
5.2 for seminary/laboratory development / <i>de desfășurare a seminarului / laboratorului</i>	Laboratory with computers (Jade/Spade and Jess/Clips installed)

6. Class objectives – expected learning results, contributed to by reading and passing of the class / Obiectivele disciplinei - rezultate așteptate ale învățării la formarea cărora contribuie parcurgerea și promovarea disciplinei

7.1. General objective / <i>Obiectivul general al disciplinei</i>	<ul style="list-style-type: none"> • Theoretical and experimental approach concerning parallel and distributed computing in Intelligent systems <ul style="list-style-type: none"> • Study of multi-agent models and architectures
7.2. Specific objectives / <i>Obiectivele specifice</i>	<ul style="list-style-type: none"> • Developing applications based on multi-agent models

Abilities / Abilități	<ul style="list-style-type: none"> - Ability to identify complex problems solving methods - Ability to analyse and design MAS applications - Ability to implement and validate MAS applications - Capacity to communicate knowledge about MAS - Capacity to apply knowledge in different domains
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7. Contents / Conținuturi

7.1 Lecture / Curs	Teaching methods / Metode de predare	Observations / Observații
C1-2. Intelligent systems	University lecture, conversation, example	Bibliography presentation, and slides
C3. Distributed problem solving	University lecture, conversation, example	Including real life examples of distributed problem solving.
C4-5. Parallel algorithms in AI (Knowledge representation; Rules compilation; Reasoning).	University lecture, conversation, example	
C6. Agent based systems	University lecture, conversation, example	Presenting Reactive, Deliberative and Hybrid models
C7-9. Blackboard model (Distributed expert systems; Cooperation models; Classification of blackboard systems; Applications.)	University lecture, conversation, example	Including Real life examples of blackboard systems.
C10-14. Multi-agent models (Foundations; Agents classification; Interaction and cooperation; Communication; Collaboration and coordination, Mobile agents, Security)	University lecture, conversation, example	Including modern agent based systems such as Serf and Consul from Hashicorp.
Bibliography / Bibliografie :		
1. Michael Wooldridge - An Introduction to Multi - Agent Systems, John Wiley & Sons, 2009		
2. F. Bellifemine, G. Claire, D. Greenwood – Developing Multi-Agent Systems with Jade, John Wiley & Sons' 2007		
3. S.Russel, P. Norvig - Artificial Intelligence. A Modern Approach, second edition, Prentice Hall, 2010		
4. J. Ferber - Les systemes multi-agents. Vers une intelligence collective, InterEditions, 1995		
5. M. dInverno - Understanding Agent Systems, Springer Verlag, second edition, 2004		
6. M. Singh and M. Huhns. Readings in Agents. Morgan-Kaufmann Publishers, 1997.		
7. M. P. Singh - Multiagent Systems - A theoretical Framework for Intentions, Know-How, and Communications, Springer Verlag, 1994		
8. J. M. Bradshaw - Software agents, MIT Press, 1997		
9. G. Weiss, eds. Multi-Agent Systems. A modern approach to Distributed AI, The MIT Press, 1999.		
10. G. F. Luger, W. A. Stubblefield - Artificial intelligence and the design of expert systems, Benjamin/Cummings Pbs., 2005		
11. T. Ishida - Parallel, Distributed and Multiagent Production Systems, Springer Verlag, 1994		
12. R. Engelmore, T. Morgan - Blackboard systems, Addison Wesley, 1988		

13. H. Kitano, J. A. Hendler - Massively Parallel Artificial Intelligence,
14. MIT Press, 1994
15. M. Watson - Intelligent Java applications for the Internet and intranets, Morgan Kaufmann, 1997 (sau versiunea în română, ed. ALL, 1999)
16. M. Wooldridge, N. R. Jennings - Intelligent agents: Theory and practice, Knowledge engineering review, 1995
17. *** IEEE - Intelligent systems
18. *** Autonomous Agents and Multi-Agent Systems, Kluwer Academic Pbs.
19. J. Giarratano, G. Riley - Expert Systems: Principles and Programming, PWS Pbs. Comp., ITP, 4th edition, 2005
20. Ernest Friedman-Hill - Jess in action. Java rule-based systems, Manning Publ. Co., 2003
21. <http://www.ghg.net/clips/Version623.html>
22. <http://herzberg.ca.sandia.gov/jess/>
23. <http://myri1.iate.ro/mas/>; <http://www.cougaar.org/>
24. <http://www.ai.sri.com/oaa/>; <http://jade.tilab.com/>

7.2 Seminary / laboratory / Seminar / laborator	Teaching methods / Metode de predare	Observations / Observații
<p>Parallel algorithms and architectures for rule based systems</p> <p>Expert systems / MAS developed on: Clips, Jess, FuzzyJess, GBB, BBClips, JADE, SpadeOAA, Cougaar etc.</p> <p>As well as application specific distributed agent based software such as Serf and Consul developed by Hashicorp.</p>		

Bibliography / Bibliografie:

Michael Wooldridge - An Introduction to Multi - Agent Systems, John Wiley & Sons, 2009

2. *F. Bellifemine, G. Caire, D. Greenwood – Developing Multi-Agent Systems with Jade, John Wiley & Sons' 2007*
3. *S. Russel, P. Norvig - Artificial Intelligence. A Modern Approach, second edition, Prentice Hall, 2010*
4. *J. Ferber - Les systèmes multi-agents. Vers une intelligence collective, InterEditions, 1995*
5. *M. dInverno - Understanding Agent Systems, Springer Verlag, second edition, 2004*
6. *M. Singh and M. Huhns. Readings in Agents. Morgan-Kaufmann Publishers, 1997.*
7. *M. P. Singh - Multiagent Systems - A theoretical Framework for Intentions, Know-How, and Communications, Springer Verlag, 1994*
8. *J. M. Bradshaw - Software agents, MIT Press, 1997*
9. *G. Weiss, eds. Multi-Agent Systems. A modern approach to Distributed AI, The MIT Press, 1999.*
10. *G. F. Luger, W. A. Stubblefield - Artificial intelligence and the design of expert systems, Benjamin/Cummings Pbs., 2005*
11. *T. Ishida - Parallel, Distributed and Multiagent Production Systems, Springer Verlag, 1994*
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15. M. Watson - *Intelligent Java applications for the Internet and intranets*, Morgan Kaufmann, 1997 (sau versiunea în română, ed. ALL, 1999)
16. M. Wooldridge, N. R. Jennings - *Intelligent agents: Theory and practice*, Knowledge engineering review, 1995
17. *** IEEE - *Intelligent systems*
18. *** *Autonomous Agents and Multi-Agent Systems*, Kluwer Academic Pbs.
19. J. Giarratano, G. Riley - *Expert Systems: Principles and Programming*, PWS Pbs. Comp., ITP, 4th edition, 2005
20. Ernest Friedman-Hill - *Jess in action. Java rule-based systems*, Manning Publ. Co., 2003
21. <http://www.ghg.net/clips/Version623.html>
22. <http://herzberg.ca.sandia.gov/jess/>
23. <http://myri1.ieat.ro/mas/>; <http://www.cougaar.org/>
24. <http://www.ai.sri.com/oaa/>; <http://jade.tilab.com/>

8. Unification of class contents with the expectations of the representatives of the epistemic community, professional organisations and employers from the class's relevant field(s) of applicability / Coroborarea conținuturilor disciplinei cu așteptările reprezentanților comunității epistemice, asociațiilor profesionale și angajatorii reprezentativi din domeniul aferent programului

Class contents corresponds to the curricula of other universities, from inside the country or from the European Union. The practical contents (laboratory works) correspond to the local labor market requirements. / *Conținutul disciplinei corespunde curriculei din alte centre universitare, din țară sau Uniunea Europeană. Conținuturile practice (lucrări de laborator) corespund cerințelor de pe piața muncii locală.*

9. Evaluation / Evaluare

Activity type / <i>Tip activitate</i>	9.1 Evaluation criteria / <i>Criterii de evaluare</i>	9.2 Evaluation methods / <i>Metode de evaluare</i>	9.3 Weight in final grade / <i>Pondere din nota finală</i>
9.4 Lecture / <i>Curs</i>	Theoretical and practice knowledge evaluation	Write exam / Project / Report	50%
	Periodic evaluation	Tests, Home work	20%
9.5 Seminary / laboratory / <i>Seminar / laborator</i>	Labs and homework evaluation	Computer tests; Home work	30%
9.6 Minimum performance standards / <i>Standard minim de performanță</i>			
Written examination / <i>Examinare scrisă</i> : • Course: The capacity to understand basic concepts of MAS and the capacity to understand basic principles to implement MAS. • Lab.: Middle level MAS problem solving			

Date of completion /
Data completării

Teacher for class /
Titular de disciplină

Date of approval inside department /
Data avizării în departament

Department director /
Director de departament