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| O imagine care conține siglă, simbol, Font, Grafică  Descriere generată automat | MINISTERUL EDUCAŢIEI **UNIVERSITATEA „AUREL VLAICU“ DIN ARAD**310130 Arad, B-dul Revolutiei nr. 77, P.O. BOX 2/158 AR *Tel.: 0040-257- 283010; fax. 0040-257- 280070*  [http://www.uav.ro](http://www.uav-arad.go.ro)*;* e-mail: rectorat@uav.ro |

**Operator de date cu caracter personal nr. 2929**

**SYLLABUS**

1. **Study programme**

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| 1.1. Higher education institution | **„Aurel Vlaicu” University of Arad** |
| 1.2. Faculty | **of Exact Sciences** |
| 1.3. Department | **Department of Mathematics and Computer Science** |
| 1.4. Field of study | **Mathematics** |
| 1.5. Study level | **2024-2025** |
| 1.6. Study cycle | **Bachelor** |
| 1.7. Study programme / Qualification | **Mathematics-Computer Science** |
| 1.8. Form of education | **Full – Time study** |

1. **Course details**

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| 2.1. Name of the course | **GICS5O04 Artificial intelligence** |
| 2.2. Course coordinator | **PhD Crăciun Mihaela-Daciana** |
| 2.3. Seminar/laboratory/project coordinator | **PhD Crăciun Mihaela-Daciana** |
| 2.4. Study year | **3** |
| 2.5. Semester | **1** |
| 2.6. Evaluation type | **ES** |
| 2.7. Course type | **Op** |

1. **Estimated total time (hours per semester)**

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| 3.1. Hours per week | **3** |
| 3.2. Lecture hours per week | **2** |
| 3.3. Seminar/laboratory/project hours per week | **1** |
| 3.4. Total hours per curriculum | **42** |
| 3.5. Lecture hours per semester | **28** |
| 3.6. Seminar/laboratory/project hours per semester | **14** |
| Time division [hrs] | |
| 3.4.1. Independent study from textbooks, course support, bibliography and notes | **30** |
| 3.4.2. Additional reading (libraries, specialized electronic platforms and field research) | **20** |
| 3.4.3. Preparing of seminars/laboratories/projects, homework, papers, portfolios and essays | **20** |
| 3.4.4. Tutorial coaching | **9** |
| 3.4.5. Examinations | **4** |
| 3.4.6. Other activities | **0** |
| 3.7. Total individual study hours | **83** |
| 3.8. Total hours per semester | **125** |
| 3.9. Number of ECTS credits | **5** |

1. **Prerequisites** (if applicable)

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| 4.1. Curriculum related |  |
| 4.2. Competence related |  |

1. **Conditions** (if applicable)

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| 5.1. for the lecture | Classroom equipped with laptop, projector, Internet connection and appropriate software. |
| 5.2. for the seminar |  |
| 5.3. for the laboratory | Lab room with computers and internet access programming language – PROLOG. |
| 5.4. for the project |  |

1. **Specific educational objectives (competences to be acquired)**

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| 6.1. Professional competencies | C4. Conceiving models for describing phenomena.  C5. Programming in high level programming languages.  C6. Analysing, testing and exploiting information systems. |
| 6.2. Transversal competencies | CT1. Applying the rules of organized and efficient work, of responsibie attitudes towards teaching-scientific field, to value the own creative potential, while respecting the principles and norms of professional ethics.  CT2. Efficient conduct of team activities.  CT3. Efficient use of information, communication resources and assisted education both in Roumanian and in an internationally widespread language.. |

1. **Course outcomes (resulting from the specific educational objectives to be acquired)**

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| 7.1. General outcomes | Knowledge of the general issues of artificial intelligence, as well as introductory notions in the main research areas: knowledge-based intelligent systems, rule-based expert systems, fuzzy systems, neural networks, genetic algorithms and evolutionary computation, hybrid intelligent systems, data mining, etc. |
| 7.2. Specific outcomes | To pass the exam students must know the general IA issues, be able to write and present a paper based on a bibliographic documentation of an IA subfield and write a simple program in Prolog. |

1. **Outline** (if applicable)

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| 8.1 Lecture Outline | Teaching methods | Remarks |
| 1. The subject and areas of artificial intelligence. Artificial intelligence vs. natural intelligence (4 hours)  2. Logic programming languages (4 hours)  3. Elements of fuzzy logic (4 hours)  4. Knowledge-based computing systems (4 hours)  5. Intelligent agents (4 hours)  6. Networked networks (4 hours)  7. Notions of natural computation. Evolutionary calculus. Genetic algorithms (4 hours) | The following will be used: interactive presentation, problem solving, case studies. Internet, intelligent teaching tools will be used. | The number of hours is in accordance with the amount of information and the degree of difficulty for each course. |
| 8.2 Lecture References  1. Dziţac, I. Inteligenţă artificială, Ed. Univ. „Aurel Vlaicu” Arad, 2008.  2. Dzitac, I. Soft Computing for Decision Making, Habilitation Thesis, Alexandru Ioan Cuza University of Iasi,2019.  3. Dzitac, I.; Bărbat, B. Artificial Intelligence + Distributed Systems = Agents , International Journal of ComputersCommunications&Control, ISSN 1841-9836, 4(1):17-26, 2009.  4. Dzitac I., Filip F.G., Manolescu M.J., Fuzzy Logic Is Not Fuzzy: World-renowned Computer Scientist Lotfi A.Zadeh,InternationalJournal of Computers Communications & Control, ISSN 1841-9836, 12(6), 748-789, DEC2017.  5. Dzitac I., Moisil I., Advanced AI Techniques for Web Mining, Proc. of MAMECTIS '08, ISSN 1790-2769, pp. 343-346, 2008  6. Dzitac I.,Vesselenyi T., Tarca R. C., Identification of ERD using Fuzzy Inference Systems for Brain-ComputerInterface,InternationalJournal of Computers Communications & Control, Special Issue on Fuzzy Sets andSystems, Vol.6, No.3, pp. 403-417,2011 (ArticleWOS:000294513700003).  7. Dzitac S., Felea I., Dzitac I.,Vesselenyi T., An Application of Neuro-Fuzzy Modelling to Prediction of someIncidence in anElectricalEnergy Distribution Center, International Journal of Computers Communications &Control, ISSN 1841-9836., Vol.3,No.S, pp. 287-292,2008 (Article WOS:000257497600043).  8. Pop, B.,;Dzitac, I. On a Fuzzy Approach to Solving Multiple Criteria Fractional Programming Problem,International JournalofComputers Communications & Control, ISSN 1841-9836, Vol.1, No. S, pp. 381-385, 2006  9. Nădăban, S.; Dzitac, S.; Dzitac, I. Fuzzy TOPSIS: A General View, Procedia Computer Science, Volume 91,Pages823-831, 2016.  10. Negulescu, S. C.; Dzitac, I.; Lascu, A. E., Synthetic Genes for Artificial Ants. Diversity in Ant ColonyOptimizationAlgorithms,International Journal of Computers Communications & Control, ISSN 1841-9836, Vol.5,No.2, pp. 216-223, 2010(Article WOS000275741400008).  11. Negulescu A.E., Negulescu S., Dzitac I.,Balancing Between Exploration and Exploitation in ACO, InternationalJournal ofComputersCommunications & Control, 12(2), 265-275, 2017.  12. Russel, S.J.; Norvig, P. Artificial Intelligence: A Modern Approach, Modified May 26, 2016http://aima.cs.berkeley.edu/  13. Secui, D.C., Dzitac, S., Bendea, G.V.; Dzitac, I.,An ACO Algorithm for Optimal Capacitor Banks Placement inPowerDistributionNetworks, Studies in Informatics and Control,ISSN 1220-1766, Vol.18, No.4, pp. 305-314, 2009(ArticleWOS:000272759700002).  14. Stanojevic, B.; Dzitac, I.; Dzitac, S., On the ratio of fuzzy numbers exact membership function computation andapplicationstodecision making, Technological and Economic Development of Economy,ISSN:2029-4913, Vol.21,No.5, pp. 815-832, 2015.(ArticleWOS:000361984500009)  15. Vesselenyi, T.; Dzitac, I.; Dzitac, S.; Hora, C.; Porumb, C., Preliminary Issues On Brain -MachineContextualCommunicationStructure Development, SOFA 2009, IEEE Proceedings, ISBN 978-1-4244-5054-1, pp. 35-40, 2009.  16. Vesselenyi, T. Dzitac, S.; Dzitac, I.; Manolescu, M.-J. Fuzzy and Neural Controllers for a PneumaticActuator,InternationalJournalofComputers Communications & Control, ISSN 1841-9836, Vol.2, No.4, pp. 375-387,2007  17. Zadeh, L.A. A New Frontier in Computation- Computation with Information Described in Natural Language(slides in PPT).  18. Zadeh, L.A.; Tufis, D.; Filip, F.G.; Dzitac, I. (eds.), From Natural Language to Soft Computing: New ParadigmsinArtificialIntelligence, Editing House of Romanian Academy, ISBN: 978-973-27-1678-6, 2008.  19. <https://waymo.com/>  20. <https://deepmind.com/>  21. <https://en.wikipedia.org/wiki/AlphaZero>  22. <https://www.hansonrobotics.com/sophia/> | | |

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| 8.3 Seminar Outline | Teaching methods | Remarks |
| 8.4 Seminar References | | |
| 8.5 Laboratory Outline | Teaching methods | Remarks |
| 1. Declarative programming paradigm (1 hour)  2. Structure of a program (1 hour)  3.Data syntax (1 hour)  4. Operating mechanism (1 hour)  5.Predefined predicates (1 hour)  6.Negation in PROLOG (1 hour) Problem solving with PROLOG (8 hours) | Direct work will be done by example and running sequences/programs on the computer. |  |
| 8.6 Laboratory References  htpps://www.swi-prolog.org | | |
| 8.7 Project Outline | Teaching methods | Remarks |
| 8.8 Project References | | |

1. Correlation of course outline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

Modern IT products, both software and hardware, are increasingly under the influence of artificial intelligence. The content of the course is designed to provide graduates with the basic knowledge to enable them to use such products.

1. **Evaluation / Grading** (if applicable)

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| Activity type | Evaluation criteria | Evaluation methods | Percentage of the final grade |
| 10.1. Lecture | Checking knowledge about the main artificial intelligence products. | Essay (40%) +Test (30%) | 70% |
| 10.2.  Seminar |  |  |  |
| 10.3.  Laboratory | Check the basics of declarative programming | Program written and run in Prolog | 30% |
| 10.4. Project |  |  |  |
| 10.5 Minimal performance standard  Learning fundamental concepts, using specialized language, making a simple application. | | | |

Course coordinator

Lect.univ.dr. Mihaela-Daciana CRĂCIUN Seminar/laboratory/project coordinator

Lect.univ.dr. Mihaela-Daciana CRĂCIUN

Head of the Department

Lect.univ.dr. Lorena Camelia POPA

Dean

Prof.univ.dr. Sorin-Florin NĂDĂBAN