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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. Ciclul de studii | **Bachelor** |
| 1.7. Study programme / Qualification | **Mathematics informatics** |
| 1.8. Form of education | **Full – Time study** |

1. **Course details**

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| 2.1. Name of the course | **Formal languages and compilers** |
| 2.2. Course coordinator | **Gașpar Octavian-Păstorel, Ph. D.** |
| 2.3. Seminar/laboratory/project coordinator | **Gașpar Octavian-Păstorel, Ph. D.** |
| 2.4. Study year | **2** |
| 2.5. Semester | **2** |
| 2.6. Evaluation type | **summative** |
| 2.7. Course type | **optional** |

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

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| 3.1. Hours per week | **4** |
| 3.2. Lecture hours per week | **2** |
| 3.3. Seminar/laboratory/project hours per week | **2** |
| 3.4. Total hours per curriculum | **56** |
| 3.5. Lecture hours per semester | **28** |
| 3.6. Seminar/laboratory/project hours per semester | **28** |
| Time division [hrs] | |
| 3.4.1. Independent study from textbooks, course support, bibliography and notes | **25** |
| 3.4.2. Additional reading (libraries, specialized electronic platforms and field research) | **15** |
| 3.4.3. Preparing of seminars/laboratories/projects, homework, papers, portfolios and essays | **25** |
| 3.4.4. Tutorial coaching | **0** |
| 3.4.5. Examinations | **4** |
| 3.4.6. Other activities | **0** |
| 3.7. Total individual study hours | **69** |
| 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 | Set theory. |
| 4.2. Competence related |  |

1. **Conditions** (if applicable)

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| 5.1. for the lecture | **Lecture room with black (or white) board and beamer** |
| 5.2. for the seminar |  |
| 5.3. for the laboratory | Lab rooms with black (or white) board, beamer and computers running JFLAP (free for academic use) |
| 5.4. for the project |  |

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

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| 6.1. Competenţe profesionale | **C2.** Mathematical processing of data, analysis of phenomena and processes.  **C3.** Designing and analysing algoritms for solving different problems.  **C5.** Programming in high level programming languages.  **C6**. Analysing, testing and exploiting information systems |
| 6.2. Competenţe transversale | **CT2.** Efficient conduct of team activities.  **CT3.** Efficient use of information, communication resources and assisted education both in romanian 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 | * **Forming abilty to work with formal elemets specific to informatics** * **Developing the capacity of constructiong algorithms, grammars and automata for specified languages** * **Gaining abilities for specific programming of word processing** |
| 7.2. Specific outcomes | * **Knowing and understanding of the basic notions in formal languages: grammars and automata;** * **Understanding of the translation of programs;** * **Knowing algorithms of lexical and sintactical analysis;** * **Gaining theoretical knowledge in the domain of formal languages, working techniques and specific concepts, Chomsky grammars, finite automata, pushdown automata, Turing machines, semantics of programming languages.** |

1. **Outline** (if applicable)

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| 8.1 Lecture Outline | Teaching methods | Remarks |
| 1. Languages, grammars, types of languages. | Interactive presentation. Exemplification | 4 hrs |
| 2. Finite automata and regular languages | Interactive presentation. Exemplification | 4 hrs |
| 3. special properties of regular languages: closure properties, the pumping lemma, regular expressions | Interactive presentation. Exemplification | 4 hrs |
| 4. Context free languages: derivation trees, decidability and ambiguity | Interactive presentation. Exemplification | 4 hrs |
| 5. Normal forma for context-free languages: Greibach and Chomsky, recursive grammars | Interactive presentation. Exemplification | 4 hrs |
| 6 Push-down automata | Interactive presentation. Exemplification | 4 hrs |
| 7. Languages of types 0 and 1: monotone grammars, normal forms, Turing machines | Interactive presentation. Exemplification | 4 hrs |
| 8.2 Lecture References  1. I. M. Chiswell, A course in formal languages, automata and groups, Springer-Verlag, London, 2009  2. P. Linz, An Introduction to Formal Languages and Automata, Jones and Bartlett, Sudbury, Massachusetts, sixthedition, 2016  3. Michel Rigo, Formal Languages, Automata and Numeration Systems, Volume 1-2, Wiley-ISTE, 2014 | | |

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| 8.3 Seminar Outline | Teaching methods | Remarks |
| 8.4 Seminar References | | |
| 8.5 Laboratory Outline | Teaching methods | Remarks |
| 1. Languages, grammars, types of languages. | Interactive presentation. Exemplification | 4 hrs |
| 2. Finite automata and regular languages | Interactive presentation. Exemplification | 4 hrs |
| 3. special properties of regular languages: closure properties, the pumping lemma, regular expressions | Interactive presentation. Exemplification | 4 hrs |
| 4. Context free languages: derivation trees, decidability and ambiguity | Interactive presentation. Exemplification | 4 hrs |
| 5. Normal forma for context-free languages: Greibach and Chomsky, recursive grammars | Interactive presentation. Exemplification | 4 hrs |
| 6 Push-down automata | Interactive presentation. Exemplification | 4 hrs |
| 7. Languages of types 0 and 1: monotone grammars, normal forms, Turing machines | Interactive presentation. Exemplification | 4 hrs |
| 8.6 Laboratory References  1. I. M. Chiswell, A course in formal languages, automata and groups, Springer-Verlag, London, 2009  2. P. Linz, An Introduction to Formal Languages and Automata, Jones and Bartlett, Sudbury, Massachusetts, sixthedition, 2016  3. Michel Rigo, Formal Languages, Automata and Numeration Systems, Volume 1-2, Wiley-ISTE, 2014 | | |
| 8.7 Project Outline | Teaching methods | Remarks |
| 8.8 Project Outline | | |

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

**The contents of the course is according to the ones in other similar universities both inland and abroad. For a better tailoring to the needs of the labor market, meetings were held with both business and education representatives.**

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

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| Activity type | Evaluation criteria | Evaluation methods | Percentage of the final grade |
| 10.1. Lecture | * **Correctness and completion of gained knowledge;** * **Logical coherence;** * **Degree of assimilation of specific terms.**   **Criteria concerning attitude aspects: thoroughness, interst for individual study** | Oral evaluation  Active participations at lectures | 40%  5% |
| 10.2.  Seminar | * **Capacity of operating with gained notions;** * **Capacity of practical application.**   **Criteria concerning attitude aspects: thoroughness, interst for individual study** | Written exam (within the exam session)  Active participation at seminars | 50%  5% |
| 10.3.  Laboratory |  |  |  |
| 10.4. Project |  |  |  |
| 10.5 Minimal performance standard  **Knowing fundamental notions, logical coherence in presentation, solving an easy exercise** | | | |

Course coordinator

Conf. univ. Dr. Octavian-Pastorel GASPAR

Seminar/laboratory/project coordinator

Conf.uinv. Dr. Octavian-Pastorel GASPAR

Head of the Department

Lect.univ.dr. Lorena Camelia POPA

Dean

Prof.univ.dr. Sorin-Florin NĂDĂBAN