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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. Academic year | **2024-2025** |
| 1.6. Study level | **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 | **Algebra 1 (Algebraic structures)** |
| 2.2. Course coordinator | **PhD. Moț Ghiocel** |
| 2.3. Seminar/laboratory/project coordinator | **PhD. Moț Ghiocel** |
| 2.4. Study year | **1** |
| 2.5. Semester | **1** |
| 2.6. Evaluation type | **summative** |
| 2.7. Course type | **compulsory** |

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 | **30** |
| 3.4.2. Additional reading (libraries, specialized electronic platforms and field research) | **30** |
| 3.4.3. Preparing of seminars/laboratories/projects, homework, papers, portfolios and essays | **25** |
| 3.4.4. Tutorial coaching | **5** |
| 3.4.5. Examinations | **4** |
| 3.4.6. Other activities | **0** |
| 3.7. Total individual study hours | **94** |
| 3.8. Total hours per semester | **150** |
| 3.9. Number of ECTS credits | **6** |

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 | Internet access  The classroom is equipped with a blackboard  Computer/Laptop and Video projector |
| 5.2. for the seminar | Internet access  Specific equipment and apparatus  Blackboard |
| 5.3. for the laboratory |  |
| 5.4. for the project |  |

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

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| 6.1. Professional skills | **C1. Develops problem-solving strategies.**  **C2. Performs analytical mathematical calculations.**  **C5. Communicates mathematical information.** |
| 6.2. Transversal skills | **TC1. Shows initiative.**  **TC5. Shows confidence.** |

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

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| 7.1. General outcomes | - The student should know the basic notions and understand the important theorems for algebraic structures.  - The student should develop the skills to correctly apply the accumulated knowledge to solve different types of problems.  - The student must train and develop his ability to think and analyze problems. |
| 7.2. Specific outcomes | - The student is able to demonstrate that he has acquired sufficient knowledge to understand the basic notions.  - The student is able to correctly apply basic methods and principles in solving algebraic structures problems.  - The student is able to recognize the main classes/types of algebra problems and select the appropriate methods and techniques for solving them. |

1. **Outline** (if applicable)

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| 8.1 Lecture Outline | Teaching methods | Remarks |
| CHAPTER 1. LAWS OF COMPOSITION  1.1. Stable part. Law of induced composition.  1.2. Properties  CHAPTER 2. UNARY ALGEBRAIC STRUCTURES  2.1. The algebraic structure of the monoid. Examples  2.2. Morphisms of monoids  2.3. Algebraic group structure. Examples  2.4. Morphisms of groups  2.5. Subgroups. Lateral classes determined by a subgroup in a group  2.6. Invariant subgroup. The factor group  2.7. Isomorphism theorems  2.8. Cyclic groups  2.9. The equivalence relations determined by a subgroup. Lagrange's theorem  CHAPTER 3. BINARY ALGEBRAIC STRUCTURES  3.1. Rings. Definitions and examples  3.2. Sub-rings  3.3. Ring morphisms  3.4. Remarkable rings  3.5. Fields  3.6. Field morphisms  3.7. Remarkable fields | Participatory lecture, problematization, demonstration, exemplification | 4 hours  14 hours  10 hours |
| 8.2 Lecture References  **1. B. Bogoșel, Probleme de structuri algebrice, Ed. Gil, 2016.**  **2. D. Mihet, Structuri algebrice prin exemple si contraexemple, Ed. Politehnica, 2011.**  **3. G. Moț, Note de curs și seminar-Structuri algebrice, SUMS, 2024.**  **4. G. Moț, C. L. Mihiț, Algebra. Seminar and course support, “Aurel Vlaicu” Univ. Publishing House Arad, 2019.**  **5. G. Moț, L. Popa, Algebră superioară pentru profilurile tehnic şi economic. Teorie şi aplicaţii-ediția a 2-a, Ed. Univ. “Aurel Vlaicu” Arad, 2013.**  **6. V. Popuța, Algebra. Curs elementar de structuri fundamentale, Ed. Mirton, Timișoara, 1998.**  **7. I. Purdea, I. Pop, Algebra, Ed. Gil, 2003.** | | |

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| 8.3 Seminar Outline | Teaching methods | Remarks |
| CHAPTER 1. LAWS OF COMPOSITION  1.1. Stable part. Law of induced composition.  1.2. Properties  CHAPTER 2. UNARY ALGEBRAIC STRUCTURES  2.1. The algebraic structure of the monoid. Examples  2.2. Morphisms of monoids  2.3. Algebraic group structure. Examples  2.4. Morphisms of groups  2.5. Subgroups. Lateral classes determined by a subgroup in a group  2.6. Invariant subgroup. The factor group  2.7. Isomorphism theorems  2.8. Cyclic groups  2.9. The equivalence relations determined by a subgroup. Lagrange's theorem  CHAPTER 3. BINARY ALGEBRAIC STRUCTURES  3.1. Rings. Definitions and examples  3.2. Sub-rings  3.3. Ring morphisms  3.4. Remarkable rings  3.5. Fields  3.6. Field morphisms  3.7. Remarkable fields | Exercises, applications, debates | 4 hours  14 hours  10 hours |
| 8.4 Seminar References | | |
| 8.5 Laboratory Outline | Teaching methods | Remarks |
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| 8.6 Laboratory References | | |
| 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 content of the discipline is consistent with what is done in other university centers in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with mathematics and computer science teachers from the Arad pre-university education.

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

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| Activity type | Evaluation criteria | Evaluation methods | Percentage of the final grade |
| 10.1. Lecture | **• completeness of knowledge;**  **• logical coherence;**  **• degree of assimilation of the specialized language;**  **• the criteria for attitudinal aspects: seriousness, interest in the topic addressed** | final written exam at the end of the semester  active participation in courses | 40%  10% |
| 10.2.  Seminar | **• the ability to operate with assimilated knowledge;**  **• the ability to apply in practice;**  **• conscientiousness and interest in studying.** | partial written exam during the semester  active participation in seminars | 40%  10% |
| 10.3.  Laboratory |  |  |  |
| 10.4. Project |  |  |  |
| 10.5 Minimal performance standard  **Knowledge of basic theoretical notions and their application in solving problems.** | | | |

Course coordinator

Prof.univ.dr. Ghiocel MOȚ

Seminar/laboratory/project coordinator

Prof.univ.dr. Ghiocel MOȚ

Head of the Department

Lect.univ.dr. Lorena Camelia POPA

Dean

Prof.univ.dr. Sorin-Florin NĂDĂBAN