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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 and Computer Science** |
| 1.8. Form of education | **Full – Time study** |

1. **Course details**

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| 2.1. Name of the course | **GlCS4O09 Differential geometry** |
| 2.2. Course coordinator | **Dr. Stoica Codruța Simona** |
| 2.3. Seminar/laboratory/project coordinator | **Dr. Stoica Codruța Simona** |
| 2.4. Study year | **2** |
| 2.5. Semester | **2** |
| 2.6. Evaluation type | **Es** |
| 2.7. Course type | **Ob** |

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 | **20** |
| 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 | **5** |
| 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 | Mathematical Analysis on R, Analytic Geometry |
| 4.2. Competence related | Calculation of derivatives and integrals, knowledge of analytical representations of lines and planes in space, calculation of determinants. |

1. **Conditions** (if applicable)

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| 5.1. for the lecture | Classroom equipped with laptop, video projector and appropriate software Mathcad prime. |
| 5.2. for the seminar | Classroom equipped with laptop, video projector and appropriate software Mathcad prime. |
| 5.3. for the laboratory |  |
| 5.4. for the project |  |

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

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| 6.1. Competenţe profesionale | **C1.** Working with mathematical concepts and methods.  **C2.** Mathematical processing of data, analysis of phenomena and processes.  **C4.** Conceiving models for describing phenomena. |
| 6.2. Competenţe transversale | **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. |

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

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| 7.1. General outcomes | **-The student should know and understand the basic notions of differential geometry.**  **- The student should develop his skills to correctly apply the accumulated theoretical knowledge to solve differential geometry problems.**  **- The student must train and develop his capacity for analysis and synthesis.** |
| 7.2. Specific outcomes | **-The student is able to demonstrate that he has acquired sufficient knowledge to understand notions such as: arc element, tangent and normal, curvature, osculating circle, evolved and involute, in the case of plane curves; arc element, tangent, normal plane, curvature and torsion, osculating circle, evolved and involute, in the case of spatial curves; tangent plane, normal, area element, curvature, in the case of surfaces.**  **- The student is able to apply the concepts learned in the study of plane curves, space curves, respectively surfaces.**  **- The student can create projects for the mathematical modeling of a concrete problem.** |

1. **Outline** (if applicable)

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| 8.1 Lecture Outline | Teaching methods | Remarks |
| **Chapter 1.** Differential geometry of plane curves 1.1. Analytical representation of plane curves. 1.2. Remarkable smooth curves. 1.3. The spring element of a plane curve. 1.4. Tangent and normal at a point of a plane curve. 1.5. The tangent segment, the normal segment, the subtangent segment and the subnormal segment. 1.6. Singular points of a plane curve. 1.7. The curvature of a plane curve. 1.8. The contact of two plane curves. 1.9. The osculating circle. 1.10. The envelope of a family of plane curves. 1.11. Develop the involute of a plane curve. | Participatory lecture, debate, interactive exposition, documentation on the web, exemplification, problematization | Chapter 1 - 10 hours |
| **Chapter 2**. Differential geometry of curves in space 2.1. Analytical representation of curves in space. 2.2. The spring element. The length of an arc dde curve. 2.3. The tangent and the normal plane to a spatial curve. 2.4. Frenet's triad. 2.5. Frenet's forms. Curvature and torsion of a curve in space. 2.6. The osculating circle at a point of a curve in space. 2.7. The wrapping of a family of curves in space. 2.8. The evolution and involute of a curve in space. | Participatory lecture, debate, interactive exposition, documentation on the web, exemplification, problematization | Chapter 2 - 8 hours |
| **Chapter 3.** Differential geometry of surfaces 3.1. Analytical representation of surfaces. 3.2. Curves drawn on a surface. 3.3. The tangent plane at a point of a surface. 3.4. The normal at a point on a surface. 3.5. The first fundamental form of a surface. 3.6. Long arc of a curve drawn on a surface. 3.7. The angle between two curves located on a surface. 3.8. The area element of the surface nut. 3.9. The second fundamental form of a surface. 3.10. Normal curvature. Asymptotic directions. Symptotic line. 3.11. Main curves. Total curvature. Average curvature. 3.12. Geodetic. | Participatory lecture, debate, interactive exposition, documentation on the web, exemplification, problematization | Chapter 3 - 2 hours |
| 8.2 Lecture References  **1. Suport de curs "Geometrie diferentială" - platforma SUMS, 2024**  **2. Moț G., Popa L., Algebră liniară, geometrie analitică și geometrie diferențială, Editura Universității “Aurel Vlaicu”,2015.**  **3. G. Moţ, L. Gaga, L. Popa, L.Sida, T. Bulzan, Exerciţii şi probleme de matematici superioare pentru profilurile tehnicşi economic, Editura Viaţa arădeană, Arad, 2003.**  **4. Nicolae Boja, Geometrie analitică şi diferenţială cu aplicaţii, Ed. Politehnica, Timişoara 2008.**  **5. Camelia Arieşanu, Anania Gîrban, Şapte lecţii de geometrie analitică şi diferenţială în spaţiul euclidian 3D,Ed.Politehnica, Timişoara 2008.** | | |

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| 8.3 Seminar Outline | Teaching methods | Remarks |
| Chapter 1. Differential geometry of plane curves 1.1. Analytical representation of plane curves. 1.2. Outstanding flat curves. 1.3. The spring element of a plane curve. 1.4. Tangent and normal at a point of a plane curve. 1.5. Tangent segment, normal segment, subtangent segment and subnormal segment. 1.6. Singular points of a plane curve. 1.7. The curvature of a plane curve. 1.8. The contact of two plane curves. 1.9. The osculating circle. 1.10. The envelope of a family of plane curves. 1.11. Develop the involute of a plane curve. | • The exercise • Heuristic conversation • Problematization. • Individual work and team work | Chapter 1 - 10 hours |
| Chapter 2. Differential geometry of curves in space 2.1. Analytical representation of curves in space. 2.2. The spring element. The length of an arc of a curve. 2.3. The tangent and the plane normal to the curve in space. 2.4. Frenet's triad. 2.5. Frenet's forms. The curvature and torsion of a curve in space. 2.6. The osculating circle at a point of a curve in space. 2.7. The wrapping of a family of curves in space. 2.8. The evolution and involute of a curve in space. | • The exercise • Heuristic conversation • Problematization. • Individual work and team work | Chapter 2 - 8 hours |
| Chapter 3. Differential geometry of surfaces 3.1. Analytical representation of surfaces. 3.2. Curves drawn on a surface. 3.3. The tangent plane at a point of a surface. 3.4. The normal at a point on a surface. 3.5. The first fundamental form of a surface. 3.6. Long arc of a curve drawn on a surface. 3.7. The angle between two curves located on a surface. 3.8. The area element of the surface nut. 3.9. The second fundamental form of a surface. 3.10. Normal curvature. Asymptotic directions. Asymptotic lines. 3.11. Main curves. Total curvature. Average curvature. 3.12. Geodetic. | • The exercise • Heuristic conversation • Problematization. • Individual work and team work | Chapter 2 - 10 hours |
| 8.4 Seminar References  **1. Moț G., Popa L., Algebră liniară, geometrie analitică și geometrie diferențială, Editura Universității “AurelVlaicu”,2015.**  **2. G. Moţ, L. Gaga, L. Popa, L.Sida, T. Bulzan, Exerciţii şi probleme de matematici superioare pentru profiluriletehnicşi economic, Editura Viaţa arădeană, Arad, 2003.**  **3. G. Moţ, A. Petruşel, Matematici speciale pentru ingineri şi economişti, Ed. Mirton, Timişoara, 1999.**  **4. Nicolae Boja, Geometrie analitică şi diferenţială cu aplicaţii, Ed. Politehnica, Timişoara 2008.**  **5. Camelia Arieşanu, Anania Gîrban, Şapte lecţii de geometrie analitică şi diferenţială în spaţiul euclidian 3D,Ed.Politehnica, Timişoara 2008.** | | |
| 8.5 Laboratory Outline | Teaching methods | Remarks |
| 8.6 Laboratory Outline | | |
| 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 subject to the demands of the labor market, meetings were held both with representatives of the business environment and with mathematics and computer science teachers from the pre-university education of Arad.

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 completeness of knowledge;  - logical coherence; - degree of assimilation of specialized language;  - criteria aimed at attitudinal aspects: conscientiousness, interest in individual study.  - correctness and completeness of knowledge;  - logical coherence; - degree of assimilation of specialized language;  - criteria aimed at attitudinal aspects: conscientiousness, interest in individual study. | Written assessment (final in the exam session)  Written assessment (during the semester): partial exam  Active participation in classes. | 10%  10%  10% |
| 10.2.  Seminar | **- correctness and completeness of knowledge;**  **- logical coherence;**  **- degree of assimilation of specialized language;**  **- criteria aimed at attitudinal aspects: conscientiousness, interest in individual study.** | Written assessment (final in the exam session)  Written assessment (during the semester): partial exam  Active participation in seminars | 30%  30%  10% |
| 10.3.  Laboratory |  |  |  |
| 10.4. Project |  |  |  |
| 10.5 Minimal performance standard  **Knowing the fundamental elements of theory, solving a simple application.** | | | |
| |  |  |  |  | | --- | --- | --- | --- | | Course coordinator | Seminar/laboratory/project coordinator | Head of the Department | Dean | | Prof.univ.dr. Codruța Simona Stoica | Prof.univ.dr. Codruța Simona Stoica | Lect.univ.dr. Lorena Camelia POPA | Prof.univ.dr. Sorin-Florin NĂDĂBAN | | | | |