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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 | **Complex Analysis** |
| 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 | **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 | **35** |
| 3.4.2. Additional reading (libraries, specialized electronic platforms and field research) | **0** |
| 3.4.3. Preparing of seminars/laboratories/projects, homework, papers, portfolios and essays | **30** |
| 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 | Calculus in R and R^n |
| 4.2. Competence related | Operating with mathematical notions |

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 | **Seminar room with black (or white) board and beamer** |
| 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.  **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 | **Using of theoretical fundaments of mathematics and of formal models** |
| 7.2. Specific outcomes | 1. **Knowing fundamental concepts of complex analysis like holomorphy and complex integral** 2. **Assimilating important principles on holomorphic functions** 3. **Gaining knowledge on solving complex analysis problems** 4. **Applying complex analysis methods in solving difficult classical analysis problems** |

1. **Outline** (if applicable)

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| 8.1 Lecture Outline | Teaching methods | Remarks |
| 1. Algebraic and topological structure of the complex plain. Stereographic projection, Complex functions | Interactive presentation. Exemplification | 2 hrs |
| 2. Analiticity and complex derivation. Partial derivatives and the Cauchy Riemann conditions. Power series. Holomorphic functions as power series | Interactive presentation. Exemplification | 6 hrs |
| 3.Compex integral. Path integrals. Cauchy integrals. Analytic functions. Primitivable functions. Theorems of Moreera and Weierstrass | Interactive presentation. Exemplification | 8 hrs |
| 4. Power series expansions of analytic functions. Cauchy’s integral formula and Taylor representation. The maximum modulud principle. Theorems of Liouville and D’Alembert. Entire functions.Zeroes of holomorphic functions. Holomorphic functions on an annulus. Laurent representations | Interactive presentation. Exemplification | 8 hrs |
| 5. Residues. The index theorem. Singularities, residues and the residue formula. Cauchy’s theorem. Applications | Interactive presentation. Exemplification | 4 hrs |
| 8.2 Lecture References  **1. L. V. Ahlfors: Complex Analysis. An Introduction to the Theory of Analytic Functions of One Complex Variable, 3rd Edition, McGraw-Hill, 1979.**  **2. D. Gaspar, N. Suciu : Analiză complexă, Editura Academiei Romane, 1999.**  **3. J. R. Muir : Complex Analysis: A Modern First Course in Function Theory, Wiley&Sons, New Jersey, 2015.**  **4. W. Rudin : Real and Complex Analysis, McGraw-Hill, 1987**  **5. D. G. Zill, P. D. Shanahan : A First Course in Complex Analysis with Applications, Jones and Bartlett, 2003.** | | |

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| 8.3 Seminar Outline | Teaching methods | Remarks |
| 1. Algebraic and topological structure of the complex plain. Stereographic projection, Complex functions | Interactive presentation. Exemplification | 2 hrs |
| 2. Analiticity and complex derivation. Partial derivatives and the Cauchy Riemann conditions. Power series. Holomorphic functions as power series | Interactive presentation. Exemplification | 6 hrs |
| 3.Compex integral. Path integrals. Cauchy integrals. Analytic functions. Primitivable functions. Theorems of Moreera and Weierstrass | Interactive presentation. Exemplification | 8 hrs |
| 4. Power series expansions of analytic functions. Cauchy’s integral formula and Taylor representation. The maximum modulud principle. Theorems of Liouville and D’Alembert. Entire functions.Zeroes of holomorphic functions. Holomorphic functions on an annulus. Laurent representations | Interactive presentation. Exemplification | 8 hrs |
| 5. Residues. The index theorem. Singularities, residues and the residue formula. Cauchy’s theorem. Applications | Interactive presentation. Exemplification | 4 hrs |
| 8.4 Seminar References  **1. L. V. Ahlfors: Complex Analysis. An Introduction to the Theory of Analytic Functions of One Complex Variable, 3rd Edition, McGraw-Hill, 1979.**  **2. D. Gaspar, N. Suciu : Analiză complexă, Editura Academiei Romane, 1999.**  **3. J. R. Muir : Complex Analysis: A Modern First Course in Function Theory, Wiley&Sons, New Jersey, 2015.**  **4. W. Rudin : Real and Complex Analysis, McGraw-Hill, 1987**  **5. D. G. Zill, P. D. Shanahan : A First Course in Complex Analysis with Applications, Jones and Bartlett, 2003.** | | |
| 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 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