



## SYLLABUS

### 1. Study programme

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	Informatics
1.5. Academic year	2024-2025
1.6. Study level	Bachelor
1.7. Study programme / Qualification	Computer Science
1.8. Form of education	Full – Time study

### 2. Course details

2.1. Name of the course	Differential equations and with partial derivatives
2.2. Course coordinator	PhD. Moț Ghiocel
2.3. Seminar/laboratory/project coordinator	PhD. Mihiț Claudia Luminița
2.4. Study year	2
2.5. Semester	1
2.6. Evaluation type	summative
2.7. Course type	compulsory

### 3. Estimated total time (hours per semester)

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

### 4. Prerequisites (if applicable)

4.1. Curriculum related	-Calculus
4.2. Competence related	-Elements of calculus: limits of functions, derivatives, integrals

### 5. Conditions (if applicable)

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	

### 6. Specific educational objectives (competences to be acquired)

6.1. Professional skills	<b>C3.Using computer tools in interdisciplinary context;</b> <b>C4.Using the theoretical bases of computers and formal models.</b>
6.2. Transversal skills	<b>CT1.Applying the rules of organized and efficient work, of responsible attitudes towards teaching-scientific field, to value the own creative potential, while respecting the principles and norms of professional ethics.</b> <b>CT3.Using of efficient methods and techniques for learning, informing, research and development of the capacity to value knowledge, adapting to the requirements of a dynamic society and communicating in English and in an Internationally widespread language.</b>

### 7. Course outcomes (resulting from the specific educational objectives to be acquired)

7.1. General outcomes	<ul style="list-style-type: none"> <li>- The student should understand and realize the modeling of phenomena from various fields of science and technology with the help of differential equations and equations with partial derivatives.</li> <li>- The student should know the classic types of differential equations and equations with partial derivatives of the 1st order and higher order.</li> <li>- The student must train and develop his ability to think and analyze.</li> </ul>
7.2. Specific outcomes	<ul style="list-style-type: none"> <li>- The student to apply the solving algorithms for differential equations and equations with partial derivatives of the 1st order and of higher order.</li> <li>- The student should deepen the existence theorems of the solutions of differential equations and Cauchy problems.</li> <li>- The student is able to select and correctly apply the methods and basic principles learned in solving equations and systems of differential equations, of equations with partial derivatives.</li> </ul>

### 8. Outline (if applicable)

8.1 Lecture Outline	Teaching methods	Remarks
1. Differential equations of the 1st order <ul style="list-style-type: none"> <li>1.1. Equations with separable variables</li> <li>1.2. Homogeneous differential equations</li> <li>1.3. Linear differential equations of the 1st order</li> <li>1.4. Bernoulli type equations</li> <li>1.5. Riccati type equations</li> <li>1.6. Equations with exact total differential</li> <li>1.7. Implicit equations</li> </ul>	Participatory lecture, problematization, demonstration, exemplification	6 hours
2. Differential equations of higher order <ul style="list-style-type: none"> <li>2.1. Differential equations of higher order integrable by quadrature</li> <li>2.2. Differential equations of higher order that admit order reduction</li> <li>2.3. Linear differential equations of higher order</li> <li>2.4. Differential equations of the Euler type</li> </ul>		4 hours
3. Systems of differential equations <ul style="list-style-type: none"> <li>3.1. Reduction to a single higher order equation</li> <li>3.2. Symmetrical systems, integrable combinations</li> <li>3.3. Linear differential systems</li> <li>3.4. Systems of linear differential equations with constant coefficients</li> <li>3.5. Stability of system solutions</li> </ul>		6 hours
4. Equations with linear partial derivatives of the 1st order <ul style="list-style-type: none"> <li>4.1. Linear and homogeneous equations with partial derivatives of the 1st order</li> <li>4.2. Equations with partial derivatives of the 1st order linear and inhomogeneous</li> </ul>		6 hours
5. Equations with partial derivatives of order 2. Mathematical physics equations <ul style="list-style-type: none"> <li>5.1. Equations with partial derivatives of the 2nd order of the hyperbolic type</li> <li>5.2. Equations with partial derivatives of the 2nd order of the parabolic type</li> <li>5.3. Equations with partial derivatives of the 2nd order of elliptic type</li> <li>5.4. Equations with partial derivatives of the 2nd order of mixed type</li> </ul>		6 hours
8.2 Lecture References <ol style="list-style-type: none"> <li>1. A. Eckstein, D. Hărăguș, <i>Exerciții standard de ecuații cu derivate parțiale</i>, Tip. Univ. de Vest din Timișoara, 2000.</li> <li>2. G. Moș, C. L. Mihiț, <i>Note de curs și seminar-Ecuatii diferențiale și cu derivate parțiale</i>, SUMS, 2024.</li> <li>3. R. Precup, <i>Ecuatii diferențiale</i>, Risoprint, Cluj-Napoca, 2011.</li> <li>4. M. Reghiș, P. Topuzu, <i>Ecuatii diferențiale ordinare</i>, Ed. Mirton, Timișoara, 2000.</li> <li>5. C. Stoica, <i>Ecuatii diferențiale și cu derivate parțiale prin exerciții și probleme</i>, Ediția a II-a revăzută și completată, Ed. Mirton, Timișoara, 2004.</li> </ol>		

8.3 Seminar Outline	Teaching methods	Remarks
1. Differential equations of the 1st order 1.1. Equations with separable variables 1.2. Homogeneous differential equations 1.3. Linear differential equations of the 1st order 1.4. Bernoulli type equations 1.5. Riccati type equations 1.6. Equations with exact total differential 1.7. Implicit equations	Exercises, applications, debates	6 hours
2. Differential equations of higher order 2.1. Differential equations of higher order integrable by quadrature 2.2. Differential equations of higher order that admit order reduction 2.3. Linear differential equations of higher order 2.4. Differential equations of the Euler type		4 hours
3. Systems of differential equations 3.1. Reduction to a single higher order equation 3.2. Symmetrical systems, integrable combinations 3.3. Linear differential systems 3.4. Systems of linear differential equations with constant coefficients 3.5. Stability of system solutions		6 hours
4. Equations with linear partial derivatives of the 1st order 4.1. Linear and homogeneous equations with partial derivatives of the 1st order 4.2. Equations with partial derivatives of the 1st order linear and inhomogeneous		6 hours
5. Equations with partial derivatives of order 2. Mathematical physics equations 5.1. Equations with partial derivatives of the 2nd order of the hyperbolic type 5.2. Equations with partial derivatives of the 2nd order of the parabolic type 5.3. Equations with partial derivatives of the 2nd order of elliptic type 5.4. Equations with partial derivatives of the 2nd order of mixed type		6 hours
8.4 Seminar References		
1. A. Eckstein, D. Hărăguș, Exerciții standard de ecuații cu derivate parțiale, Tip. Univ. de Vest din Timișoara, 2000. 2. G. Moț, C. L. Mihiț, Note de curs și seminar-Ecuații diferențiale și cu derivate parțiale, SUMS, 2024. 3. R. Precup, Ecuații diferențiale, Risoprint, Cluj-Napoca, 2011. 4. M. Reghiș, P. Topuzu, Ecuații diferențiale ordinare, Ed. Mirton, Timișoara, 2000. 5. C. Stoica, Ecuații diferențiale și cu derivate parțiale prin exerciții și probleme, Ediția a II-a revăzută și completată, Ed. Mirton, Timișoara, 2004.		
8.5 Laboratory Outline	Teaching methods	Remarks
8.6 Laboratory Outline		
8.7 Project Outline	Teaching methods	Remarks
8.8 Project Outline		

**9. 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.

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

Activity type	Evaluation criteria	Evaluation methods	Percentage of the final grade
10.1. Lecture	<b>Checking knowledge about the main notions related to differential equations and equations with partial derivatives.</b>	written exam	50%
10.2. Seminar	<b>Checking the main applications related to differential equations and equations with partial derivatives.</b>	partial written exam	50%
10.3. Laboratory			
10.4. Project			
10.5 Minimal performance standard			
<b>Knowledge of basic theoretical notions and their application in solving problems.</b>			

Course coordinator  
Prof.univ.dr. Ghiocel MOȚ

Seminar/laboratory/project coordinator  
Lect.univ.dr. Claudia MIHIȚ

Head of the Department  
Lect.univ.dr. Lorena Camelia POPA

Dean  
Prof.univ.dr. Sorin-Florin NĂDĂBAN