



DISCIPLINE ACADEMIC SHEET
ACADEMIC YEAR 2025 – 2026

1. PROGRAMME DATA

1.1. Higher Education Institution	UNIVERSITY OF CRAIOVA
1.2. Faculty	Automation, Computers and Electronics
1.3. Department	Computers and Information Technology
1.4. Field of Study	Computers and Information Technology
1.5. Study level	L(License / Undergraduate)
1.6. Organizational form	IF
1.7. Study Program (name/code) /Qualification	Computers / L2060101010

2. DISCIPLINE DATA

2.1 Discipline Name				Numerical Methods			
2.2 Course Activities Holder				Assoc. Prof. Maria-Magdalena Boureanu			
2.3. Practical Activities Holder				Assist. Madalina Brezoi			
2.4. Study Year	2	2.5. Semester	2	2.6. Evaluation type	E	2.7. Discipline regime	DOB

3. ESTIMATED TOTAL TIME (hours per semester of teaching activities)

3.1. Number of hours per week	4	in which: 3.2 course	2	3.3. sem./lab./pr.	2
3.4. Total hours of curriculum	56	in which: 3.5 course	28	3.6. sem./lab./pr.	28
3.7. Time distribution - hours/week					3
Study after manual, course support, bibliography and notes					28
Additional documentation in library, on specialized electronic platforms and field					7
Training seminars / labs, homework, portfolios and essays					7
Tutorial					
Examinations					2
Other activities.....					
Total hours per individual activities					44
3.8. Total hours per semester					100
3.9. Number of credits					4

4. PRECONDITIONS (where appropriate)

4.1. of curriculum	• Linear Algebra • Mathematical Analysis • Differential Equations • Computer Programming
4.2. of competence	• Knowledge of vectors and matrices • Understanding of calculus and differential equations • Basic programming skills in C/C++

5. CONDITIONS (where appropriate)

5.1. of the course	The teaching is thought to be both explanatory and interactive and it is done on-site, by writing at the blackboard. In addition, the teacher remains connected permanently to the students during the entire week via Google Classroom. Our approach is student-centered, focusing on their needs, interests, and active participation in the learning process. Approximately 70% of the course consists of theoretical teaching based on the course syllabus, while the remaining 30% involves direct interaction with students. This balance ensures that the learning experience is not only well-structured and effective but also engaging and motivating for students to take an active role in their education. All new notions, definitions, properties, and theorems are introduced rigorously. The main focus is to ensure that students clearly understand the new concepts, their significance, and their applications. Selected proofs of the theorems are presented in class, while for others, students are referred to appropriate references. For each theorem, we illustrate some applications on the blackboard, as we believe that performing calculations by hand is one of the most effective ways to ensure a solid understanding of both the mathematics and the corresponding algorithms.
5.2. of seminar/ laboratory/project	Equipment needed for this discipline: computers, the appropriate programming languages, internet connection and access to online platforms (Google Classroom etc). Our goal is to make students better understand the numerical algorithms and to be able to utilize them by means of programming languages.

6. COURSE OBJECTIVES – expected learning outcomes that are supported by completing and passing the course

Knowledge	1. The student/graduate identifies and describes basic concepts, principles, and methods in mathematics and computer science. 2. The student/graduate explains and interprets theoretical and experimental results in mathematics and computer science.
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Skills (Abilities)	1. The student/graduate operates with basic concepts, principles, and methods in mathematics and computer science. 2. The student/graduate solves mathematical problems with applicability in engineering and validates the obtained solution. 3. The student/graduate applies evaluation criteria and methods to identify, model, experiment, analyze, and qualitatively and quantitatively assess phenomena and processes specific to the fundamental field, including through the use of digital technologies. 4. The student/graduate acquires and processes data, and interprets theoretical and experimental results. 5. The student/graduate designs solutions, in compliance with relevant standards, for engineering problems of medium complexity that meet specified needs, while respecting public health, safety, welfare, environmental, sustainability, and economic requirements, as well as other specific constraints. 6. The student/graduate applies modern project management, economic, and decision-making techniques, including within a multidisciplinary framework.
Responsibility and autonomy	1. The student/graduate applies the values of ethics and professional deontology of the engineering profession. 2. The student/graduate practices logical reasoning, evaluation, and self-evaluation in decision-making. 3. The student/graduate communicates effectively about engineering activities with a wide range of audiences. 4. The student/graduate is engaged in lifelong learning to acquire and implement knowledge, as needed, using appropriate learning strategies. 5. The student/graduate promotes dialogue, cooperation, respect for others, and interculturality.

7. CONTENT

7.1. Course	The method of implementation	Teaching methods	Allocated time (hours)
1. Solving linear systems by direct methods: Gauss method (basic, with partial pivoting, with total pivoting), LR factorization method (Doolittle, Crout).	face to face	The main method of providing information for knowledge is through lectures and supporting material. The electronic materials are at the disposal of the students via Google	6

		Classroom, where we can also interact during the entire week. To assist the students in assimilating this knowledge we use different means, like debate, exposition, exemplification, dialogue. The structure of the course takes into consideration the fact that 70% of the activity represents a theoretical teaching and 30% of the activity represents dynamic interaction with students	
2. The calculus of a determinant and of the inverse of a matrix (Gauss method, LR factorization method, Chio method).	face to face		2
3. Iterative methods: solving linear systems (Jacobi method, Seidel-Gauss method); solving nonlinear equations (successive approximation method; Newton method).	face to face		4
4. Characteristic polynomial, eigenvalues and eigenvectors (Krylov method, Fadeev method).	face to face		4
5. Lagrange interpolating polynomial, Newton interpolating polynomial.	face to face		4
6. Numerical evaluation of simple integrals (trapeze method, Simpson method).	face to face		2
7. Numerical evaluation of double integrals.	face to face		2
8. Differential equations: Euler method, Runge-Kutta method, finite difference method.	face to face		4
Bibliography:			
1. Boureanu M.M. and Temereanca L.E., A friendly course on Numerical Methods (2022), online course for students https://www.ucv.ro/departamente-academice/dma/activitate-didactica/discipline.php			
2. Ayyub, B. M., & McCuen, R. H. (2026). Numerical analysis for engineers: Methods and applications (3rd ed.). CRC Press.			

3. J.R. Chasnov, Numerical Methods, Creative Commons Attribution 3.0 Hong Kong License, 2012, online course available at https://www.math.ust.hk/~machas/numerical-methods.pdf
4. Corriou, J.-P. (2022). Numerical methods and optimization: Theory and practice for engineers. Springer.
5. Epperson, J. F. (2021). An introduction to numerical methods and analysis (3rd ed.). Wiley.
6. Lindfield, G., & Penny, J. (2025). Numerical methods (5th ed.). Academic Press.
7. Militaru R., Méthodes Numériques. Théorie et Applications, Ed. Sitech, Craiova, 2008
8. Novak, K. (2022). Numerical methods for scientific computing: The definitive manual for math geeks. Open SUNY Textbooks.
9. Popa M., Militaru R., Metode numerice - algoritmi și aplicații, Ed. Sitech, Craiova, 2007
10. Racila M., Metode Numerice pentru studenții automatiști, Ed. Universitaria, 2020

7.2. Seminar/laboratory/project	The method of implementation	Teaching methods	Allocated time (hours)
1. Solving linear systems by direct methods: Gauss method (basic, with partial pivoting, with total pivoting), LR factorization method (Doolittle, Crout).	face to face	The algorithms developed during the course are implemented as computer programs. In order to help the students to develop the necessary skills, we use several methods such as exercising, discussions, brainstorming, debate. Laboratory platforms (containing the abstract of the theory and the basic algorithms) are put at the disposal of the students.	6
2. The calculus of a determinant and of the inverse of a matrix (Gauss method, LR factorization method, Chio method).	face to face		2
3. Iterative methods: solving linear systems (Jacobi method, Seidel-Gauss method); solving nonlinear equations (successive approximation method; Newton method).	face to face		4
4. Characteristic polynomial, eigenvalues and eigenvectors (Krylov method, Fadeev method).	face to face		4

5. Lagrange interpolating polynomial, Newton interpolating polynomial.	face to face		4
6. Numerical evaluation of simple integrals (trapeze method, Simpson method).	face to face		2
7. Numerical evaluation of double integrals.	face to face		2
8. Differential equations: Euler method, Runge-Kutta method, finite difference method.	face to face		4
Bibliography:			
1. M.M. Boureanu and L.E. Temereanca, A friendly course on Numerical Methods (2022), online course for students https://www.ucv.ro/departamente-academice/dma/activitate-didactica/discipline.php			
2. M.M. Boureanu si L.E. Temereanca, Numerical Methods – Info for lab (2021), online course https://www.ucv.ro/pdf/departamente_academice/dma/suporturi_curs/Laboratoare_eng_2021.pdf			
3. Epperson, J. F. (2021). An introduction to numerical methods and analysis (3rd ed.). Wiley			
4. Popa M., Militaru R., Metode numerice in pseudocod. Aplicatii, Ed. Sitech, Craiova, 2013			
5. Racila M., Metode Numerice pentru studentii automatiști, Ed. Universitaria, 2020			

8. Correlating the content of the discipline with the expectations of representatives from the epistemic community, professional associations and representative employers in the field related to the program

By completing this course, students acquire and develop key concepts, methods, and modern mathematical techniques that are widely used in mathematical modeling and engineering problem-solving. These skills align with the expectations of the academic and professional community, including professional associations and employers in engineering and applied sciences, who require graduates to be proficient in applying numerical methods to real-world problems and computational challenges.

9. EVALUATION

Activity Type	9.1. Evaluation criteria	9.2. Evaluation methods	9.3. Final mark weight
9.4. Course	We evaluate the ability of the students to: - understand the problem; - formulate the mathematical statement of the problem; - solve the problem; - understand the numerical algorithms and to be able to utilize them by	The final exam consists in written examination that involves solving problems. Mandatory condition in order for the students to be allowed to sustain the exam: accomplishment of all the the projects of the practical activities from the laboratory.	75%

	means of programming languages.		
9.5. Seminar/laboratory/project	We evaluate: - the capacity to create or understand numerical algorithms based on the methods presented at the course and the ability to utilize them by means of programming languages; - the degree of development of the practical abilities to handle the notions, the techniques, and the numerical methods that were introduced; - the creativity of the students which are encouraged to find different ways to improve a basic algorithm by applying what they have learned from the mathematical discussion.	The evaluation of the practical activities is based on the evaluation of the interest shown by students, their correct answers, and on the quality of the algorithms inserted by them on the computer.	25%
9.6. Minimum standard of performance			
Obtaining of at least 5(five) points from the maximum of 10(ten).			

Date of Completion	Signature of the Course Activities Holder,	Signature of the Practical Activities Holder,
23.08.2025		

Date of Approval in the Department	Signature of the Department Director,
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25.08.2025	Ș.l.dr.ing. Nicolae ENESCU
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Date of Approval in the Faculty	Signature of the Dean,
	Prof.dr.ing. Dorin ȘENDRESCU