

SYLLABUS ¹

THIS COURSE UNIT IS TAUGHT IN ROMANIAN LANGUAGE

1. Information about the program

1.1 Higher education institution	Politehnica University of Timisoara
1.2 Faculty ² / Department ³	Chemistry and Environmental Engineering
1.3 Chair	—
1.4 Field of study (name/code ⁴)	Chemical Engineering / Environmental Engineering
1.5 Study cycle	Undergraduate studies
1.6 Study program (name/code/qualification)	Organic Compounds Chemistry and Engineering, Oil and Coal Chemistry / Engineering and Protection of Industrial Environment

2. Information about the discipline

2.1 Name of discipline/ formative category ⁵	Computer Aided Mathematics / Numerical Methods						
2.2 Coordinator (holder) of course activities	Conf. univ. dr. Bogdan Caruntu						
2.3 Coordinator (holder) of applied activities ⁶	Conf. univ. dr. Bogdan Caruntu						
2.4 Year of study ⁷	II	2.5 Semester	I	2.6 Type of evaluation	D	2.7 Type of discipline ⁸	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) ⁹

3.1 Number of fully assisted hours / week	4 of which:	3.2 course	2	3.3 seminar / laboratory / project	2
3.1* Total number of fully assisted hours / semester	56 of which:	3.2* course	28	3.3* seminar / laboratory / project	28
3.4 Number of hours partially assisted / week	of which:	3.5 training		3.6 hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	3.5* training		3.6* hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	7 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1
		hours of individual study after manual, course support, bibliography and notes			2
		training seminars / laboratories, homework and papers, portfolios and essays			4
3.7* Number of hours of unassisted activities / semester	98 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			14
		hours of individual study after manual, course support, bibliography and notes			28
		training seminars / laboratories, homework and papers, portfolios and essays			56
3.8 Total hours / week ¹⁰	11				
3.8* Total hours /semester	154				
3.9 Number of credits	4				

4. Prerequisites (where applicable)

¹ The form corresponds to the Discipline File promoted by OMECTS 5703 / 18.12.2011 and to the requirements of the ARACIS Specific Standards valid from 01.10.2017.

² The name of the faculty which manages the educational curriculum to which the discipline belongs

³ The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.

⁴ The code provided in HG no.140 / 16.03.2017 or similar HGs updated annually shall be entered.

⁵ Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).

⁶ Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

⁷ Year of studies in which the discipline is provided in the curriculum.

⁸ Discipline may have one of the following regimes: imposed discipline (DI), optional discipline (DO) or optional discipline (Df).

⁹ The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.

¹⁰ The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.1 Curriculum	• Calculus, Linear Algebra
4.2 Competencies	•

5. Conditions (where applicable)

5.1 of the course	•
5.2 to conduct practical activities	•

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> Numerical approximation skills, equation-solving skills, probability and statistics-related skills
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> Description, analysis and use of the basic concepts and theories from the chemical engineering field
Transversal competencies ascribed to the specific competencies	<ul style="list-style-type: none"> Performing the professional tasks in accordance with the specified requirements and imposed time, with the rules of professional ethics and moral conduct, following a predetermined work plan and qualified guidance

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	<ul style="list-style-type: none"> The general objective of the discipline is to provide the students with a strong background on numerical / approximation methods, equation-solving techniques and probability and statistics essentials
7.2 Specific objectives	<ul style="list-style-type: none"> Numerical approximation skills: approximation of functions, approximation of integrals Equation-solving skills: numerical solutions of nonlinear algebraic equations, exact and numerical solutions for differential equations, exact solutions for particular cases of partial differential equations, solutions of certain variational problems Probability and statistics-related skills: application of classical probability schemes, computation of random variables, applications of descriptive statistics

8. Content ¹¹

8.1 Course	Number of hours	Teaching methods ¹²
1. Interpolation, least squares approximation, numerical integration	4	Face-to face lectures, blackboard/whiteboard presentation, overhead projector presentation.
2. Numerical solutions for algebraic equations	4	
3. Numerical solutions for differential equations	2	
4. Laplace transform method for differential equations	4	
5. Partial differential equations of second order, canonical form	8	

¹¹ It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".

¹² Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

6. Elements of variational calculus	2	
7. Elements of probability theory and statistics	4	
Bibliography ¹³ Năslău P., Negrea R., Cădariu L., Căruntu B., Popescu D., Balmez M., Dumitrascu C., <i>Matematici asistate de calculator</i> , Ed. Politehnica, Timisoara, 2005 Negrea R., Căruntu B., Hedrea C., <i>Advanced calculus in engineering</i> , Ed. Politehnica, Timisoara, 2009		
8.2 Applied activities ¹⁴	Number of hours	Teaching methods
Seminar 1. Interpolation and approximation: Lagrange interpolation polynomial, Least squares approximation polynomial, numerical integration using the trapeze and Simpson methods 2. Approximate solutions of algebraic equations using Newton's method 3. Solutions of linear differential equations using the Laplace transform 4. Canonical form of a second order linear partial differential equation, exact solutions for particular cases 5. Solutions of variational problems using Euler's equations 6. Elements of probability and statistics: classical probability schemes , random variables, descriptive statistics.	14	Examples and exercises illustrating the notions introduced during the course. Implementation in Matlab of the methods introduced during the course..
Laboratory 1. Introduction to the Matlab software. 2. Interpolation and approximation: Lagrange interpolation polynomial, Least squares approximation polynomial, numerical integration using the trapeze and Simpson methods 3. Approximate solutions of algebraic equations using Newton's method 4. Numerical solutions of differential equations using Euler's and Runge-Kutta methods 5. Solutions of linear differential equations using the Laplace transform 6. Elements of probability and statistics: classical schemes of probability, random variables, descriptive statistics.	14	
Bibliography ¹⁵ Năslău P., Negrea R., Cădariu L., Căruntu B., Popescu D., Balmez M., Dumitrascu C., <i>Matematici asistate de calculator</i> , Ed. Politehnica, Timisoara, 2005 Negrea R., Căruntu B., Hedrea C., <i>Advanced calculus in engineering</i> , Ed. Politehnica, Timisoara, 2009		

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

¹³ At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.

¹⁴ Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".

¹⁵ At least one title must belong to the discipline team.

- Massachusetts Institute of technology OpenCourseware: <https://ocw.mit.edu/courses/mathematics/>

10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁶	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course		Written examination	50%
10.5 Applied activities	S:	Written evaluation test	25%
	L:	Computer-based evaluation test	25%
	P¹⁷:		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified ¹⁸)			
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Date of completion

Course coordinator
(signature)

Coordinator of applied activities
(signature)

Head of Department
(signature)

.....
Date of approval in the Faculty
Council ¹⁹

.....
Dean
(signature)

.....

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¹⁶ Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

¹⁷ In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

¹⁸ It will not explain how the promotion mark is awarded.

¹⁹ The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.