



Number. \_\_\_\_\_ from \_\_\_\_\_

Form UASVM -CN- 0124010108

## SUBJECT OUTLINE

## 1. Information on the programme

1.1. Higher education institution	University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca
1.2. Faculty	Agriculture
1.3. Department	Environmental and plant protection
1.4. Field of study	Environmental and plant protection
1.5. Cycle Education <sup>1)</sup>	Master
1.6. Specialization / Study program	Environmental Engineering
1.7. Form of education	IF

## 2. Information on the discipline

2.1. Name of the discipline	NUMERICAL METHODS IN ENVIRONMENTAL ENGINEERING							
2.2. Holder of course activities	Lecturer Cristian Mălinaș Ph.D							
2.3. Holder of seminar / laboratory activities / project	Lecturer Cristian Mălinaș Ph.D							
2.4. Year of study	I	2.5. Semester	I	2.6. Evaluation type	Sumative	2.7. Discipline status	Content <sup>2)</sup>	FD
							Compulsoriness <sup>3)</sup>	DI

## 3. Total estimated time (teaching hours per semester)

3.1. Number of hours per week - frequency form	4	Out of which: 3.2. lecture	2	3.3. seminar / laboratory / project	1
3.4. Total hours of the educational plan	42	Out of which: 3.5. lecture	28	3.6. seminar / laboratory	14
<b>Distribution of the time fund</b>					hours
3.4.1. Study after manual, lecture support, bibliography and notes					29
3.4.2. Additional documentation in the library, on specialized electronic platforms and in the field					5
3.4.3. Preparation of seminars / laboratories / projects, topics, reports, portfolios and essays					9
3.4.4. Tutorials					4
3.4.5. Examinations					4
3.4.6. Other activities					
3.7. Total hours of individual study	97				
3.8. Total hours per semester	125				
3.9. Number of credits <sup>4)</sup>	4				

## 4. Preconditions (where applicable)

4.1. of curriculum	-
4.2. of skills	Analysis and use of fundamental concepts and theories in the field of environmental science and engineering sciences, the proper use of the basic knowledge in the field of environmental engineering, the use of computers.

## 5. Conditions (if applicable)

5.1. for the course	Room equipped with computer, video projector, blackboard, internet access. Academic discipline is required throughout the duration of the lecture. No other activities are tolerated during the lecture, mobile phones must be closed.
5.2. for the seminar / laboratory / project	Room equipped with computer, video projector, blackboard. Academic discipline is imposed throughout the duration of the work.

## 6. Cumulated specific competences

Professional skills	Description, analysis and use of fundamental concepts and theories in the field of engineering sciences; Exploiting processes with the application of knowledge in the field of environmental engineering; Description, analysis and use of the notions of structure and reactivity of environmental pollutants; Exploitation of equipment and methods of analysis and characterization specific to environmental engineering
Transversal Competences	Execution of professional tasks according to the specified requirements and within the required deadlines, in compliance with the rules of professional ethics and moral conduct, following a pre-determined work plan and with qualified guidance. task distribution for subordinate levels Information and permanent documentation in its field of activity in the Romanian language and in a language of international circulation, using the modern methods of information and communication

## 7. Discipline objectives (based on the grid of specific skills accumulated)

7.1. General objective of the discipline	Acquiring theoretical and practical knowledge on modeling, and simulating transfer processes specific to natural and anthropic systems. Acquiring theoretical and practical knowledge regarding the optimization of transfer processes of pollutants specific to natural and anthropic systems.
7.2. Specific objectives	Modeling specific environmental processes specific to natural and anthropic systems, analytical and experimental models. Process optimization techniques and their applications in environmental engineering.

## 8. Contents

8.1. Course Number of hours - 28	Teaching methods	Remarks
1. Introduction. General notions, optimization problem specific to environmental engineering	Lecture - Discussions	2 lectures
2. The mathematical model. Classification of mathematical models. The analytical deduction of the mathematical model. Examples of analytical models. Experimental development of the mathematical model.	Lecture - Exemplification	2 lectures
3. Optimization criteria, purpose function, optimization techniques. Calculate the classic differential. Numerical techniques for direct search of the optimum for single variable functions and multidimensional purpose functions.	Lecture - Exemplification	4 lectures
4. Methods for determining the optimal policies. Dynamic programming. The principle of maximum	Lecture - Exemplification	2 lectures

8.2. PRACTICAL WORKS Number of hours - 14	Teaching Methods	Remarks
1. MATLAB programming environment - numerical methods for systems of nonlinear equations and for differential equations.	Individual study based on the notes presented at the course; exercises, applications, discussions and debates.	2 Practical Works
2. MATLAB optimization toolbox, presentation, applications.		2 Practical Works
3. Examples of applying optimization techniques and the principle of maximum		2 Practical Works
<b>Bibliography Required:</b>		
1. Valentin-Petrescu Mag, 2018, <i>Metode numerice în ingineria mediului, Note de curs</i>		
<b>Optional bibliography:</b>		
1. The Mathworks Inc.: "Optimization Toolbox. User's guide", Version 3, Natick (SUA), 2007		
2. Lindfield G., Penny J.: "Numerical methods using MATLAB", Prentice Hall, 2000		

**9. Corroborating the contents of the discipline with the expectations of representatives of epistemic communities, professional associations and representative employers in the field related to the program**

- The skills acquired will be required for employees who work in the field of environmental protection, research and design units, etc.

**10. Evaluation**

Activity type	10.1. Evaluation criterias	10.2. Methods of evaluation	10.3. Weight in the final grade
<b>10.4. Course</b>	Assessment during the course	Written tests	60%
<b>10.5. Practical Works</b>	During the evaluation of the acquisition of the practical activities	Presentation of solutions / answers to questions	30%
<b>10.6. Minimum standard of performance</b>			
Course: mastery of the notions and knowledge taught at the rate of at least 50%.			
Practical works: promotion of all the verification works during the course with note 5;			

- <sup>1</sup> The study cycle - one of the variants is chosen - Bachelor / Master / Doctorate
- <sup>2</sup> The regime of the discipline (content) - for the license level one of the variants is chosen - DF (fundamental discipline), DD (discipline in the field), DS (specialized discipline), DC (complementary discipline).
- <sup>3</sup> The regime of the discipline (compulsory) - one of the variants is chosen - DI (compulsory discipline) DO (optional discipline) DFac (optional discipline).
- <sup>4</sup> A credit is equivalent to 25-30 hours of study (teaching activities and individual study)

Date completed  
04.09.2019

Course holder  
Lect. Mălinaş Cristian  
PhD.

Holder of laboratory works / seminars  
Lect. Mălinaş Cristian PhD.

Date of approval department  
in the department  
05.09.2019

Department Director  
Professor. Ioan Oroian PhD