SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeş-Bolyai University of Cluj-Napoca**
1.2 Faculty	**Environmental Science and Engineering**
1.3 Department	**Environmental Analysis and Assessment**
1.4 Field of study	**Environmental Engineering**
1.5 Study cycle	**Bachelor**
1.6 Study programme / Qualification	**Environmental Engineering**

2. Information regarding the discipline

2.1 Name of the discipline		Transfer phenomena and unitary operations in environmental engineering I					
2.2 Course coordinator		Assist. Prof. (Lecturer) PhD Roba Carmen					
2.3 Seminar coordinator		Assist. Prof. (Lecturer) PhD Roba Carmen					
2.4. Year of study	II	2.5 Semester	3	2.6. Type of evaluation	E	2.7 Type of discipline	DD

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					26
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					-
Evaluations					4
Other activities:					-

3.7 Total individual study hours	70
3.8 Total hours per semester	126
3.9 Number of ECTS credits	5

4. Prerequisites (if necessary)

4.1. curriculum	-
4.2. competencies	-

5. Conditions (if necessary)

5.1. for the course	• Normal (classical) conditions of attendance at teaching activities
5.2. for the seminar /lab activities	• Mandatory attendance at practical work • Mandatory presentation of the calculation and graph report in the second session after the data collection session. Late presentation of results is penalized

6. Specific competencies acquired

Professional competencies	• Defining the basic notions, concepts, theories and models in the field of engineering and their appropriate use in professional communication • Using basic general knowledge to explain and interpret engineering phenomena • Identifying and applying concepts, methods, theories and calculation formulas to solve typical engineering problems under qualified assistance • Critical analysis and using principles, methods and working techniques for the quantitative and qualitative evaluation of engineering processes • Applying basic concepts and theories to develop professional projects • Explaining and interpreting the principles and methods used in the operation of industrial processes and installations • Critical evaluation of industrial processes, equipment, procedures and products • Developing professional projects for engineering technologies • Ability to solve balance problems associated with industrial processes • Ability to use the acquired notions to establish the structure of an industrial process, technological flow, separation and purification subsystems
Transversal competencies	• Performing the requested tasks according to the specified requirements and within the imposed deadlines, respecting the norms of professional ethics and moral conduct, following a work plan pre-established by the leader • Solving the requested tasks in accordance with the general objectives established through individual activity or integration into a work group • Permanent information and documentation in the field of activity • Understanding the phenomenological interdependencies taken from other disciplines and the connections between them

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• To familiarize students with the basic notions, concepts, theories and basic models in the field of engineering
7.2 Specific objective of the discipline	• Acquiring basic theoretical knowledge to understand the unit operations that support any industrial or domestic process • Acquiring knowledge regarding the preparation of mass and energy balances • Acquiring knowledge regarding the use of formulas and calculation diagrams necessary for the sizing of industrial machinery and equipment

8. Content

8.1. Course	Teaching methods	Remarks
8.1.1. Introductory concepts I: property, diffusivity, potential, potential gradient, transport medium, transport mechanisms, boundary layer, transport through boundary layer, partial and total transfer coefficients, quantity of transported property	Lecture Explanation Conversation	
8.1.2. Introductory concepts II: process engineering, technological processes, technological schemes, process devices and equipment, transfer phenomena and unit operations.	Lecture Explanation Conversation	
8.1.3. Operating regimes, logarithmic mean potential. Similarity and models. Flow of materials through pipes and channels. Flow regimes.	Lecture Explanation Conversation	
8.1.4. Impulse transfer – concepts from fluid statics.	Lecture Explanation Conversation	

8.1.5. Impulse transfer – concepts from fluid dynamics	Lecture Explanation Conversation	
8.1.6. Fluid transport – different types of pumps	Lecture Explanation Conversation	
8.1.7. Transport through pipes and fittings	Lecture Explanation Conversation	
8.1.8. Sedimentation. Phenomenology. Sedimentation regimes. Liquid-solid sedimentation apparatus.	Lecture Explanation Conversation	
8.1.9. Filtration of suspensions. Filtration equation. Types of filters. Operation. Sketches.	Lecture Explanation Conversation	
8.1.10. Mixing of solid, liquid and gaseous materials. Mixing power. Scaling of mixers	Lecture Explanation Conversation	
8.1.11. Centrifugation and hydrocyclones	Lecture Explanation Conversation	
8.1.12. Fluidization. Phenomenology. Calculation relations. Pressure loss during fluidization	Lecture Explanation Conversation	
8.1.13. Purification of gases and air from solid or liquid particles. Impact separators, sedimentation chambers, cyclones, electrical filters. Operation. Sketches.	Lecture Explanation Conversation	
8.1.14. Flotation of materials. Surfactants. Coagulation. Flocculation	Lecture Explanation Conversation	

Bibliography:

[1] Literat L.; Transfer phenomena and equipment in the chemical industry; UBB; Cluj - Napoca; 1985.
[2] Tudose R.Z., Vasiliu M., Cristian Gh., Isbăşoiu I., Stancu A., Lungu M.; Processes, operations and equipment in the chemical industry; Did. and Ped. Ed.; Bucharest; 1977.
[3] Ciplea L.I., Ciplea Al.; Environmental pollution; Technical Ed., Bucharest, 1978.
[4] Florea J.; Robescu D.; Hydrodynamics of hydropneumatic transport and water and air depollution installations; Did. and Ped. Ed.; Bucharest; 1982.
[5] Bratu E.A.; Unitary operations in chemical engineering, vol I, II, III; Technical Ed., Bucharest; 1982.
[6] Băran Gh., Beuran D.; Hydrodynamics of suspensions; Technical Ed., Bucharest, 2000.
[7] Sterbacek Z., Tausk P., Mixing; Technical Ed., Bucharest, 1969.
[8] Ivănuş Gh., Todea I., Pop Al., Nicola S., Damian Gh.; Fluidization Engineering, Technical Ed., Bucharest, 1996.
[9] Mândru I., Ceacăreanu V.; Detergents and other surface active agents; Technical Ed., Bucharest, 1968,
[10] Ozunu A., Mişca B.R.H.; Introduction to the design of chemical installations; Ed. Genesis, Cluj - Napoca; 1995.
[11] Mişca B.R.H., Ozunu Al.; Introduction to environmental engineering. Unitary operations; Cluj University Press, Cluj-Napoca; 2006.
[12] Mişca B.R.H., Manciula D.I., Ozunu Al.; Practical Workbook for Environmental Engineering, Cluj University Press, Cluj-Napoca; 2009.

8.2 Seminar / laboratory	Teaching methods	Remarks
8.2.1. Flow and flow regimes	Problematization Experimental measurements Mathematical model	Both experimental determination sessions and the resolution of specific

		case situations are carried out.
8.2.2. Pressure loss and pumping power	Mathematical model	
8.2.3. Grilles. Pressure loss	Mathematical model	
8.2.4. Packed columns. Pressure loss	Mathematical model	
8.2.5. Calculation of local and combined resistances	Mathematical model	
8.2.6. Sedimentation. Laminar sedimentation regime	Mathematical model	
8.2.7. Sedimentation. Intermediate and turbulent sedimentation regime. Use of the Li-Ar-Re diagram	Mathematical model Experimental measurements	
8.2.8. Calculation of longitudinal and radial decanters	Mathematical model	
8.2.9. Calculation of mixing power. Scaling of mixers	Mathematical model	
8.2.10. Filtration of suspensions. Determination of filtration constants	Experimental measurements	
8.2.11. Filter sizing	Mathematical model	
8.2.12. Calculation of filtration times	Mathematical model	
8.2.13. Solid-gas fluidization	Experimental measurements	
8.2.14. Solid-fluid fluidization	Mathematical model	

Bibliography:
[1] Pavlov C.F., Romankov P.G., Noskov A.A.; Main processes and operations in the chemical industry; Exercises and problems; Technical Publishing House; Bucharest; 1981.
[2] Bratu E.A.; Unitary operations in chemical engineering, vol I, II; Technical Publishing House, Bucharest; 1982.
[3] Floarea O., Smigelschi O.; Calculations of operations and equipment in the chemical industry; Technical Publishing House; Bucharest; 1966.
[4] Ghirișan A.L.; Physical-mechanical separation of heterogeneous solid-liquid systems; Publishing House Casa Cărții de Știința, Cluj-Napoca, 2005.
[5] Ozunu A., Mişca B.R.H.; Introduction to the design of chemical installations; Publishing House Genesis, Cluj - Napoca; 1995.
[6] Mişca B.R.H., Ozunu Al.; Introduction to Environmental Engineering. Unitary Operations; Cluj University Press, Cluj-Napoca; 2006.
[7] Mişca B.R.H., Manciula D.I., Ozunu Al.; Practical Workbook for Environmental Engineering, Cluj University Press, Cluj-Napoca; 2009.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

By mastering the theoretical and methodological concepts and addressing the practical aspects included in the Unitary Operations discipline, students acquire a consistent knowledge base, in accordance with the partial competencies required for the possible occupations provided for in Grid 1 - RNCIS

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Correctness of answers – correct acquisition and understanding of the issues covered in the course Correct solution of the presented problem. When solving problems, the use of bibliography is accepted	Written exam – access to the exam is conditional on the presentation of laboratory reports corresponding to the practical work Intention to cheat on the exam is punished by elimination from the exam. Cheating on the exam is punished by expulsion according to the ECST regulation of UBB	80 %

10.5 Seminar/lab activities	Quality of papers Activity during the semester		20 %
10.6 Minimum performance standards			
• Grade 5 (five) on the exam according to the scale • Knowledge of introductory concepts, process phenomenology, equipment sketches, minimum description of how it works			

Date	Signature of course coordinator	Signature of seminar coordinator
04.12.2024	Assist. Prof. (Lecturer) PhD Roba Carmen	Assist. Prof. (Lecturer) PhD Roba Carmen

Date of approval

.....

Signature of the head of department

….....