

DATA SHEET

1. Information regarding the program

1.1 Higher education institution	Babeş-Bolyai University, Cluj-Napoca
1.2 Faculty	Chemistry and Chemical Engineering
1.3 Department	Chemistry and Chemical Engineering of Hungarian Line
1.4 Field of Study	Chemistry
1.5 Study cycle	Master
1.6 Study programme / Qualification	Advanced Techniques in Chemical Synthesis

2. Information regarding the discipline

2.1 Name of the discipline	Physical Chemistry of Nanostructured Materials CME 6632						
2.2 Course coordinator	Assoc.prof. dr. Szabó Gabriella Stefánia						
2.3 Seminar coordinator	lecturer dr. eng. Rácz Csaba						
2.4 Year of study	II	2.5 Semester	3	2.6. Evaluation Type	E	2.7 Discipline type	Op

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					15
Additional documentation (in libraries, on electronic platforms, field documentation)					15
Preparation for seminars/labs, homework, papers, portfolios and essays					30
Tutorship					4
Evaluations					5
Other activities					—
3.7 Total individual study hours	69				
3.8 Total hours per semester	125				
3.9 Number of ECTS credits	5				

4. Prerequisites (if necessary)

4.1 curriculum	• Not the case
4.2 competencies	• Not the case

5. Conditions (if necessary)

5.1 For the course	<ul style="list-style-type: none"> Students will turn off their mobile phones Students will attend the courses having the materials made available prior to each course
5.2 For the seminar/lab activities	<ul style="list-style-type: none"> Students will turn off their mobile phones Students will attend the seminar with the course notes referring to the seminar topic Students will present their laboratory report no later than the week following the actual performance of the work
In accordance with the principles and values promoted, according to the Code of Ethics of Babeş-Bolyai University art. 39, "discrimination or unequal treatment of members of the university"	

community, based explicitly or implicitly on extra-professional criteria such as race, sex, ethnicity, religion, membership of minority groups, political beliefs, orientations and personal preferences, etc." are prohibited and constitute violations of the duties of justice and fairness.

6. Specific competencies acquired

Professional competencies	<ul style="list-style-type: none"> • Definition of notions, concepts, theories and advanced models in the field of Physical Chemistry of Nanostructured Materials as well as their proper use within the professional community • Application and interpretation of the structural properties of materials as well as concepts, approaches and phenomena • Application of fundamental notions for solving problems associated with the structure and reactivity of chemical compounds. • Critical analysis of existing models and theories regarding the structure and reactivity of chemical compounds. • Development of projects aimed at the structure and reactivity of chemical compounds by using existing models and theories.
Transversal competencies	<ul style="list-style-type: none"> • Carrying out professional tasks efficiently and responsibly in compliance with the legislation and deontology specific to the field under qualified assistance • Carrying out activities in a multidisciplinary team using interpersonal communication skills to achieve the proposed objectives. • Effective use of information sources and communication resources and assisted professional training, both in Romanian and in an international language.

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> • Presentation of the phenomenon of self-organization, spontaneous association of molecules, the forces that govern this process, the structures that arise as a result.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> • Formation of the ability to describe the phenomenon of self-assembly. • Acquiring knowledge about nanoparticles, nanoparticle assemblies and their properties • Acquiring knowledge about the important aspects of thin films. • Formation of the ability to describe the main applications of the presented supramolecular structures.

8. Content

8.1 Course	Teaching methods	Remarks
8.1.1. Introduction. Classification of colloidal systems.	Presentation; Explanation; Conversation; Debate	
8.1.2. Self-assembly of organic and inorganic substrates.	Presentation; Explanation; Conversation; Debate	
8.1.3. Forces governing self-assembly. Dynamic self-assembly.	Presentation; Explanation; Conversation; Debate	
8.1.4. Classification of nanostructured materials.	Presentation; Explanation; Conversation; Debate	
8.1.5 Preparation of nanostructured materials.	Presentation; Explanation; Conversation; Debate	
8.1.6. Gels. Formation, structure, properties.	Presentation; Explanation; Conversation; Debate	
8.1.7. Preparation and properties of sols.	Presentation; Explanation; Conversation; Debate	
8.1.8. Sol-gel transformation.	Presentation; Explanation; Conversation; Debate	

8.1.9. Characterization methods of nanostructured systems. SEM, TEM, AFM microscopy.	Presentation; Explanation; Conversation; Debate	
8.1.10. Microemulsions: preparation, properties, use for the preparation of nanoparticles	Presentation; Explanation; Conversation; Debate	
8.1.11. Interaction of dispersed systems with electromagnetic waves: a new way of nanotechnology.	Presentation; Explanation; Conversation; Debate	
8.1.12 Thin films obtained by self-assembly: preparation, properties	Presentation; Explanation; Conversation; Debate	
8.1.13. Nanostructured fullerene films: preparation, properties	Presentation; Explanation; Conversation; Debate	
8.1.14. Carbon nanotubes: preparation, properties	Presentation; Explanation; Conversation; Debate	
Bibliography 1.) E. Chifu: Chimia coloizilor și a interfețelor, Presa Universitară Clujeană, Cluj-Napoca, 2000 2.) E. Chifu: Chimie coloidală, Editura didactică și pedagogică, București, 1969 3.) F. Szántó: A kolloid kémia alapjai, Gondolat Kiadó, Budapest, 1987 4.) E. Wolfram: Kolloidika, Nemzeti Tankönyvkiadó, Budapest, 1994 5.) K. Holmberg: Surface and Colloid Chemistry Volume 1, Published by John Wiley & Sons Ltd, England, 2002 6.) M. J. Rosen: Surfactants and Interfacial Phenomena, Published by John Wiley & Sons, Inc., Hoboken, New Jersey, 2004. 7.) Guozhong Cao; Nanostructures and nanomaterials, Imperial College Press, London, 2004 8.) C. Brechignac, P. Houdy, M. Lahmany: Nanomaterials and nanochemistry, Springer-Verlag Berlin Heidelberg, 2007 9.) G. B. Sergeev: Nanochemistry, Elsevier B.V., Amsterdam, 2006. 10.) G. Gregoriadis: Liposome Technology, Informa Healthcare USA, 2007 11.) C. Cosgrove: Colloid science, principles, methods and applications, John Wiley & Sons Ltd, 2010		
8.2 Seminar / laboratory	Teaching methods	Remarks
8.2.1. Labor protection, presentation of works on the chemistry of colloids, requirements, way of drawing up reports. Experimental data processing methods.	Experiment; Explanation; Conversation; Problem solving;	
8.2.2. Presentation of Origin and Excel computer programs for experimental data processing and data graphic representation, error calculation.	Experiment; Explanation; Conversation; Problem solving;	
8.2.3 Obtaining SiO ₂ nanostructured films by the sol-gel method, dip-coating technique on glass and metal (Zn) support.	Experiment; Explanation; Conversation; Problem solving;	
8.2.4. Impregnation of nanostructured films with dyes: indigo carmine, rhodamine.	Experiment; Explanation; Conversation; Problem solving;	
8.2.5 Obtaining thin films by the sol-gel method: preparation of chitosan layers	Experiment; Explanation; Conversation; Problem solving;	
8.2.6. Obtaining Langmuir-Blodgett films.	Experiment; Explanation; Conversation; Problem solving;	
8.2.7. Evaluation	Test	
Bibliography 1.) E. Chifu, M. Tomoaia-Cotișel, I. Albu, A. Mocanu, M.-I. Sălăjan, Cs. Racz, D.-V. Pop, Metode experimentale in chimia si biofizica coloizilor si a interfețelor, Presa Universitară Clujeană, Cluj-Napoca, 2004.		

2.) Arthur M. Halpern, Experimental Physical Chemistry, 2-nd ed., Prentice-Hall International, London 1997.

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

- Acquirement of the theoretical and practical concepts of **Physical Chemistry of Nanostructured Materials CME 6632** course will provide the students with the competencies requested by RNCIS.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the final grade (%)
10.4 Course	Correctness of answers – proper understanding and learning of notions and concepts discussed during lectures; Correct use of learned concept within new contexts.	Written exam - access to the exam is conditioned by taking the laboratory colloquium and presenting the laboratory reports corresponding to all the practical works. Elaboration of short essays on the subject of the courses during the semester. Intent to cheat on the exam is punishable by removal from the exam. Exam fraud is punishable by expulsion according to the ECST regulation of UBB.	60%
	Correct problem solving The quality of the essays		20%
10.5 Seminar/laboratory	The correctness of the answers - the acquisition and correct understanding of the issue treated at the seminar/laboratory	Exam presentation conditions: performance of all laboratory work; the laboratory work for which the student was absent with reason can be recovered with another group of students, in the last week before the session. The laboratory reports corresponding to all the practical works - are presented weekly. The essays are presented. Laboratory colloquium - test - is held in the last week of didactic activity	20%
	The quality of the reports prepared		
Grade 5 (five) both in the laboratory colloquium and in the exam according to the scale			

Date of completion

Course coordinator's signature

Seminar coordinator's signature

Assoc.prof. dr. Szabó Gabriella Stefánia

lect. dr. ing. Rác

Csaba

4.04.2024

Date of approval in the department

Signature of the department director

4.04.2024

Prof.dr.ing. Paizs Csaba