UNIVERSITATEA BABEŞ-BOLYAI
BABEŞ-BOLYAI TUDOMÁNYEGYETEM
BABEŞ-BOLYAI UNIVERSITÄT
BABEŞ-BOLYAI UNIVERSITY
TRADITIO ET EXCELLENTIA

Tradiție și Excelență prin
Cultură - Știință - Inovație din 1581

Facultatea de Chimie și Inginerie Chimică

Str. Arany János nr. 11
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SYLLABUS

Green Chemistry-Theoretical and Technological Aspects

University year **2025-2026**

1. Information regarding the programme

1.1. Higher education institution	Universitatea Babeş-Bolyai din Cluj Napoca
1.2. Faculty	Chemistry and Chemical Engineering
1.3. Department	Chemical Engineering
1.4. Field of study	Chemical Engineering
1.5. Study cycle	Master
1.6. Study programme/Qualification	Advanced Process Chemical Engineering /Msc
1.7. Form of education	Full time education

2. Information regarding the discipline

2.1. Name of the discipline	Green Chemistry-Theoretical and Technological Aspects					Discipline code	CME 7141
2.2. Course coordinator	Assoc prof. dr. eng. CRISTEA CASTELIA						
2.3. Seminar coordinator	Assoc prof. dr. eng. CRISTEA CASTELIA						
2.4. Year of study	I	2.5. Semester	2	2.6. Type of evaluation	E	2.7. Discipline regime	DS/Optional

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

3.1. Hours per week	**4**	of which: 3.2 course	2	3.3 seminar	2
3.4. Total hours in the curriculum	**56**	of which: 3.5 course	28	3.6 seminar	28
Time allotment for individual study (ID) and self-study activities (SA)					**Hours**
3.5.1. Learning using manual, course support, bibliography, course notes (SA)					14
3.5.2. Additional documentation (in libraries, on electronic platforms, field documentation)					21
3.5.3. Preparation for seminars/labs, homework, papers, portfolios and essays					28
3.5.4. Tutorship					3
3.5.5. Evaluations					3
3.5.6. 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	General chemistry, Organic Chemistry
4.2. competencies	no

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5. Conditions (if necessary)

5.1. for the course	• Students will access the course material in pdf format within the group created on the Microsoft Teams platform subscribed to UBB • Part of the teaching activities can be carried out in synchronous online format through the Microsoft Teams platform subscribed to UBB, according to national and university/faculty regulations, these aspects being brought to the attention of students in the first two weeks from the beginning of the semester. • Registration by students of the online course is not allowed • Interactive participation
5.2. for the seminar /lab activities	• Attendance is mandatory under the conditions established by the faculty regulations • Students will have access to the educational resources for preparing the seminar within the group created on the Microsoft Teams platform subscribed to UBB • Students will present themselves to the seminar with the bibliographic support indicated in the previous seminars

6. Specific competencies acquired

Professional/essential competencies	Using chemical knowledge for environmentally friendly chemistry. Mastering the principles of "Green Chemistry" as methodology for achieving sustainability in the chemical industry. Formulate, develop and apply creative solutions for strategic problems by promoting innovative chemical technologies that reduce or eliminate the use or generation of hazardous substances in the design, manufacture and use of chemical products.
Transversal competencies	Team working and professional task Documentation in foreign languages using new information and communication technologies.

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

7.1 General objective of the discipline	To familiarize the students with the green chemistry concept, with the theoretical and technological aspects of sustainable chemical processes.
7.2 Specific objective of the discipline	To understand the principles of Green Chemistry concept Life Cycle Assessment of chemical products To develop abilities in planning strategies of sustainable development

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8. Content

8.1 Course	Teaching methods	Remarks
Principles of Green Chemistry, definition and specific concepts	Lecturing PPT presentation	1 course (2hours)
Life cycle assessment of chemical products	Lecturing PPT presentation	1 course (2hours)
Prevention of waste formation in chemical industry (/Reduce/Recycle//Recover)	Lecturing PPT presentation	1 course (2hours)
Atom economy (inherently atom economic reactions)	Lecturing PPT presentation	1 course (2hours)
Risk factors: toxicity of chemical products and intermediates.	Lecturing PPT presentation	1 course (2hours)
Design of safer chemical compounds: biodegradable chemical products	Lecturing PPT presentation	1 course (2hours)
Solvents and auxiliaries in industrial chemical processes.	Lecturing PPT presentation	1 course (2hours)
Catalytical processes in chemical industry.	Lecturing PPT presentation	1 courses (2hours)
Renewable resources for the chemical industry	Lecturing PPT presentation	1 courses (2hours)
Alternative energy sources for chemical processes.	Lecturing PPT presentation	1 courses (2hours)
Analytical methods for real time analysis and pollution control.	Lecturing PPT presentation	1 course (2hours)
Processes intensification; modern industrial equipment for unit operations	Lecturing PPT presentation	1 course (2hours)
Reduce/elimination of hazards in chemical industry	Lecturing PPT presentation	1 course (2hours)
Progress and limitations in the design of chemical processes (case studies)	Lecturing PPT presentation	1 course (2hours)

Bibliography: pdf copy of PPT presentation

1. P. T. Anastas, J. C. Warner "*Green Chemistry Theory and Practice*" Oxford Univ. Press, 1998.
2. M. Lancaster "*Green Chemistry an introductory text*" Pub. The Royal Society of Chemistry, 2002
3. P. Tundo, A. Perosa, F. Zechinni, *Methods and Reagents for Green Chemistry*" J. Wiley and Sons, 2007.
4. W. M. Nelson, *Green solvents for chemistry: perspectives and practice,* Oxford Univ. Press, 2003.
5. M. Doble, A. K. Kruthiventi *Green Chemistry &Engineering,* Elsevier Sci & Technol. Books, 2007.

8.2 Seminar	Teaching methods	Remarks
Life Cycle Assessment (LCA) of polyethyleneterephthalate (PET bottles)	Report, Presentation, Debate, Collaborating	1 seminar
LCA of detergents for household cleaning	Report, Presentation, Debate, Collaborating	1 seminar
LCA of paints and dyes	Report, Presentation, Debate, Collaborating	1 seminar

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LCA of automobile fuels	Report, Presentation, Debate, Collaborating	1 seminar
LCA of polystirene	Report, Presentation, Debate, Collaborating	1 seminar
LCA of rubber	Report, Presentation, Debate, Collaborating	1 seminar
LCA of refrigerants	Report, Presentation, Debate, Collaborating	1 seminar
Application of green chemistry principles in the industrial production of methanol	Report, Presentation, Debate, Collaborating	1 seminar
Application of green chemistry principles in the industrial production of phenol.	Report, Presentation, Debate, Collaborating	1 seminar
Application of green chemistry principles in the industrial production of sulphuric acid	Report, Presentation, Debate, Collaborating	1 seminar
Application of green chemistry principles in the industrial production of aniline.	Report, Presentation, Debate, Collaborating	1 seminar
Application of green chemistry principles in the industrial production synthetic fibers Nylon.	Report, Presentation, Debate, Collaborating	1 seminar
Application of green chemistry principles in the industrial production of plastic materials Polycarbonate.	Report, Presentation, Debate, Collaborating	1 seminar
Application of green chemistry principles in the industrial production of acetic acid.	Report, Presentation, Debate, Collaborating	1 seminar
Bibliography: Ullmann's Encyclopedia for Industrial Chemistry, Wiley-VCH Verlag GmbH & Co. KGaA.		

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

- The content of this discipline is based on a modern/critical approach of chemical processes employed in the design and fabrication of chemical compounds. It is helpful for employers from the chemical industry equally for production and sales programmes.
- The content of this discipline is also valuable for the development of a scientific carrier (doctorate, research)

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10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	Demonstrating knowledge of the 12 principles of green chemistry Demonstrating ability to use the green chemistry concepts in the analysis of industrial processes for production of commodity chemicals Formulate creative solutions for sustainable development of chemical processes	Written report describing the LCA of a commodity chemical Oral presentation with ppt support of the LCA Answer to questions addressed by the course coordinator	50% 20% 20%
10.5 Seminar	Demonstrating understanding of the green chemistry principles Demonstrating capacity of adequate use of green chemistry concepts and methods	Homework reports Interactive participation	10%
10.6 Minimum standard of performance			
Grade 5: Demonstrating knowledge of the 12 principles of green chemistry			

11. Labels ODD (Sustainable Development Goals)

Date:
31.03.2025

Signature of course coordinator

Assoc prof. dr. eng. CRISTEA CASTELIA

Signature of seminar coordinator

Assoc prof. dr. eng. CRISTEA CASTELIA

Date of approval:
15.04.2025

Signature of the head of department

Prof. dr. eng. TOSA MONICA