SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babes-Bolyai University**
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	**ICAP/Msc**

2. Information regarding the discipline

2.1 Name of the discipline			**Green Chemistry-Theoretical and Technological Aspects - CMX7141**				
2.2 Course coordinator			Assoc prof. . Dr. CRISTEA CASTELIA				
2.3 Seminar coordinator			Assoc prof. Dr. CRISTEA CASTELIA				
2.4. Year of study	**II**	2.5 Semester	**III**	2.6. Type of evaluation	**C**	2.7 Type of discipline	**Optional**

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					20
Additional documentation (in libraries, on electronic platforms, field documentation)					32
Preparation for seminars/labs, homework, papers, portfolios and essays					50
Tutorship					3
Evaluations					3
Other activities:					

3.7 Total individual study hours	108
3.8 Total hours per semester	150
3.9 Number of ECTS credits	**6**

4. Prerequisites (if necessary)

4.1. curriculum	• No
4.2. competencies	• No

5. Conditions (if necessary)

5.1. for the course	• The mobile telephones must be switched off during course and seminar
5.2. for the seminar	• Not necessary

6. Specific competencies acquired

Professional competencies	Mastering the principles of "Green Chemistry" as methodology for achieving sustainability in the chemical industry. Using chemical knowledge for environmentally friendly chemistry. 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 the new information and comunication 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 Assesment of chemical products • To develop abilities in planning strategies of sustainable development

8. Content

8.1 Course	Teaching methods	Remarks
1. The 12 principles of Green Chemistry, definition and specific concepts	Lecturing	1 course
2. Prevention of waste formation in chemical industry	Lecturing	1 course
3. Life cycle assessment	Lecturing	1 course
4. Catalysis in chemical synthesis	Lecturing	2 courses
5. Non polluting solvents in chemical processes	Lecturing	2 courses
6. Renewable resources for the chemical industry	Lecturing	2 courses
7. Alternative energy sources for chemical processes	Lecturing	2 courses
8. Designing nonpolluting processes	Lecturing	1 course
9. Case studies	Lecturing	2 courses

Bibliography

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
1. The 12 principles of Green Chemistry, definition and specific concepts	Collaborating	1 seminar
2. Life Cycle Assessment of sulphuric acid	Collaborating	1 seminar
3. Life Cycle Assessment of phenol	Collaborating	1 seminar
4. Life Cycle Assessment of aniline	Collaborating	1 seminar

5. Life Cycle Assessment of synthetic fibres	Collaborating	1 seminar
6. Life Cycle Assessment of plastic materials	Collaborating	2 seminars

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 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)

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the 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 products	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	Homework reports	10%
	Demonstrating capacity of adequate use of green chemistry concepts and methods	Homework reports	
10.6 Minimum performance standards			
Demonstrating knowledge of the 12 principles of green chemistry			

Date | Signature of course coordinator | Signature of seminar coordinator

8.03.2015 .. . ..

Date of approval | Signature of the head of department

Prof. Dr. Cristian SILVESTRU

11.05.2015