STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Environmental protection and green chemistry		**1010702221010702651**
Field of study: **Chemical Technology**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **1 / 2**
Elective path/specialty: **Composites and Nanomaterials**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **15** Classes: **-** Laboratory: **-** Project/seminars: **-**		No. of credits: **2**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **technical sciences**		ECTS distribution (number and %): **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student has a structured, theoretically founded knowledge covering key issues in the field of chemical technology.
2	**Skills**	Student can obtain information from literature, databases and other sources, also in English. Student is able to interpret the information, draw conclusions and formulate and justify opinions.
3	**Social competencies**	Student can appropriately prioritize used to perform a particular task.

Assumptions and objectives of the course:

Obtaining knowledge of the principles and objectives of green chemistry focused on sustainable development, the production of modern chemical product safety, economic means, while protecting the environment.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student has detailed knowledge of green chemistry - [-]
2. Student has knowledge of the development trends and the most important new developments in the field of sustainable chemistry - [K_W08]

Skills:

1. Student can reasonably assess the use of raw materials in the chemical industry, guided by the principles of green chemistry, environmental protection and sustainable development - [K_U12]
2. Student is able to critically evaluate the practical suitability of the use of new developments in chemical technology - [K_U16]

Social competencies:

1. Student has formed awareness of the limitations of science and technology related to chemical technology, including environmental. - [K_K02]

Assessment methods of study outcomes

Written test.

Course description

The essence of green chemistry and sustainable development. The objectives and principles of green chemistry. Unconventional ways of conducting a chemical reaction (electrochemical synthesis, photochemical, sonochemical, using microwave radiation, no solvents). The search for new synthetic methods using readily available and safe reagents (water, supercritical fluids? Water and carbon dioxide, ionic liquids). The elimination of the production processes of hazardous reagents. Renewable raw materials in organic synthesis (raw fats, carbohydrates, natural rubber). Issues of green chemistry in polymer materials. Patents in green chemistry. Examples of application of green chemistry principles in the industry - the President of the United States Award (Presidental Green Chemistry Challenge Awards). Quantitative measures of sustainable chemistry. Prospects for the development of green chemistry and its future tasks.

Basic bibliography:

1. Matlack A.S., Introduction to green chemistry, New York; Basel; Marcel Dekker, 2001.
2. Nelson W.M., Green solvents for chemistry: perspectives and practice, Oxford: Oxford University Press, 2003.
3. Asmus K.-D., Bobrowski K.Tł., Pollution and environmental protection: chemical aspects and related considerations, Poznań: Wydawnictwo Naukowe UAM, 2005.
4. Burczyk B.: Zielona chemia. Zarys, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2006.

Additional bibliography:

1. Clark J. H., Green chemistry: today (and tomorrow), Green Chem., 2006, 8, 17-21.
2. Nelson W.M., Green solvents for chemistry: perspectives and practice, Oxford: Oxford University Press, 2003.
3. Paryjczak T., Lewicki A., Kataliza w zielonej chemii, Przem. Chem. 85/2 (2006) 85-95.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	15
2. Consultation	20
3. Preparation for written test	15

Student's workload

Source of workload	hours	ECTS
Total workload	50	2
Contact hours	35	0
Practical activities	15	0