A. Informacje ogólne (wypełnia koordynator przedmiotu z wyjątkiem pól *Kod przedmiotu*, *Przyporządkowanie do grupy przedmiotów*).

Nazwa pola		
Course title		Chemical technology
Faculty/Institute		Faculty of Chemistry, University of Warsaw
Programme for which the course is offered		
Course ID		
Erasmus code		**13300**
Course group		
Didactic cycle		First level of studies, winter semester
Type/form of class		lecture
Brief course description		The aim of this lecture is the chemical processes presentation in the commercial-scale units. Lecture introduces some elements of chemical engineering.. The course gives knowledge on raw materials for Polish chemical industry, as well as its main branches and processes structures. Lecture gives basic knowledge on chemical industry waste, and presents the environment protection treatment.
Full course description		The course covers physicochemical background of technological processes. Are presented the following topics: technical, economical and environmental factors in large-scale processes, elements of chemical engineering and chemical processes control, unit operations and processes realized in periodic and continuous mode, chemical reactors, material and energy balances, Sankey's diagrams – material and energy balances visualization. Lecture introduces elements of industrial catalysis and hydrocarbon polymer chemistry. Examples of large-scale plastic production processes are given. This course introduces students to selected technology of inorganic and organic products. The special attention is given to new material technology, environmental impact of chemical industry processes.
Prerquisites	Formal prerquisites	Passed fundamental courses of general, physical and organic chemistry.
	other prerquisites	A least satisfactory knowledge of general, physical and organic chemistry
Learning outcomes		To the end with this lecture student: - describes chemical technology as a science - explains differences between laboratory and large-scale processes - knows the theoretical background of chemical engineering - distinguishes periodic and continuous chemical processes - knows reactor types used in chemical industry - explains mechanisms mass and energy transfer - analyses the material and energy balances for industrial processes - defines parameters describing chemical process yield - distinguishes unit operations and unit processes - explains technical, economical and environmental factors in a large-scale processes - describes catalytic processes in chemical technology - describes a chosen organic technologies - describes a chosen nonorganic technologies - explains environmental impact of chemical industry processes - distinguishes an environmental protection methods used in new industrial chemical technologies and waste treatment techniques
ECTS credits		3ECTS
Assessment methods and criteria		Credit for a course with the mark
Type of examination		Written exam
Type of course		Fundamental course
Mode of delivery		lecture

Language of instruction	Polish
Bibliography	1. E. Bortel, H.Koneczny „Zarys technologii chemicznej”. 2. J. Kępiński „Technologia chemiczna nieorganiczna”. 3. J. Ciborowski „Podstawy inżynierii chemicznej”. 4. M.Taniewski „Przemysłowa synteza organiczna. Kierunki rozwoju.” 5. J.F.Rabek „Współczesna wiedza o polimerach” 6.G.C. Bond „Kataliza heterogeniczna. Podstawy i zastosowania”. 7.B. Grzybowska-Świergosz „Elementy katalizy heterogenicznej”. 8.E. Grzywa, J. Molenda „Technologia podstawowych syntez organicznych”. Tom 1 i 2. 9.A. Johansson „Czysta technologia. Środowisko, technika, przyszłość.
Work placement(s)	none
Course coordinator	**Hanna Wilczura-Wachnik**
Academic teachers	**Hanna Wilczura-Wachnik**
Remarks	none

B. Informacje szczegółowe (wypełnia prowadzący zajęcia, z wyjątkiem pól: *Limit miejsc w grupie, Terminy odbywania zajęć*, *Miejsce odbywania zajęć* – pola te prowadzący zajęcia wypełnia w porozumieniu z administracją).

Nazwa pola	
Name of the academic teacher	**Hanna Wilczura-Wachnik**
Academic degree	**Phd**
Form of the class	Lecture
Learning outcomes	To the end with this lecture student: - describes chemical technology as a science - explains differences between laboratory and large-scale processes - knows the theoretical background of chemical engineering - distinguishes periodic and continuous chemical processes - knows reactor types used in chemical industry - explains mechanisms mass and energy transfer - analyses the material and energy balances for industrial processes - defines parameters describing chemical process yield - distinguishes unit operations and unit processes - explains technical, economical and environmental factors in a large-scale processes - describes catalytic processes in chemical technology - describes a chosen organic technologies - describes a chosen nonorganic technologies - explains environmental impact of chemical industry processes - distinguishes an environmental protection methods used in new industrial chemical technologies and waste treatment techniques
Assessment methods and criteria for this course	Nonobligatory test during semester.
Type of examination	Written exam containing test and open questions
A list of topics	1. Introduction and basic definitions. Chemical engineering background. Unit operations and unit processes. Chemical processes development. Technical, economical and environmental factors in large-scale processes. Elements of chemical engineering and chemical processes control. Unit operations and processes realized in periodic and continuous mode. 2. Chemical reactors. Types of flow and periodic reactors. Material and energy balances. Sankey’s diagrams – material and energy balances visualization. Mass and

	energy transfer. Units transfer with mass and heat exchange: rectification, absorption, adsorption (adsorbents, bio-adsorption), extraction, filtration, evaporation, osmosis. 3. Definition of catalysis and catalyst. Types of catalysis: heterogeneous, homogeneous and enzymatic. Contact definition. Fluidal phase definition. 4. Polymer definition. Preliminary informations on polymers as organic compounds. Polymerization: types and methods. Examples of hydrocarbon polymer technologies. 5. Row and secondary materials for chemical industry. Main organic and non-organic technologies. 6. Petroleum refining, hydrocarbon processing, straight run. Coal processing. Gas processing. 7. Petroleum cracking: catalytic cracking, thermal cracking. Fluid-bed catalytic cracking. Commercial-scale units: Clauss, Oleflex, Cyclar, petrol stabilization. Main synthesis with ethylene, propylene, BTX, C_4 fraction. 8. Non-organic technologies: sulfuric acid, nitric acid, calcined soda, chemical fertilizers. 9. Industrial waste. Hazardous waste. Industrial waste treatment. Ecological aspects in chemical processes development. Biodegradable materials in large- scale chemical industry. New materials – nanomaterials, nanotechnologies.
Learning activities and teaching methods	Lecture, individual consultations
Bibliography	1. E. Bortel, H.Koneczny „Zarys technologii chemicznej”. 2. J. Kępiński „Technologia chemiczna nieorganiczna”. 3. J. Ciborowski „Podstawy inżynierii chemicznej”. 4. M.Taniewski „Przemysłowa synteza organiczna. Kierunki rozwoju.” 5. J.F.Rabek „Współczesna wiedza o polimerach” 6.G.C. Bond „Kataliza heterogeniczna. Podstawy i zastosowania”. 7.B. Grzybowska-Świergosz „Elementy katalizy heterogenicznej”. 8.E. Grzywa, J. Molenda „Technologia podstawowych syntez organicznych”. Tom 1 i 2. 9.A. Johansson „Czysta technologia. Środowisko, technika, przyszłość.
Limit of places available	
Time	Once per week; Tuesday 8.15-9.45
Place	Faculty of Chemistry, Pasteura 1, lecture hall 141