DESCRIPTION OF THE COURSE OF STUDY

Course code	**0531.6.CHEM1.B/C.TC**	
Name of the course in	Polish	***Technologia Chemiczna***
	English	***Chemical Technology***

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1. Field of study	**chemistry**
1.2. Mode of study	**full-time studies/extramural studies**
1.3. Level of study	**graduate studies**
1.4. Profile of study*	**general**
1.5. Person/s preparing the course description	**Walentyna Zubkowa, Andrzej Strójwąs**
1.6. Contact	**walentyna.zubkowa@ ujk.edu.pl** **andrzej.strojwas@ujk.edu.pl**

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	**English**
2.2. Prerequisites*	**Basics of Chemistry, Organic Chemistry, Inorganic Chemistry**

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		**Lecture: 30 hrs, Laboratory: 60 hrs**
3.2. Place of classes		**Classes at the UJK facilities**
3.3. Form of assessment		**Lecture: exam (test)** **Laboratory: credit with a grade**
3.4. Teaching methods		**Lecture, laboratory (self-conducted experiments), discussion (problem solving)**
3.5. Bibliography	**Required reading**	Molenda I. Technologia Chemiczna. WNT. Warszawa 1997; Synordzki L., Wisialski J. Projektowanie procesów technologicznych. Praca zbiorowa. OWPW. Warszawa 2006.
	Further reading	Szarawara J., Piotrowski J. Podstawy teoretyczne technologii Chemicznej. WNT. Warszawa 2010; Kacperski W.T. Inżynieria procesowa. OWPR. Radom 2001; Machocki A. Technologia chemiczna. Ćwiczenia laboratoryjne. Praca zbiorowa. Wyd. UMCS. Lublin 2002.

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives ***(including form of classes)***

The main objective of the course is to educate students in the assessment of chemical knowledge in order to evaluate the prospects of chemical processes on industrial scale.

C1. *The objective of lectures is to introduce selected raw materials and products of chemical industry along with basic processes of transformation of raw materials into products of utility values to students.*

C2. *The objective of laboratories is to introduce the basic unit activities in technological processes to students.*

4.2. Detailed syllabus ***(including form of classes)***

Lecture

Definition and scope of the subject**. Raw materials** of chemical industry**. The criteria of evaluation** of the quality of raw materials and products of chemical industry and chemical manufacturing**. Physicochemical basis** of technological processes. Technological principles. Unit processes and operations. Technological schemes. Chemical reactors. Processes and equipment related to liquid flow, mass transport, heat transfer. The speed of industrial processes and industrial catalysis. **Outline of the most important chemical technologies**: obtaining sodium, nitrogen, and sulphur compounds. **Processing of energy raw materials:** natural gas, crude oil, hard coal, processing directions**. Catalytic processes** in organic synthesis**.** Selected **unit processes**. **Technologies of materials for special purposes**: methods of obtaining plastics. Obtaining dyes. **Biotechnology** – the definition and scope of application of modern technology. Selected biotechnological processes: production of antibiotics, microbiological concentration and leaching of metals, immobilized biocatalysts. **Membrane technologies**: organic and inorganic membranes. Formation methods and separation principles. **Analytical control of technological processes.** The stages of analytical procedure**. The sources of renewable energy.**

Laboratory

Enrichment of mineral resources. Evaluation of enrichment operation yield. **Unit operations**. Dynamic operations.

Determination of heat transfer coefficient k for water. **Crystallization**. Material balance of crystallization process. **Adsorption**. Investigation of adsorption properties of coal. **Extraction**. Dyes extraction in Soxhlet apparatus. **Dyes**. Obtaining mineral paints. Identification of organic dyes along with practical classification. **Large-tonnage production**. Air lime mortar. Production of sodium carbonate during the Solvay process. Crude oil processing. Determination of physical, chemical, and physico-chemical properties of liquid fuels. Obtaining biofuels and determination of their properties. Obtaining of glyptal resin and determination of its properties. Raising agents, chemical and thermal decomposition of raising agents.

4.3 Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
within the scope of **KNOWLEDGE:**		
W01	explains the stages of production proces development	CHEM1A_W11
W02	classifies raw materials and products of chemical industry	CHEM1A_W11
W03	interprets the directions of further processing of selected chemical products	CHEM1A_W11
within the scope of **ABILITIES:**		
U01	analyses the results of measurements during selected unit activities	CHEM1A_U05
U02	knows the criteria of matching of synthetic membranes to the separation processes of components of liquids and industrial gases	CHEM1A_U06
U03	analyses the course of industrial processes using technological schemes	CHEM1A_U05
within the scope of **SOCIAL COMPETENCE:**		
K01	evaluates the acquired knowledge in a critical way	CHEM1A_K01

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes *(code)*	Method of assessment (+/-)														
	Exam ~~oral~~ /written*			Test*			~~Project*~~			~~Group work*~~			~~Others* e.g. standardized test used in e-learning~~		
	Form of classes			*Form of classes*			~~*Form of classes*~~			~~*Form of classes*~~			~~*Form of classes*~~		
	L	~~*C*~~	...	~~*L*~~	*C*	...	~~*L*~~	~~*C*~~	...	~~*L*~~	~~*C*~~	...	~~*L*~~	~~*C*~~	...
W01	+														
W02	+				+										
W03	+				+										
U01					+										
U02	+														
U03	+				+										
K01	+				+										

delete as appropriate

4.5. Criteria of assessment of the intended learning outcomes

Form of classes	Grade	Criterion of assessment
Lecture (L) * (including e-learning)	**3**	Exam : the student must earn at least 60% of the total points
	3,5	Exam : the student must earn at least 66% of the total points
	4	Exam : the student must earn at least 76% of the total points
	4,5	Exam : the student must earn at least 86% of the total points
	5	Exam : the student must earn at least 96% of the total points
Laboratory	**3**	Student performed all practical tasks; wrote reports with corrections; earned >60% of corrected answers.
	3,5	Student performed all practical tasks; wrote reports with corrections; earned >66% of corrected answers.
	4	Student performed all practical tasks; wrote reports with corrections; earned >76% of corrected answers.
	4,5	Student performed all practical tasks; wrote reports with corrections; earned >86% of corrected answers.
	5	Student performed all practical tasks; wrote reports with corrections; earned >96% of corrected answers.

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	Student's workload	
	Full-time studies	Extramural studies
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/	***90***	
*Participation in lectures**	***30***	
*Participation in classes, seminars, laboratories**	***60***	
*Preparation in the exam/final test**		
*Others**		
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	***60***	
*Preparation for the lecture**	***15***	
*Preparation for the classes, seminars, laboratories**	***25***	
*Preparation for the exam/test**	***20***	
*Gathering materials for the project/Internet query**		
Preparation of multimedia presentation		
*Others**		
TOTAL NUMBER OF HOURS	***150***	
ECTS credits for the course of study	***7***	

delete as appropriate

Accepted for execution *(date and legible signatures of the teachers running the course in the given academic year)*

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