

FACULTY OF CHEMISTRY					
SUBJECT CARD					
Name of subject in Polish:	Metody analityczne stosowane w badaniu chemikaliów specjalistycznych				
Name of subject in English:	Analytical Methods in Fine Chemicals				
Main field of study:	Chemical Technology				
Specialization:	Technology of Fine Chemicals				
Profile:	academic and practical				
Level and form of studies:	2 <sup>nd</sup> level, full-time				
Kind of subject:	obligatory				
Subject code:	TCC024024				
Group of courses:	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	60		60		
Form of crediting	crediting with grade		crediting with grade		
For group of courses mark (X) final course	X				
Number of ECTS points	2		2		
including number of ECTS points for practical (P) classes	0		2		
including number of ECTS points for direct teacher-student contact (BK) classes	1		1		
<b>PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES</b>					
1. Basic theoretical knowledge in a field of spectroscopic and chromatographic analytical methods and techniques. 2. Ability to use basic laboratory glassware and equipment and to apply the safety rules of work in a chemical laboratory. 3. Fluency in performing chemical calculation. 4. Ability to work in a group.					
<b>SUBJECT OBJECTIVES</b>					
C1 To acquaint student with the basics concerning fine chemicals. C2 To familiarize the student with the regulations, function and effects of the REACH regulation in the context of scientific research and industrial activity. C3 To familiarize the student with a technical dossier containing information on substance properties depending on the type and tonnage in which the substance is manufactured or imported into the EU under REACH. C4 To acquaint student with the theoretical and practical aspects of good laboratory practice (GLP) and good manufacture practice (GMP). C5 To familiarize the student with principles and recommendations of analytical green chemistry C6 To familiarize the student with the techniques of preparing complex samples of various origins for the analysis. C7 To acquaint the student with advanced methods and techniques of qualitative and quantitative analysis (chemical, electrochemical, chromatographic and spectroscopic) used in various branches of industry related to fine chemicals. C8 To familiarize the student with practical approach of selected analytical methods and techniques (chemical, electrochemical, chromatographic and spectroscopic) used in various industries related to fine chemicals.					

C9 To acquaint student with the analytical equipment and instruments, as well as principles of its operation.

### SUBJECT LEARNING OUTCOMES

#### Relating to knowledge:

Student, who has completed the course:

PEK\_W01 gained the knowledge concerning fine chemicals.

PEK\_W02 has knowledge of the regulations, functions and effects of the REACH regulation in the aspect of scientific research and industrial activity.

PEK\_W03 has knowledge about the obligations in the supply chain for registering chemical substances under REACH, which are manufactured or imported into the EU, and can determine the 7 key steps to successful registration.

PEK\_W04 gained theoretical knowledge concerning application of the good laboratory practice (GLP) and good manufacturing practice (GMP) in terms of fine chemicals.

PEK\_W05 knows the recommendations of green analytical chemistry.

PEK\_W06 is familiar with basic definitions and types of errors, their causes and means of elimination in the quantitative analysis of fine chemicals.

PEK\_W07 is familiar with definitions and approaches of analytical data quality objectives associated with validation, remediation, assessment, accuracy, precision, specificity and sensitivity of analytical methods and techniques, and the basics of their control.

PEK\_W08 gained a wide knowledge in a field of various methods and techniques utilized in a qualitative and quantitative analysis (physical, chromatographic, chemical, electrochemical, spectroscopic) of fine chemicals in different industrial branches.

PEK\_W09 is familiar with the construction of the laboratory equipment and instruments which are used in analysis of fine chemicals in different industrial branches and understands its operating principles.

#### Relating to skills:

Student, who has completed the course:

PEK\_U01 is able to apply principles of good laboratory practice (GLP).

PEK\_U02 is able to assess necessity to comply with the requirements imposed by the REACH regulation.

PEK\_U03 is able to develop a workflow when necessary to meet the requirements imposed by the REACH regulation.

PEK\_U04 is able to properly sample an analytical sample and prepare it for various analytical processes.

PEK\_U05 is able to apply various methods of separation of single components of the complex matrix.

PEK\_U06 is able to select and apply appropriate analytical methods (chemical, electrochemical, chromatographic and spectroscopic) to determine the quality and purity of fine chemicals.

PEK\_U07 is able to select and apply an appropriate analytical methods (chemical, electrochemical, chromatographic and spectroscopic) for quantitative analysis of specialty chemicals.

PEK\_U08 is able to select and apply an appropriate research equipment to conduct qualitative and quantitative analysis of fine chemicals.

PEK\_U09 is able to adjust the analytical procedure and the research method to the recommendations of analytical green chemistry.

PEK\_U10 is able to prepare a report concerning performed experiments and obtained results, including their basic statistical analysis.

#### Relating to social competences:

PEK\_K01 has the competence to cooperate in a team.

PEK\_K02 has competence for efficient communication.

PEK\_K03 is focused on acquiring and consolidating knowledge.

PEK\_K04 is aware of the responsibility for the results obtained.

### PROGRAMME CONTENT

Lectures		Number of hours
Lec 1	Introduction to fine chemicals.	2

Lec 2	Regulations, function and effects of REACH regulation in scientific research and industrial activity - substance identification.	2
Lec 3	Key steps towards the successful registration of REACH, preparation of technical documentation and chemical safety assessment.	2
Lec 4	Analytical data quality objectives associated with GLP & GMP standards – validation, remediation, assessment, accuracy and precision.	4
Lec 5	General review of quantitative and qualitative analytical methods and techniques utilized in various branches of industry related to fine chemicals	4
Lec 6	Green analytical chemistry recommendations.	2
Lec 7	Analytical techniques utilized to study active ingredients in various formulations, detecting impurities and trace analysis.	3
Lec 8	Methods and techniques applied to investigate food additives.	2
Lec 9	Methods and techniques applied for analysis of surfactants.	2
Lec 10	Methods and techniques applied to study additives for polymers, plastics and textiles.	2
Lec 11	Methods and techniques applied for analysis of coatings and thin films.	2
Lec 12	Methods and techniques applied for analysis of colorants and dyes.	2
Lec 13	Final test.	1
	Total hours	30

Laboratory		Number of hours
Lab 1	Introductory class: the terms of the subject and its crediting, safety rules, rules of the chemical laboratory in terms of selected aspects of GLP.	2
Lab 2	Qualitative analysis of selected ingredients in a shampoo.	4
Lab 3	Qualitative and quantitative analysis of a dye in a fabric.	4
Lab 4	Qualitative and quantitative analysis and estimation of antioxidant activity of substances isolated from plant material.	4
Lab 5	Food additives in a beverage – isolation of preservatives.	4
Lab 6	Food additives in a beverage – quantitative analysis of preservatives, sweeteners and other additives.	4
Lab 7	Quantitative analysis of vitamins in a cosmetic product.	4
Lab 8	Additional classes; consultations; credits.	4
	<b>Total hours</b>	<b>30</b>
	<b>Total hours</b>	<b>30</b>
	Total hours	30

#### TEACHING TOLS

N1 Multimedial presentation.

N2 Performing experiments with different laboratory equipment and instruments.

N3 Preparation of report including analysis and interpretation of obtained results.

#### EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

<b>Evaluation</b> (F – forming (during semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
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<b>F1</b>	PEK_W01 – PEK_W09 PEK_K03, PEK_K04	Regular attendance and active participation during the lectures.
<b>F2</b>	PEK_W04 – PEK_W09 PEK_U01 – PEK_U10 PEK_W01, PEK_W02	5 grades for reports on the experiments conducted.
<b>P1 (lecture)</b>	PEK_W01– PEK_W09, PEK_K03	Grade for the final test.
<b>P2 (laboratory)</b>	PEK_W04 – PEK_W09 PEK_U01 – PEK_U10	Average from 5 grades for reports on the experiments conducted (F2) <b><math>P2 = (\Sigma F2)/5</math></b>
<b>PRIMARY AND SECONDARY LITERATURE</b>		
<p><b><u>PRIMARY LITERATURE:</u></b></p> <p>[1] G.D. Christian, <i>Analytical Chemistry</i>, John Wiley &amp; Sons, New York, ,1994.</p> <p>[2] R.S. Khandpur, <i>Handbook of Analytical Instruments</i>, ed.India Published, New York 2006;</p> <p>[3] H. Schmidt-Traub, <i>Preparative Chromatography of Fine Chemicals and Pharmaceutical Agents</i>, Wiley-VCH, Verlag, 2005</p> <p>[4] P. Pollack, <i>Fine Chemicals. The Industry and the Business</i>, John Wiley &amp; Sons, New York, 2007.</p> <p>[5] <i>Ullmann's Encyclopedia of Industrial Chemistry</i>, Vol. A20, 193, VCH Verlagsgesellschaft, Weinheim 1994.</p> <p><b><u>SECONDARY LITERATURE:</u></b></p> <p>[1] F.A. Settle, <i>Handbook of Instrumental Techniques for Analytical Chemistry</i>. Prentice-Hall Inc., 1997.</p> <p>[2] K.A. Rubinson, J.F. Rubinson, <i>Contemporary Instrumental Analysis</i>, Upper Saddle River Prentice Hall, 2000.</p> <p>[3] S.S. Nielsen, <i>Food Analysis Laboratory Manual</i>, Springer, West Lafayette, IN, USA, 2010</p>		
<b>SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)</b>		
<b>dr inż. Marta Tsirigotis-Maniecka (marta.tsirigotis@pwr.edu.pl)</b>		