FACULTY OF CHEMISTRY

SUBJECT CARD

Name of subject in Polish: Metody Analityczne w Projektowaniu i Technologii Wytwarzania Leku
Name of subject in English: Analytical Methods in Drug Design and Technology
Main field of study: Chemistry
Specialization: Medicinal Chemistry
Profile: academic and practical
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code: CHC024054
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		60		
Number of hours of total student workload (CNPS)	60		120		
Form of crediting	crediting with grade		crediting with grade		
For group of courses mark (X) final course	X				
Number of ECTS points	2		4		
including number of ECTS points for practical (P) classes			4		
including number of ECTS points for direct teacher-student contact (BK) classes	0.5		2		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Principles of organic chemistry, theoretical and practical.
2. Basic knowledge on chromatographic and spectroscopic methods.
3. Knowledge in the field of basis of analytical chemistry is recommended.

SUBJECT OBJECTIVES

C1 To acquaint student with the theoretical and practical aspects of good laboratory practice (GLP) and good manufacture practice (GMP).
C2 Gaining of the knowledge on the modern chromatographic techniques and their applications in drug design and technological process of drugs production.
C3 Acquaintance with the different technological concepts of application of spectroscopic methods in drugs design and quality control in the production system.
C4 Expanding the knowledge in the field of electrochemical methods applications in the design of biologically active compounds and the production procedures of them.
C5 Acquaintance with the different concepts in the field of mixed analytical methods.

SUBJECT EDUCATIONAL EFFECTS

Relating to knowledge:
Student, who has completed the course:
PEK_W01 – has knowledge on good laboratory practice (GLP) rules, good manufacture practice (GMP) rules, and validation procedures necessary to be used in analytical methods,
PEK_W02 – has knowledge about the modern chromatographic, spectroscopic, electrochemical and mixed analytical techniques and their applications in drug design and technological process of drugs production,

PEK_W03 – can define the advantages and disadvantages of the analytical techniques, the sensitivity level of each of them.

Relating to skills:

Student, who has completed the course:

PEK_U01 – has skills of use chromatographic techniques for separation of a mixture of different compounds, to detect them, do interpretation of the results and prepare the report according to GLP,

PEK_U02 – has knowledge about using different types of spectrometric instruments, and about the parameters of the sample ready to analyze,

PEK_U03 – has skills to do the analysis of the biologically active compounds using electrochemical methods, do interpretation of the results and prepare the report according to GLP,

PEK_U04 – has skills to detect the biologically active compounds in a drug formulation using physical and physicochemical methods.

Relating to social competences:

PEK_K01 – has the competence to cooperate in a team.

PROGRAMME CONTENT

	Lectures	**Number of hours**
Lec 1	Introduction to analytical techniques as tools for drug design and production. Good practice rules in analytical chemistry. Error estimation in analytical methods used in drugs design and technology.	2
Lec 2	Validation techniques. Pharmacopoeias. GLP, GMP and drugs production normalization rules.	2
Lec 3	Chromatographic techniques in drugs design and control of production process.	2
Lec 4	Mixed advanced analytical techniques as a tool in drugs design and control of their activity. Immunoenzymatic assays in design and technology of drugs.	2
Lec 5	Potentiometry and conductometry as modern analytical methods.	2
Lec 6	Voltamperometry and other electrochemical methods in drug design and technology.	2
Lec 7	Methods and techniques in physical analysis of solid components of drugs.	2
Lec 8	Novel advanced applications in quality control systems in the pharmaceutical industry.	1
	Total hours	**15**

Laboratory		Number of hours
Lab 1	Safety rules in the laboratory of organic chemistry, good laboratory practice and the rules of the reports preparation.	4
Lab 2	Spectrophotometry UV-Vis – principles of the method and procedure of measurement. The quality analysis of a pharmaceutical formulation.	4
Lab 3	UV-Vis method as the tool to control of kinetic of a reaction. Control technique of synthesis of the biologically active compound.	4
Lab 4	Liquid chromatography – the separation technique useful in mixture separation. TLC method as a tool of quality control procedure.	4
Lab 5	HPLC technique – a scheme of the procedure of a sample preparation. Preparation of a sample to HPLC analysis.	4
Lab 6	HPLC – the equipment scheme. The analysis of biologically active components of a pharmaceutical formulation. Gas chromatography equipment and the procedure of analysis. Detection techniques.	4
Lab 7	GC analysis - separation and identification of a mixture of components.	4
Lab 8	Viscosimetry – presentation of the method and application possibilities. Preparation of the emulsion and measurement of its reological parameters.	4
Lab 9	Turbidimetry – the analytical method useful to drug design and quality control of it using microplates reader.	4
Lab 10	Infrared spectroscopy (FT-IR) of a biologically active compound. Sample preparation and spectrum collection.	4
Lab 11	Physical analysis of solid components of drugs using sieves method.	4
Lab 12	Conductometry – principles of the analytical method based on the Ohm's law. The presentation of the application of this technique in the biologically active compounds design.	4
Lab 13	Potentiometry – the method used for potentiometric titration of the biologically active molecules possessing positive or negative charge. Application of potentiometric titration to pH-metric analysis.	4
Lab 14	Electrophoresis as a tool in qualitative and quantitative analysis of a components mixture.	4
Lab 15	Repeating of the not successful realized experiments. Consultation of the reports results.	4
	Total hours	**60**

TEACHING TOOLS

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 EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 – PEK_W03	11 grades for the short queries in the topics of the laboratory experiments.
F2	PEK_U01 – PEK_U4 PEK_K01	11 grades for reports on the experiments conducted.
P1 (laboratory)		Average from 11 grades for the queries (F1) and 11 for the reports on the experiments conducted (F2) **P1 = Σ (F1+F2)/22**
P2 (lecture)	PEK_W01– PEK_W03	Final test.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] J. Ermer, J.H.McB. Miller, Method Validation in Pharmaceutical Analysis. A Guide to Best Practice. Wiley-VCH, Weincheim. 2005.
[2] Farmakopea Polska, Urząd Rejestracji Leków, Wyrobów Medycznych i Produktów Biobójczych, Warszawa.
[3] W. Jennings, E. Mittlefehldt, P. Stremple, Analytical Gas Chromatography. 2nd Ed. Academic Press, 1997.
[4] R.P.W. Scott, Tandem Techniques. John Wiley & Sons, 1997.
[5] M.S. Lee, Integrated Strategies in Drug Discovery Using Mass Spectrometry. John Wiley & Sons, 2005.
[6] A.J. Bard, R.L. Faulkner, Electrochemical Methods. Fundamental and Applications. John Wiley & Sons, 2001.

SECONDARY LITERATURE:

[1] D.M. Bliesner, Validating Chromatographic Methods. A Practical Guide. John Wiley & Sons, 2006.
[2] P.A. Christensenand A. Hamnett, Techniques and Mechanisms in Electrochemistry. Kluver Academic Press, 1994.
[3] AC Moffat, MD Osselton, B Widdop, Clarke's analysis of drugs and poisons. Pharmaceutical Press, 2005.
[4] F.A. Settle, Handbook of Instrumental Techniques for Analytical Chemistry. Prentice-Hall Inc., 1997.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

dr inż. Izabela Pawlaczyk-Graja, izabela.pawlaczyk@pwr.edu.pl