GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	PROCESS ANALYTIC METHODS, PG_00064464						
Field of study	Chemistry						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2026/2027			
Education level	first-cycle studies		Subject group	Optional subject group Subject group related to scientific research in the field of study			
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish			
Semester of study	4		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Patrycja Makoś-Chełstowska					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study	SUM	
	Number of study hours	30		2.0	18.0	50	
Subject objectives	The aim of the course is to familiarize students with the principles of quality control and methods for evaluating the performance characteristics of materials, raw materials, and technical products used in industry. Students will acquire knowledge and practical skills related to the sampling, preparation, and analysis of representative solid, liquid, and gaseous materials, as well as the application of selected instrumental methods for the determination of physicochemical and quality parameters. The course is designed to develop competencies in the interpretation of analytical results with respect to regulatory, technological, and quality requirements, the identification of non-conformities, and the assessment of the suitability of materials for technical applications.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U07] is able to undertake accurate and precise analytical measurements, to synthesise simple and large-molecular chemical compounds, to purify and analyse their composition and to determine their structure using classical and instrumental methods	is able to perform technical analyses of industrial materials and products using classical and instrumental methods, interpret analytical results, and assess the quality and suitability of materials for technical applications.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_U04] creates detailed documentation of the results obtained from the experiments carried out individually or as part of a team, analysing and interpreting the results in the form of text documents, spreadsheets, graphs, technological diagrams, multimedia presentations using correct chemical nomenclature	is able to document, analyze, and interpret the results of technical analyses and present them in the form of reports, graphs, and presentations using correct chemical nomenclature.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
[K6_K03] is aware of the importance of caring for the quality and diligence of the tasks performed, being responsible for their consequences	recognizes the importance of quality, reliability, and accuracy in performing technical analyses and accepts responsibility for the correctness and interpretation of analytical results. The student follows the principles of good laboratory practice and quality assurance, ensuring careful execution of measurements and understanding their impact on material quality assessment and the safety of technological processes.	[SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills [SK2] Assessment of progress of work
[K6_W02] classifies acquired information, assessing its usefulness in solving the posed problems concerning the synthesis and analysis of selected groups of compounds, determining their physical and chemical properties, making measurements and determining the parameters of chemical reactions and processes	understands the principles of selecting and evaluating information related to technical analytical methods and recognizes the importance of physicochemical and quality parameters used in the quality control of industrial materials and products.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents

Course content – lecture

- Sampling of solid technical materials,
- Sampling of liquid technical materials,
- Sampling of gaseous technical materials,
- Preparation of solid, liquid and gaseous samples for analysis,
- Isolation, and separation of analytes.
- Research on basic physicochemical and technical parameters of solid, liquid and gaseous samples.
- Performing measurements using spectroscopic, chromatographic, electroanalytical, X-ray and other methods.
- Evaluation and quality control of measurement results.

Course content – laboratory

- Determination of the basic parameters of technical materials
- Application of spectroscopic methods for assessing the purity of technical oils
- Determination of aggregate parameters of complex mixtures
- Analysis of industrial wastewater
- Assessment of the purity of fuel additives

Prerequisites and co-requisites

The student has basic knowledge about:

- measurement methods used in analytics,
- physical, inorganic and organic chemistry,
- chemical technology and unit processes,
- basic physicochemical parameters of gaseous, liquid and solid samples.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture - written examination	60.0%	60.0%
Laboratory - written quizzes and laboratory reports	60.0%	40.0%

Recommended reading	Basic literature	• - W. Szczepaniak, Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1997. • - J. Piotrowski i in., Pomiary, WNT, Warszawa, 2012. • - J. Namieśnik i in., Pobieranie próbek środowiskowych do analizy, PWN, Warszawa, 1995. • - Z. Witkiewicz, Podstawy chromatografii, WN-T, 2005; • - T. Lipiec, Z. Szmal, Chemia analityczna z elementami analizy instrumentalnej , Państwowy Zakład Wydawnictw Lekarskich, Warszawa, 1976. • - J. Berćik - Fizyczne i fizykochemiczne metody analizy - W N T, Warszawa . - 1981 • - B. Klepaczko-Filipiak, J. Łoin - Pracownia chemiczna, Analiza techniczna - wyd.2, W S i P, Warszawa . - 1998 • - Z. Łada, C. Różycki - Pracownia chemii analitycznej, Analiza techniczna i instrumentalna - wyd. 6, W S i P, Warszawa . - 1990
	Supplementary literature	• Skoog D.A., Holler F.J., Crouch S.R., *Principles of Instrumental Analysis*. • Harris D.C., *Quantitative Chemical Analysis*. • Robinson J.W., Frame E.M.S., Frame G.M., *Instrumental Analytical Chemistry: An Introduction*. • Berćik J., *Fizyczne i fizykochemiczne metody analizy*. • Selected PN-EN, ASTM, and ISO standards related to the analysis of fuels, technical oils, gases, fuel additives, and industrial wastewater.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1) The distribution of the aviation gasoline molecular weight in the TBP range from 40 to 180°C can be examined by the techniques / methods: • Classic atmospheric distillation or simulated distillation • Vacuum distillation • Liquid chromatography in reverse phase systems with refractometric detector • Exclusion liquid chromatography with a refractometric detector 2) The Hoppler viscometer is used to directly determine: • Relative viscosity - relative to water • Kinematic viscosity • Dynamic viscosity • Direct kinematic and dynamic viscosity testing. 3) The Ubelhode viscometer is used to directly determine: • Relative viscosity - relative to water • Kinematic viscosity • Dynamic viscosity • Direct kinematic and dynamic viscosity testing. 4) What technique can be used to determine the content of the main biogas components (CH4, CO2, H2, O2, N2) • Gas chromatography coupled with thermal conductivity detector (GC-TCD) with carrier gas - helium • Gas chromatography coupled with flame ionization detector (GC-FID) with helium carrier gas • Gas chromatography coupled with thermal conductivity detector (GC-TCD) with carrier gas - nitrogen • Liquid chromatography in normal phase systems with refractometric detector 5) The reference mixture for testing the octane number is: • n-heptane and isooctane • iso-pentane and n-heptane • n-heptane and toluene • n-hexadecane and 1-methylnaphthalene	
Practical activites within the subject	Not applicable	

Document generated electronically. Does not require a seal or signature.