GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Master's thesis, PG_00048940		
Field of study	Chemistry		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-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	3	ECTS credits	20.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor		
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	0.0	0.0	0.0	0

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	0	30.0	470.0	500

Subject objectives

The aim of this work is to investigate modern strategies for reducing analysis time in high-performance liquid chromatography (HPLC) without compromising separation quality. The project will analyze key factors influencing separation speed, such as gradient profile, column temperature, and selected chromatographic parameters (including particle size, column length and diameter, and mobile phase flow). The work will focus on assessing which of these parameters have the greatest impact on retention time reduction and how their optimization can lead to more efficient, shorter analyses. The developed solutions can be used in both routine laboratories and more advanced research analyses.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] integrates and interprets information from literature, databases and other sources	The studentis able to use information from scientific literature, databases and other sources to analyze and solve problems in chemistry.	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
[K7_K01] is aware of the problems related to the profession of a chemist, is able to assess the effects of the activity performed	The student understands the ethical, environmental and social issues related to the work of a chemist and is able to assess the consequences of the actions taken.	[SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work
[K7_U03] plans and performs the synthesis of chemical compounds with the required properties	The student is able to plan and carry out the analysis of chemical compounds with specifically defined properties.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K7_W02] identifies analytical techniques appropriate for solving specific analytical tasks – also in the production plant	The student has the necessary knowledge to identify and select appropriate analytical techniques for solving specific analytical problems, including those in a production plant environment.	[SW2] Assessment of knowledge contained in presentation

Subject contents

Prerequisites and co-requisites

Basic knowledge of analytical chemistry and analytical techniques.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Diploma	60.0%	100.0%

Recommended reading

Basic literature

Scientific publications on the use of modern liquid chromatography for pharmaceutical assays, especially those of a review nature, are available in the Gdańsk University of Technology databases. Scripts and books are available in the Gdańsk University of Technology library.

Some examples:

Sobolewska E., Biesaga M.
High-Performance Liquid Chromatography Methods for Determining the Purity of Drugs with Weak UV Chromophores A Review, **Critical Reviews in Analytical Chemistry**, 2025.

Caldicot E.
Advances in High Performance Liquid Chromatography (HPLC) Techniques for Pharmaceutical Analysis: A Comprehensive Review, **Journal of Analytical & Bioanalytical Techniques**, 2024.

Parys W., Dołowy M., Pyka-Pająk A.
Significance of Chromatographic Techniques in Pharmaceutical Analysis, **Processes**, 2022.

Kumar D. et al.
A Comprehensive Review on Analytical Method Development using RP-HPLC and Recent Advances in Pharmaceutical Applications, **Journal for Research in Applied Sciences and Biotechnology**, 2023.

Elnekaib M.A. et al.
The Role of High-Performance Liquid Chromatography in Pharmaceutical Analysis Review, **Mediterranean Journal of Pharmacy & Pharmaceutical Sciences**, 2025.

Chawla G., Chaudhary K.K.
A Review of HPLC Technique Covering its Pharmaceutical Applications , **International Journal of Pharmaceutical Chemistry and Analysis**, 2019.

Supplementary literature

Books:

- Snyder L.R., Kirkland J.J., Dolan J.W., *Introduction to Modern Liquid Chromatography*, Wiley, **2010**.
- Kazakevich Y., LoBrutto R., *HPLC for Pharmaceutical Scientists*, Wiley, **2007**.
- Swartz M.E., Krull I.S., *Analytical Method Development and Validation*, Marcel Dekker, **1997**.
- Dong M.W., *Modern HPLC for Practicing Scientists*, Wiley, **2006**.

eResources addresses

Example issues/ example questions/ tasks being completed

Tasks to be completed (examples, suggested):
1. Analysis of the effect of different gradient profiles on retention time and separation quality.
2. Evaluation of the effect of elevated column temperature on shortening analysis time and method stability.
3. Comparison of column parameters (particle size, length, diameter) in terms of their efficiency in rapid separation.
4. Determination of the optimal combination of chromatographic conditions ensuring the shortest analysis time while maintaining the required resolution.
5. Development of a short, optimized HPLC method and evaluation of its potential for applications in a pharmaceutical laboratory.

Practical activites within the subject	Not applicable

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