PhD STUDIES COURSE UNIT DESCRIPTION

Name of subject	Field of science, code	Faculty / Center	Department
Chromatography	Chemistry N 003	Chemistry and Geosciences	Analytical and environmental chemistry
Student's workload	**Credits**	**Student's workload**	**Credits**
Lectures		Consultations	3
Independent study	7	Seminars	

Course annotation
Theoretical backgrounds of chromatography: intermolecular forces, retention characteristics, efficiency, resolution and selectivity, band broadening, van Deemter equation, diffusion processes in a column. **Gas chromatography.** Gas-liquid chromatography, gas adsorption chropmatography. Mobile phases. Stationary liquid phases, solid supports, adsorbents. **Instrumentation of gas chromatography:** packed chromatographic columns, capillary columns, sample inlets, detectors (conductometric, flame ionisation, electron capture, nitrogen-phosphorus, flame photometric, photoionisation) **Gas chromatography-mass spectrometry:** electro ionisation, chemical ionisation, mass analyzers (magnetic sector, quadrupole, time-of-flight), full scan mode, selected ion monitoring. **Instrumentation of high-performance liquid chromatography (HPLC)**: pumps, sample introduction systems, columns, detectors (UV/Vis, refractive index, evaporative light scattering, fluorimetric, electrochemical). **Stationary phases**: main characteristics, particle size and shape, specific area, pore parameters, inorganic sorbents, organic polymers, monoliths, ion-exchangers, chiral phases, chemically bonded phases, bonding techniques, ligands, problems. **Solvents for mobile phases**: main properties and classification, solvent choice, isocratic and gradient elution modes. **HPLC separation modes**: normal–phase, reversed-phase, hydrophilic interaction, hydrophobic interaction, chiral, ion-exchange, ion pair, size exclusion, affinity. **HPLC-mass spectrometry**: basic principles, atmospheric pressure ionisation sources, mass analyzers (quadrupole, ion trap, time-of-flight, orbitrap), tandem mass spectrometry, identification of molecules, elemental composition determination. **Trends and developments in HPLC**: ultra performance liquid chromatography, multidimensional HPLC, miniaturization of HPLC. **Sample preparation for chromatography**: isolation, preconcentration and derivatization techniques. **Practical aspects of chromatography**: column selection and testing, mobile phase selection, optimization of the separation, quantification, applications of chromatography.
Reading list
1. L.R. Snyder, J.J. Kirkland, J.W. Dolan. Introduction to Modern Liquid Chromatography. John Wiley & Sons, Ltd., 2010. 2. R.L. Grob, E.F. Barry. Modern Practice of Gas Chromatography. John Wiley & Sons, Ltd., 2004. 3. V.R. Meyer. Practical High-Performance Liquid Chromatography. John Wiley & Sons, Ltd., 2010. 4. R. E. Ardrey. Liquid Chromatography-Mass Spectrometry: an Introduction. John Wiley & Sons, Ltd., 2003.

The names of consulting teachers	Science degree	Main scientific works published in a scientific field in last 5 year period
Audrius Padarauskas Vida Vičkačkaitė	Habil. dr. Dr. (HP)	1. Journal of Physics D: Applied Physics, 53 (2020) 264001. 2. BioMed Research International, Volume 2018, Article ID 6318630. 3. Crop & Pasture Science, 69 (2018) 1020-1030. 4. Journal of Applied Botany and Food Quality, 90 (2017) 346-353.

Certified during Doctoral Committee session on September 28th, 2021. Protocol No. 610000-KT-142.
Committee Chairman prof. habil. dr. Aivaras Kareiva