COURSE TITLE:

SEPARATION SCIENCE

COURSE DESCRIPTION:

General description of chromatography processes based on the course of separation forces and the mechanism of separations. Definition of retention time (t_R), adjusted retention time (t'_R), partition coefficient (K), capacity factor (k), selectivity factor(α), efficiency (measured by the theoretical plate number N), theoretical plate height (H) and resolution (R_s). Van Deemter's equation and plot. Principles of Adsorption-, Ionexchange- (IEC) and Ion- (IC)-chromatography; stationary- and mobile phases (eluent's strenght), mechanisms of separation. Principles of Gel Permeation (GPC or SEC) and Affinity Chromatography (AC): stationary- and mobile phases, mechanisms of separation. Principles of Paper- and Thin Layer Chromatography (TLC). Capillary action as the driving force of eluent moving. Retention factor (Rf). Sorbents and Precoated Layers in TLC. Developing chambers and presaturation. Visualization, detection and quantitation in TLC. HPTLC and applications. Principles of Gas Chromatography (GC). Instrumental setup: carrier gases, injection techniques, types of GC columns, stationary phases in GSC and GLC. GC detectors (FID and EC). General properties of detectors. Qualitative and quantitative analysis. The significance of Kovats Retention Indices in qualitative GC analysis. Calibration methods: external and internal standard methods. Derivatization in GC. Principles of High Performace Liquid Chromatography (HPLC). Instrumental setup: reciprocal pumps, mixer, injector and column types. Description of the stationary- and mobile phases in case of normal- and reversed phase (NP and RP) HPLC. Gradient- and isocratic elutions. Ion-pair RP-HPLC. HPLC detectors: UV-VIS, Fl, conductivity, evaporative light scattering (ELSD). Shell-core and BEH columns. Sample pretreatment for solid and liquid samples. Soxhlet and automated Soxhlet extraction, PFE, LLE, SPE, SLE, MIP, MEPS, SPME, Head Space, Purge and Trap methods.

Competences:

Students have a good grounding in the core areas of chemistry (inorganic, organic, physical, biological and classical analytical chemistry) and in addition the necessary background in mathematics and physics.

Students have competences to fit them for employment as professional environmental chemists in chemical and related industries or attained a standard of knowledge and competence which will give them access to third cycle degree programmes.

LITERATURE:

1, Slides of the lectures on my personal webpage:
http://www.chem.elte.hu/departments/anal/vasanits/

2, Francis Rouessac and Annick Rouessac: Chemical Analysis Modern Instrumentation Methods and Techniques Second Edition 2007 by John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England, Chapters: 1-8.

TEACHER:
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