Module	**Process Design and Optimization**
Code	MLS_S03
Degree Program	Master of Science in Life Sciences (MSLS)
Cluster	Chemistry
Specialization	Chemical Development and Production
ECTS Credits	4
Workload	120 h: Contact 56 lessons = 42 h; Self-study 78 h
Module Coordinator	**Name** Dr. Michal Dabros **Phone** +41 (0)26 429 68 79 **Email** michal.dabros@hefr.ch **Address** Haute école d'ingénierie et d'architecture de Fribourg Bd de Pérolles 80, CH-1700 Fribourg
Lecturers	• Dr. Michal Dabros, HEIA-FR • Dr. Charles Guinand, SafEcho (charles.guinand@gmail.com) • Guest lecturer(s)
Entry Requirements	Bachelor of Science in Chemistry or in a related course of study, basic knowledge in chemical reaction techniques and modeling (Bachelor level)
Learning Outcomes and Competences	After completing the module students will be able to: • perform experimental design for a process, analyze the results and model the response surface • apply chemometrics to analyze and model multivariate experimental data • use direct search methods to explore a response surface in search of a process optimum
Module Content	• Problem formulation in view of process design and optimization • Design of Experiments (DOE) & Response Surface Methodology (RSM) • Direct Search Methods (Nelder-Mead Simplex, Genetic Algorithms) • Model identification by gradient methods • On-line / at-line Spectroscopy applied to process monitoring • Chemometrics and Multivariate Analysis (PCA, PCR, PLS)
Teaching / Learning Methods	• Lectures • Individual and group exercises • Invited speakers / excursion
Assessment of Learning Outcome	• Active participation in the module is required • Mini-projects, reports / presentations: 25% of the final grade • Final examination (oral): 75% of the final grade • Reassessment (if final grade 3.5): oral exam or special project

Bibliography	• Fürbringer J.-M. (2011). Design of Experiments. Lausanne : École polytechnique fédérale de Lausanne. • Nelder, J. A., & Mead, R. (1965). A simplex method for function minimization. Computer Journal, 7(4), 308-313. • Chambers, L. (2001). The Practical Handbook of Genetic Algorithms. Boca Raton: CRC Press. • Carraux Y, Naef O (2009). Chimiométrie – Introduction. Fribourg: Haute école d'ingénierie et d'architecture. Documentation: http://cyberlearn.hes-so.ch (requires a login)
Language	English
Comments	The students are responsible for covering any transportation costs involved.
Last Update	17.02.2023 / Michal Dabros