



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	<p>Name Dr. Michal Dabros</p> <p>Phone +41 (0)26 429 68 79</p> <p>Email michal.dabros@hefr.ch</p> <p>Address Haute école d'ingénierie et d'architecture de Fribourg Bd de Pérolles 80, CH-1700 Fribourg</p>
Lecturers	<ul style="list-style-type: none"> • Dr. Charles Guinand, Syngenta (charles.guinand@gmail.com) • Dr. Julien Billeter (julien.billeter@alumni.epfl.ch) • Guest lecturer(s)
Entry Requirements	Bachelor of Science in Chemistry or in a related course of study including basic knowledge in chemical reaction techniques and modeling (Bachelor level)
Learning Outcomes and Competences	<p>After completing the module students will be able to:</p> <ul style="list-style-type: none"> • 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 global optimum.
Module Content	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Lectures • Individual and group exercises • Invited speakers / excursion • Active participation in the module is required

Assessment of Learning Outcome	<ul style="list-style-type: none"> • Final examination (oral): 100 % of the final grade • Reassessment: oral exam or special project
Bibliography	<ul style="list-style-type: none"> • 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: École d'ingénieurs et d'architectes de Fribourg. <p>Documentation: http://cyberlearn.hes-so.ch (requires a login)</p>
Language	English
Comments	The students are responsible for covering any transportation costs involved.
Last Update	26.05.2020 / Michal Dabros