Module	**Safety, Production and Quality**
Code	MLS_S05
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. Véronique Breguet Mercier **Phone** +41 (0)26 429 69 76 **Email** veronique.breguetmercier@hefr.ch **Address** Haute école d'ingénierie et d'architecture de Fribourg, Bd de Pérolles 80, CH-1700 Fribourg
Lecturers	• Dr. Pierre Brodard, HEIA-FR • Laurent Donato, HEIA-FR • Olivier Vorlet, HEIA-FR
Entry Requirements	Bachelor of Science in Chemistry or in a related course of study including chemical production, physical chemistry and automation (Bachelor level)
Learning Outcomes and Competences	The objectives are to study, to understand, and to apply production techniques including the corresponding thermal safety, automation and quality in a sustainable development vision. The student will be able to: • List and evaluate the important processes of industrial chemistry • Assess a process in terms of costs, validation, planning and safety • Know the norms ISO 9001 and GMP • Application of standards to concrete case • Select industrial facilities most suitable for the development of an industrial process chemistry • Know the strength of equipment materials • Evaluate the thermal risk of a chemical process • Know the elements of a process risk analysis • Design an automated production
Mode Content	Industrial processes • Safety of industrial processes • Thermal data analysis and calculation for scale-up of exothermal reaction • Analysis, understanding and troubleshooting of Industrial incidents • Case studies at large scale

	Thermal safety • Chemical thermodynamic • Reactions kinetics and dynamics • Thermal safety • Calorimetry, DSC • Risk analysis • Case studies Process Automation • Enterprise-control system integration (ISA S95) • Batch Control (ISA S88) • Safety Integrity Level (ISA S84) • Industry 4.0 • Case studies Quality • To know what means managing according to ISO 9001 • To be able to define managing and working processes • To know the importance of quality controls and tracking systems • To know the basics of GMP • To be able to use several tools to increase the quality, especially in production process
Teaching / Learning Methods	• Lectures • Individual and group exercises • Active participation in the module is requested
Assessment of Learning Outcome	• Final examination (oral): 100 % of the final grade • Reassessment: oral exam
Bibliography	• F. Stoessel, Thermal Safety of Chemical Processes: Risk Assessment and Process Design, Wiley-VCH 2008 • J. Steinbach, Safety Assessment for Chemical Processes, Wiley-VCH 1998 • D. W. Fleming, A. Pillai, S88 implementation guide: strategic automation for the process industries, McGraw Hill 1999 • J. Kletti, Manufacturing Execution System – MES, Springer 2007 • Total Quality Management, Shoji Shiba, Dunod • Fundamentals of Management, Stephen Robbins, David Decenzo, Mary Coulter, Pearson 2011 • How do I implement ISO 9001?, multi authored, ISO Documentation: http://cyberlearn.hes-so.ch (requires a login)
Language	English
Comments	
Last Update	23.04.2020 / Véronique Breguet Mercier 22.03.2019/ Véronique Breguet Mercier 08.03.2018 / Ennio Vanoli 05.06.2018 / Michal Dabros & Roger Marti