Module	**Genomics and genome analysis**
Code	MLS_S08
Degree Program	Master of Science in Life Sciences (MSLS)
Cluster	Bio/Pharma
Specialization	Applied Biosciences
ECTS Credits	4
Workload	120 h: Contact 56 lessons = 42h; Self-study 78 h
Module Coordinator	**Name** Dr. Bruno Schnyder **Phone** +41 58 606 8659 **Email** bruno.schnyder@hevs.ch **Address** HES-SO Valais, Sion
Lecturers	• Dr. Alexandre Kuhn, HES-SO Valais, Sion • Dr. Bruno Schnyder, HES-SO Valais, Sion • Guest speakers (from industry)
Entry Requirements	Bachelor of Science in Life Science Engineering, in Life Technologies (Biotechnology or Bioanalytical Chemistry) or in a related course of study (Bachelor level)
Learning Outcomes and Competences	The participants will acquire knowledge on gene functions and dysfunctions related to diseases, as well as in the respective approaches and techniques of analysis. The student must be able to: • understand the gene structures and the related analysis • compare and evaluate different analytical systems for genes and genomes • search, read and apply scientific literature
Module Content	**Principles of genetic information** • in eukaryotic cells, in comparison with prokaryotic cells • cell signaling from transcription factors to gene expression **Gene analytics** • Sanger's method of gene sequencing • genomics, transcriptome analysis on micro-chips ("case-studies") **Genetic diseases in human** • genes and phenotypes (e.g. eye color) • genotype-related diseases (e.g. immunodeficiency) • and gene therapy ("case studies") **Model organisms** • engineering a gene-deficient KO mouse • applications in pharma ("case studies") • gene-engineering to produce "sweet proteins" (glycoproteins)

	Genomics and bioinformatics • Next generation sequencing NGS **Genomics in industrial biotechnology** • Basics of microbial genetics • Metabolic engineering • Synthetic biology **Gene therapy of genetic diseases** • The Sickle cell anemia paradigm **Mass spectrometry (MS) meets genomics** • (invited lecture from industry)
Teaching / Learning Methods	• lectures in oral and written form • exercise trainings in groups • literature study of selected research publications • self-study, mainly following the lectures • active participation in the module is required
Assessment of Learning Outcome	The reports related to each case study, and Journal Clubs must be validated to gain access to the exam. Written examination at the end of the semester. The grade of the exam is the grade of the course. Remediation : written examination
Bibliography	The lecturers' documentations and scientific papers will be handed out. Key literature books include : • Molecular Biology of the Gene, 7th Edition, By James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick; Published by Benjamin Cummings (2014); ISBN-10: 0-321-76243-6 ; ISBN-13: 978-0-321-76243-6 • Lewin's Genes XI, Jones & Bartlett Learning, Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick (2014), ISBN-13: 9781449659851
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