BIOENGINEERING AND - OMICS

Minor code	LLS345VE2
Education cycle	1st cycle (bachelor)
Mode of delivery	On-Campus
Study programme	Biotechnology
Part of study year	Year 3
Location	Leeuwarden
Semester	Spring semester; Terms 3 and 4
Number of credits (ECTS)	30
Language of instruction	English
Target group	Life Sciences students, Van Hall Larenstein students, Erasmus+ students, external students
Minor co-ordinator and contact person	Wouter Suring and Xavier Gallego y van Seijen Wouter.suring@hvhl.nl xavier.gallegoyvanseijen@hvhl.nl
Entry requirements and prerequisites	To start the minor students should have completed a minimum of 75 ECTS related to Life Sciences including courses on cell culturing and DNA cloning. Foreign students are asked to deliver proof of a successfully completed course on working safely in a biological laboratory setting.
Application procedure	Consult Exchange Possibilities

Major study units

Term of teaching	Study unit code	Name of the study unit	ECTS
Term 3	NA	Part A (Theory)	6
Term 3	NA	Part B (Practical instructions in the laboratory)	3
Term 3	NA	Part C (Project design)	6
Term 4	NA	Part D (Laboratory assignment)	10
Term 4	NA	Part E (-Omics Journal club)	4
Term 4	NA	Part F (Self-reflection)	1

Content

CRISPR-Cas9 is a technique that can be used to edit specific genes. The technique utilizes a Cas9 enzyme that can cleave DNA and is guided by a guide RNA. The CRISPR-Cas9 system can be used to study and cure diseases, to improve crops for plant breeding or to increase biofuel yields, among other things. The discoverers of this technique were recently awarded a Nobel prize.

During the minor Bioengineering and -omics you will use CRISPR-Cas9 to knock-out the Nrf2 gene that encodes a transcription factor that is dysregulated in some types of cancer. A human cancer cell line is available that will be used to study the effects of the knock-out. In addition, you knock-in a gene encoding a green fluorescent protein that can be viewed using a fluorescent microscope.

You start the project by designing your CRISPR-Cas9 experiment. Next, you have the freedom in the lab to organize your own project. In weekly work discussions, we discuss your progress and there is time to ask questions. The minor also contains an introduction on genomics, transcriptomics, proteomics and metabolomics. We explore these fields in the context of the role NRF2 plays in cancer.

Competences

NA

Learning goals

- Students will be able to orientate in the field of genetic engineering.
- Students will be able to perform a predesigned CRISPR-Cas9 experiment and design their own CRISPR-Cas9 gene editing project.

	• Students will be able to set up a research proposal and execute the practical part in the laboratory. • Students will be able to use cloning software and online tools to visualize a cloning strategy. • Students will be able to present a cloning design/research proposal. • Students will be able to interpret and report data obtained from molecular cloning and software tools. • Students will be able to interpret data obtained from research articles. • Students will be able to work in a research group and reflect on their work.
Added value	Students learn to apply the CRISPR-Cas technique in a laboratory setting.
Mandatory literature	Not applicable
Teaching methods and student workload	Part A (Theory): 160 hours Lectures, self-study Part B (Practical instructions in the laboratory): 88 hours Practical instruction, preparation/self-study Part C (Project design): 166 hours Literature study, project meetings, computer practicals, research proposal Part D (Laboratory assignment): 290 hours Self-study/preparation, project meetings, practicals, work discussions, poster presentation Part E (-Omics Journal club): 108 hours Lectures, self-study/article analysis, work discussion Part F (Self-reflection): 28 hours Preparation, report Total 840 hours
Assessment	Theoretical exam, attendance, presentation, poster, report
Evaluation scale	Grades between: 1-10; 0,1 interval; 5,5 pass View ECTS credits and grading