Module title	**Design and Analysis of Experiments**
Code	D2
Degree Programme	Master of Science in Life Sciences
Workload	3 ECTS (90 student working hours) - Asynchronous and synchronous distance learning, decentralized teaching: 32 h - Self-study: 58 h (10 h self-study before module starts)
Module Coordinator	**Name**: Lorenzo Tanadini **Phone**: +41 (0)31 910 21 20 **Email**: lorenzo.tanadini@bfh.ch **Address**: Berner Fachhochschule, HAFL, Länggasse 85, 3052 Zollikofen
Lecturers	Lorenzo Tanadini, BFH
Entry requirements	Attending the module "Handling and Visualizing Data" is required. Prior to this module, additional preparatory materials will be made available to facilitate student preparation for the module. Students are advised to start five weeks before the module with the preparatory work.
Learning outcomes and competences	After completing the module, students will be able to: • apply the basics of statistical inference (estimation, testing, confidence regions) in the course setting, • identify common and important types of experimental designs with respective advantages and disadvantages, • choose an appropriate design in a given research setting, • perform a correct statistical analysis of different types of designs, including unbalanced data sets, • perform post hoc tests, • interpret the model and report the findings scientifically.
Module contents	• Introduction to statistical inference (population and sample, statistical hypothesis testing, confidence regions) • General principles of experimental design (blocking, randomization) • Important particular experimental designs (e.g. fully randomized designs, randomized block designs; incomplete designs; factorial designs, fractional factorial designs; split-plot designs); when to use which design • Statistical analysis of all the particular designs that were introduced (including interpretation of e.g. block effects or interaction effects, adapted to the design) • Post hoc tests (also for ordinal factors) e.g. to compare subsets of treatments to each other • Interpretation and visualization of the results; scientific reporting of the results, back-translation from statistical terminology to the original research question
Teaching / learning methods	In the weeks before module start, students are expected to do preparatory work to prepare themselves for the module: preparations for the statistical topics as well as a minor brush-up of the course software R. The students receive preparatory as well as follow-up self-study work for each course day (regardless of whether it is a central or local day). The self-study consists e.g. of preparatory reading/videos, follow up exercises, examining case studies, etc.

	Central teaching is offered in a distance learning mode consisting of a combination of asynchronous activities (e.g. script, videos) and live online sessions. Local coaching consists of physical presence sessions where students actively solve exercises together with the local coaches. These exercises are meant to deepen the understanding of the material, give an opportunity to practice, provide extensions etc.
Assessment of learning outcome	Final written individual exam (open book, using individual laptop computers to run statistical analyses using the course software) (100%)
Format	7-weeks
Timing of the module	For ZHAW and FHNW: Autumn semester, CW 45-51 For BFH and HES-SO: Spring semester, CW 15-21
Venue	Distance learning (central teaching) and in-presence teaching at respective school (local coaching)
Bibliography	Material will be provided on Moodle.
Language	English
Links to other modules	This module builds on module D1 “Handling and Visualising Data” and complements the module D3 “Modelling and Exploration of Multivariate Data”.
Comments	Material treated during local teaching is relevant for the exam. Students have to make sure that an updated version of R is installed. Details will be communicated in advance.
Last Update	16.09.2021