Module	**Modeling and Simulation**
Code	MSLS_FS-02
Degree Program	Master of Science in Life Sciences (MSLS)
ECTS Credits	5
Workload	150 h: Contact 45 h; Group Exercise in the field 40 h; Self-study 65 h
Module Coordinator	**Name** Luuk Dorren **Phone** +41 31 910 29 78 **Email** luuk.dorren@bfh.ch **Address** Bern University of Applied Sciences, School of Agricultural, Forest and Food Sciences, Laenggasse 85, 3052 Zollikofen
Lecturers	• Christine Moos • Adel Albaba • Gaspard Dumollard • Martin Ziesak
Entry Requirements	None.
Learning Outcomes and Competences	After completing the module students will be able to: • explain the difference between modelling and simulation to a layman • understand principles of different modelling and simulation approaches • critically evaluate the possibilities and limitations of different modelling approaches • create simple models on their own • model or simulate aspects of practical, forest-relevant questions independently from model-language In addition, and as an example, students will learn to: • apply a forest growth model to reproduce forest development scenarios over different spatial scales (e.g. stand- to landscape level), and • simulate and quantitatively describe interactions between forests and erosion, transport, and deposition processes in fluvial systems with existing models, or • capture the simplest forestry engineering processes in commercially available tools and "simulation engines".
Module Content	• Fundamentals of modelling (mathematical description of a system, statistical vs. process-based modelling, types of models - point model vs. spatial models, deterministic vs. probabilistic, model calibration) (1 ECTS) • Basics of computer simulation (static/dynamic; Monte Carlo simulation; system dynamics; (multi-)agent based) (0.5 ECTS) • Forest growth models and their application in forest ecosystem management (e.g., simulation of interventions/disturbances; combination with silvicultural optimization) (1 ECTS) • Simulation of interactions between forests and erosion, transport and deposition processes in fluvial systems (0.5 ECTS) / Application of simulation techniques for forestry engineering processes using existing simulation solutions (0.5 ECTS) • Consolidation and synthesis in a problem case project (2 ECTS)

Teaching / Learning Methods	A combination of contact lectures, hands-on group exercises and Moodle assignments, both for individual- and teamwork
Assessment of Learning Outcome	1) four attestation exercises with passed/failed evaluation – 3 passed are required for successfully passing module 2) 2 Short PDF-based presentations of the simulation exercises (40%) 3) Report of the problem case project (60%)
Bibliography	https://www.acqnotes.com/Attachments/White%20Paper%20Introduction%20to%20Modeling%20and%20Simulation%20by%20Anu%20Maria.pdf https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2616 http://www.mas.ncl.ac.uk/~ndjw1/teaching/sim/R-intro.html#:~:text='R'%20is%20a%20programming%20language%20for%20data%20analysis%20and%20statistics.&text=It%20has%20many%20built%2Din,has%20a%20simple%20object%20system
Language	English (with additional explanations in German or French where necessary)
Comments	
Last Update	01.04.2021 / Luuk Dorren