



Module Title		Research Methods 2: Quantitative Approaches
Code	MCCf423	
Degree Programme	Master of Science – Circular Innovation and Sustainability	
ECTS Credits	3	
Workload	90 hours	
Module Coordinator	Name: <a href="#">Prof. Dr. Gernot Pruschak</a> Phone: +41 31 848 41 63 E-mail: <a href="mailto:gernot.pruschak@bfh.ch">gernot.pruschak@bfh.ch</a> Address: Brückenstrasse 73, 3005 Bern	
Lecturers	<ul style="list-style-type: none"> <li>• <a href="#">Prof. Dr. Stefan Grösser</a>; TI</li> </ul>	
Entry Requirements	Prerequisite: <ul style="list-style-type: none"> <li>• Successful completion of the <a href="#">Self-Evaluation: Basics of Statistics</a></li> </ul>	
Competencies upon Completion	<p><b>Competencies</b></p> <p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> <li>• conceptualize a dynamic problem suitable for systems analysis utilizing a qualitative causal modelling approach;</li> <li>• understand and interpret existing simulation models;</li> <li>• apply a systems analysis to small scale problems;</li> <li>• ensure the validity of a system dynamics simulation model with a defined set of validation tests;</li> <li>• understand the importance of quantitative data analysis;</li> <li>• clean and structure data;</li> <li>• perform descriptive statistical analysis;</li> <li>• know the elementary methods of quantitative data analysis;</li> <li>• understand the utility and differences of linear and logistic regression analysis as well as propensity score matching;</li> <li>• independently identify which method is most appropriate in which situation and be able to apply it concretely.</li> </ul> <p><b>Outcomes</b></p> <p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> <li>• reflect on issues/problems when applying data analysis methods;</li> <li>• apply statistical analysis and causal simulation modelling to adequate topics in the context of sustainability.</li> </ul>	
Content	The module offers a hands-on application-oriented approach to gathering, structuring, cleaning, visualizing, and analysing quantitative data. In addition to lectures, hands-on self-study exercises are provided during which students apply defined methods to their own “method-oriented” projects.	

	<p>This module comprises five sections. First, systems analysis, which is highly suited to the analysis of sustainability, is addressed. Second, we address why quantitative statistical methods have become more important in recent years and decades and where they can be applied. Third, data cleaning and structuring approaches are explained. Fourth, essential elements of descriptive statistics are reviewed (distribution, central tendency, dispersion, correlation). Fifth, methods for hypothesis testing and group comparisons are introduced.</p> <p>R-Studio, an open-source software, will be used for quantitative analyses. Additionally, Vensim, a simulation software, will be used for system dynamics modelling. Students are expected to build a basic understanding of programming so that they can use this software. Each student needs to have their own laptop for this module.</p>
<b>Teaching and Learning Methods</b>	<ul style="list-style-type: none"> <li>• Flipped classroom</li> <li>• Project-Based Learning</li> <li>• Individual exercises</li> <li>• Learning videos</li> </ul>
<b>Competency Assessment</b>	<ul style="list-style-type: none"> <li>• Midterm exam on systems analysis (50%)</li> <li>• Online quizzes on statistical analysis (during lectures) (10%)</li> <li>• Individual assignment on statistical analysis (40%)</li> </ul> <p>Students who receive an insufficient overall grade of 3.5, are given the opportunity to carry out a <i>subsequent improvement</i> of written assignments defined by the module coordinator. The maximum overall grade that can then be obtained is 4. This still counts as the first attempt.</p>
<b>Mode of Repetition</b>	<p>Should a student fail the module, they have one more attempt.</p> <p>They may either:</p> <ul style="list-style-type: none"> <li>• Submit a new assignment (100%), defined by the <i>Module Coordinator</i>, for the next resit examination session.</li> <li>• Repeat the full module next time it is offered.</li> </ul>
<b>Format</b>	<p>2 lessons per week over 7 weeks → Possible additional coaching sessions</p>
<b>Attendance</b>	Not mandatory
<b>Module Type</b>	Compulsory
<b>Timing of the Module</b>	Spring Semester, Calendar Weeks 08 to 14
<b>Venue</b>	Onsite   Brückenstrasse 73, 3005 Bern
<b>Literature</b>	<ul style="list-style-type: none"> <li>• Schaffernicht, M.; Grösser, S. (2018). <i>Growth Dynamics in New Markets</i>. Wiley Publishing.</li> </ul>
<b>Language</b>	English
<b>Links to Other Modules</b>	<ul style="list-style-type: none"> <li>• MCCf013 Introduction to Circular Economy and Scientific Literature</li> <li>• MCCf413 Research Methods 1: Qualitative Approaches</li> <li>• MCCf433 Research Methods 3: Transdisciplinary Approaches</li> <li>• MCCf443 Impact Assessment</li> </ul>
<b>Last Update</b>	June 2024