

Module Title		Pathways to Net Zero GHG Emissions in the Energy and Chemical Sectors
Code	MCCf133	
Degree Programme	Master of Science – Circular Innovation and Sustainability	
ECTS Credits	3	
Workload	90 hours <ul style="list-style-type: none"> • 14 hours contact teaching • 70 hours self-study • ~6 hours excursion 	
Module Coordinator	Name: Prof. Dr. Michael Hans-Peter Studer Phone: +41 (0) 31 910 29 36 Email: michael.studer1@bfh.ch Address: BFH – HAFL, Länggasse 85, 3052 Zollikofen	
Lecturers	-	
Entry Requirements	None	
Competencies upon Completion	After completing the module, students will be able to: <ul style="list-style-type: none"> • describe the current energy and raw material system in Switzerland; • summarize and evaluate the possible renewable technologies for the energy services heat, mobility and power; • discuss technologies for carbon capture and storage and negative emissions; • discuss possible pathways to net zero GHG emissions in the Swiss energy system; • name the available renewable carbon sources and possible pathways to net zero GHG emissions for the chemical industry. 	
Content	<p>Our current energy system and the chemical industry is highly dependent on finite and climate damaging fossil-based raw materials. For the transition to a circular economy, these materials must be replaced by renewable sources and feedstocks.</p> <p>In this module, the characteristics of today's energy system in terms of energy demand and sources will be presented. Based on this, the potential renewable technologies for each energy service (heat, mobility, power) will be discussed. Additionally, students gain an overview of carbon capture and storage and negative emissions technologies which are part of all published pathways to net zero GHG emissions. The course finishes with a discussion of the opportunities that exist today to defossilize the plastics and chemical industry.</p>	
Teaching and Learning Methods	<ul style="list-style-type: none"> • Screencasts • Flipped classroom • Reading and presenting scientific papers • Excursion 	

Competency Assessment	Oral exam (100 %)
Mode of Repetition	Should a student fail the module, they have one more attempt. They may either: <ul style="list-style-type: none"> • Repeat the oral exam (100%) during the next resit examination session. • Repeat the entire module next time it is offered.
Format	2 lessons per week over 7 weeks and 1 excursion
Attendance	Not mandatory
Module Type	Compulsory-Elective
Timing of the Module	Spring semester, Calendar Weeks 17 to 23
Venue	Onsite Brückenstrasse 73, 3005 Bern
Literature	<ul style="list-style-type: none"> • Brethauer, S. and Studer, M. H.-P. (2021). <i>Towards Net Zero Greenhouse Gas Emissions in the Energy and Chemical Sectors in Switzerland and Beyond - A Review</i>. CHIMIA. 75(9). p.788. https://doi.org/10.2533/chimia.2021.788 • Troiano, D.T., Hofmann, T., Brethauer, S. and Studer, M. H-P. (2024). <i>Toward optimal use of biomass as carbon source for chemical bioproduction</i>. Current Opinion in Biotechnology 81:102942. https://doi.org/10.1016/j.copbio.2023.102942
Language	English
Links to Other Modules	<ul style="list-style-type: none"> • MCCf143 Pathways to Net Zero GHG Emissions in the Mobility Sector • MCCf153 Pathways to Net Zero GHG Emissions in the Food Sector
Last Update	February 2026