

Module title	1.4 Pathways to net zero GHG emissions in the mobility sector
Workload (ECTS)	3 ECTS
Module coordinator	Prof. Dr. Andrea Vezzini
Contributing lecturers	<ul style="list-style-type: none"> • Prof. Dr. Joachim Huber • Prof. Peter Affolter • Dr. Priscilla Caliandro • Ueli Kramer (SBB), Bernhard Riegel (BERNMOBIL) Sabine Rapold (Krummen Kerzers AG)
Entry requirements	<p>Builds on:</p> <ul style="list-style-type: none"> • 0.1 Introduction to circular economy • 0.2 Bridging technology
Description	<p>A well-functioning global mobility system is central to the economy and the well-being of society. However, the movement of people and goods requires space, infrastructure, and energy resources, and has a negative impact on the environment, especially as fossil fuels continue to dominate the mobility sector. This course will address various measures to improve the sustainability of transportation and mobility over the complete sector: Reducing excessive traffic, shifting to more energy efficient modes, improving energy conversion efficiency, and finally, replacing fossil fuels. Policy, pricing, appropriate use of digitalization, and consideration of human behavioural aspects play key roles in this transformation.</p> <p>Mobility as a system</p> <ul style="list-style-type: none"> • mobility system CH (logistics, MIV, air, agriculture, public transport) • coupling mobility and energy systems (demand and supply side) • mobility and greenhouse gas emissions • mobility strategy of the federal government, sustainability goals <p>Vehicle technologies (road transport)</p> <ul style="list-style-type: none"> • fundamentals of propulsion systems • fuels (fossil, electric, hydrogen) and their sustainability potential • well to wheel efficiencies based on sustainable energy for different propulsion systems • test cycles (WLTP) <p>Public transport (CH)</p> <ul style="list-style-type: none"> • public transport in future cities (busses, trams) • individual public transportation (car sharing, robotaxis) • rail based public transport <p>Air and freight transport</p> <ul style="list-style-type: none"> • Potential of Electric Aircrafts • Sustainable fuels for Aviation • Sustainable freight concepts for Switzerland <p>Transport planning and sustainability</p> <ul style="list-style-type: none"> • Spatial planning and sustainability • Transport planning and transport turnaround • Space and mobility

	<p>Circular Economy Models for e-mobility</p> <ul style="list-style-type: none"> • Basics, Production, and function of batteries for mobility • Second life/use concepts for storage systems • Raw materials and life cycle analysis for automotive batteries <p>Digitalization and automation in vehicle technology</p> <ul style="list-style-type: none"> • Introduction to Advanced Driving Assistant Systems (ADAS) • Potential of Vehicle to Everything (V2X) communication • General impact of the digitalization in transport <p>The transformation to climate neutrality is a major challenge. Informed decisions, innovative technologies and business models, fair pricing, and a combination of long-term strategic planning and tactical flexibility to respond to unforeseen developments will be crucial.</p>
<p>Learning outcomes and competences</p>	<p>Competences:</p> <p>Students</p> <ul style="list-style-type: none"> • Learn to understand the global context of the mobility sector transformation and its direct relation to the energy system and resources • Get to know different technical solutions for drivetrains in individual and public transport systems for road, rail and air • Learn to analyse mobility related problems and recognize the potentials for a transformation towards a circular economy • Can evaluate the potential of digitalization for the mobility system <p>Outcome:</p> <p>Students</p> <ul style="list-style-type: none"> • Will be able to recognize dynamics in the complex system of mobility and the circular economy. • Learn to understand the effects of measures and apply them to concrete problems. • Will be able to identify potentials for sustainable and integrated mobility solutions. • Can develop innovative, intelligent, and marketable products or services and develop and implement new business models.
<p>Assessment of learning outcomes</p>	<ul style="list-style-type: none"> • The student will identify and propose to the module coordination body at the beginning of the module a possible improvement of a mobility system related challenge within his field of work (1 page). • At the end of the module the student will write a 4-page paper with problem analysis, proposed solution and an evaluation of the impact of his solution
<p>Didactic approach</p>	<ul style="list-style-type: none"> • Contact teaching • individual and group exercises • blended learning • field trips • guest lectures
<p>Project-based learning</p>	<p>Selected live cases and best practices: Swiss-wide, world-wide</p>



Links to other modules	<ul style="list-style-type: none">• 1.3 Pathways to net zero GHG emissions in the energy and chemical sectors
Bibliography	Literature will be provided before the start of the module
Language	English
Location	Bern