Anhang 4.1 NE zum SP Physik: Integration der Nachhaltigen Entwicklung in der Lehre

Kanton und Universität Bern haben sich verpflichtet, das Thema Nachhaltigkeit in allen Studienprogrammen zu integrieren. In sämtlichen einführenden Vorlesungen des Bachelorprogramms Physik/Astronomie werden die wissenschaftlichen Grundlagen vermittelt, die überhaupt erst eine quantitative Auseinandersetzung mit dem Thema Nachhaltigkeit ermöglichen. Zudem werden in allen Veranstaltungen der Physik/Astronomie Kernkompetenzen vermittelt, die bei der nachhaltigen Entwicklung eine wichtige Rolle spielen, z.B. wie man Probleme präzise formuliert, Lösungsstrategien entwickelt und diese mittels realer Daten validiert.
Um die Relevanz der Physik und Astronomie für Nachhaltigkeit zu verdeutlichen, veranstaltet der Fachbereich Physik/Astronomie darüber hinaus im Rahmen des Physikalischen Kolloquiums ca. einmal pro Jahr einen wissenschaftlichen Vortrag mit Bezug zu Nachhaltigkeit, zu dem sämtliche Studierende der Physik eingeladen werden.

NE-relevante Veranstaltungen:

Titel: **Specialist Course - Carbon Cycle**	**Dozierende:** **Prof. F. Joos, Prof. T. Fröhlicher**	**Stamm-Nr.:** **7830**
• Veranstaltungstyp: V* • Wiederholung im Semester: Alle 2 Jahre • Learning Outcomes: s. KSL • LV*/DL*: DL		
Beschreibung:		
Relevanz für NE: Carbon emissions from fossil fuel burning and land use change perturb the Earth System in a fundamental and non-sustainable manner. In this lecture we will discuss the anthropogenic perturbation of the carbon cycle and the role of natural carbon cycle variations for atmospheric CO2 and climate. The lecture provides a natural science background to better understand the United Nations Framework Convention on Climate Change and the Paris Agreement.		
Stichworte: • carbon cycle • climate change • carbon emission reduction as a central challenge of sustainable development • sustainability in the context of multiple ecosystem stressors and multiple climate targets		

Titel: **Specialist Course - Climate and Environmental Physics**	**Dozierende:** **Prof. M. Leuenberger, Prof. F. Joos, Prof. Th. Stocker, Prof. Chr. Raible, Prof. H. Fischer**	**Stamm-Nr.:** **7716**
• Veranstaltungstyp: V* • Wiederholung im Semester: alle 2 Jahre • Learning Outcomes: s. KSL • LV*/DL*: DL		
Beschreibung: This course can also be attended by master and PhD students of the Graduate School of Climate Sciences.		
Relevanz für NE: Anthropogenic climate change is one of the greatest challenges faced by human societies. The reduction of		

human caused greenhouse gas emission to meet the climate targets of the legally-binding Paris Agreement is key to reach the UN sustainability goals. This lecture will discuss the fundamentals of the climate system including the atmospheric radiation balance, carbon and other biogeochemical cycles, ocean and atmospheric circulation, multiple climate equilibria, climate variations of the last million years and applications of stable isotopes and radionuclides to trace environmental processes.

Stichworte:

- climate change as one of the greatest challenges for sustainable development
- Paris climate targets are key to reach the UN sustainable development goals
- IPCC report
- the physical climate system
- biogeochmical cycles and greenhouse gases

Titel: **Specialist Course - Introduction to Climate Modelling**	**Dozierende:** **Prof. Th. Stocker, Prof. Chr. Raible**	**Stamm-Nr.:** **11506**

- Veranstaltungstyp: V*
- Wiederholung im Semester: alle 2 Jahre
- Learning Outcomes: s. KSL
- LV*/DL*: DL

Beschreibung:

The goals of this course are:

a) to introduce the physical basis and the mathematical description using differential equations of the major components of the climate system;
b) to present the basics of numerical solution of ordinary and partial differential equations using examples from climate modelling;
c) to use an integrated programming language (e.g., Matlab or Python) to solve a series of problems in simplified climate modelling.

Relevanz für NE:

Sustainable development depends on quantitative knowledge of the Earth System. This course provides the physical basis of the atmosphere and the ocean, the major components that determine the Earth's climate. In order to understand the past natural, and man-made future climate changes, physically based models are required. The fundamental building blocks of climate models are introduced in this course. It also provides an introduction to the broader context, in particular the science-policy interface through the presentation and discussion of assessment reports of the Intergovernmental Panel on Climate Change that formed the scientific basis of the Paris Agreement.

Stichworte:

- Earth System
- Climate
- Climate Modelling
- IPCC
- Paris Agreement
- quantitative Analysis of Earth System Processes
- simulation of Earth System Processes

Titel: Fundamentalastronomie I	Dozierende: PD Dr. Rolf Dach, Prof. Dr. Thomas Schildknecht	Stamm-Nr.: 447504

- Veranstaltungstyp: V*
- Wiederholung im Semester: Wiederholung im FS Semester
- Learning Outcomes: s. KSL
- LV*/DL*: DL

Beschreibung:
Methods of Space Geodesy and Optical Astrometry

Relevanz für NE:
The sea level is one of the so-called Essential Climate Variable (ECV). Measuring the sea level rise is thus providing a fundamental input for climate models. Space debris research, on the other hand, is providing the scientific foundation for sustainable use of outer space.

Stichworte:

- land and atmosphere monitoring (incl. tides)
- data acquisition and validation/calibration (GNSS, SLR)
- sea level rise and marine environment monitoring
- climate change and emergency management
- earth environment and space situational awareness (operations, objectives)
- space debris and NEOs (operations, objectives)

V = Vorlesung
LV = ganzer Kurs
DL = Doppellektion

Bern, 10. Dezember 2018

Fachbereich Physik und Astronomie
Der Studienleiter:

A. Jäggi

Prof. Dr. Adrian Jäggi

Vom Studienausschuss genehmigt:

Bern, 11. Dezember 2018

Im Namen der Phil.-nat. Fakultät
Der Dekan:

Zoltan Balogh

Prof. Dr. Zoltan Balogh