UNIVERSITY OF THE ARCTIC

Circumpolar Studies Program

Advanced Emphasis Title: Arctic Environmental Technology

Institution: University Centre in Svalbard (UNIS)

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Start Date: Mid-August – Mid-December (only available in the Fall semester)

Delivery Method: Only onsite – no option for online delivery because of field course work

Application deadline: 15 April

Credits: 30 ECTS (15 North American credits at most institutions)

Requirements: The program requires that the student has completed 60 ECTS (2 semesters) in mathematics, physics, chemistry or mechanics/engineering (or a combination thereof) at the university level. This is a sciences based programme.

Advanced Emphasis Description:
Through the courses AT-207 Pollution in the Arctic (15 ECTS-credits) and AT-209 Arctic Hydrology and Climate Change (15 ECTS-credits) the program gives insight into environmental issues of the high Arctic, with focus on water management and pollution. The courses run from mid-August until mid-December and all teaching is local in Longyearbyen (78 deg. N) on the Spitsbergen Island. The courses provide the student with extensive field training as well as a thorough theoretical basis taught by a variety of experts. This program prepares the student for further studies in topics as well as gives valuable training for those who wish to pursue a professional career within the field.

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Courses:

AT-207 Pollution in the Arctic (15 ECTS)

Note: The course is interdisciplinary

Objective: The purpose of the course is to give students from all the departments at UNIS an overview of current and potential pollution problems, environmental effects and possible remediation techniques in Arctic areas.

Content: Despite its remoteness and general character of wilderness, certain Arctic areas are today subjected to substantial contamination. Exploitation of coal, oil and gas is the impetus behind major Arctic industrial developments. Arctic areas have also a relatively high input of persistent pollutants transported by air and sea currents. Industrial smelters, (Ni, Al, etc.), in the Arctic contribute to air pollution and leakage of oil has also caused substantial pollution.

In other areas, nuclear power plants, plutonium/uranium production as well as nuclear weapon testing, have caused severe pollution in lakes and rivers. The course addresses a broad variety of topics including pollution from the mining industry, radioactive pollutants, persistent organic pollutants, local waste handling, pollution from spilled oil, spreading, transport and environmental effects of these pollutants. Practical learning by field excursions and laboratory experiments is an important part of this course. The course will also focus on the dilemma between preserving remains from earlier and current industrial activities as a part of a cultural heritage and possible pollution from such remains.

A four day field excursion with practical experiments focused on the fate of oil spills and possible countermeasure techniques is compulsory. In addition, there will be shorter excursions to other polluted sites in the vicinity of Longyearbyen. The students will perform a project related to one of the lectured environmental topics as a part of the course. This project could be purely theoretical, a literature study, or based on lab/field work or finally it can include several of these parts.

Period:	Autumn semester 2010
Teaching:	60 hrs lectures, 22 hrs exercises and compulsory 3-5 days field work
Evaluation:	Written 5 hrs exam, approved reports and exercises.
Course responsible:	**Mark Hermanson**

AT-209 Arctic Hydrology and Climate Change (15 ECTS)

Note: The course is interdisciplinary

Objective: The purpose of the course is to give an introduction to the freshwater cycle in cold climate. Emphasis will also be on consequences of climate change based on the work by the Intergovernmental Panel on Climate Change (IPCC) and the Arctic Climate Impact Assessment

(ACIA). The course is designed in such a way that it will also be valuable and relevant for students specializing in other topics like geophysics, geology and biology.

Content: Freshwater is a crucial component of physical and biological systems in the Arctic. For example, water stored as snow during winter influences on vegetation, wildlife and soil properties. In spring, snow melt causes a major release of water into soil, streams and lakes causing transport of nutrients, sediments and erosion. Since water is inherently linked to key elements of the Arctic nature, there is a need for specialized knowledge about availability, transport and storage of water. The climate conditions and permafrost conditions limit the availability of water both spatially and in time, and make the few available resources vulnerable to pollution and other misuse. Further, water in the phase as snow and ice significantly influences on the surface energy balance due to its high reflection of solar radiation. On the contrary, lack of snow, sea ice and glaciers will absorb solar energy at the Earth's surface more efficiently, known as a positive climate feedback effect.

The course will cover topics such as: Hydrological effects of climate change, regional water balance in the Arctic; available water resources (surface water and groundwater); hydrological measurement techniques in an Arctic climate (precipitation, runoff, evaporation and snow); hydrological processes in permafrost areas; snow related hydrology; erosion and sediment transport in catchments and rivers; lake and river ice; surface energy balance; hydrological models for Arctic catchments. The course will give a broad background within Arctic hydrology and also focus on the consequences of the ongoing climate change. Excursions will be made during the course. The most important one will be a four day excursion to Ny-Ålesund at the beginning of the course.

Period:	Autumn semester 2010
Teaching:	60 hrs lectures, 30 hrs exercises/lab, 6 days field work
Evaluation:	Written 5 hrs exam (graded)
Course responsible:	**Carl Egede Bøggild**