

## THT 313- Water management technologies in cold climates

Special course organised by the Faculty of Sciences and Technology, Norwegian University of Life sciences (NMBU) - in collaboration with the Faculty of Chemistry, Biotechnology and Food Sciences, NMBU, and the UArctic network

### Key information:

Date: 13-17 June 2022

Type: Physical lectures and activities

5 ECTS: 40 hours of lectures and activities + a project report (7-10 000 words) by 31<sup>st</sup> August 2022

Final mark: 50% from an MCQ exam held on the 17<sup>th</sup> June and 50% for the project report.

Tuition fees: none

Enrolment deadline: 15<sup>th</sup> March 2022

Enrolment: via email to Susann Andersen <susann.andersen@nmbu.no>

### Background:

Cold and temperate climates have special challenges when it comes to the management of water, water supply and wastewater treatment. Some of the most pristine environments are located in colder climates and the pollution of water by emerging contaminants, in addition to the nutrients, is an increasing challenge. Most treatment processes are temperature dependent, requiring additional volume and time due to the slowing down of conventional processes at lower temperatures. Water distribution and sewer systems need special care to minimise operational problems during winters and snow melting periods. Climate change often negatively impacts these conditions further.

### Course contents:

Lectures on: Water quality status, Water resources management, Water treatment, Wastewater treatment related to Cold Climates – including arctic and temperate climates, and impact of climate change. Project report/scientific writing. Excursions: to water and wastewater treatment plants focusing on challenges and solution in cold climates.

### Learning outcome:

Knowledge: students will have an extended understanding of cold climate conditions related pollution states and management, treatment and operational aspects of treatment systems.

Professional skills: Students shall be able to make conceptual designs for water supply and wastewater treatment systems addressing the challenges in cold climates. They shall be able to carry out a literature review using modern scientific databases and the internet and to prepare a well-structured project report.

General competence: students shall have an extended understanding of the pollution trends in cold climates and specialised techniques to manage challenges related to water supply and wastewater treatment processes. They will be able to identify the advantages/weaknesses in current systems and propose improvements based on modern practices.

## Water Management Technologies in Cold Climates: THT313

13-17 June 2022, Ås, Norway (tentative schedule)

<b>13<sup>th</sup> June, Monday</b>		
09:00-09:15	Welcome and introduction to the course	Ratnaweera
09:15-10:15	General challenges in water management in cold climates	Ratnaweera
10:30-12:00	Arctic environment: pollution sources, statues, and management	Kallenborn
12:00-12:30	Lunch	
12:30-15:30	Colloidal and water chemistry in cold climate	Chernyshova
15:30-16:00	Project report – structure and topics	Maletskyi
19:00	Welcome dinner	Andersen
<b>14<sup>th</sup> June, Tuesday</b>		
08:00-15:00	Visit to treatment plants for drinking water and wastewater. How utilities reduce impacts from cold temperatures and solution to manage climate change impacts (Two groups to Lillestrøm/Vestby)	Ratnaweera (SFR) Maletskyi (NRVA)
15:00-19:00	Visit to the world's most spectacular <a href="#">indoor arena for snow experiences</a> .	Andersen
<b>15<sup>th</sup> June, Wednesday</b>		
09:00-09:45	Water supply and distribution in cold climates – general	Hem
10:00-12:00	Water supply technologies in cold climates – processes & design principles	Hem
12:00-12:30	Lunch	
12:30-14:00	Group work/Discussion: Design of DWTP in Cold Climates	Hem
14:30-16:30	Emerging pollutants: monitoring and removal	Cuprys
<b>16<sup>th</sup> June, Thursday</b>		
09:00-10:00	Wastewater collection and transport in cold climates – general	Nilsen
10:15-12:30	Wastewater treatment technologies in cc – processes & design principles	Ratnaweera
12:30-13:00	Lunch	
13:00-14:30	Design of WWTP- discussions	
14:00-16:00	Time for exam preparations	
09:00-10:30	Water supply and distribution: practice and challenges in Iceland	Gunnarsdóttir
10:45-12:00	Wastewater collection and treatment: practices and challenges in Iceland	Andradóttir
12:00-12:30	Lunch	
12:30-14:00	Time for exam preparations	Ratnaweera
14:00-15:30	MCQ online exam & discussion of results	Ratnaweera
15:30-16:00	Closure of the course	

### Lecturers/responsible staff

Prof. Harsha Ratnaweera, Course coordinator

Prof. Roland Kallenborn, NMBU

Prof. Lars Hem, Oslo Water/NMBU

Associate prof. Zakhar Maletskyi, NMBU

PostDoc Agnieszka Cuprys, NMBU

Logistics coordinator Susann Andersen, NMBU

Guest lecturers.

Prof. Hrunn O. Andradóttir, Faculty of Civil and Environmental Engineering. University of Island

Dr María J. Gunnarsdóttir, Faculty of Civil and Environmental Engineering. University of Island