

THT 311 - 2022

Water Resources Management and Water & wastewater treatment (Special topics)

Time: 20th – 30th June 2022

Course contents

This course is an intensive course complimentary to THT 271, THT 310, THT312 or can be taken as an independent professional development course.

This course focuses on thematic modules addressing the modern water and wastewater management:

- Global water challenges
- Integrated Water Resource Management
- Climate change impacts on water sector
- Water Quality Management
- Water quality monitoring
- Bioeconomy
- Digitalisation of the water sector
- Cybersecurity in the water sector
- Nanotechnology in water treatment
- Emerging water challenges
- Research skills for the water sector

Course assignments will focus on implementation of one or more special topics in a water utility upgrading.

Learning outcome

After completion of this course, graduates will be able to:

- apply principles of the integrated water resource management
- recognise global and emerging challenges in the water sector
- explain principles, opportunities and risks of digitalisation in the water sector
- implement bioeconomy principles in the water sector
- explain advantages with nanotechnologies in the water sector
- develop research concepts and present results

Learning activities

(1) Lectures (2) group work in small teams, (3) Tutorials with process simulation program STOAT, (4) instructions and hands-on practice in usage of scientific databases and reporting. Most of the presentations will be available in Canvas before the lectures

Lecturers:

Course responsible	Prof, Harsha Ratnaweera (HR)
Lecturers from RealTek	Assoc. Prof. Zakhar Maletskyi Assoc. Prof. Pelin Schumacher, Prof. Lars Hem (Oslo Water). Research Prof S Vigneswaran (Prof em, University of Technology Sydney, Australia) Dr Agnieszka Cuprys (PostDoc), Dr Goitom Weldehawaryat (PostDoc), Fanjing Feng (PhD fellow)
Guest lecturers	Prof Jan Vermaat (Faculty of Env. Sci. & Natural Resource Management, NMBU), Haakon Thaulow (Former Director, Norwegian Institute for Water Research-NIVA), Dr Abhilash Nair (Project Manager, DOSCON AS), Prof Ted Edwards (University of Calgary, Canada), Assoc. Prof Sathish Ponnurangam (University of Calgary, Canada), Prof Alex Orlov (State Univ of New York, Stony Brook, USA)
Exam (1 st July)	Digital exam

Curriculum:

- Powerpoint presentations and hand-outs from lecturers (available in Canvas)
- Additional information given orally at the physical lectures or zoom lectures
- Selected publications stored in Canvas.

Reference literature:

- Kemira: [About Water treatment](#), 2020 (pdf in Canvas)
- Wastewater Engineering: Treatment and Resource Recovery. 5th Ed, by Metcalf & Eddy, 2013, (selected sections).
- Water Treatment: Principles and Design, 3rd Edition, MWH, 2012 (selected sections)

Term paper

- There will be one project work.
- Detailed tasks will be presented at the beginning of the course. A report of about 5000-7000 words (15-20 pages including figures) is expected.
- Individual submissions only (no group submissions). More information will be provided with the task description.

Language:

- All lectures and handouts will be in English,
- Exam questions, term paper descriptions etc will be provided only in English.
- Project work could be provided either in English or Norwegian.

NB: The lecture plan could be changed – please follow the information in Canvas

Introductory revision sessions (Voluntary for students who completed THT271)

Saturday 18 th June: Water supply Revision	
Course introduction (Ratnaweera)	09:00-09:15
Needs, challenges and legislations: EU and WHO (Hem)	09:15-09:45
Coagulation, Corrosion control Disinfection and NOM removal (Hem)	10:00-10:45
Drinking water quality: sources, parameters, principles of monitoring (Maletskyi)	11:00-11:30
Separation: sedimentation and flotation (Ratnaweera)	11:30-12:00
Separation: Surface, depth and membranes (Maletskyi)	12:00- 12:30
Discussion time (voluntary- teachers will be present)	13:00-14:00
Sunday 19 th June: Wastewater Revision	
Needs, challenges and legislation: EU and WHO (Ratnaweera)	09:00-09:30
Wastewater quality: sources, parameters, principles of monitoring (Maletskyi)	09:30-10:00
Physical methods and application (Maletskyi)	10:15-10:45
Chemical methods and application (Ratnaweera)	10:45-11:15
Biological methods and application (Hem)	11:30-12:30
Discussion time (voluntary- teachers will be present)	13:00-14:00

THT 311 – 2021

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Monday 20 th June	
Course introduction (Ratnaweera) and group work structure (Maletskyi)	09:00-09:30
Module 1: Meeting the global challenges in the water sector (Thaulow)	09:30-12:00
Group work: Groupmap exercise (Maletskyi)	12:30-16:00
Tuesday 21 th June	
Module 2: Research skills and visibility	
Research publication writing (Ratnaweera)	09:00-09:45
Increasing visibility: ResearchGate, Google Scholar, Scopus, LinkedIn etc (Maletskyi)	10:00-10:45
Managing scientific references – Literature databases (Ludwig)	11:00-12:00
Introduction to Mendeley – a Reference tool (Ratnaweera)	12:30-13:30
Group work: Hands-on literature search (Ludwig)	13:30-16:00
Wednesday 22 nd June	
Module 3: Planning for the future and emerging water challenges	
Groupwork (Playing serious game on Adaptive Planning) (Maletskyi)	09:00-12:00
Planning of water and wastewater utilities for the future (Hem)	12:30-15:30
Thursday 23 rd June	
Module 4: Water quality monitoring	
Sampling and online monitoring (Ratnaweera)	09:00-10:00
Advanced methods (Maletskyi/Cuprys)	10:15-11:30
Introduction on the project work (Maletskyi)	11:30-12:00
Groupwork: designing a water quality monitoring plan for a DWTP/WWTP (Ratnaweera)	12:30-15:00
Friday 24 th June	
Module 5: Emerging water challenges and innovations in water treatment	
Emerging water challenges (Ratnaweera)	09:00-09:45
Securing water quality from pathogens (Ratnaweera)	10:00-10:45
Emerging pollutants and their management (Cuprys)	11:00-12:30
Introduction to electrochemical methods (Maletskyi)	13:00-14:00
Electrooxidation (Ponnurangam)	14:15-15:15
Electrocoagulation (Edwards)	15:30-16:30
Saturday 25 th June	
Excursion- by bus and ship to Sweden (bus leaves at 14:00, returns at 22:30)	
Sunday 26 th June	
Free	
Monday 27 th June	
Module 6: Bioeconomy (Schumacher)	09:00-12:00
Group work: discuss and prepare a PPT presentation on given topics	12:30-14:00
Presentation in plenum (Pelin)	14:00-15:00
Tuesday 28 th June	
Module 7: Integrated water resources management and water-food-land nexus	
Sustainable integrated management of water-land-food-energy-climate for a resource efficient Europe (Laspidou)	09:00-10:00
Groupwork (Playing serious game SIM4NEXUS) (Weldehawaryat)	10:00-12:30
Integrated water resources management & Water quality (Vermaat)	13:00-16:00
Wednesday 29 th June	
Module 8: Innovations in water treatment: nanotechnology	
Nanoparticles in water: sources, fate and impacts on environment & health (Vigneswaran)	09:00-10:15
Nanotechnology in wastewater treatment (Vigneswaran)	10:30-12:00
Nanotechnology in water supply (Ratnaweera)	12:30-14:00

How nanotechnology can save us and the environment (Orlov)	14:15-17:00
Thursday 30th June	
Module 9: Digitalisation of the water sector	
Opportunities and threats (Weldehawaryat)	09:00-10:15
BIM and digital twins (Nair)	10:30-12:00
Introduction to simulation programs in the water sector (Ratnaweera)	12:30-13:15
Simulation program STOAT (Ratnaweera/Fanjing)	13:15-15:00
Friday 1st July	
Module 10: Planning of water and wastewater utilities for the future (Hem)	
Discussion of exam question & project report (Ratnaweera)	09:00-11:00
Preparation for exam	11:00-11:30
Exam – MCQ/Digital	11:30-14:00
Exam – MCQ/Digital	14:00-15:00
Discussion of questions/answers	15:00-15:45
Closure	15:45-16:00