



Course-PM 2019

ACE085 Water systems and modelling (7.5 hp)

Course purpose

The aim of the course is to provide students with an understanding of problem solving and modelling in the field of water systems.

Learning objectives:

- Understand the hydraulic, hydrodynamic and pollutant transport processes in natural and constructed water systems
- Distinguish between different models, considering both simple and advanced models
- Be able to select and use an appropriate model for a given analysis to assess the quantity and quality of water, including model calibration, validation and uncertainty
- Evaluate appropriate input values for the model parameters of the models considered, and to appreciate the sensitivity of the simulation results to the selected parameter values
- Write a scientific paper
- Carry out a literature review
- Assess and give constructive feedback on other projects group's work:
 - a. Critically evaluate used methods with consideration to scientific trustworthiness
 - b. Interpret and assess the quality of the results
 - c. Evaluate whether research has been carried out in a trustworthy and defensible manner

Contact details

Course is offered by the department of Architecture and Civil Engineering

Examiner:

- Mia Bondelind, mia.bondelind@chalmers.se, 031 – 772 21 51

Teachers:

- Oskar Modin, oskar.modin@chalmers.se
- Kathleen Murphy, murphyk@chalmers.se
- Ekaterina Sokolova, ekaterina.sokolova@chalmers.se

Please use email to contact the teachers.

Course design

The course consists of several lectures and exercises, one individual assignment and one group project.

Lectures and exercises

Lectures and exercises cover central topics in the course. Exercises illustrate how various models can be used to model water systems. Lectures and exercises will give support to both the group work and the individual assignment. The exercises are solved in groups of two students. The exercises are graded pass or fail. Support to solve the exercise is given during the scheduled sessions.

Exercise		Program	Deadline
Ex1	Numerical modelling	Matlab	
	Report handed in. Instructions in a separate document.		13/9
Ex2a&b	Ex2a: MIKE model	MIKE 3 FM	
	Ex2b: MIKE model	MIKE 3 FM	
	Report handed in. Instructions in a separate document.		20/9
Ex3	Wastewater process modelling	Matlab/ Excel	
	Report handed in. Instructions in a separate document.		4/10
Ex4	Statistics - exploratory data analysis	Matlab	
	Report handed in. Instructions in a separate document.		11/10
Ex5	DHI	MIKE21	
	Mandatory attendance		18/10

Individual assignment

The assignment will be sent to 'Urkund' (Plagiarism control). The assignment is graded (Fail, 3, 4, 5). Write 2500 words (not included references) and use at least 10 different references.

Formulate a hypothesis to examine and write a reflective assignment according to the instructions below:

- Identify one problem that can be solved/addressed with digitalisation and formulate your hypothesis
- Describe briefly the background to the identified/selected problem
- Describe how digitalisation can help address/solve the selected problem
- Reflect on the advantages and limitations of the suggested approach
- Discuss the ethical issues that need to be considered

Mandatory Tasks	Deadlines
Submit individual assignment	At 18.00, 10 th of October

Group project

The group project is carried out in teacher assigned groups of 3-4 students. See separate document for further information on the group project.

You are expected to:

- Organise, plan and manage the project work load according to the tasks and the members of the group
- Collaborate professionally according to the project group's needs of structured management and task distribution

The group project will be sent to Urkund. The group project is graded (Fail, 3, 4, 5).

Mandatory Tasks	Deadlines
Submit paper (Send paper to reviewers)	At 18.00, 16 th of October
Send reviewed paper back to authors	At 10.00, 22 nd of October
Presentation of results	At 10 – 12, 22 nd of October
Hand in final paper	At 18.00 25 th of October

Computer Software

We will use Matlab, Excel, MIKE21 and MIKE 3 FM in the course.

Course literature

The course literature consists of documents and scientific articles. It can be found on Canvas.

Examination

Written individual assignment (graded). Computer exercises (Pass/Fail). Project work is reported in a written scientific paper (graded). Perform a clear oral presentation of the project result that is well-suited to its intended audience. Assess and give constructive feedback to other projects group's work and scientific paper.

Course schedule

W1	Time			Teacher
3/9	8-10	Le	Introduction and start of group work	MB/ES
3/9	10-12	Le	Transport in fluids, partial differential equations and numerical solutions	MB
4/9	8-10	Le	Academic writing, research ethics and group work	MB
6/9	8-10	Le	Transport in fluids, partial differential equations and numerical solutions	MB
	10-12	Ex1	Numerical modelling	MB
W2				
10/9	8-10	Le	Hydrodynamic modelling	ES
	10-12	Ex2a	Hydrodynamic modelling, MIKE	ES
11/9	8-10	GW	GW consultation – help with model set-up in MIKE	ES/MB
13/9	8-10	Le	Water quality modelling	ES

	10-12	Ex2b	Water quality modelling, MIKE	ES
W3				
17/9	8-10	Le	Wastewater process modelling	OM
17/9	10-11 11-12	GW	Discussion on individual assignments Independent GW without supervision	MB
18/9	8-10	Ex3	Wastewater process modelling	OM
20/9	8-10	Ex3	Wastewater process modelling	OM
W4				
24/9	8-10	Le	Dag Wendelin, AI and Big Data	DW
24/9	10-12	GW	GW consultation help with MIKE-modelling	ES/MB
25/9	8-10	Le	Göteborg kretslopp o vatten	
27/9	8-10	Ex3	Wastewater process modelling	OM
W5				
1/10	8-10	Le	Statistics - exploratory data analysis	KM
1/10	10-12	GW	GW consultation help with MIKE-modelling	ES/MB
2/10	8-10	Le	Statistics - exploratory data analysis	KM
4/10	8-12	Ex4	Statistics - exploratory data analysis	KM
W6				
8/10	8-10	Le	Giving feedback and reviewing a paper	MB
8/10	10-12	GW	GW consultation – writing paper discussions	MB
W7				
15/10	8-10	Le	DHI lecture	
	10-12	GW	GW consultation, final questions, help with MIKE-modelling	MB/ES
16/10	8-10	Le	DHI lecture	
18/10	8-12	Ex 5	DHI exercise – mandatory attendance!	
W8				
22/10	10-12	Le	Presentations – mandatory attendance!	MB/ES
25/10	18.00		Hand in of group project	