## Course Specifications

Valid as from the academic year 2016-2017

### Environmental Modelling (C003809)

#### Course Specifications

**Lecturers in academic year 2019-2020**

- **Soetaert, Karline**: WE11 lecturer-in-charge
- **Bonte, Dries**: WE11 co-lecturer

**Course offerings and teaching methods in academic year 2019-2020**

<table>
<thead>
<tr>
<th>Course</th>
<th>Language</th>
<th>Type</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (semester 2)</td>
<td>English</td>
<td>lecture</td>
<td>15.0 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>seminar: coached exercises</td>
<td>15.0 h</td>
</tr>
</tbody>
</table>

Offered in the following programmes in 2019-2020

- Master of Science in Marine and Lacustrine Science and Management
  - 3 A

**Teaching languages**

- English

**Keywords**

- Present day environmental problems (e.g. eutrophication, contaminant dispersal, climate change, ocean acidification) require a quantitative approach. To better understand how natural systems respond to such changing inputs and boundary conditions, biogeochemical models of varying complexity are being called upon. The central aim of this course is to learn how to develop and apply such models. In this course we will focus particularly on elemental cycling (Carbon, Nitrogen etc) and transport of contaminants within aquatic ecosystems (e.g. rivers, estuaries, lakes, oceans). Models are implemented in the open-source programming language R. Models in the environmental sciences.

- Construction of models
  - Balance equations, boundary conditions, transport formulation, kinetic rate laws
  - Reactive transport models (box models, 1D, 2D and 3D)
  - pH models, acid-base chemistry and CO2 uptake

- Model solution
  - steady-state solutions versus transient solutions
  - analytical versus numerical solution
  - numerical integration procedures

- Model applications
  - Causes of uncertainty in model predictions
  - Sensitivity analysis
  - Fitting models to data: parameter estimation, cost functions, estimators (least squares, maximum likelihood)
  - Parameter uncertainty
  - Model selection

**Initial competences**

<table>
<thead>
<tr>
<th>Course size</th>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.0</td>
<td>90 h</td>
<td>30.0 h</td>
</tr>
</tbody>
</table>

(Approved)
Final competences

Conditions for credit contract
  Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract
  This course unit cannot be taken via an exam contract

Teaching methods
  Lecture, seminar: coached exercises

Learning materials and price

References

Course content-related study coaching

Evaluation methods
  end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period
  Oral examination

Examination methods in case of periodic evaluation during the second examination period
  Oral examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation
  not applicable

Calculation of the examination mark
  oral exam: 100%