Fall Term, a.y. 2017-2018

Course: The Role of Ecosystem Services in Environmental Disaste
Lecturer: Dr. Ir. Ghada El Serafy
Date: 01/10/2018 -05/10/2018
Classroom: 1-16 @ IUSS

Course schedule

Week	Date	Lecture hours From____ To____	Tutorial hours From____ To_____	Subject	Tot h
1	01.10.2018	14:00-16:00		Introduction, Ecosystem Services Theory, Concepts	2
	01.10.2018	16:00-18:00		Trade-offs, Quantification	2
	02.10.2018	9:00-13:00		Introduction to Environmental Disasters	4
	02.10.2018	14:00-18:00		Environmental Policy	4
	03.10.2018	9:00-13:00		Data Services	4
	03.10.2018		14:00-18:00	Practical exercise – Setting-up a Model (Delft3D)	4
	04.10.2018	9:00-13:00		Bayesian Belief Network Theory, Concepts	4
	04.10.2018		14:00-18:00	Constructing a BBN Model (Netica/GeNIe)	4
	05.10.2018	8:00-9:00		Exam	2
	05.10.2018		9:00-10:00	Practical Applications	

Brief Contents Description and Course Syllabus:

Day 1: Ecosystem Services (ESS)

Afternoon Session 1: Introduction, ESS Theory, Soncepts

The session starts with the course outline and general introduction. Later, the concept of ecosystem services and their role in preventing environmental disasters will be presented. Moreover, the different categories of ESSs will be introduced, such as provisioning, regulating, supporting and cultural services, with strong emphasizes given to their connection to environmental disaster prevention/mitigation.

Afternoon Session 2: Trade-offs, Quantification

The afternoon session presents the possible ways of quantifying and valuing ESSs. Trade-offs between different ESSs will be demonstrated. The trade-offs will be assessed in connection with relevant policy documents. Finally, ecosystem indicators (or group of indicators) measured to quantify ESSs will be presented along with with their link to policy and disaster evaluation.

Day 2: Introduction to Environmental Disasters and Policy

Morning Session: Introduction to Environmental Disasters

Day 2 will start with an introduction to environmental disasters such as pollution (point source or diffuse), spring blooms and Harmful Algal Blooms (HABs). In addition, a general risk framework (hazard, exposure, vulnerability) for environmental risks will be introduced to assess the environmental disasters.

Afternoon Session: Environmental Policy

During this afternoon session an overview on the role of policy instruments will be presented including how they aim to prevent environmental disasters and maintain/restore good ecological status. Examples of such policies are: Integrated Maritime Policy, Marine Strategy Framework Directive, Common Fisheries Policy,

BLUEMED Initiative, Water Framework Directive, Natura 2000, or Ramsar convention. The data requirements for implementing these environmental policies will be given.

Day 3: Environmental Monitoring Systems

Morning Session: Data Services

On Day 3, monitoring methods to collect ecological data will be presented including their limitations and spatial/temporal resolutions. This will cover in-situ monitoring networks (instruments and measured variables), satellite remote sensing of ecological variables (concepts, variables), and physically based environmental modelling (e.g. Partial Differential equations, boundary conditions, initial conditions, spatial-/temporal discretization, numerical schemes, main model processes).

The connection between the monitored ecological variables and relevant policies will be emphasized. Common gaps in the ecological datasets and the role of environmental modelling to complement monitoring efforts will be introduced. Moreover, a brief overview will be given on probabilistic modelling and forecasting of the ecological status with ensembles techniques.

Afternoon Session: Practical exercise - Setting-up a Model (Delft3D)

During this afternoon session a small exercise will be done using Delft3D software. The course attendees will set up a simple model specifying the model spatial domain (grid generation on a small domain), temporal domain (choosing a time step), specifying simple boundary and initial conditions, and other forcings (e.g. river discharge, atmospheric deposition). The results will be visualized/explored as point results (time series) and area results (map outputs).

Day 4: Bayesian Belief Networks (BBNs)

Morning Session: BBN Theory, Concepts

Day 4 starts with an introduction to statistical modelling (with probabilistic graphical models) of ecological status based on probabilities derived from data or expert opinion. Main advantages and disadvantages of BBNs, and their potential applications in environmental modelling will be listed. In addition, the session will cover the basic BBN theory such as Bayes theorem, conditional probability tables (CPTs), and causality between parent/child nodes.

Afternoon Session: Constructing a BBN Model (Netica / GeNIe)

The BBN theory of the morning session will be translated into practice by constructing a simple Bayesian Belief Network using open source software (Netica or Genie). This exercise includes building a BBN schematization and filling in the nodes with data or expert opinion.

Day 5: Exam, Practical applications

Morning Session 1: Exam

The course attendees will be evaluated at the end of the course through an exam on theory and practical exercises (multiple choices, problem or case-based test). The exam intends to measure the attendees' comprehension of the taught course material and grades it according to the ECTS system (A to F) or local grading system (if required).

Morning Session 2: Practical Applications

For the closing session of the course, example projects and applications from industry will be presented which will be discussed in groups. This will be followed by a time slot dedicated for questions and answers.