Course Name
“Introduction to Systems Thinking, Systems Analysis and System Dynamics: The Role of Systems Science in Sustainability Science”

Course Description
**Objective:** The overall objective of the course is to develop the student's capacity to make a systemic analysis of complex dynamic issues by applying systems science with respect to sustainability criteria.

**Course Details and Content:** The course will introduce the students to a generic systems science modeling framework consisting of:
1. conceptual modeling and systems analysis; and
2. system dynamics modeling and integrated scenario analysis.

Firstly, the students will be introduced to systems science and sustainability science concepts to understand the interconnected patterns of three dynamic and complex systems that constitute the world we live in – namely, the biophysical world system (natural resources: e.g. water, soil, biomass etc.), the human system (individuals, society) and the human built support system (all physical, legislative and institutional infrastructures: e.g. from economy to government, to technology to agriculture etc.). With the help of systems thinking and systems analysis the students will apply casual loop diagramming methodology to create conceptual models showing interconnections, cause effect relations, feedbacks and time delays between/within these dynamic systems. This will help the students to get a holistic view and develop a better understanding of the entire system behaviour. This understanding is essential when identifying and assessing problems, as well as the main driving forces and the associated potential alternative solutions to these problems.

Secondly, systems dynamics will be introduced as a methodology to understand the behavior of complex systems over time. By using Stella Architect system dynamics modeling software, the students will be introduced to how conceptual model structures are transferred into dynamic numerical models in computer environment, and how such models can be used as decision support tools to generate model simulation results under various scenarios and to perform integrated scenario analysis.

**Course Design:** Besides lectures, the course is mainly based on hands on exercises, where the group modelling process and cooperation are of great importance. The exercises will incorporate elements from biophysical world system, human system and the built support system covering natural, economical, technological and social issues in long-term time frames.

**Learning outcomes:** Upon successful completion of this course the students will be able to;
Learn how different types of complex systems and processes can be understood, analyzed and modeled (conceptually and numerically); Understand all model development phases; Learn how to critically evaluate models and their limitations (assumptions/simplifications); Learn how to use Stella Architect software; and understand how models, as decision support tools, can generate alternative simulations under different scenarios for integrated analysis and strategic planning.

**Dates:** 14-18 May, 2018

**Course application:** Deadline for registration is May 7, 2018. Admission will be on first-come, first-serve basis. No prerequisite for the course. The course is open to all Ph.D. students across disciplines and faculties.

**Course coordinator:** Deniz Koca
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