ELE 3744 System Dynamics

Programme
Elective

Responsible for the course
Kim van Oorschot

Department
Department of Leadership and Organizational Behaviour

Term
According to study plan

ECTS Credits
7,5

Language of instruction
English

Introduction
Many of the problems we now face arise as unanticipated side effects of our own past actions. All too often the policies we implement to solve important problems fail, make the problem worse, or create new problems. Effective decision making and learning in a world of growing *dynamic complexity* requires us to become system thinkers to expand the boundaries of our mental models and develop tools to understand how the structure of complex systems creates their behavior.

This course introduces students to *system dynamics* as a tool for analyzing and modeling complex business problems and strategies. System dynamics is a tool that enables us to understand the structure and dynamics of complex systems. System dynamics is also a modeling method that enables us to build computer simulations of complex systems and use them to design more effective policies and organizations. Together, these tools allow us to create "management flight simulators" that can be used to experience the long-term side effects of decisions, speed learning, develop our understanding of complex systems, improve the quality of decision making, and design structures and strategies for greater success.

This course is especially applicable for students that want to learn a *new way of thinking about business processes* . Furthermore, the course gives students, interested in a future career as consultant or business analyst, a competitive edge in the job market.

Learning outcome
Acquired knowledge
After completing the course, students will be able to explain how the structure of business systems creates their behavior and performance. Furthermore students will be able to understand how well-meant policies often inadvertently *create* business performance issues, rather than *solve* them.

Acquired skills
After completing the course, students will be able to develop simulation models of business systems, and perform *what-if* scenarios with these models. Based on the outcomes of the what-if scenarios, students will be able to develop better policies.

Reflection
After completing the course, students will be able to reflect on their "old way of thinking" and how it differs from the new way of thinking. Students will be able to recognize when a problem is dynamic, and when they should apply the "new way of thinking". Students will learn to look at business or social problems from a broader perspective.

Prerequisites
None.

Compulsory reading
Books:
Sterman, John D.. 2000. Business dynamics : systems thinking and modeling for a complex world. Irwin McGraw-Hill

Recommended reading

Course outline
- Introduction, course overview, objectives, rules of the game
- Overview of system dynamics modeling and interrelations of structure and behavior, causal loop diagramming
- Stocks and flows diagramming
- Dynamics of stocks & flows structures
- S-shaped growth & real-life case
- Delays & Oscillations
- Decision-making & Modeling human behavior
- Supply Chains and Oscillations & Case Introduction

Computer-based tools
Vensim PLE (software, free download available at www.vensim.com)

Learning process and workload
There will be different means of learning in this course for instance lectures, group work, case studies and case presentations. Firstly, the lectures and the reading of compulsory literature in order to get a grasp of basic concepts. Secondly, different kinds of assignments will be given. These must be completed in order for the student to be well prepared for the examination. Finally students are to deliver a group term paper based on a case study in a given topic. The term paper can be executed in groups of up to 4 persons (can also be done individually).

A reading plan will be provided at the start of the semester.

Student Workload

Activity	Use of hours
Participation in lectures	27
Preparation for lectures / Reading literature	68
Assignments & Working with software tool	25
Exam (preparation & participation)	10
Term paper based on a case study / practical project	70
Total use of hours recommended	**200**

Use of hours
Activity - Hours
Lectures 27
Working with software tool (instructions, supervision) 8
Term paper (Case study - group work) supervision, providing feedback 10
SUM 45

Examination
Final grade in the course will be based on following activities and weights:

Part 1 – A three-hour individual multiple-choice exam, counts 40 % of final grade
Part 2 – Term paper (case study, max 4 students per group), counts 60 % of final grade

Examination code(s)
ELE 37441 - Multiple Choice exam, accounts for 40 % of the grade in the course ELE 3744 System Dynamics
ELE 37442 - Term paper, accounts for 60 % of the grade in the course ELE 3744 System Dynamics.

Examination support materials
Examination - All support materials are allowed.
Group assignment - All support materials are allowed.

Re-sit examination
A re-sit examination is offered the next time the course is scheduled.

All parts must be passed to obtain final grade in the course. Re-sit exams are however possible to do separately.

Additional information