UNIVERSITY OF BERGEN

International Masters Program in System Dynamics at the University of Bergen

Why study System Dynamics at UiB?

In a complex and developing world, we need theories, methods, and tools to help us understand, manage, and communicate effectively. System dynamics studies how and why things change over time.

System Dynamics is a tool for the development of a well-balanced set of policies to guide decision making that altogether contributes a successful strategy causing a favorable development over time.

- *Which policies cause the most favourable development over time?*
- *How do we avoid shaping strategies, policies and decisions based on misperceptions? And how do we assess their consequences effectively before implementing them in our social context?*
- *What is the wider impact of our decisions over a longer time span?*

To answer questions such as these, you are trained to develop simulation models that represent the cause-and-effect structure of the systems studied, to derive their dynamics by way of simulation, and to investigate the relationship between the two.

We offer a vibrant, international student life focusing on the study of System Dynamics - a study available to very few students across the world. We use state-of-the-art learning technology and client-based case studies. Plus, as of 2020, we offer a fully online version of our master program.

Courses in System Dynamics

System Dynamics Courses at UiB; First Year

UNIVERSITY OF BERGEN
Faculty of Social Sciences

Autumn Semester First Year

GEO SD 302: Fundamentals of Dynamic Social Systems 
GEO SD 303: Model-based Analysis & Policy Design 
GEO SD 304: System Dynamics Modeling Process 

Spring Semester First Year

GEO SD 308: Policy Design & Implementation (online) 
GEO SD 321: Model-based Socioeconomic Planning 
GEO SD 325: Client-based Modeling Project 

System Dynamics Courses at UiB; Second Year

UNIVERSITY OF BERGEN
Faculty of Social Sciences

Autumn Semester Second Year

GEO SD 309: Model-based Interactive Learning Environments  
GEO SD 310: Writing Course & Project Description   
GEO SD 660: Natural Resources Management (online) 

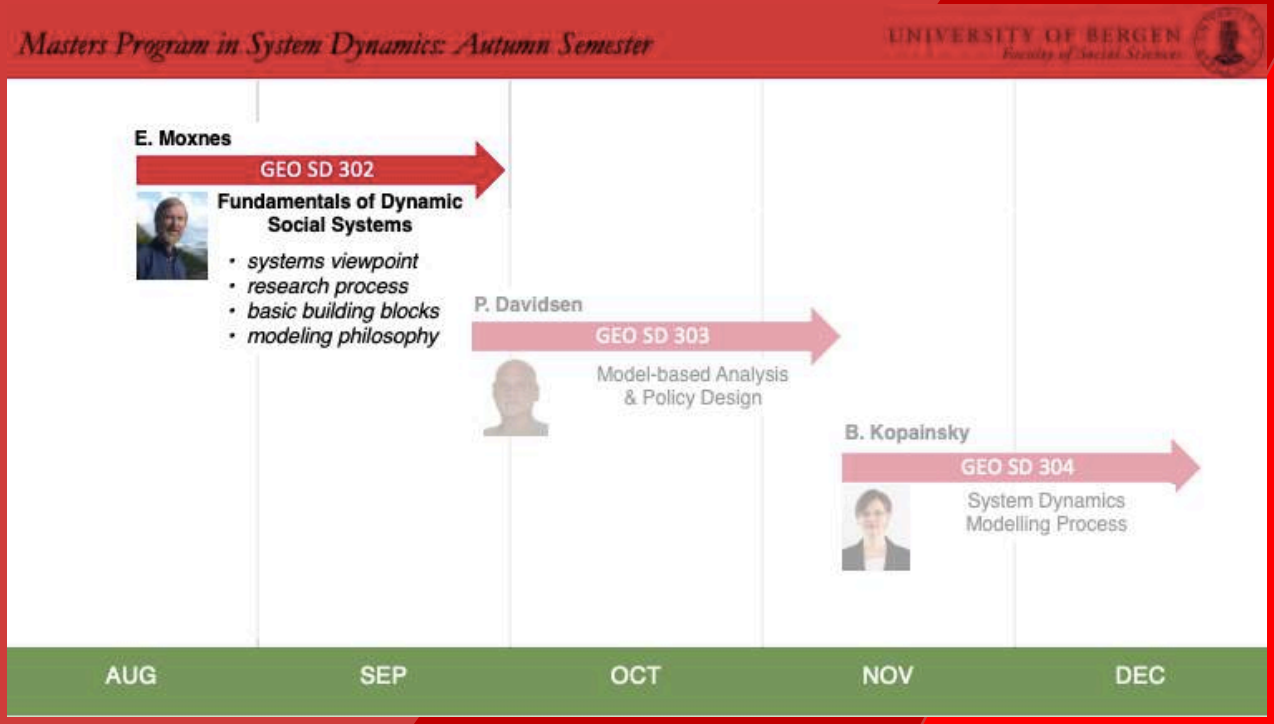
Spring Semester Second Year (admission criterium; C)

GEO SD 350: Master's thesis in System Dynamics   

For mode detailed information, visit
https://www.uib.no/en/studies/MASV-SYSDY

Fundamentals of Dynamic Social Systems

GEO SD 302

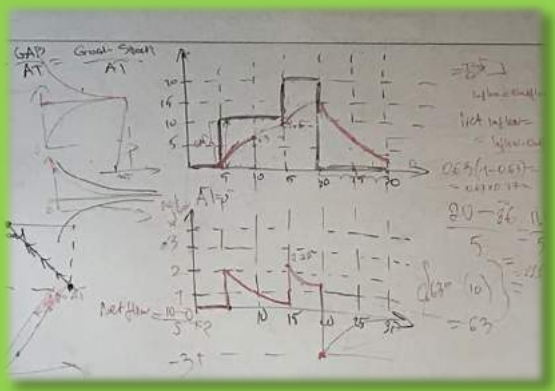


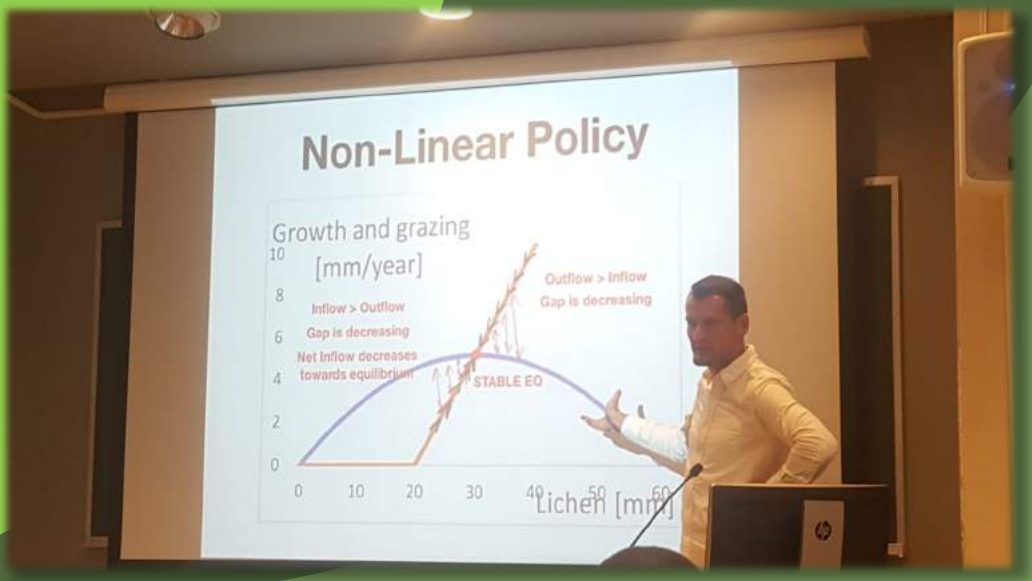
Learn the basics of the System Dynamics method!

- *recognize typical problem behaviours of dynamic systems*
- *formulate hypotheses for why problems develop*
- *represent those hypotheses in simulation models*
- *use the models to test your hypotheses.*

At a more general level, the course gives training in applying the scientific method to socio-economic problems, it provides a common language for interdisciplinary research, and it gives training in project formulations and reporting.

The reading material is presented in a MOOC where students are challenged while reading, in quizzes, and in interactive learning environments. Class sessions make use of the flipped classroom format where students answer questions, discuss with each other and engage with the instructor.



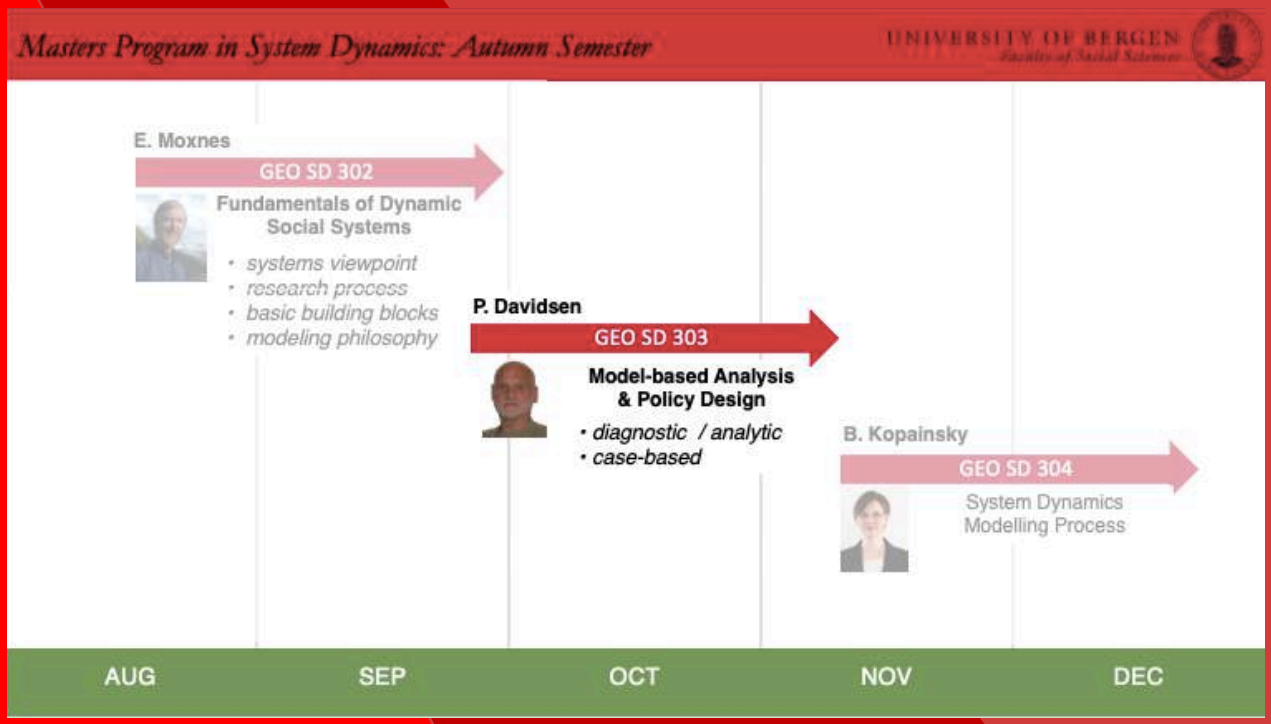

Non-Linear Policy
Growth and grazing
[mm/year]
Inflow > Outflow
Gap is decreasing
Net Inflow decreases
towards equilibrium
STABLE EQ
Outflow > Inflow
Gap is decreasing
Lichen [mm]


AUDITORIUM 2
HUGLEIKSSONS HALL


DON'T
GOOD LUCK!!

Model-based Analysis & Policy Design

GEO SD 303



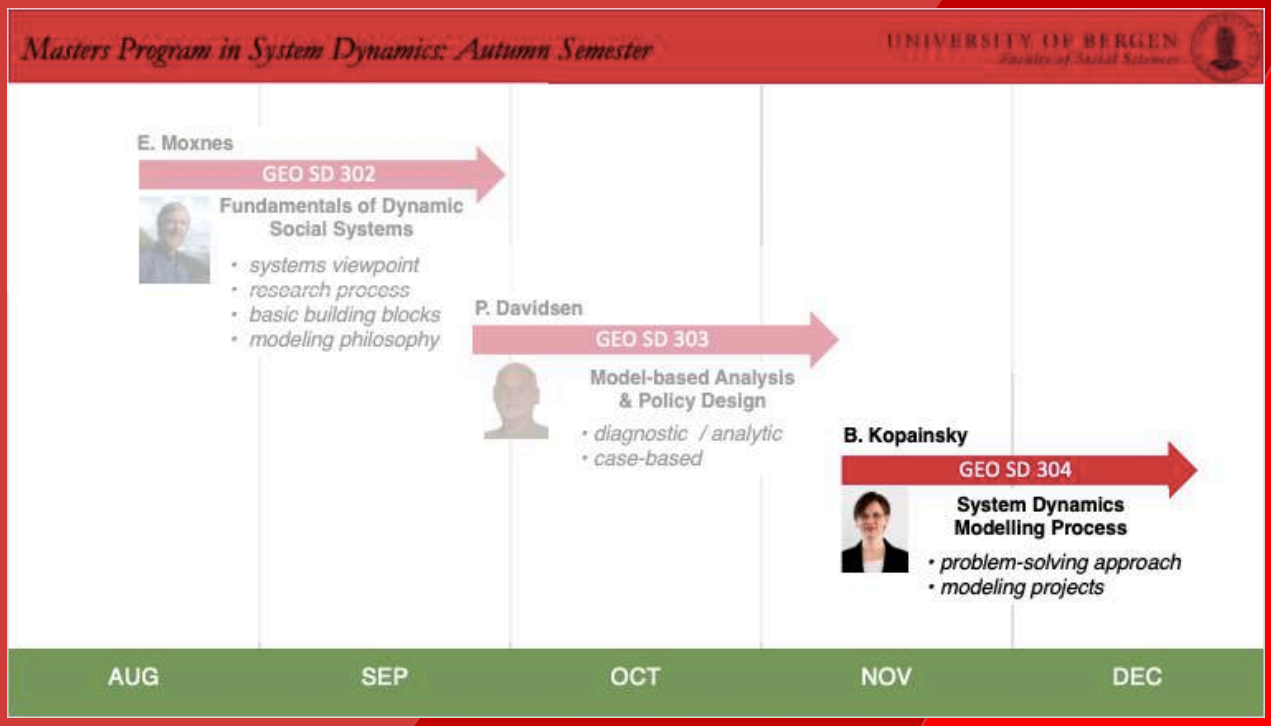
Understand the relationship between Structure & Behaviour !

- *build, simulate and test models of social, natural and hybrid systems*
- *analyze the structural causes of problem behavior*
- *develop and evaluate policies aimed at addressing such problems.*

The course allows students to gain a deep understanding of the intimate relationship between structure and behaviour in complex, dynamic systems; how structure gives rise to behavior and how the resulting behaviour may feed back to change the relative significance of the structural components of the system. This enables the students to analyze problems and to develop and evaluate policies of their own choice.

System Dynamics Modeling Process

GEO SD 304

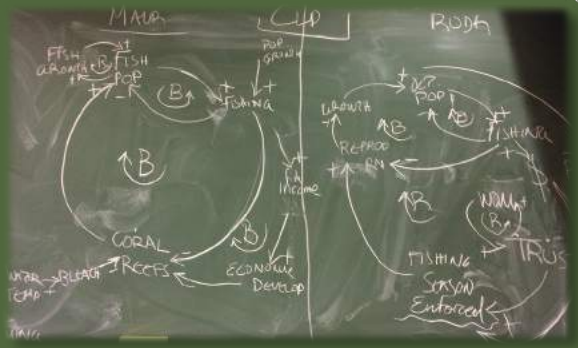


Learn to use the System Dynamics Modelling Process!

- *define the dynamics of problems*
- *develop hypotheses regarding the structure underlying problem behaviour*
- *analyse and validate computer simulation models*
- *design policies to improve systemic behaviour*

Students will apply and gain reinforcement of skills learned in the previous courses as they follow a structured process for modelling and simulation of dynamic problems in both social and natural systems. Emphasis is on the design of simulation models to explain problem behaviour in dynamic systems, and on the re-design of such models to represent the implementation of policies aimed at improving their behaviour.

In addition to learning from the lectures and materials, students gain hands-on experience through in-class tasks, assignments, and an in-depth project.


CORAL
REEFS
ECONOMIC
DEVELOP
FISHING
SEASON
Enforced

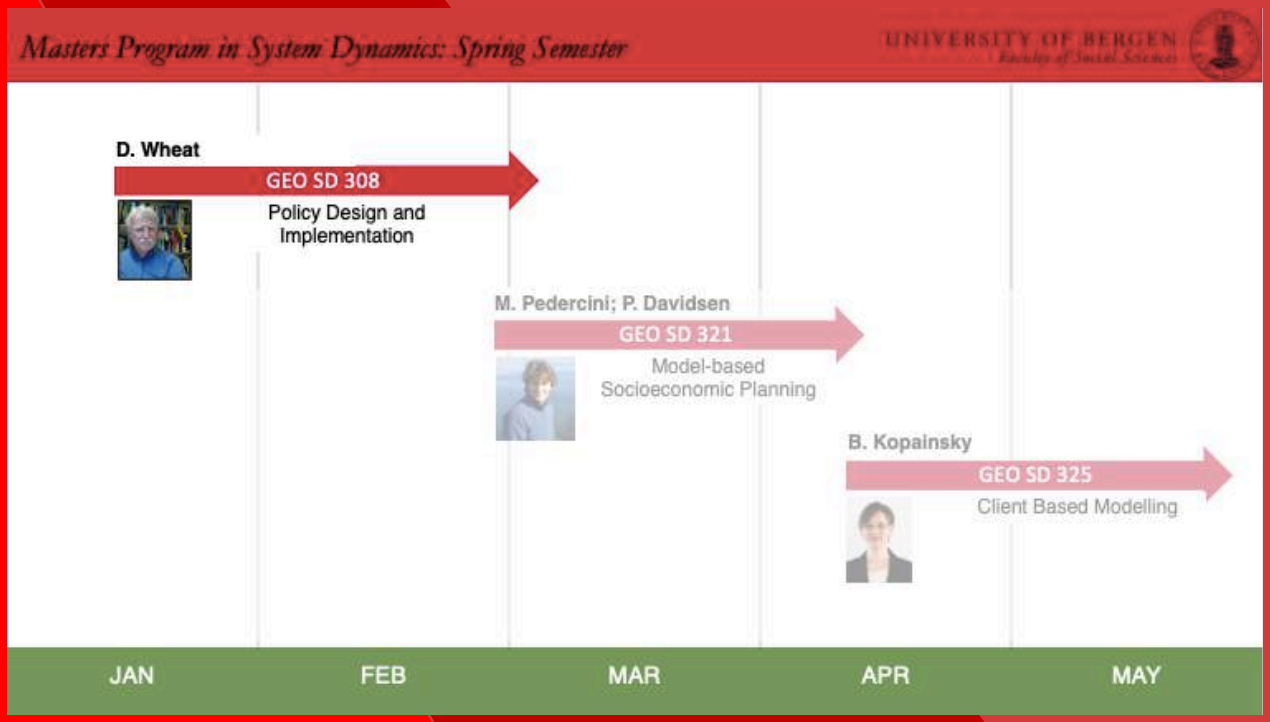

GEOSD 304 – November 14, 2018
System Dynamics Modeling
Process – Lab 2


Project Speed-dating


Let's Build the Policy Model
Open Stella
and the model sent to you

Policy Design & Implementation

GEO SD 308



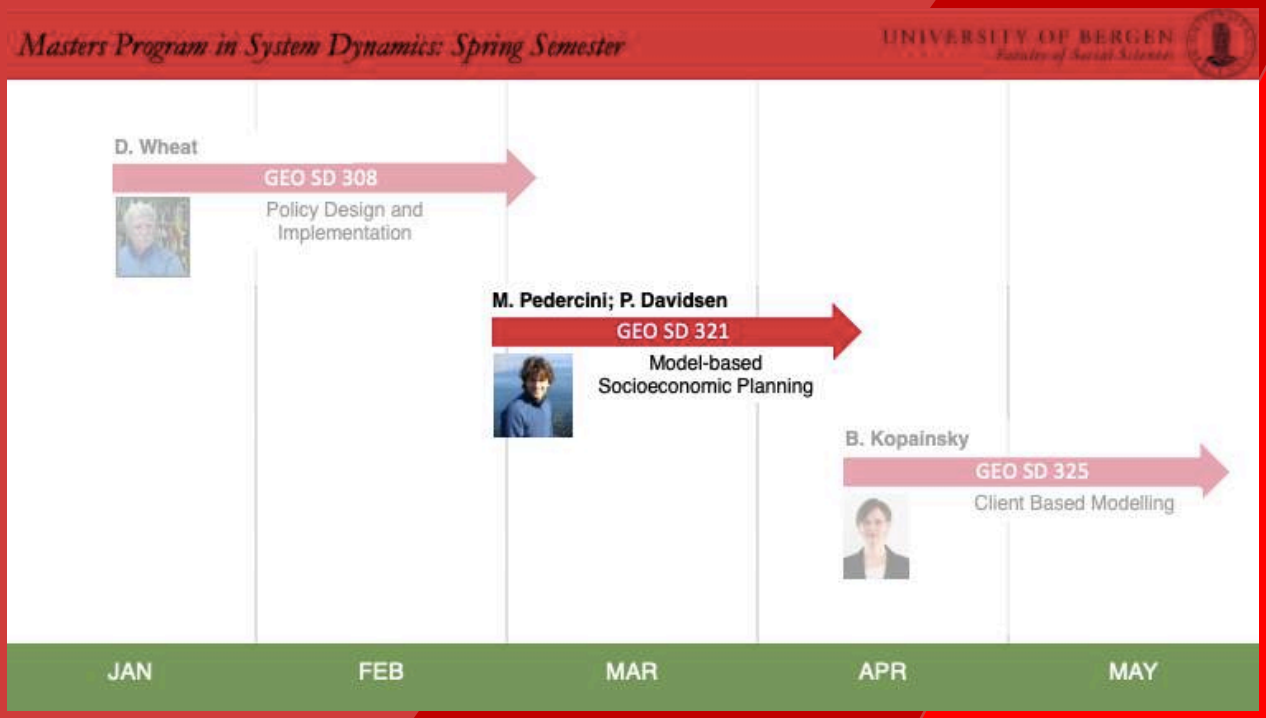
Learn to Design Policies & Understand Implementation Challenges

- *Learn to use a structured method for policy design and evaluation*
- *Gain experience of institutional and cultural constraints on policy feasibility and outcomes, including costs and benefits*
- *Develop skills for interacting with those for whom the modelling work is done, including relevant organizational procedures and potential obstacles to implementing new policies*

improving the behaviour of social systems by designing feasible, cost-effective, and transparent public policies with minimal adverse unintended consequences. The focus is on public policies, but business policy design is also discussed and demonstrated.

Model-based Socioeconomic Planning

GEO SD 321



Apply the SD method to the identification and solution of dynamic problems in socio-economic domains

- *Use SD-based models to study and manage complex, dynamic socioeconomic problems in developing countries*
- *Use the planning models as an aid to identifying the structural origin of such problems and designing and evaluating policies for their alleviation*
- *Gain knowledge about the significance of a robust strategy development (policy design and the resulting decision making) in national contexts*

Developing countries often struggle with long-lasting, comprehensive problems that seem immune to quick fixes. The model-based analysis extends to macroeconomic, social, and environmental issues. While the focus is on problems in developing countries, some of the model-based insights also apply to problems faced by industrialized countries.


2008


Zambaqui 2013


2011

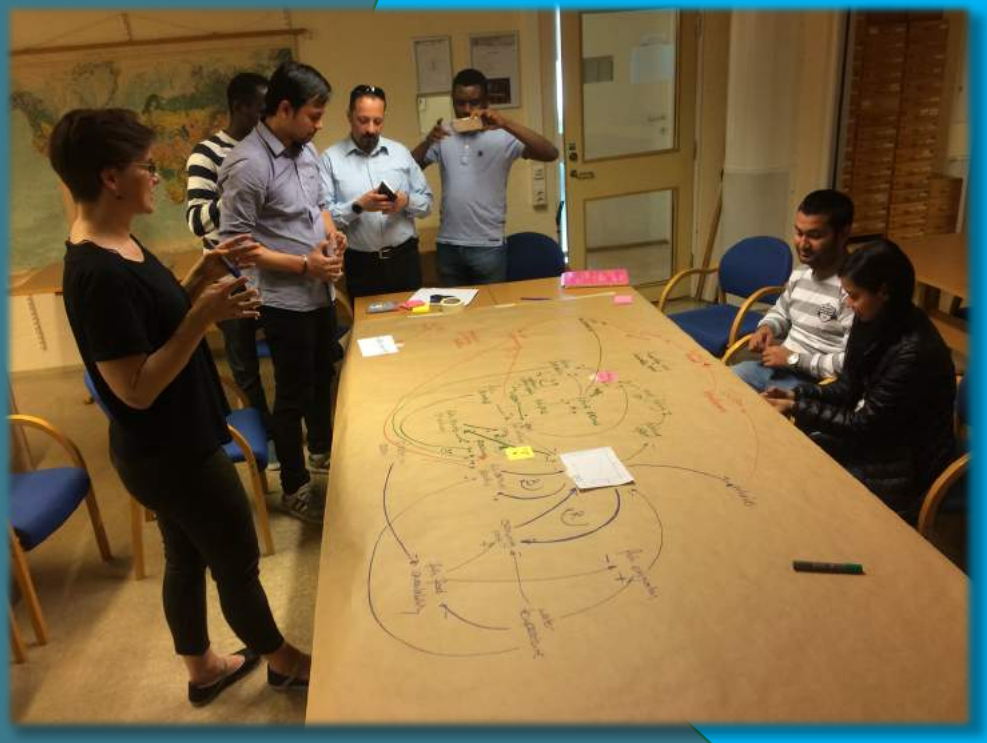

2012

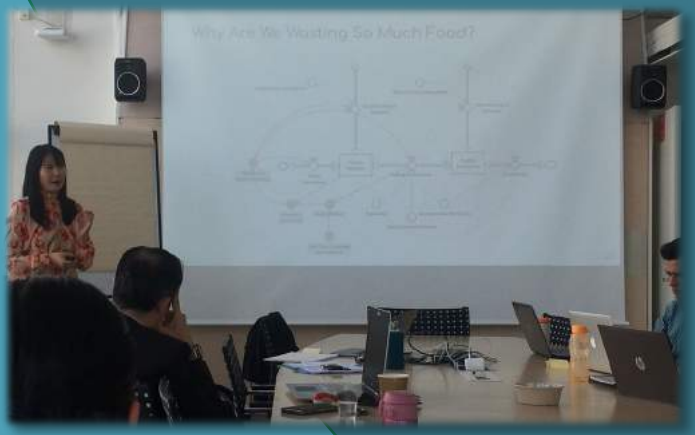

2014


2016


2015

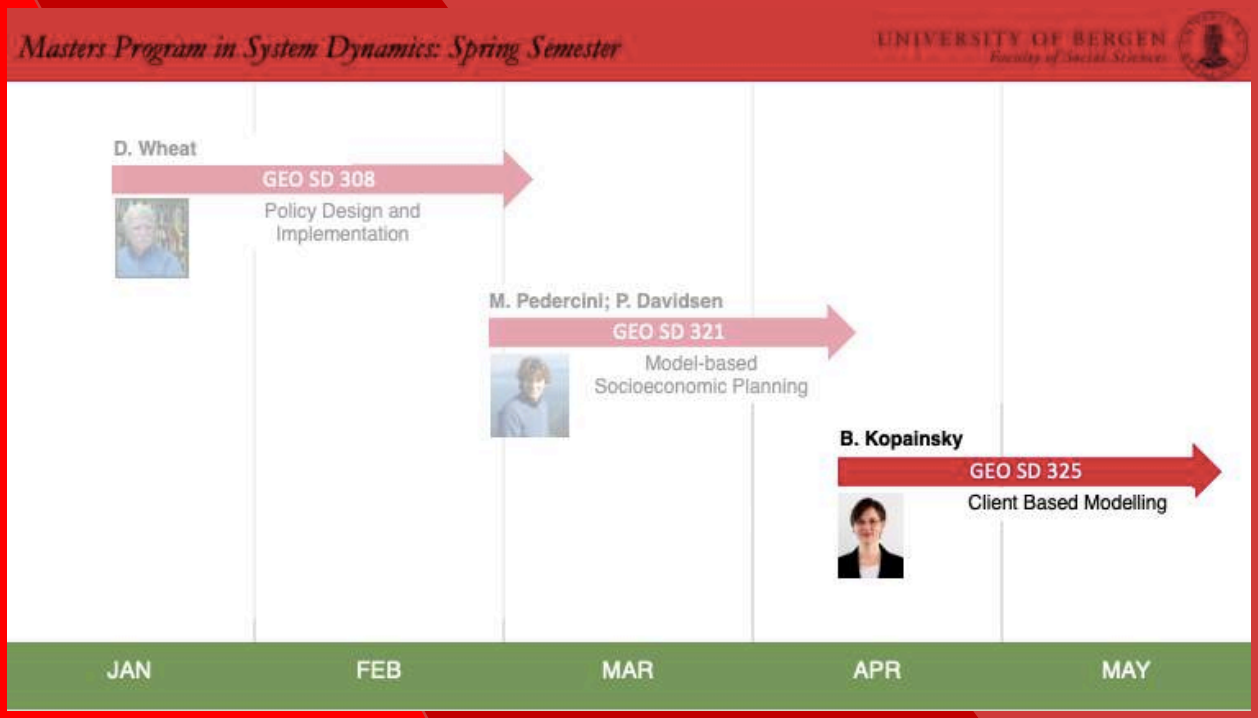

2017




Why Are We Wasting So Much Food?

Client-based Modeling

GEO SD 325

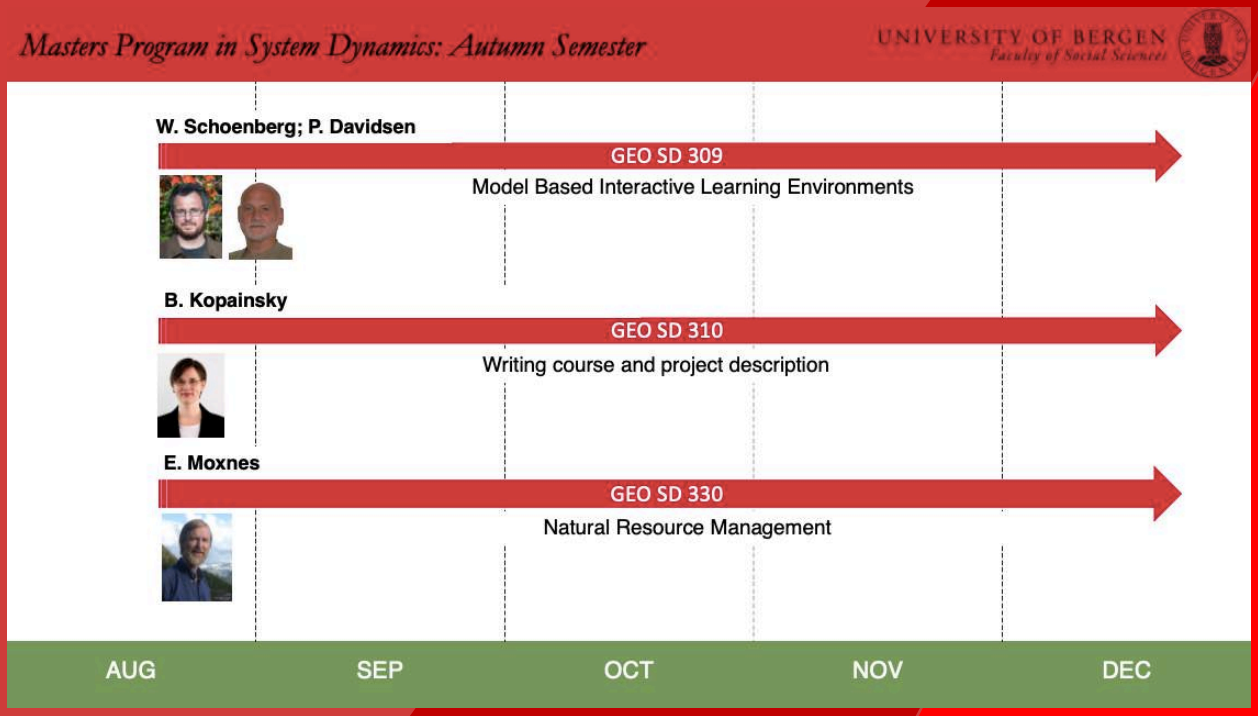


Gain practical experience in modeling with and for a client

- *Work with organizations outside the University of Bergen (the clients) in an applied context and specific problems they are currently dealing with*
- *Develop simulation models that help solve these problems*
- *Learn how to present your findings to the clients*

From the problems that the client organizations present, students first need to distill those aspects that lend themselves to the system dynamics method and agree with the clients on relevant deliverables. Students then need to interact with the organizations to develop, calibrate and validate a simulation model and eventually present model findings in a way that is appealing to these organizations.

Second year of the program; Autumn semester



Model Based Interactive Learning Environments

GEO SD 321

Learn how to develop, evaluate, and use Simulation-based Interactive Learning Environments to facilitate learning & exploration of Complex Systems

Writing course and project description

GEO SD 310

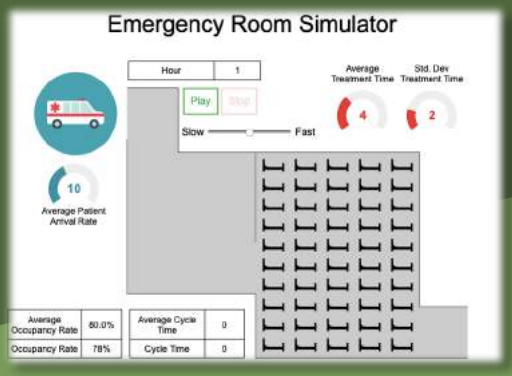
Receive writing training and practical insight into the research process. Get support as you develop your research proposal for the Masters Thesis

Natural Resources Management

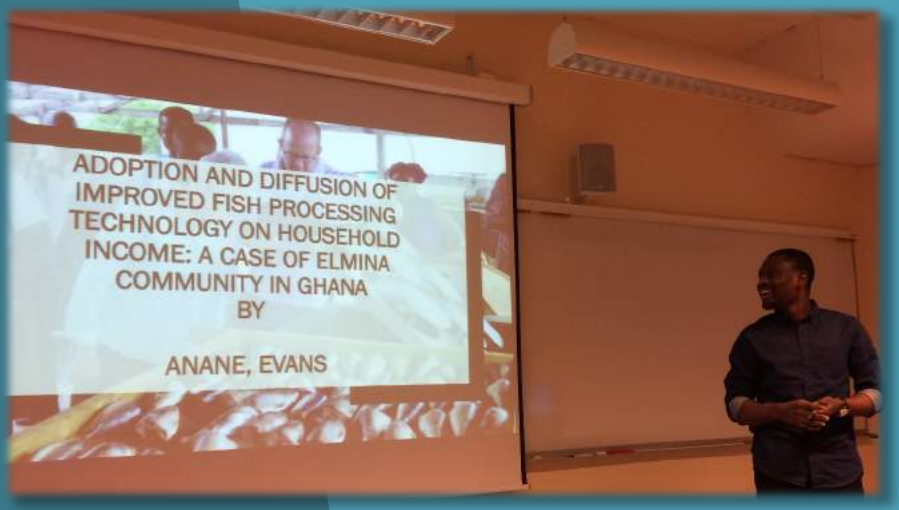
GEO SD 330

Understand theories and principles underlying natural resources & develop skills and competencies needed for their proper management


Do Not Disturb
Blood Alcohol Experiment
is in progress
TIME
75
minutes till midnight
meal
Bottles of beer to drink
?
0
1
2
3
4
Submit
decisions left
7


Emergency Room Simulator
Hour
1
Play
Stop
Slow
Fast
Average Treatment Time
Std. Dev Treatment Time
4
2
10
Average Patient Arrival Rate
Average Occupancy Rate
80.0%
Occupancy Rate
78%
Average Cycle Time
0
Cycle Time
0

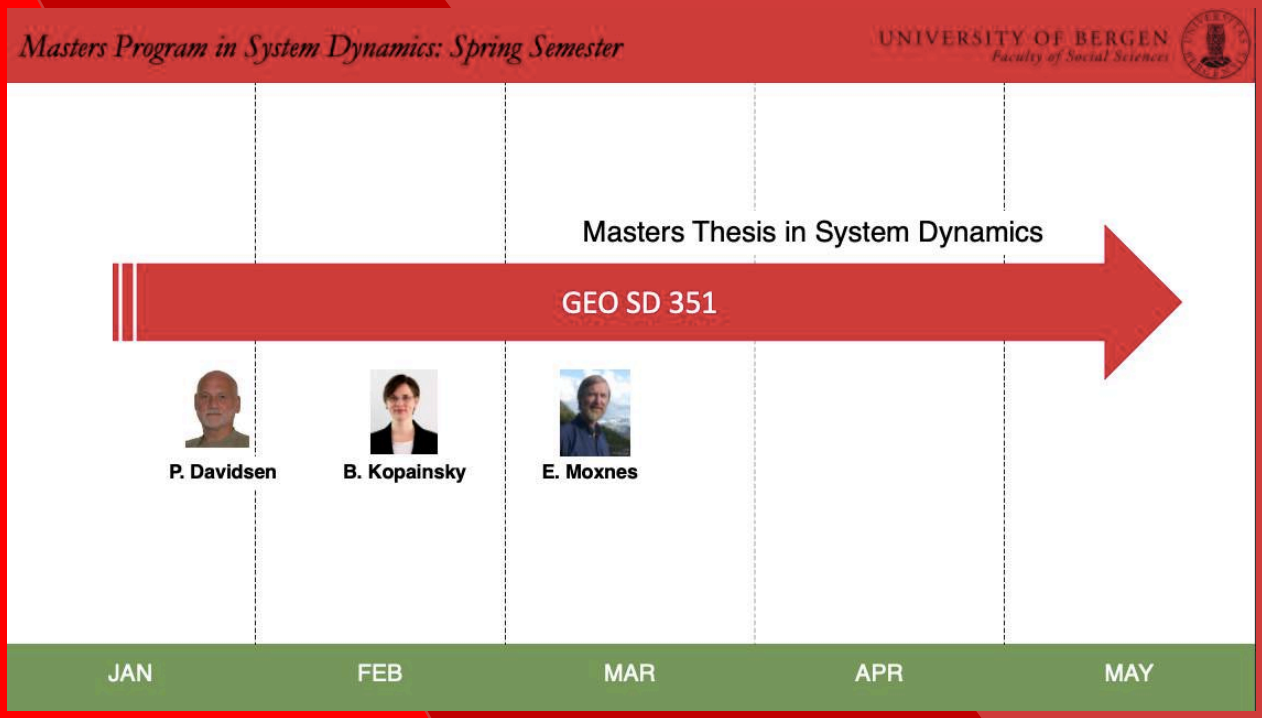

Methodology
- Develop a System Dynamics model complying SD norms either based on past SD literature and/or theoretical understanding of the system.
Data Sources
- Secondary Data Sources for model validation and parameter estimation.
- Major source: Annual Statements of NRB and Commercial Bank, Quarterly review of Monetary policy by NRB, World Bank data, newspaper and publications.


ADOPTION AND DIFFUSION OF IMPROVED FISH PROCESSING TECHNOLOGY ON HOUSEHOLD INCOME: A CASE OF ELMINA COMMUNITY IN GHANA
BY
ANANE, EVANS


Interaction of positive and negative changes perceptions


EFERENCE MODE
Source: Economic Survey report (2018/2019) Ministry of Finance (MOF)

Second year of the program; Spring semester



Master's Thesis in System Dynamics
GEO SD 321

Practice and develop the skills necessary to do good system dynamics work & develop skills to manage and carry out a research project.

Your final semester is spent writing your master's thesis. The thesis is an independent scientific work that you write with the guidance and support of a supervisor. When you choose a topic for your thesis, you can develop one yourself or choose among available master's thesis topics.

UNIVERSITY OF BERGEN

The Masters program in System Dynamics at UiB is a high-level, interdisciplinary educational program…

Why study at UiB?

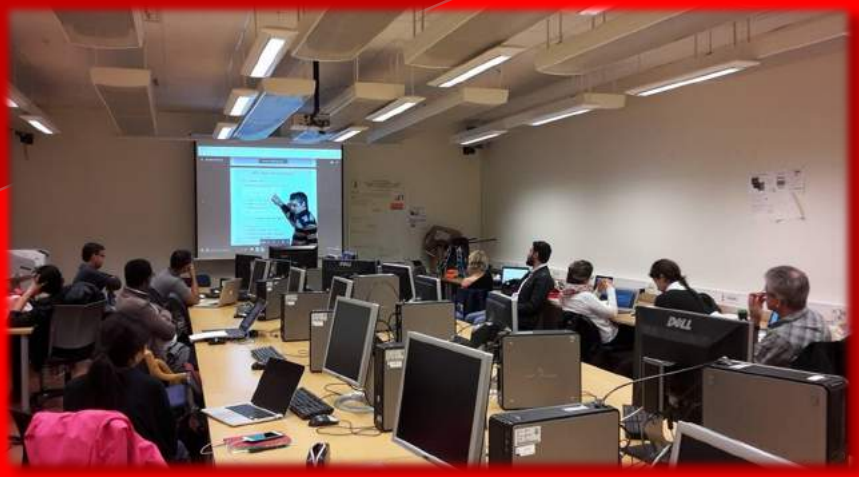
UNIVERSITY OF BERGEN

… but it is also a vibrant, multi-cultural community

Why study at UiB?

Here, we work together and learn from each other…

Group Projects, Study Groups & the general interdisciplinary nature of the program bring passionate people together in exchanging knowledge & inspiring each other

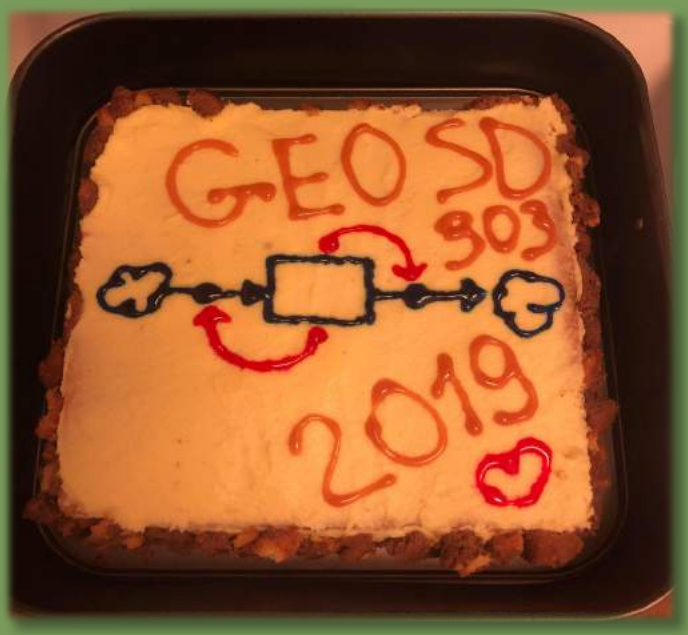


…we develop a strong passion for modeling…

At Uib, we use the software Stella Architect for our System Dynamics models

But the only limit is our imagination!

Sometimes we are modeling on cupboards, sometimes even on cakes!



...we enjoy the amazing landscape of Bergen...

Winter or Summer, the beauty of Bergen is only surpassed by the joy of sharing it with new friends

...and each others company...

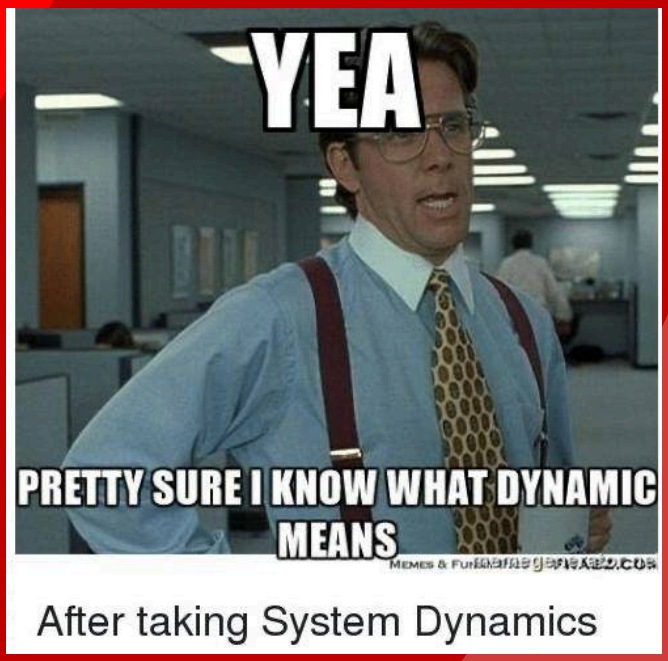
We celebrate together, share both food and experiences, and develop strong relationships.

...and we smile (a lot!)

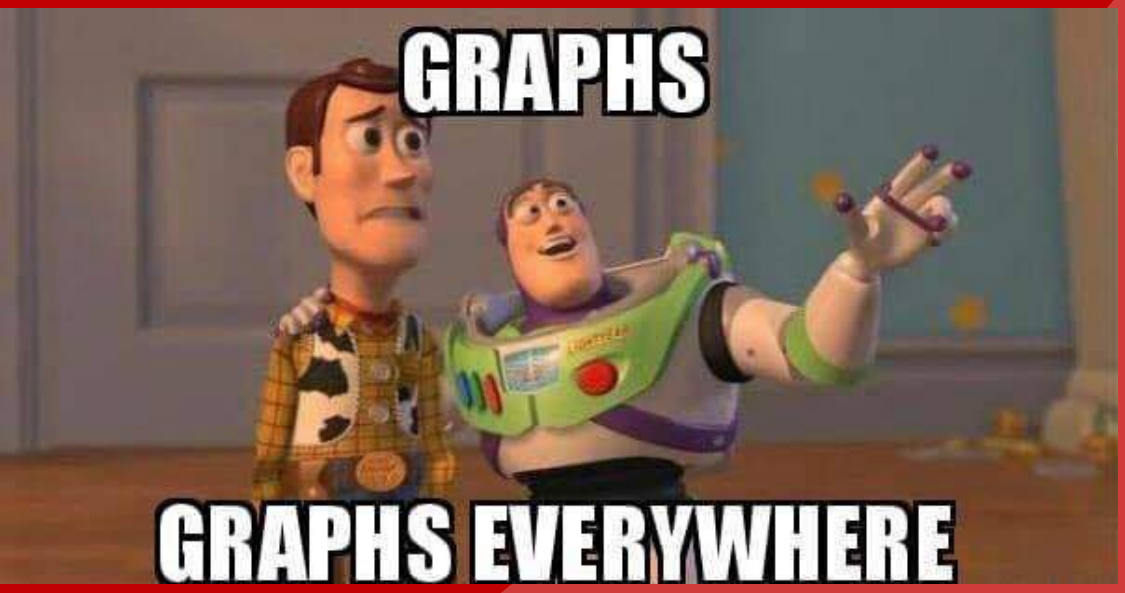
Here, we are more than a sum of students; we are a community

Each cohort of the Masters program has their own emblem!

Niaz Nipu;
2017-19 Cohort



Simon Peter Muwafu;
2018-20 Cohort



Kris Temirkanova; 2019-21 Cohort

What will be yours?

UNIVERSITY OF BERGEN

Welcome to the

International Masters Program in System Dynamics at the University of Bergen