Càtedra UNESCO de Sostenibilitat

UNIVERSITAT POLITÈCNICA DE CATALUNYA

System Dynamics

Online University Course 2009

ORGANIZATION OF THE COURSE

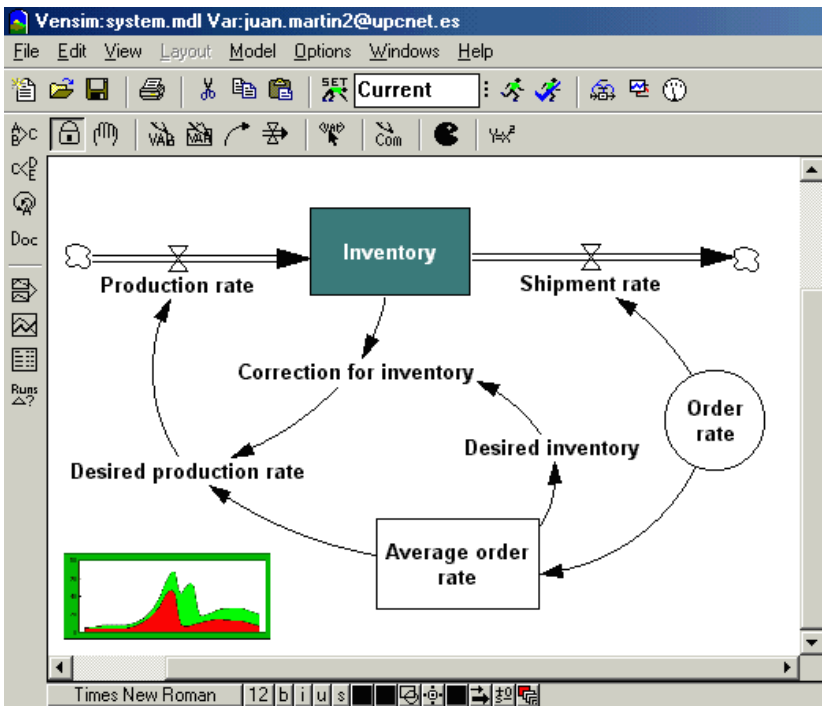
The Politechnic University of Catalonia - UPC - has a solid reputation in higher learning and research, and is a dynamic university in constant evolution. As such, the University offers online courses to serve English-speaking students.

Online courses are an excellent opportunity to access postgraduate education, as the student may access the course on the student's own time, at his own pace, and minimizing the loss of work hours.

Additionally, it has been noted that this online course gives excellent results because the student is very closely monitored in his learning process by the course instructor.

The student receives the documentation of the course and the simulation software Vensim PLE at home. Throughout his progress in the course, he receives by e-mail instruction with study cases and exercises to complete. The student then submits the models he creates to the instructor by e-mail. The instructor is available to the student in this capacity for any help the student needs during his studies.

Because of this very close relationship between the instructor and the student his evaluation is continuously monitored through the completion of the different exercises and study cases.



INSTRUCTORS

Juan Martín García is Ph. D. Industrial Engineer by the UPC. Diplomated in the Sloan School of Management of the Massachusetts Institute of Technology (MIT). His specialization on System Dynamics during more than 20 years allows him to offer a double vision: theoretical and practical. Member of the System Dynamics Society Conference Paper Review Committee.

Other contributing professors to this course is professor Jordi Morató, which is the Director of the UNESCO - Sustainable Developement Department of the UPC.

OBJECTIVES OF THE COURSE

This course allows the student to acquire, in a time-efficient and uncomplicated manner, knowledge in the formation and construction of dynamic models.

Many times, the models are performed with minimal current data and very few historical data. The simulation models that the student will design in this course accommodate these analyses, with the construction of realistic hypotheses and elaborate behavior models.

That's done with the help of software that facilitates the construction of the models as well as performing model simulations. (Software is available for Windows and Mac computers.)

At the end of the course, the student is able to:

1. Describe the components of a complex system.
2. Diagnose the natural evolution of the system under analysis.
3. Create a model of the system and present it using the simulation software.
4. Carry out simulations with the model, in order to predict the behavior of the system.

COURSE SYLLABUS

First, the basic structures of the systems and more common dynamics are presented. Next, the phases in the construction of a model are studied. Last, using study cases, the student is taught how to model with the software and simulate different alternatives.

SYSTEM DYNAMICS
- Causal diagrams
- Stable, unstable and oscillating systems
- Medium term dynamics

CONSTRUCTION OF A MODEL
- Diagramming the flows
- Phases in the construction of a model
- Computer simulations

STUDY CASES
- MODELING A BASIC SYSTEM
  - Using the software

DYNAMICS OF A TANK
- Foreseen behavior and behavior in the model

PRODUCTION AND INVENTORY
- From the text description to the model
- Using Tables in non-linear relations
- Using Delays in the models

PROJECT DYNAMICS
- Building a model in phases
- The measurement units help us
- Using Logical Functions

SHORT TERM vs. LONG TERM POLICIES
- Studies in soft defined environments. To extract the data
- Importance of the horizon of the simulation
- Simulating different management styles

COMMODITY CYCLE
- To integrate several submodels in a bigger one
- The cause of the oscillations
- Explanation of the results

OPTIONAL EXERCISE
- A CATASTROPHE STUDY

DOCUMENTATION

The documentation contains all the theoretical explanations and the study cases around which the course is based.

Additionally, the student receives a CD-ROM which contains the software for building and simulating models (VENSIM PLE) together with demo versions of other similar software: ITHINK and STELLA.

The CD also contains more than 250 works and articles on this methodology, including text and graphs, that allow the student to go deeper in the aspects of the course he/she is more interested.

A bibliographical listing is also included, as well as a description of other simulation software that exists, newsgroups, and internet addresses with models. Finally, several employment opportunities of consulting companies are included for the student's benefit.

COST

The total cost of the course is 360 euro.

PREVIOUS REQUIRED KNOWLEDGE

This course is intended for undergraduate and graduate students with or without professional experience.

Only basic computer skills are needed. No statistical or specific mathematical education is required.

APPLICABILITY

The content of this course can be applied in many areas. In the business world, these topics are mainly used to address issues related to Strategic Plannig, Business Planning, Leadership Developement, Strategic Marketing and Sales, Organization Redesign, Process Improvement, Implementation of operational plans. In general to build and sustain high performance over the long term, and ensure successful implementation of changes.

In the academic world, these topics may be used to develop Final Projects or Doctorate, and theses on diverse subjects.

SOFTWARE

Vensim PLE (Personal Learning Edition) is a software that gets you started in system dynamics modeling and is free for educational use and inexpensive for commercial use. Vensim PLE is ideal for classroom use and personal learning of system dynamics.

Main Features of the software included in the course

Causal Loop Diagrams	X
Stock and Flow Diagrams	X
Tree Diagrams	X
Document Tool	X
Loop Identification	X
Equation Editor	X
Built-in Functions	X
Units Check	X
Sketch Editor with Undo/Redo	X
Simulation	X
Graphs	X
Tabular Output (Tables)	X
Set up a simulation	X
Run Comparison (between two simulations)	X
Multiple Views (pages or sectors of a model)	X
SyntheSim	X

STUDENTS

Until now, the students of this courses did come from 58 different countries all around the world:

DATES

Register now and start the course immediately!

Each student begins the course and is coached independently, on his own schedule.

Students need to work in this course about 50 hours, depending on what they know previously in this field, and depending of how deep they want to understand the contents of the course. This is a self-paced course: you decide how fast you like to work on it.

This is a course addressed to people with few hours to study, and the contents has been elaborated trying to avoid unnecessary materials, and really I am very happy seen how fast the students achieve the skills to build interesting models. I expect that you agree soon with this statement.

Academic Year 2008/2009 will end the 31 October 2009.

MORE INFORMATION

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