

Course Specifications

From the academic year 2016-2017 up to and including the

System Dynamics (F000124)

Course size (nominal values; actual values may depend on programme)

Credits 5.0 Study time 150 h Contact hrs 45.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	lecture	30.0 h
		seminar: coached	15.0 h
		exercises	

Lecturers in academic year 2018-2019

Loccufier, Mia	TW08	lecturer-in-charge
----------------	------	--------------------

Offered in the following programmes in 2018-2019

	crdts	offering
Master of Science in Business Engineering (main subject Data Analytics)	5	A
Master of Science in Business Engineering (main subject Finance)	5	A
Master of Science in Business Engineering (main subject Operations Management)	5	A
Master of Science in Economics	5	A
Exchange programme in Economics and Business Administration	5	A

Teaching languages

English

Keywords

Dynamical Analysis, Modelling, Control Theory

Position of the course

The dynamic behaviour of technical and economic systems is analysed. The approach typical of engineers to understand the dynamics of simple technical systems is explained. The universal character of system dynamics is stressed by focussing on the underlying mechanism which causes a time evolution in systems of highly different disciplines: technology, economics, biology. The systems are analysed via a mathematical model which interacts with its environment. The concept of control will be introduced as a designed feedback loop: the undesirable behaviour (due to disturbances) of a system is adjusted based on some control technique which uses system's observations. A feedback loop can be a technical realization with sensors and actuators, a feedback loop can be a policy in a economic system.

Contents

- basic concepts : dynamical system; linear versus nonlinear system, stability, steady state behaviour, transient response, impulse response, harmonic analysis.
- Control concepts : feedback loop, process, measurement, actuator, transducer, controller, disturbance, set point, policy in a economic system as a feedback loop
- modelling : complexity versus accuracy, modeling of linear systems
- System analysis : different types of systems (first order; second order; non-linear) with corresponding mathematical tools.

Initial competences

Mathematics II

Final competences

- 1 Model and analyse the dynamics of simple technical and economic systems.
- 2 Determine the most important physical parameters which cause the dynamic behaviour.
- 3 Control unwanted dynamic behaviour with simple feedback loops.

- 4 Calculate free and forced responses of general dynamic models under general inputs.
- 5 Identify the explained general dynamics in new systems

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, seminar: coached exercises

Extra information on the teaching methods

Lectures, classroom exercises.

Learning materials and price

Syllabus : available via Minerva

References

Course content-related study coaching

The syllabus contains all the basic information to be able to achieve the final objectives. The lectures are organised such that there is enough time to repeat topics and allow discussions. Examples are worked out in group. The lecturer can be contacted for extra explanation.

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Written examination, oral examination

Examination methods in case of periodic evaluation during the second examination period

Written examination, oral examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

Theory : written and oral with written preparation, closed book

Exercises : written, closed book

Theory and exercises are questioned together during one exam

Calculation of the examination mark

End-of-term evaluation (100%).