

Basics of Control Engineering (I002405)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size	<i>(nominal values; actual values may depend on programme)</i>		
Credits 3.0	Study time 75 h	Contact hrs	30.0 h

Course offerings and teaching methods in academic year 2021-2022

A (semester 1)	English	Gent	lecture	11.25 h
			seminar: practical PC room classes	15.0 h
			guided self-study	3.75 h

Lecturers in academic year 2021-2022

Volcke, Eveline	LA24	lecturer-in-charge
Tumlos Solon, Kimberly	LA24	co-lecturer

Offered in the following programmes in 2021-2022

	crdts	offering
International Master of Science in Environmental Technology and Engineering	3	A
International Master of Science in Sustainable and Innovative Natural Resource Management	3	A
Exchange Programme in Bioscience Engineering: Chemistry and Bioprocess Technology (master's level)	3	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	3	A

Teaching languages

English

Keywords

system dynamics, process control, linear systems

Position of the course

The aim of this course is to provide the student a basic education in terms of control engineering and process engineering. Through practical examples, the student is familiarized with the block scheme representation of controlled systems. After imparting the necessary understanding of the dynamic behavior of linear systems, the relationship between open-and closed-loop dynamics is elaborated. Attention is paid to the selection and tuning of controllers. Besides the basic single-loop feedback scheme, cascade control and feedforward control schemes are studied as well.

Contents

Control engineering

1. Introduction
 - 1.1 Aim of process control
 - 1.2 Terminology
2. Dynamic behaviour of linear systems
 - 2.1 First order systems
 - 2.2 Second order systems
 - 2.3 Higher order systems
3. Feedback control
 - 3.1 Principle – examples
 - 3.2 Controller types
 - 3.3 Open-loop versus closed-loop dynamics
4. Controller selection and tuning

- 4.1 Controller design problem
- 4.2 Performance criteria
- 4.3 Controller type selection
- 4.4 Controller tuning
- 5. Cascade control - feedforward control

Initial competences

Basic knowledge of physical transport phenomena (mass and heat balances)

Final competences

The student is able to interpret a control problem and to translate it into a block scheme. He knows how to choose an appropriate type of controller and to tune it. He has insight in the dynamics of linear systems, both in open and closed loop.

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

Guided self-study, lecture, seminar: practical PC room classes

Learning materials and price

Copies are available estimated total cost: 15 euro. Also electronically available on Minerva

References

Stephanopoulos G. (1984). Chemical process control, an introduction to theory and practice. Prentice-Hall Englewood Cliffs, USA, ISBN 0-13-128629-3

Course content-related study coaching

Student counseling is possible before and after the lectures, during the exercise sessions and by appointment. At the end of the course, a brushup lecture is foreseen.

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

Calculation of the examination mark

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.