GHENT UNIVERSITY

Course Specifications

From the academic year 2017-2018 up to and including the

Control Theory (E741023)

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

Credits	6.0	Study time	180 h
Contact hrs	60.0 h		

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	Dutch	lecture	36.0 h
		practicum	12.0 h
		lecture: plenary exercises	12.0 h
B (semester 2)		practicum	12.0 h
		lecture: plenary exercises	12.0 h
		lecture	36.0 h

Lecturers in academic year 2018-2019

Beyens, Jan	TW05	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
Bachelor of Science in Engineering Technology (main subject Electromechanical Engineering Technology)	6	A
Bachelor of Science in Engineering Technology (main subject Electronics and ICT Engineering Technology)	6	A
Bachelor of Science in Electronics and ICT Engineering Technology	6	A
Bachelor of Science in Electromechanical Engineering Technology	6	A
Master of Science in Chemical Engineering Technology	6	A
Linking Course Master of Science in Electrical Engineering Technology (main subject Automation)	6	B
Linking Course Master of Science in Electrical Engineering Technology (main subject Electrical Engineering)	6	B
Linking Course Master of Science in Electromechanical Engineering Technology	6	B

Teaching languages

Dutch

Keywords

Closed loop, feedback, process control, continuous time linear systems, three term controller

Position of the course

The course is situated in the "drive technology and automation" learning path of the bachelor in electromechanics and in the "analogue systems" learning path of the bachelor in electronics & ict and the technical-engineers focused learning path of the master in chemistry.
Main goal is the acquisition of interdisciplinary knowledge on the analysis and synthesis of basic control systems.

Contents

Concepts:
How to influence processes? Which configurations? What is control? What is feedback? What's the meaning of direct and inverse control-action, feedforward, cascade? The industrial relevance of control theory.
Analysis:
Characteristics and performance of a feedback control loop in time-domain and

frequency domain. Closed loop stability, suppression of disturbances, robustness, servosystems, bandwidth, static behaviour and errors, transients, gainmargin, phasemargin. The use of dedicated computertools.
Design:
Design of controlsystems in time-domain and frequency domain. Traditional PID-controllers with algorithms and tuning. The use of CACSD-tools.

Initial competences

mathematics, physics, signals and systems

Final competences

1 To understand the link between different scientific and technical disciplines.
2 To be able to analyze the static and dynamic behavior of processes in time-domain, both in open and closed loop.
3 To be able to apply the Routh Hurwitz stability criterion.
4 To understand the P, I and D control actions, to know the practical aspects of PID-controllers and to be able to tune PID-controllers in an appropriate way.
5 To be able to analyze and sketch the behavior of processes in frequency-domain, both in open and closed loop (Bode, Nichols, Nyquist).
6 To be able to apply the Nyquist stability criterion.
7 To know specific control configurations (cascade control, split range control, ratio control, feed forward compensation).

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, practicum, lecture: plenary exercises

Extra information on the teaching methods

Lectures (theory): 36h
Theoretical exercises: 12h
Labs: 12h

Learning materials and price

Handbook: N.S. Nise, "Control Systems Engineering"
Additional slides through the electronic learning environment

References

B.C. Kuo, "Automatic Control Systems" (7th ed), John Wiley & Sons.
Dorf and Bishop, "Modern Control Systems" (11th ed), Pearson Prentice Hall.

Course content-related study coaching

The lecturer is available during or in between lectures; there is assistance during the exercise-sessions and lab-sessions. Individual assistance is provided on demand (by appointment)

Evaluation methods

end-of-term evaluation and continuous assessment

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

Oral examination

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

Oral examination

Examination methods in case of permanent evaluation

Written examination, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

End-of-term evaluation: oral with written preparation (part 1 = 5 open questions, closed book / part 2 = 1 excercise, open book).
Labs: permanent evaluation + 1 test with report.
Exercises: 1 test (written).
In the second examination period, only the oral examination can be redone. The results for labs and exercises remain the same as in the first examination period.

Calculation of the examination mark

Oral examination = 2/3 (part 1 = 1/3 + part 2 = 1/3)
Exercises = 1/6
Labs = 1/6
A weighted average is used to compute the final score for a training item. However, if a student gains a score of 7 or less on 20 on one of the different parts of this course, this indicates that his skill for certain subcompetencies is insufficient. Consequently, the examiners can deviate from the arithmetical calculation of the final marking of a training item and use another marking in mutual consensus.