GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2023-2024

Signals and Systems (E702010)

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

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2023-2024

A (semester 1)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2023-2024

Beyens, Jan	TW05	lecturer-in-charge
Tonesi, Cristina	TW05	co-lecturer

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bachelor of Science in Engineering Technology(main subject Chemical Engineering Technology)	6	A
Bachelor of Science in Engineering Technology(main subject Civil Engineering Technology)	6	A
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 Engineering Technology(main subject Information Engineering Technology)	6	A
Linking Course Master of Science in Electrical Engineering Technology(main subject Automation)	6	A
Linking Course Master of Science in Electrical Engineering Technology(main subject Electrical Engineering)	6	A
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject Electronics Engineering)	6	A
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject Embedded Systems)	6	A
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject ICT)	6	A
Linking Course Master of Science in Chemical Engineering Technology	6	A
Linking Course Master of Science in Electromechanical Engineering Technology	6	A
Linking Course Master of Science in Information Engineering Technology	6	A
Preparatory Course Master of Science in Chemical Engineering Technology	6	A

Teaching languages

Dutch

Keywords

Vector calculus, line integrals, series, signals, systems, Laplace transform, Fourier transform, convolution

Position of the course

This course consists of two parts:
1) to provide insight in some basic concepts and mathematical tools related to vector calculus, integral transforms and series. The subjects are chosen primarily to answer the needs of a course in engineering.
2) to increase the level of abstraction acquired in previous courses (maths, physics, electricity, mechanics, ...). This will be done using simple conceptual mathematic methods used to describe the interaction between LTI-systems and signals.
This course is interdisciplinary.

Contents

1) vector analysis and series
Vector analysis: derivative and integration of vector functions; gradient, curl, divergence, laplacian: properties, calculus and applications. Line integrals: definition, computation, applications, Green's theorem and corollaries, conservative vector fields and potentials. Series: notions of convergence, criteria of convergence. Series of functions: general concepts, Taylor series, Fourier series and applications.
2) analysis of signals and systems
Classification of signals and systems
Linear time-invariant systems in continuous time: response, convolution, eigenfunctions. Laplace transform and solving lineair differential equations with constant coefficients. Fourieranalysis of signals and systems, sampling

Initial competences

Maths (complex numbers, limits, differentiation, integration, differential equations, functions, lineair algebra, vector calculus), Physics, Electricity and Mechanics (dynamics).

Final competences

1 Correlate different scientific and technical disciplines with each other.
2 Explain fundamental concepts of vector analysis.
3 Compute line integrals.
4 Predict the convergence of numerical and function series.
5 Construct Taylor-and Fourier series.
6 Classify signals and systems and apply basic operations on them.
7 Analyse the interaction between signals and systems through convolution.
8 Analyse the interaction between signals and systems in a complex frequency domain (Laplace-transform).
9 Analyse signals and systems in continuous time through Fourier theory.

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

Seminar, Lecture, Independent work

Extra information on the teaching methods

- Lecture: 36 hrs
- Plenary exercises: 24hrs

Learning materials and price

Syllabus in Dutch (ca. 10 euro)
Handbook Signals and Systems, Schaum's Outline Series (ca. 20 euro)
Slides (Ufora)

References

Frank Ayres Jr., Differential Equations, Schaum's Outline Series.
Lothar Papula, Wiskunde voor het hoger technisch onderwijs, Academic Service.
Murray R. Spiegel, Schaum's Outline of Laplace Transforms.
Murray R. Spiegel, Advanced Calculus, Schaum's Outline Series.
Linear Systems and Signals, B.P. Lathi, Oxford Press
Signals and Systems, analysis using transform methods and Matlab, M.J. Roberts, Mc Graw-Hill
Signals and Systems (2nd ed), Haykin & Van Veen, John Wiley & Sons

Course content-related study coaching

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

Assessment moments

end-of-term and continuous assessment

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

Written assessment

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

Written assessment

Examination methods in case of permanent assessment

Written assessment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

NPE and second chance NPE: written examination (closed book) on vector calculus and series
PE1 en PE2: written examination (closed book) on signal and system analysis.
The use of a formularium is allowed.
Unlawfully absence (second chance) NPE: marks NPE = 0

Calculation of the examination mark

First examination Period: Total = NPE*1/3 + PE1*2/3
Second examination Period: Total = NPE*1/3 + PE2*2/3
When the student scores less than 8/20 for at least one of the two components (Part 1: vector calculus and series, Part 2: Signal and system analysis), he/she can no longer pass the entire course unit. If the total score is a mark of ten or more out of twenty, then this is reduced to the highest failing mark (9/20).