

Signals and Systems (E620100)

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	Kortrijk	lecture seminar
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Lecturers in academic year 2023-2024

Lemey, Sam	TW05	lecturer-in-charge
Franchois, Ann	TW05	co-lecturer

Offered in the following programmes in 2023-2024

	crdts	offering
Bachelor of Science in Engineering Technology(main subject Machine and Production Automation)	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 calculus 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) Signal and system analysis

Classification of signals and systems

Linear time-invariant systems in continuous time: response, convolution, eigenfunctions.

Laplace transform and solving linear differential equations with constant coefficients.

Fourier analysis of signals and systems, sampling

Initial competences

Maths (complex numbers, limits, differentiation, integration, differential equations, functions, linear 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

Extra information on the teaching methods

- Lecture: 36 hrs
- Seminar (guided exercises): 24hrs

Learning materials and price

Syllabus in Dutch (ca. 10 euro)

Handbook Signals and Systems, Schaum's Outline Series (ca. 20 euro)

References

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 on signal and system analysis. The use of a formularium is allowed.

Illegitimate absence (second chance) NPE: marks NPE = 0

Calculation of the examination mark

First examination Period: Total = $NPE \cdot 1/3 + PE1 \cdot 2/3$

Second examination Period: Total = $NPE \cdot 1/3 + PE2 \cdot 2/3$

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 course.

If the total score is a mark of ten or more, then it is reduced to the highest failing mark (9/20).