

## 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

**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**

[Bachelor of Science in Engineering Technology\(main subject Machine and Production Automation\)](#)

**crdts**

6

**offering**

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 =  $NPE \cdot \frac{1}{3} + PE1 \cdot \frac{2}{3}$

Second examination Period: Total =  $NPE \cdot \frac{1}{3} + PE2 \cdot \frac{2}{3}$

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).