Course: Mathematics for Smart Systems — credits: 5

Course code	ELVB25MSS
Name	Mathematics for Smart Systems
Study year	2025-2026
ECTS credits	5
Language	English
Coordinator	J.M. Wilson
Modes of delivery	Project-based learning
Assessments	Mathematics for Smart Systems - Computer, organised by STAD examinations

Learning outcomes

Design
The novice professional considers different solutions to arrive at a detailed and well-founded (electrical) technical product / service / process based on the program of requirements and uses appropriate design methods and takes into account social interests and engineering standards.

Realisation
The novice professional realizes and validates a (prototype of a) product / service / process based on an (electrical) technical design and makes appropriate use of materials / techniques / instruments.

Content

This module covers mathematics often used in smart systems, especially applied linear algebra.

Professional products

- Simulations and calculations – Studying the performance of a process or system through the imitation of a physical system or design in a virtual environment or on paper. *In this module: Calculations involving linear algebra, used for data fusion*
- Smart system – A system that incorporates (multiple) sensor(s), data processing, and automation to analyse information, make decisions, and adapt to changing conditions, enhancing efficiency, performance, and user interaction or recommendations.
- System Design – An overview of components and interactions between different components of a system. It includes the design of software and hardware architecture, components, interfaces, and data.
- Software for a Smart System – The applications and algorithms that enable intelligent functionality, data processing, decision-making, and communication within a smart system. It typically includes embedded software, control software, and communication protocols to facilitate real-time operations, automation, and system integration.

Skills

- Information and recommendation generation – The process of analyzing and combining data—often through embedded software, data fusion, and AI algorithms—to produce meaningful insights or actionable suggestions. This enables systems to support decision-making, personalize responses, or automate actions based on real-time sensor input and learned patterns.

Knowledge

- Linear algebra – The branch of mathematics that deals with vectors, matrices, and linear equations, and studies how they can be used to model and solve problems involving linear relationships. Concepts include matrices, vectors, systems of equations, fundamental subspaces, orthogonality and least squares, determinants, eigenvalues and eigenvectors, singular value decomposition, etc.

Included in programme(s)

Exchange Sensors and Smart Systems (autumn)
Minor Sensors and Smart Systems

School(s)

Institute of Engineering

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