Course: Internet of Things — credits: 5

Course code	ELVB25IOT
Name	Internet of Things
Study year	2025-2026
ECTS credits	5
Language	English
Coordinator	H.T. Keulen
Modes of delivery	Project-based learning
Assessments	Internet of Things - Assignment

Learning outcomes

Management
The starting professional can professionally set up, define, implement, plan, adjust and deliver a small-scale project on time.

Definition
The novice professional clearly maps out a problem or customer need, places it in the correct context, consults relevant sources, and translates this into an objective, problem statement, and electrical engineering requirements.

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.

Content

In this module the working principles of an Internet of Things (IoT) system will be addressed, this includes all aspects from data acquisition to transport, processing and storage.

Professional products

- 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. *In this module: The networking involved in a smart system*
- Proof of concept – A prototype or small test setup used to demonstrate that an idea, theory or design is feasible in practice. This can be in the form of testing a circuit, or a simulation of a design. *In this module: An internet of things network*
- 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. *In this module: An internet of things network design.*

Skills

- Smart System design – The interdisciplinary process of creating intelligent, connected systems that integrate sensors, data processing, control algorithms, and communication technologies to enable adaptive, autonomous, and efficient operation in complex environments. It involves hardware and software co-design, system integration, and consideration of factors like energy efficiency, scalability, reliability, and user interaction. *In this module: The communication technologies involved in a smart system*
- Embedded System Development – The process of designing, programming, and integrating hardware and software to create specialized computing systems that perform specific tasks within larger devices, often with real-time performance and resource constraints.
- Component and design choices – The process of evaluating and selecting alternatives during the design process, based on criteria such as functionality, cost, sustainability, and aesthetics, to achieve an optimal solution. *In this module: design choices based on cost efficiency, scalability, modularity, sensor placement and future proofness.*
- Data management – The process of collecting, storing, organizing, and maintaining data to ensure its accuracy, security, accessibility, and usefulness for analysis and decision-making. For instance, locally, in the cloud hybrid, with use of ETL etc.
- Data transport – The transmission of data between devices or systems using various media (such as wired cables or wireless signals) and network architectures (like cloud, mesh or distributed). It ensures reliable, secure, and efficient communication across networks, enabling real-time data exchange.

Knowledge

- Internet of Things (IoT) components, structure and network protocols – The essential elements and communication methods that enable the functioning of Internet of Things systems. Core components include sensors, actuators, microcontrollers, communication modules, and software. The typical IoT structure

follows a layered architecture with a perception layer (for sensing), a network layer (for data transmission), and an application layer (for data processing and user interaction). Various network protocols are applicable in IoT, for example MQTT, CoAP, HTTP, Bluetooth, Zigbee, and Wi-Fi.
- Data management systems – Software tools or platforms designed to efficiently store, organize, retrieve, and manage data. They ensure data integrity, security, accessibility, and support functions like data entry, querying, analysis, and reporting. For example: Relational Databases, NOSQL databases, cloud based platforms, data warehousing systems, integration and ETL tools.

Included in programme(s)

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

School(s)

Institute of Engineering

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