# Course: Advanced Sensor Applications — credits: 5

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| **Course code** | ELVB25ASA |
| **Name** | Advanced Sensor Applications |
| **Study year** | 2025-2026 |
| **ECTS credits** | 5 |
| **Language** | English |
| **Coordinator** | P.M. Gomes Lourenco |
| **Modes of delivery** | Project-based learning |
| **Assessments** | Advanced Sensor Applications - Assignment |

**Learning outcomes**

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.

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.

Professionalisation
The starting professional is able to acquire skills and keep them up to date, is self-managing, constructive in giving and receiving feedback, shows flexibility and can communicate clearly.

**Content**

In this module different sensor types, their working principles and their applications in fields like, industry, chemistry and biology are explored.

**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. I*n this module: The sensor system*
- Hardware Design – Representation of the structure of electrical hardware. This can be done using a circuit diagram, single line diagram, block diagram, I/O list, PCB design drawing, 3D drawing, 2D drawing, Components list or Bill of Materials *In this module: Hardware of a sensor system*
- Schematic – A graphical representation of an electronic circuit. It shows the components (such as resistors, capacitors and transistors) and their interconnections with symbols and lines, which provide insight into the functioning of the circuit. *In this module: Sensor schematics*
- 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.
- Specifications of a (partial) product – Detailed descriptions of the properties, functionalities, dimensions, performance and materials of the product. They indicate exactly how the product must be designed, built and function in order to meet the stated requirements. *In this module: Sensor specifications*
- Test documentation – The set of documents describing the testing process, including test plans, test cases, test results, and any error messages. It provides insight into the test strategy, the tests performed, and the results obtained to evaluate the quality of a product. *In this module: test plans and results on sensor measurements*

**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 sensor system*
- Assembling – Combining individual parts or components into a complete and functioning product or system, according to a predetermined design or schematic
- Handling Technical Documentation – The ability to understand, correctly apply, and, where necessary, update or create technical manuals, specifications, schematics, and other technical documents to ensure effective communication and execution of technical tasks.
- Drawing up Specifications for a (partial) product – The process of establishing the functional, technical and performance requirements that determine what the product or part must meet, as a basis for design, production, quality control and use.

- 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.

**Knowledge**

- Embedded Systems – Specialized computing systems, combining hardware and software, designed to perform dedicated functions within larger mechanical or electrical systems. Key aspects include the use of limited resources, writing low-level code (for example C), interfacing with other peripherals using hardware protocols, efficient data storage, (low)power management, using interrupts/timers and optimal DAQ setup.
- Sensors – Devices that detect and measure physical quantities and convert them into signals that can be read and processed by electronic systems. Key aspects include operating principles and application in a broad range of fields including mechanical, industrial, medical, chemical, biological applications.

**Included in programme(s)**

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

**School(s)**

Institute of Engineering

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