ECQA Certified Electric Powertrain Engineer

5 Days Training

Background

One of the main technological challenges forced by CO2 reduction regulations in the automotive sector nowadays is the need to develop and implement efficient electric powertrains. To be able to cope with this change and be able to propose innovative solutions, engineers must be able to understand the domain-specific knowledge. In this paper, we introduce the skill set defined as the basic knowledge of the electric powertrain engineer and present the pilot course implementation developed to cover the needed skills. The skill card is based on the analysis of different stakeholders' viewpoints and combined views from different technical domains; mainly mechanical, electronics, and software engineering.

The ECQA Certified Electric Powertrain Engineer project (ECEPE) is co-funded by the Erasmus+ Call 2019 Round 1 KA203 Programme of the European Union under the agreement 2019-1-CZ01-KA203-061430. This work is partially supported by Grants of SGS No. SP2021/87 and SP2021/49, VSB - Technical University of Ostrava, Czech Republic.

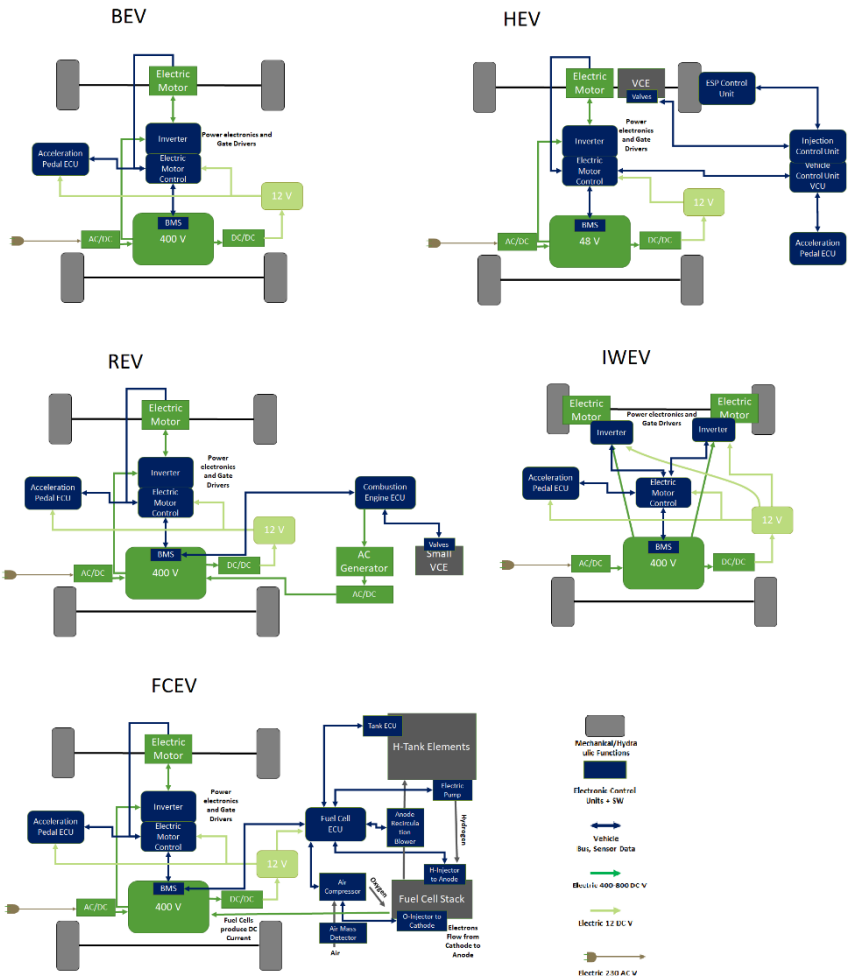
Based on the defined scope and skills requirements described in the previous section, we have established the structure of the electric powertrain (ePowertrain) skill card as follows:

- **U.1 Introduction**
  - U1.E1 ePowertrain Engineer
  - U1.E2 Product life cycle
  - U1.E3 Product homologation and standards
  - U1.E4 Embeded automotive systems
  - U1.E5 ePowertrain Architecture
- **U.2 System engineering (Function-based-Development)**
  - U2.E1 Function-Based Development
  - U2.E2 Functional Safety Aspects
  - U2.E3 Cyber Security aspects
- **U.3 Propulsion systems**
  - U3.E1 eMotor

  - U3.E2 Power electronics, inverters
  - U3.E3 Motor control unit
  - U3.E4 Hybrid control systems
  - U3.E5 Energy transformation systems
  - U3.E6 Transmission systems
- **U.4 Energy Storage Systems**
  - U4.E1 Battery systems
  - U4.E2 Battery management systems
  - U4.E3 Fuel cells
- **U.5 Life Cycle Management**
  - U5.E1 Product life cycle
  - U5.E2 Life Cycle Management and Business Models

From the technical perspective, there are several electric powertrain concepts being used and developed nowadays (see Fig. below):

- Battery Electric Vehicle (BEV),
- Hybrid Electric Vehicle (HEV),
- Range Extender Electric Vehicle (REV),
- Fuel Cell Electric Vehicle (FCEV),
- In Wheel Concept of an Electric Vehicle (IWEV)



ISCN is a certified training partner of VDA-QMC and iNTACS for Automotive SPICE.

https://nqa2.iscn.com/images/PdfFiles/TP-Certificate-CCF15042021.pdf

http://www.intacs.info/index.php/component/weblinks/category/122-training-organisation

The project partners are certified training bodies for the EuroSPI/ASA Certified Functional Safety Manager, accredited by EuroSPI/ASA (EuroSPI Certificates & Services GmbH and the ASA Automotive Skills Alliance led by ACEA).

https://conference.eurospi.net/index.php/certification

The course is based on a joined development of the ECEPE consortium, and the skill card was reviewd by leading Tier 1 companies in the Soqrates group (www.soqrates.de) such as ZF Friedrichshafen AG, Continental Automotive AG, Hella KG, etc.

The online training will be held in the EuroSPI Academy platform, wich is maintained by ISCN. All partners contribute to the EuroSPI conference series. A white paper has been pubkished in the EuroSPI SPRINGER book series.

https://academy.eurospi.net/

https://www.eurospi.net

Electric Powertrain Engineer Course

In this 5 days training course the attendees get introduced to the different architectural concepts of electric powertrains. The participants will participate actively be involved in case studies and elaborate on the concepts of an electric powertrain architecture.

The approach of „Learning by Doing“ is used to elaborate different forms of electric powertrains, analyze advantages and disadvantages, do a safety analysis and elaborate questions concerned with motor control.

The training modules are based on the skills set structure.

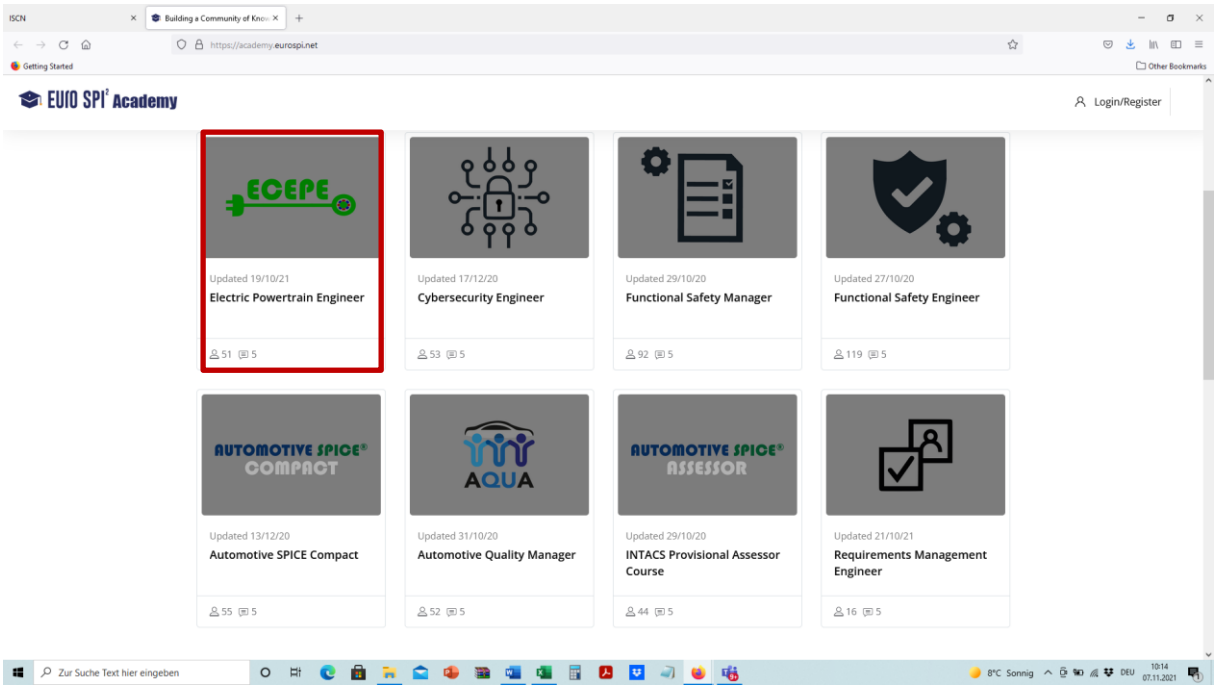
- **Training Module U.1 Introduction**
  - Lecture U1.E1 ePowertrain Engineer
  - Lecture U1.E2 Product life cycle
  - Lecture U1.E3 Product homologation and standards
  - Lecture U1.E4 Embeded automotive systems
  - Lecture U1.E5 ePowertrain Architecture
- **Training module U.2 System engineering (Function-based-Development)**
  - Lecture U2.E1 Function-Based Development
  - Lecture U2.E2 Functional Safety Aspects + Exercise
  - Lecture U2.E3 Cyber Security aspects + Exercise
- **Training module U.3 Propulsion systems**
  - Lecture U3.E1 eMotor
  - Lecture U3.E2 Power electronics, inverters
  - Lecture U3.E3 Motor control unit + Interactive Session for Exercise
  - Lecture U3.E4 Hybrid control systems
  - Lecture U3.E5 Energy transformation systems + Exercise
  - Lecture U3.E6 Transmission systems + Exercise
- **Training module U.4 Energy Storage Systems**
  - Lecture U4.E1 Battery systems + Exercise
  - Lecture U4.E2 Battery management systems + Exercise
  - Lecture U4.E3 Fuel cells + Exercise
- **Training module U.5 Life Cycle Management**
  - Lecture U5.E1 Product life cycle
  - Lecture U5.E2 Life Cycle Management and Business Models + Interactive Discussion

Resources

ECEPE Materials

The course materials and lectures are online available on the EuroSPI Academy platform. The materials will be provided latest till 10.9.2021.

https://academy.eurospi.net/



- Select the course Electric Powertrain Engineer (is accessible from June 2021)
- Register
- You will receive an email and need to confirm by clicking the link in your email.
- Then you can login
- You need the enrollment key **– will be provided -**

Course Schedule 19.11.2021 & 25.11.2021 & 2.12.2021 & 9.12.2021 & 16.12.2021

A more detailed schedule for the 5 distributed online days can be found below:

	Date	Time	#Slides	Exercise	Presentation in mins	Exercise in mins	Who	Hours without coffee breaks
Training Module U.1 Introduction (available 4 hours.)								
Lecture U1.E1 ePowertrain Engineer	19.11.2021	08.00 - 08.30		15 no	30		TUG	
Lecture U1.E2 Product life cycle	19.11.2021	08.30 - 09.00		8 no	30		HSD	
Lecture U1.E3 Product homologation and standards	19.11.2021	09.00 - 10.00		39 no	60		TUS	
Lecture U1.E4 Embeded automotive systems	19.11.2021	10.30 - 11.30		26 no	60		TUG	
Lecture U1.E5 ePowertrain Architecture	19.11.2021	12.30 - 13.00		12 no	30		ISCN	3,5
Training module U.2 System engineering (Function-based-Development) (available 8 hours)								
Lecture U2.E1 Function-Based Development	19.11.2021	13.00 - 14.00		24 no	60		ISCN	
Lecture U2.E2 Functional Safety Aspects + Exercise	19.11.2021	14.00 - 17.00 (incl. Break)		40 yes	90	90	ISCN	
Lecture U2.E3 Cyber Security aspects + Exercise	09.12.2021	08.00 - 09.30		26 yes	60	90	TUG	6,5
Training module U.3 Propulsion systems (available 12 hours)								
Lecture U3.E1 eMotor	25.11.2021	08.00 -10.00		51 no	90		VSB/TUO	
Lecture U3.E2 Power electronics, inverters	25.11.2021	10.30 - 12.00		35 no	60		VSB/TUO	
Lecture U3.E3 Motor control unit + Interactive Session for Exercise	25.11.2021	13.00 - 16.30 (incl. Breaks)		38 + Video yes	90	90	ISCN/TUG	
Lecture U3.E4 Hybrid control systems	02.12.2021	08.00 - 09.00		39 no	60		VSB/TUO	
Lecture U3.E5 Energy transformation systems + Exercise	02.12.2021	09.00 - 10.00		28 no	60		TUS	
Lecture U3.E6 Transmission systems + Exercise	02.12.2021	10.30 - 12.30		42 yes	90	90	TUS	10,5
Training module U.4 Energy Storage Systems (available 12 hours)								
Lecture U4.E1 Battery systems	09.12.2021	10.00 - 11.00		16 no	60		VSB/TUO	
Lecture U4.E2 Battery management systems + Exercise	09.12.2021	and 13.00 - 14.00		26 no	60	60	TUG	
Lecture U4.E3 Fuel cells + Exercise	09.12.2021	14.00 - 15.00		28 no	60	90	TUS	5,5
Training module U.5 Life Cycle Management (available 4 hours)								
Lecture U5.E1 Product life cycle	16.12.2021	08.00 - 09.00		8 no	30		HSD	
Lecture U5.E2 Life Cycle Management and Business Models + Interactive Discussion	16.12.2021	09.00 - 12.00 (incl. Breaks)		45 yes	60	60	HSD	2,5

MS Teams Links

ECEPE Main Course Stream (Lecturing, meet always here at start)

Will be provided

ECEPE Break Out Room 1

Will be provided

ECEPE Break Out Room 2

Will be provided

This course is based on practical Automotive examples from electric powertrain examples.