

The project is co-financed by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

# Selected Problems in Power Electronics Education

Round Table 13 May 2025, Košice, Slovakia

## 1. Introduction

Three universities from Slovakia (Technical University of Košice), Poland (Wrocław University of Science and Technology), and Hungary (University of Győr) are joining forces to enhance teaching in Power Electronics and Electrical Drives by the Visegrad (V4) Grant. This [project](#) aims to improve higher education practices in the field through a series of three dynamic two-day events—workshops, roundtables, and seminars. Each event will take place in one partner country, hosting participants from across the network.

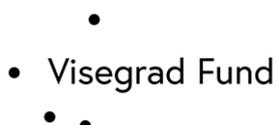
While our collaboration has focused on research until now, PAEPEDE projects introduces a new dimension: innovative teaching. This initiative specifically targets Power Electronics and Electrical Drives courses, offering participants diverse teaching methods and exposure to unique educational systems.

The Department of Electrical Engineering and Mechatronics at the Faculty of Electrical Engineering and Informatics, Technical University of Košice (TUKE) has one bachelor's and one master's study program (Applied Electrical Engineering). Both are focused on electrical engineering from the points of view of electrical drives, industrial automation, and power electronics.

The department teaches three subjects focused on Power Electronics: one in the bachelor's study programme and two in the master's study programme.

Tab. 1 Courses focused on electrical engineering to illustrate the limited time we have to influence the students' point of view

Study programme	Course
Bachelor	<ul style="list-style-type: none"> <li>• <b>Power Electronics</b></li> <li>• Electrotechnics (1<sup>st</sup> year)</li> <li>• Industrial Electronics</li> <li>• Electrical Machines</li> <li>• Automotive Electrotechnics</li> <li>• Electrical Drives</li> </ul>
Master	<ul style="list-style-type: none"> <li>• <b>Power Semiconductor Systems</b></li> <li>• <b>Control of Power Semiconductor Systems</b> (from 2025/2026)</li> <li>• Construction and Design of Converters (finishing in 2024/2025)</li> <li>• Electrical Machines for Automation</li> <li>• Application of Digital Signal Processors</li> <li>• Design of Electrical Devices</li> </ul>



The project is co-financed by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

The courses aimed at power electronics have a core in general electrical engineering, focusing on the control of electrical energy flow and its transformations. A study programme and its curriculum govern the education. The goal of the roundtable is to suggest improvements with a big impact within hard-to-change boundaries.

## 2. The topic, objectives and outcomes

**Topic** Selected Problems in Power Electronics Education

**Objectives**

1. Identify Key Challenges: To pinpoint the most significant obstacles faced by educators and students in teaching and learning power electronics/electrical engineering in bachelor and master study programmes
2. To exchange successful strategies and methods used by different institutions and industrial partners to teach electrical engineering, with a focus on power electronics.

**Outcomes**

1. A comprehensive list of challenges that need to be addressed, such as curriculum gaps, resource limitations, or student engagement issues.
2. A collection of effective teaching practices that can be adopted or adapted by participants to improve their own programs.

## 3. Boundaries and limitations

Facts, which define the boundaries within which changes can be made:

- Students have a fixed curriculum in the first year of bachelor's studies, which is compulsory for the Electrical Engineering and Informatics faculty. There is little room for increased support of electrical engineering and general natural science courses such as physics, mathematics, etc.
- The study programme, however, has a **Study Programme Council (SPC)**, which is responsible for courses and curriculum and has the power to influence the profile of the study programme.
- There is no entrance exam at the faculty level. We need to work with students from different backgrounds and any type of high school.
- Students have generally poor knowledge of natural science courses, usually in terms of definitions, general formulas, etc., without the „big picture“ of common technical understanding and natural laws beyond their definitions.

## 4. Opportunities

Opportunities for improvements within the abovementioned boundaries:

- There are experts in modern teaching methods with a focus on electrical engineering.
- The university can ask for national grants focused on education topics.
- Students are motivated to study electrical engineering.

- 
- Visegrad Fund
- 
- 



The project is co-financed by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

- Big companies in the region are lacking in highly skilled young people. The study programme is publicly supported by <https://www.studujenergetiku.sk/>
- SPC can update the curriculum at the university administration level.
- A traditional study programme, well known among high school students and industry partners, needs to be updated to reflect modern trends.
- Support of exchange programmes, e.g. Erasmus, SCOPUS, etc. for student mobility.

Ideally, the university should teach what the industry will see in 5 years. We are far from this, however, it indicates the interconnection between the university and the industry. The roundtable will focus on possibilities for improvements in the context of the Visegrad region (except Czechia, as there is no project member), as well as the input from industry. The main area of study will be electrical engineering, mainly as a way of processing electrical energy.

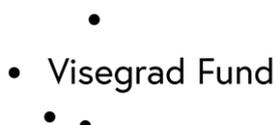
## 5. Improvements

Space for improvements from V4 universities and industry partners:

- **Defined requirements from industry and V4 partners**, e.g. in the form of a skill-to-job matrix.
- Expressed interest of young students in the form of invited presentations and students' visits to the plants.
- Active participation from the industry in the curriculum of the study programme within SPC.
- Active cooperation with top talents is also an expression of their distinction.
- Support of healthy Engagement and prevention of Quiet Quitting at the university level.
- A balanced curriculum which makes student exchanges easier and complements courses at the V4 universities.

The most important output from the roundtable should be the definition of core requirements and common challenges, which will lead to significant improvements in education. We, as teachers, think about what is essential for highly skilled graduates. However, we need feedback and updates from V4 partners and the industry. Because we do not produce graduates only for one company, we need many inputs to find their intersection. Students need to transfer responsibility for their education to themselves, and a teacher is a guide during the learning process, not the maker. And as a guide, he/she needs to know the requirements of the environment.

*Please be as to the point as possible during the discussion. Avoid general ideas or ideas which are outside of the defined boundaries, such as "make an entrance exam," "improve soft skills," or "improve mathematical background," and focus on big topics that will have momentum for a decade and brainstorm.*



The project is co-financed by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

## 6. Suggested agenda and Inspiration (generated by Copilot)

A round table discussion on "Selected Problems in Power Electronics Education" can have several objectives, such as:

### 1. Identifying Key Challenges

- **Description:** Discuss the main issues faced by educators and students in power electronics, such as curriculum gaps, outdated materials, or lack of practical training.
- **Possible Outcome:** A comprehensive list of challenges that need to be addressed, providing a clear focus for future improvements and initiatives.

### 2. Sharing Best Practices

- **Description:** Exchange successful teaching methods, tools, and resources that have proven effective in engaging students and enhancing their understanding of power electronics.
- **Possible Outcome:** Compilation of best practices that can be adopted by other educators, leading to improved teaching effectiveness and student learning outcomes.

### 3. Innovative Solutions

- **Description:** Brainstorm new approaches to overcome existing problems, including the integration of modern technologies, interactive learning platforms, and industry collaborations.
- **Possible Outcome:** Generation of innovative ideas and strategies that can be implemented to enhance power electronics education, fostering creativity and modernization.

### 4. Curriculum Development

- **Description:** Evaluate current curricula and suggest improvements to better align with industry needs and technological advancements.
- **Possible Outcome:** Recommendations for curriculum updates that ensure students are well-prepared for the demands of the power electronics industry.

### 5. Professional Development

- **Description:** Explore opportunities for educators to enhance their skills and knowledge through workshops, seminars, and continuous learning programs.
- **Possible Outcome:** Identification of professional development programs that can help educators stay current with the latest advancements in power electronics, improving their teaching capabilities.

### 6. Student Engagement

- **Description:** Discuss strategies to increase student interest and participation in power electronics courses, such as hands-on projects, competitions, and real-world applications.
- **Possible Outcome:** Development of engagement strategies that make power electronics more appealing to students, leading to higher enrollment and retention rates.

### 7. Resource Allocation

- 
- Visegrad Fund
- 
- 



The project is co-financed by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

- **Description:** Address the need for better funding, equipment, and facilities to support effective power electronics education.
- **Possible Outcome:** Advocacy for increased resources and funding, resulting in improved educational infrastructure and learning environments.

#### 8. Collaboration and Networking

- **Description:** Facilitate connections between educators, industry professionals, and researchers to foster collaboration and share insights.
- **Possible Outcome:** Establishment of a network of professionals that can collaborate on projects, share knowledge, and support each other in advancing power electronics education.

## 7. Round table moderator

[Marek Pástor](#), a member of SPC for Applied Electrical Engineering and person responsible for teaching power electronics courses, will lead the roundtable. It will take place on 13 May from 14:30 to 16:30, and up to 20 people from three different V4 universities, together with industry partners, will participate.

