Universitatea Transilvania din Brașov
ȘCOALA DOCTORALĂ INTERDISCIPLINARĂ

PHD ADMISSION SEPTEMBER 2025 SESSION

Ph.D. field: Electrical Engineering
PhD supervisor: Prof.dr.ing. Paul Nicolae BORZA

THEMES (THEMES) FOR THE CONTEST

TOPIC 1: *Intelligent management of electricity in low and medium voltage networks equipped with electricity storage facilities based on the similarity between the biological and electrical*

Content / Main issues addressed

- **Analysis of homeostasis processes identifiable in biosystems (constituents of systems, control laws, and performances);**
- **Low and medium voltage electricity networks having elements such as: renewable sources, prosumers, electricity storage systems;**
- **Modeling, simulation of energy management systems;**
- **Experimental implementation, control algorithms. Management programs related to the integrated control environment**
- **Development of the integrated, versatile, and scalable adaptive control environment for real-time management of grid power flows**
- **Experimental validation of developed systems**

Recommended bibliography:

[1]. Balabanian, N., Bickart, T.A. (1969) Electrical Network Theory. John Wiley & Sons, New York, ISBN: 0471045764
[2]. J. D. Bronzino, Peterson D. R., The Biomedical Engineering Handbook Four Volume Set, 4th edition, CRC Press Taylor & FrancisGroup, Boca-Raton FL, 33487-2742, 2015
[3]. V. Delgado-Gomes, J. F. Martins, C. Lima and P. N. Borza, "Smart grid security issues," 2015 9th International Conference on Compatibility and Power Electronics (CPEI, 2015, pp. 534-538, doi: 10.1109/CPE.2015.7231132.

Notes / Preconditions / Note:

- Bachelor's degree studies lasting 5 years or 3-4 years of bachelor's and master's degrees in fields such as electrical engineering, electronics and telecommunications, computer science or mathematics
- Knowledge of physics and mathematics
- Knowledge of computer programming
- Good knowledge of English and possibly other languages of international circulation

☐ **Scientific doctorate (full-time only)** ☐ **Professional doctorate (full-time or part-time)**
☐ **with funding from the state budget** ☐ **with a fee or with financing from sources other than the state budget**

TOPIC 2: *Development of stationary and mobile applications equipped with hybrid electrical energy storage systems (supercapacitors, fuel cell batteries)*

Contents / Main aspects

- **Low and medium voltage electricity networks having elements such as: renewable sources, prosumers, electricity storage systems;**
- **Cells, devices and systems for storing electricity (principles of operation of devices, their sizing, interconnection, control and integration);**
- **Modeling, simulation and experimentation of applications that have hybrid electricity storage systems**
- **Experimental validation of the applications addressed**

Recommended bibliography:

[1]. Conway B.E., Electrochemical Supercapacitors: Scientific Fundamentals and Technological Applications, Springer Sciences + BusinessMedia New York, 1999, 001: 10.1007/978-1-4757-3058-6

[2]. Balabanian, N., Bickart, T.A. (1969) Electrical Network Theory. John Wiley & Sons, New York, ISBN : 0471045764

[3]. Borza P.N., 1Vl . Machedon-Plsu, 1Vl . C.Carp, Hybrid electrical storage solutions rut developing reliable transport systems, 14th International Renewable Energy Storage Conference 2020 (IRES 2020), Atlantis Press, part of Springer Nature 2021 .

Notes / Preconditions / Note:

◘ Bachelor's degree studies lasting 5 years or 3-4 years of bachelor's studies followed by master's studies in fields such as electrical engineering, electronics and telecommunications, computer science or mathematics

◘ Knowledge of physics, mathematics and biology

◘ Knowledge of computer programming

◘ Good knowledge of English and possibly other languages of international circulation

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TOPIC 3: *Holistic methods for real-time optimization of power flows in systems equipped with electricity storage facilities – stationary & mobile systems –*

Content / Main issues addressed

- **Analysis, synthesis, modeling of medium (distribution) and low voltage networks that include renewable energy sources, energy storage systems as well as facilities that allow the intermittent connection of electric vehicles to them.**
- **Electrical power converters, structure, control control and real-time supervision components;**
- **Electricity storage systems: cells, devices and systems for storing electricity (principles of operation of the devices, their sizing, interconnection, control and integration);**
- **Modeling, simulation, optimization and experimentation of applications that have hybrid electricity storage systems**
- **Experimental validation of the applications addressed**

Recommended bibliography:

[1]. Conway B.E., Electrochemical Supercapacitors: Scientific Fundamentals and Technological Applications, Springer Sciences + BusinessMedia New York, 1999, 001: 10.1007/978-1-4757-3058

[2]. Balabanian, N., Bickart, T.A. (1969) Electrical Network Theory. John Wiley & Sons, New York, ISBN : 0471045764

[3]. Maryam Farsi, Alireza Daneshkhah, Amin Hosseinian-Far, Hamid Jahankhani, Series: Internet of Things, Springer International Publishing, 2020, ISBN: 978-3-030-18731-6; 978-3-030-18732-3

[4]. Wenjuan Wang, Qasim Zaheer, Shi Qiu, Weidong Wang, Chengbo Ai, Jin Wang, Sicheng Wang, Wenbo Hu, Digital Twin Technologies in Transportation Infrastructure Management, Springer, 2023, ISBN 978-981-99-5803-0

[5]. Borza P.N., 1VI . Machedon-Plsu, 1VI . C.Carp, Hybrid electrical storage solutions rut developing reliable transport systems, 14th International Renewable Energy Storage Conference 2020 (IRES 2020), Atlantis Press, part of Springer Nature 2021 .

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PhD supervisor,

Prof. dr. ing. Paul Nicolae BORZA

Signature

Coordinator of the doctoral field,

Prof. dr. ing. Ioan SERBAN

Signature