


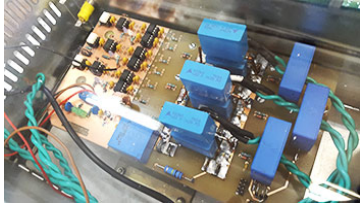


## CENTER OF APPLIED RESEARCHES IN ELECTRICAL ENGINEERING FOR SUSTAINABLE DEVELOPMENT

### Contact details

Name	<b>Center of Applied Researches in Electrical Engineering for Sustainable Development</b>	<i>GreenMot Lab with a testbench for testing electrical machines up to 4 phases, 125kW and 12,000r/min</i>	
Acronym	<b>CCAIEDD</b>		
Logo		Permanent magnet synchronous machine of 20kW and 26,000r/min	
Site	<a href="http://memm.utcluj.ro/ccaiedd/en/index.html">http://memm.utcluj.ro/ccaiedd/en/index.html</a>		
Address	2 Observatorului str., 400489 Cluj-Napoca, Romania	150V and 200A power converter	
Faculty Department	<b>Faculty of Electrical Engineering Electrical Machines and Drives Department</b>		
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### Areas of expertise

**Design, modeling, and optimization of electrical machines & drives for energy-efficient applications in industrial, automotive, and renewable energy fields**  
**Control of electric and electromechanical systems**  
**Condition monitoring, fault tolerance, and diagnosis of electromechanical systems**  
**DSP, microcontroller, and FPGA programming**  
**Hardware-in-the-loop (HiL) simulation in hybrid-electric vehicles**

### Team

**Prof. Dr. Loránd Szabó**, Prof. Dr. Horia Hedeşiu, Prof. Dr. Claudia Marţiş, Prof. Dr. Csaba Szász, Prof. Dr. Daniel Fodorean, Assoc. Prof. Dr. Dan-Cristian Popa, Assoc. Prof. Dr. Florin Jurca, Assoc. Prof. Dr. Ştefan Breban, Assoc. Prof. Dr. Mircea Ruba, Lecturer Dr. Claudiu Oprea, Lecturer Dr. Adrian Augustin Pop, Assistant lecturers: Dr. Sorin Iulian Cosman, Dr. Răzvan Alexandru Inţe, Ph.D. students: Sebastian Ciceo, Simina Derban, Erzsebet Mátyás, Teodor-Sebastian Ursache, Paula-Ioana Şerban, Bogdan Butnariu, Eliza-Maria Olariu, Diana Artudean.

### Representative projects

**DiArtIS – Network of excellence in digital technologies and AI solutions for electromechanical and power systems applications** (HORIZON-WIDERA-2021-ACCESS-03-01, coordonator), 2022-2025. Director: Prof.dr.ing. Claudia Marţiş. <https://ditartis.utcluj.ro/>  
**DISEP – Dispozitiv inerţial pentru stocare energetică şi protecţie a microreţelelor electrice locale** (PN-III-P2-2.1-PTE-2021-0639, partener), 2022-2024. Director: Prof.dr.ing. Claudia Marţiş. <http://www.icpe.ro/ro/disep/>  
**MAXIMA – Modular AXial flux Motor for Automotive – MAXIMA** (HORIZON-CL5-2022-D5-01, partener), 2023-2027. Director: Prof.dr.ing. Claudia Marţiş. <https://maxima-he.eu>  
**Studiul tehnic pentru dezvoltarea unui sistem de stocare a energiei electrice cu baterii tip LiFePo** (ROMBAT S.A.), 2022-2027. Director: Conf.dr.ing. Mircea Ruba.

### Significant results

#### The most representative publications of the past 5 years:

- [1] R. Nemeş, M., Ruba, R., Raia, C., Marţiş, C. Oprea, C., **X-in the Loop based high accuracy test facility for industrial development of electric vehicles**. IEEE Transactions on Transportation Electrification, vol. 9, no. 2, pp. 2778-2791, 2023.
- [2] C.V. Pop, D. Fodorean, **Purely electromagnetic propulsion system with two transmission levels – design, numerical and experimental results**, IEEE Transactions on Industrial Electronics, vol. 70, no. 5, pp.4494- 4504, 2022.
- [3] S. Ciceo, F. Chauvicourt, J. Gyselinck, C. Marţiş, **Data-driven electrical machines structural model using the vibration synthesis method**, IEEE Transactions on Transportation Electrification, vol. 8, no. 3, pp. 3771-3781.

- [4] J.E. Ruiz-Sarrio, F. Chauvicourt, J. Gyselinck, C. Martiș, **Impedance Modeling Oriented Toward the Early Prediction of High-Frequency Response for Permanent Magnet Synchronous Machines**, IEEE Transactions on Industrial Electronics, vol. 70, no. 5, pp. 4548-4557, 2022.
- [5] R. Nemeș, M. Ruba, R. Raia, C. Martiș, C. Oprea: **X-in the Loop based high accuracy test facility for industrial development of electric vehicles**. IEEE Transactions on Transportation Electrification, 2022.
- [6] C.V. Pop, D. Fodorean, D.C. Popa, **Structural Analysis of an In-Wheel Motor with Integrated Magnetic Gear Designed for Automotive Applications**, Sustainability, vol. 14, no. 19, paper #12007, 2022.
- [7] L. Szabó, D. Fodor, **The Key Role of 3D Printing Technologies in the Further Development of Electrical Machines**, Machines, vol. 10, paper #330, 2022.
- [8] A.A. Pop, **Incremental Encoder Speed Acquisition Using an STM32 Microcontroller and NI ELVIS**. Sensors, vol. 22, no. 14, paper #5127, 2022.
- [9] Ș Breban, M. Dranca, M. Chirca, A.M. Pacuraru, P.D. Teodosescu, C.A. Oprea, C. A.: **Experimental Tests on a Spoke-Type Permanent Magnets Synchronous Machine for Light Electric Vehicle Application**. Applied Sciences, vol. 12, no. 6, paper #3019, 2022.
- [10] R.C. Nacu, D. Fodorean, **Lithium-Ion Cell Characterization, Using Hybrid Current Pulses, for Subsequent Battery Simulation in Mobility Applications**. Processes, vol. 10, paper #2108, 2022.
- [11] C.V. Pop, D. Fodorean, D.C. Popa, **Structural Analysis of an In-Wheel Motor with Integrated Magnetic Gear Designed for Automotive Applications**", Sustainability 2022, 14, 12007. <https://doi.org/10.3390/su141912007>, ISSN 2071-1050.
- [12] A.A. Pop, **Incremental Encoder Speed Acquisition Using an STM32 Microcontroller and NI ELVIS**. Sensors, vol. 22, no. 14, paper #5127, 2022.

**Significant solutions:**

Prototypes and laboratory models of special electrical machines; static converters; fault detection and fault tolerant systems; electrical machines MiL and HiL testing and evaluation procedures, solar electric vehicle for solar car student competition, etc.

**Products and technologies:**

Microcontroller-based boards for motor control, energy management, and position detection based on resolvers, DSP development boards for motor control and diverse applications, FPGA-based development boards for motor control and diverse applications, energy management: on board on light electric vehicles and hybrid power sources, HiL testing platforms for electric vehicle propulsion, and auxiliaries systems.

**Patents:**

- [1] Ș Breban, M. Dranca, I. Mălăeș: **Airborne wind power generation system**, no. RO133886.
- [2] Ș Breban, M. Dranca, M. Fărtan, **Electric propulsion machine with direct drive wheel for guided track transport vehicles**, no. RO134496.

**The offer addressed to the economic environment**

Research & development	Electrical machine design and optimization Electrical drives and control based on microcontrollers, DSPs, and FPGA devices Electromechanical systems for smart, green, and integrated transportation Secure, clean, and efficient renewable energy generation and storage systems Energy management on hybrid electrical power sources Offering advanced technical solutions for industrial clients in all our research fields. Seeking research & development partners (both from industry and academia) in all the fields of expertise of the center.
Consulting	Offering consultancy services for companies in all the fields of expertise of the center. Offering applied engineering services for companies in all our fields of expertise.
Training	Offering training for under and postgraduate students, Ph.D. students, and engineers working in research and industry in all the fields of expertise of the Center.

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