

DEPARTMENT OF ELECTRICAL ENGINEERING AND MECHATRONICS

<http://kem.fei.tuke.sk>

Tel.: ++421 55 602 2279, Fax: ++421 55 633 0115

Head of Department
prof. Ing. Daniela Perduková, PhD.
E-mail: daniela.perdukova@tuke.sk

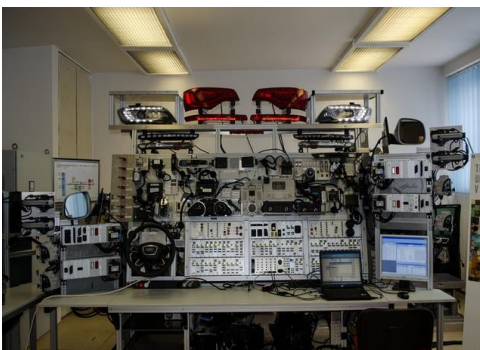
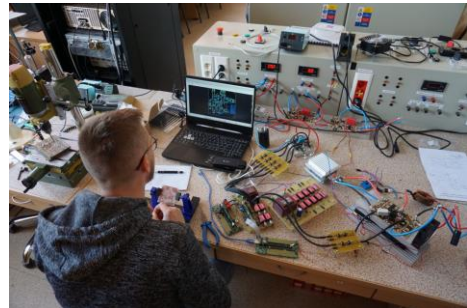


1 DEPARTMENT'S PROFILE

The Department was established at foundation of the Faculty of Electrical Engineering in 1969 as the Department of Electrical Drives but originally it presents a continuation of the Department of Electrical Engineering established at foundation of the Technical University of Kosice (1953). Through the years the name of the department was changed due to express closer its activities and development.

Staff members of the department are experienced in wide areas of electrical engineering, incl. automotive electrical engineering, mechatronics, and robotics what they utilise in teaching and research. Currently, the department is responsible for education and research in area of electrical engineering, namely in fields of power and industrial electronics, electrical machines and apparatuses, sensors, electromechanical systems, controlled drives, multi-motor drives, control systems, and industrial and automotive mechatronic systems up to drives of robots.

The Department offers all types of university courses: bachelor, master and Ph.D. courses.



2 STAFF

Professors: prof. Ing. Jaroslav Dudrik, PhD. (till December 2023)
prof. Ing. Pavol Fedor, PhD.
prof. Ing. Daniela Perduková, PhD.

Associate Professors: doc. Ing. František Ďurovský, PhD.
doc. Ing. Želmíra Ferková, PhD.
doc. Ing. Peter Girovský, PhD.
doc. Ing. Ján Kaňuch, PhD.
doc. Ing. Karol Kyslan, PhD.
doc. Ing. Milan Lacko, PhD.
doc. Ing. Marek Pástor, PhD.
doc. Ing. Jaroslava Žilková, PhD.

Assistant Professors: Ing. Ján Bačík, PhD.
Ing. Peter Bober, PhD.
Ing. Viktor Šlapák, PhD.
Ing. Viktor Petro (since October 2023)

Senior Scientists: Ing. Peter Hajsák
doc. Ing. Viliam Fedák, PhD.
doc. Ing. Michal Kostelný, CSc.
prof. Ing. Pavel Zásalický, PhD.

Technical Staff: Zuzana Olexová

Full time Ph.D. Students: Ing. Stanislav Alexovič (till August 2023)
Ing. Juraj Biľanský (till August 2023)
Ing. Tomáš Basarik (since September 2023)
Ing. Dávid Bodnár
Ing. Daniel Gordan (since September 2023)
Ing. Tadeáš Kmecik (since September 2023)
Ing. Daniel Marcin
Ing. Adrián Marcinek (till August 2023)
Ing. Lukáš Pancurák
Ing. Viktor Petro (till August 2023)
Ing. Richard Olexa (till August 2023)

3 LABORATORIES

- Power Electronics Laboratory
- Simulation Systems Laboratory (COSMOS, ProEngineer, MATLAB, PSpice, and applied SW, ABBRobotStudio, EPLAN, AVL)
- Laboratory of Industrial Automation
- Laboratory of Electrical Machines and Electrical Drives
- Laboratory of Controlled Electrical Drives
- Automotive Electrical Engineering Laboratory
- Laboratory of Electrical Devices and Applied Electronics
- Laboratory of Electric Drives Applications
- BSH Motor Control Laboratory
- Virtual Laboratory of Mechatronic Systems Control:
<http://andromeda.fei.tuke.sk>

4 TEACHING

4.1. Undergraduate Study (Bc.)

a) Bachelor study programme in Automated Electrical Systems (title: Bc.)

Subject	Semester	Lectures/exercises (hours per week)	Lecturer
Fundamentals of Electrical Engineering	1 st	2/2	Kaňuch
Computer Applications	3 th	2/2	Perduková
Electrical Machines	3 rd	2/2	Záskalický
Automotive Electrical Systems	3 th	2/2	Đurovský
Industrial Electronics	3 th	2/2	Kaňuch
Electrical Drives	4 th	2/2	Žilková
Fundamentals of Microcomputer programming	4 rd	2/2	Lacko
Modeling and Simulation in Electrical Engineering	4 th	2/2	Fedák
Power Electronics	4 th	3/3	Páštor
Sensors and Measurement of Nonelectrical Quantities	4 th	2/2	Girovský
Industrial Control Systems	4 th	2/2	Fedor
Pneumatic and Hydraulics Systems	4 th	2/2	Bober
Controlled Electrical Drives	5 th	2/2	Đurovský
Fundamentals of Robotics	5 th	2/2	Žilková
ManMachine Interface	5 th	2/2	Perduková
Bachelor Project	5 th	0/8	Supervisor
Bachelor Thesis	6 th	3/9	Supervisor
Simulation of Production Systems	6 th	2/2	Bober
Modeling of Electromechanical Systems	6 th	2/2	Fedák
Projecting of Electrical Systems	6 th	2/2	Lacko

4.2. Graduate Study (Ing.)

a) Master study programme in Electrical Systems (title: Ing.)

Subject	Semester	Lectures/exercises (hours per week)	Lecturer
Power Semiconductor Systems	1 st	2/2	Dudrik
Non-linear Electro-Mechanical Systems	1 st	2/2	Fedor
Servosystems	1 st	2/3	Kyslan

Dynamic Phenomena of Electrical Machines	1 st	2/2	Záskalický
Electrical Machines for Automation	1 st	2/2	Ferková
Technology of Production in Electronics	1 st	2/2	Slosarčík
Signal Processors	1 st	2/3	Lacko/Šlapák
Applications of Digital Signal Microcontrollers	2 nd	2/3	Šlapák
Vehicle Mechatronics	2 nd	2/2	Đurovský
Construction and Design of Converters	2 nd	2/2	Dudrik
Control of Assembly Lines with Programming Controlllers	2 nd	2/2	Fedor
Diploma Project 1	2 nd	0/4	Supervisor
Diploma Project 2	3 rd	2/6	Supervisor
Mechatronic Production Systems	3 rd	2/2	Đurovský
Intelligent Control of Electrical Systems	3 rd	2/2	Žilková
Three-Dimensional Modelling and Simulation	3 rd	2/2	Ferková
Technology of Production in Electrotechnics	3 rd	2/2	Girman
Design of Documentation in Electrical Engineering	3 rd	1/3	Lacko
Diploma Thesis	4 th	9/9	Supervisor

4.3. Undergraduate and Graduate Study for Foreign Students (in English)

All subjects listed above are offered in English language for foreign students.

4.4. Ph.D Postgraduate Course on Electrical Systems

Subject	Semester	Lectures/exercises (hours per week)	Lecturer
Power Electronics	1 st	2/0	Dudrik
Ph.D. Project I	1 st	0/2	Supervisor
Foreign Language I	1 st	2/0	Dept. of Foreign Languages
Servosystems	2 nd	2/0	Fedor
Ph.D. Project II	2 nd	0/2	Supervisor
Foreign Language II	2 nd	2/0	Dept. of Foreign Languages
Ph.D. Project III	3 rd	0/4	Supervisor
Subject of Specialization	3 rd	2/0	According to the subject
Scientific Activity	3 rd	0/8	Supervisor
Ph.D. Project IV	4 th	0/2	Supervisor
Scientific Activity	4 th	0/8	Supervisor
Ph.D. Project IV	5 th	0/2	Supervisor
Scientific Activity	5 th	0/8	Supervisor
Ph.D. Thesis	5 th	0/9	Supervisor

5 RESEARCH PROJECTS

- *Development of Modular Traction Battery and Optimization of Electrical Power Consumption in Electric Midibus.* Project supported by the Slovak Research and Development Agency under the contract No. APVV-18-0436. Principal investigator: LACKO, M. (2019-2023)
- *HIL Emulator for Small Hydropower Plant Control.* Project supported by the Slovak Research and Development Agency under the contract No. APVV-19-0210. Principal investigator: PERDUKOVÁ, D. (2020-2023).
- *Experimental Validation of Predictive Control of Permanent Magnet Synchronous Machine.* Project supported by the Faculty of Electrical Engineering and Informatics, Technical University of Kosice, Slovakia, under the Grant FEI-2023-98. Principal investigator: PANCURÁK, L. (2023).

- *Research on High-efficiency Electromechanical Systems with Applications for Electromobility*, Project VEGA 1/0363/23, Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences, Principal investigator: KYSLAN, K. (2023-2025).

6 CO-OPERATION

6.1. Co-operation in Slovakia

The Department co-operates with many industrial enterprises in Slovakia having joint projects at modernising of the electrical drive systems, control and mechatronic applications: U.S.STEEL Košice, SIEMENS, ABB, BSH Drives and Pumps Michalovce, Redox Prešov, Křížík Prešov, Schneider Electric Slovakia, Spell Procont Prešov, Spinea Prešov, Vonsch Brezno, Kybernetika Košice, TEKO Košice, ENERGO CONTROL Košice, ŽP Podbrezová, Bukóza Hencovce, Embraco Slovakia Spišská Nová Ves, Slovak Union for Quality, Innovation and Design Q-IMPULZ, Košice, SEZ Krompachy, DATAKON Košice, STATON Turany, ROŠERO-P, Sp.N.Ves, ComAp, s.r.o. Košice, Siemens Healthcare Košice, Mitsubishi Electric, s.r.o. Košice, SOLUTIONS JMD s.r.o., Košice.

6.2. International Co-operation

- University of Zagreb, Croatia
- Brno University of Technology, Czech Republic
- Technical University of Liberec, Czech Republic
- VŠB -Technical University of Ostrava, Czech Republic
- West Bohemian University, Pilsen, Czech Republic
- University of Technology and Economy, Budapest, Hungary
- University of Miskolc, Hungary
- Silesian University of Technology, Gliwice, Poland
- Széchenyi István University, Győr, Hungary
- Delft University of Technology, The Netherlands
- Czech Academy of Science, Prague, Czech Republic.
- University of Oradea, Romania
- University of Maribor, Slovenia
- University of Zagreb, Croatia
- University of Novi Sad, Serbia
- CAG Electric Machinery, Český Brod, Czech Republic
- Wroclaw University of Technology, Wroclaw, Poland

6.2.1. Visits of Staff Members to Foreign Institutions

- BODNÁR, D.: TU Delft (NL). April 2022 – January 2023.
- FEDOR, P.: VSB-Technical University of Ostrava (CZ), May 2023, November 2023
- FERKOVÁ, Ž.: Technical University of Liberec (CZ), January 2023.
- FERKOVÁ, Ž.: Conference Ansys 2023, TechSoft Engineering Praha (CZ). June 2023
- FERKOVÁ, Ž.: University of Technology Brno (CZ), June 2023.
- GIROVSKÝ, Automation Academy Eggelsberg - B&R Campus, B&R Headquarters, Eggelsberg (Austria), 7.2 – 9.2.2023

- KAŇUCH, J.: PEMINE 2023, Gliwice (PL), September 2023.

6.3. Membership in International Organizations, Societies and Committees

- DUDRIK, J; FERKOVÁ, Ž, KYSLAN: IEEE members.
- FEDÁK, V.: Power Electronics and Motion Control Council (PEMC). Vice chairman and AwardCom chair.
- FEDÁK, V.: Member of the Expert evaluation jury for awarding products within the ZLATÝ AMPER competition for the most beneficial exhibit at the 30th International trade fair on electrical engineering, electronics, automation, communication and safety technology AMPER 2024. Brno (CZ). May 19-21, 2024.
- PERDUKOVÁ, D.: Member of Programme Committee: 18th International Conference on Soft Computing Models in Industrial and Environmental Applications – SOCO 2023, Salamanca, Spain, 5.-7. September 2023.

6.4. Membership in Slovak Professional Bodies

- FEDÁK, V.; KAŇUCH, J.; ZÁSKALICKÝ, P.; FEDOR, P.; FERKOVÁ, Ž.; GIROVSKÝ, P.; HAJŠÁK, P.; LACKO, M.; PERDUKOVÁ, D.: members of The SES (Slovak Electrotechnical Society), Branch at FEI TU Košice.
- FERKOVÁ, Ž.: Member of Technical Standards Commission on Electrical Machines in Slovak Republic.
- PERDUKOVÁ, D.: Council of the Secondary Technical School for EE, Košice (delegate of the FEI TU Košice).
- PERDUKOVÁ, D.: Program Committee of 22th Scientific Conference of Young Researchers of the Faculty of Electrical Engineering and Informatics, Technical University of Košice – SCYR 2023.
- PERDUKOVÁ, D.: Member of board for the PhD. Study in Electrical Engineering at FEI TU Košice.

6.5. National Educational Projects

6.6. Editorial Boards

- BOBER, P.: Editorial board of journal “Quality Innovation Prosperity” (Kvalita, Inovácia, Prosperita), ISSN 1335-1745 (print), ISSN 1338-984X (online).
- DUDRIK, J.: Member of the Series Editorial Board of Annals of the Academy of Romanian Scientists.
- DUDRIK, J.: Editorial board of Transactions on Electrical Engineering, Czech Republic, ISSN 1805-3386.
- FEDÁK, V.: Editorial board of the Journal “Przeglad Elektrotechniczny” (Polish Academy of Sciences, Warsaw, <http://www.red.pe.org.pl/>), ISSN 0033-2097, e-ISSN 2449-9544.
- FEDOR, P.: Editorial board of Acta Electrotechnica et Informatica – AEI. Journal of the Faculty of Electrical Engineering and Informatics. ISSN 1335-8243.
- KYSLAN, K.: Associate Editor of journal „Power Electronics and Drives“, Wroclaw, Poland, ISSN 2543-4292.
- PERDUKOVÁ, D.: Editorial board of Elektroenergetika journal, ISSN 1337-6756.

- ZÁSKALICKÝ, P.: Editorial board of Acta Technica CSAV. Journal of Czech Academy of Science, Prague. Czech Republic. ISSN 0001-7043.
- ZÁSKALICKÝ, P.: Editorial board of KOMEL, Branzowy osrodek badawczo-rozwojowy Maszyn elektrycznych, Katowice, Poland. ISSN 0239-3646.

7. THESES Defended Theses in 2023

- ALEXOVIČ, S.: *Autonomous control of UAV in GPS denied environment*. Supervisor: Lacko, M.
- BILANSKÝ, J.: Models of electric vehicle battery systems. Supervisor: Lacko, M.
- MARCINEK, A.: *Control of Multiport Power Converters*. Supervisor: Pástor, M.
- OLEXA, R.: Modeling and Control of Small Hydropower Plants. Supervisor: Fedor, P.
- PETRO, V.: *Sensorless Control of Permanent Magnet Synchronous Machine for Low-Speed Operation*. Supervisor: Kyslan, K.

Thesis type	Bachelor	Master	Doctoral
Number	32	31	5

8 OTHER ACTIVITIES

8.1. Symposia, Workshops, Conferences

2023 *International Conference on Electrical Drives and Power Electronics (EDPE 2023)*, 24-27 September 2023, Hotel Atrium, The High Tatras, Slovakia. *organized by the department.*

8.2. Projects for Industry

- *Training on frequency converters*. For Siemens Large Drives s.r.o., Košice. Co-ordinator: Ďurovský, F., 2023.

8.3. Student Competitions and Rewards

- MARCINEK, A.: SCYR 2023. Dean Prize for Survey or Progress, Electrical & Electronics Engineering Section, 3rd year PhD students.

8.4. Compositions for Dissertation Examinations

- BODNÁR, D.: *Power management of electric vehicles*. Supervisor: Ďurovský, F.

9 PUBLICATIONS

9.1. Books and book chapters

- [1] MERVA, Tomáš - VIRGALA, Ivan - GIROVSKÝ, Peter: **Soft Actor-Critic in robotic arm position control within ROS**. 2022. In: Novus Scientia 2022. Košice (Slovensko): Technická univerzita v Košiciach p. 128-133 [online]. - ISBN 978-80-553-4085-2.
- [2] ZGODAVOVÁ, K. - LENGYELOVÁ, K. - BOBER, P. - VINCZE, T.: (2023). **Integrated Management System Role-Play Simulation: Training and**

Development Tool. In: de Oliveira Matias, J.C., Oliveira Pimentel, C.M., Gonçalves dos Reis, J.C., Costa Martins das Dores, J.M., Santos, G. (eds) Quality Innovation and Sustainability. ICQUIS 2022. Springer Proceedings in Business and Economics. Springer, Cham. https://doi.org/10.1007/978-3-031-12914-8_16

9.2. Textbooks

9.3. Scientific Journals

Journals indexed in Thomson Reuters “Current Contents” database

- [1] BILANSKÝ, Juraj - LACKO, Milan - PÁSTOR, Marek - MARCINEK, Adrián - ĎUROVSKÝ, František: **Improved Digital Twin of Li-Ion Battery Based on Generic MATLAB Model.** 2023. In: Energies. Basel (Switzerland): Multidisciplinary Digital Publishing Institute Vol. 16, Issue 3 (2023), p. [1-21] [online]. ISSN 1996-1073 (online). Access: <http://dx.doi.org/10.3390/en16031194>.
- [2] PÁSTOR, Marek - LACKO, Milan - DUDRIK, Jaroslav - MARCINEK, Adrián: **Soft-Switching Full-Bridge DC-DC Converter with Energy Recovery Capacitor Snubber.** 2023. In: Energies. Basel (Switzerland). Multidisciplinary Digital Publishing Institute Vol. 16, Issue 4 (2023), p. [1-18] [online]. ISSN 1996-1073 (online): Access: <http://dx.doi.org/10.3390/en16041591>.
- [3] FERKOVÁ, Želmíra - BOBER, Peter: **Influence of the rotor geometry on efficiency and torque ripple of switched reluctance motor controlled by optimized torque sharing functions.** 2023. In: Machines. Basel (Switzerland). Multidisciplinary Digital Publishing Institute Vol. 11, Issue 6 (2023), p. [1-17] [online]. ISSN 2075-1702 (online). Access: <http://dx.doi.org/10.3390/machines11060613>.
- [4] JANKOWSKA, Kamila - DYBKOWSKI, Mateusz - PETRO, Viktor - KYSLAN, Karol: **Classification of speed sensor faults based on shallow neural networks.** 2023. In: Applied sciences. Basel (Switzerland): Multidisciplinary Digital Publishing Institute Vol. 13, Issue 12 (2023), p. [1-20] [online]. ISSN 2076-3417 (online). Access: <https://doi.org/10.3390/app13127263>.
- [5] KYSLAN, Karol - SMOLEŇ, Pavol - ŠLAPÁK, Viktor - ĎUROVSKÝ, František: **A nonlinear controller for point-to-point position control.** 2023. In: Energies. Basel (Switzerland): Multidisciplinary Digital Publishing Institute Vol. 16, Issue 17 (2023), p. [1-16] [online]. ISSN 1996-1073 (online). Access: <https://doi.org/10.3390/en16176339>.

Foreign Journals

- [1] KAŇUCH, Ján - GIROVSKÝ, Peter: **Three-stator disk synchronous motor with permanent magnets.** 2023. In: Maszyny Elektryczne: Zeszyty Problemowe. Katowice (Poland): Łukasiewicz - Instytut Przemysłu Organicznego. Vol. 1, Issue 128 (2023), p. 27-33 [print]. ISSN 0239-3646.
- [2] ŠLAPÁK, Viktor - ĎUROVSKÝ, František - IVAN, Jozef - HRIC, Matúš: **Emulation of mechanical loads in electric drives – an overview of methods.** 2023. In: Power Electronics and Drives. Warsaw (Poland): SCIENDO Vol. 8, Issue 1 (2023), p. 53-64. ISSN 2543-4292 (online). Access: <http://dx.doi.org/10.2478/pead-2023-0004>.
- [3] PERDUKOVÁ, Daniela - FEDOR, Pavol - FEDOR, Marek: **A New High-Quality Dynamic Identification Structure for IM Parameters.** 2023. In: Mathematical modeling. International scientific journal. Sofia (Bulgaria): Scientific-technical union of mechanical engineering industry 4.0. Vol. 7, Issue 1 (2023), p. 23-26

[print, online]. ISSN 2535-0986. Access:
<https://stumejournals.com/journals/mm/2023/1/pdf>.

Journals indexed in Web of Science or Scopus databases

- [1] PERDUKOVÁ, Daniela - FEDOR, Pavol: **Multi-motor drive non-parametric black-box fuzzy model**. 2023. In: MM Science Journal. Praha (Czech Republic): MM Publishing Vol June 2023, p. 6446-6452 [print, online]. ISSN 1803-1269. Access: http://dx.doi.org/10.17973/mmsj.2023_06_2023009.
- [2] KAŇUCH, Ján - GIROVSKÝ, Peter - ŽILKOVÁ, Jaroslava - PÁSTOR, Marek: **Design and measurement of a frequency converter with spwm modulation of output voltage for a two-phase induction motor**. 2023. In: Elektronika ir Elektrotechnika = Electronics and Electrical Engineering: Electrical Engineering: Elektros Inžinerija: Research Journal. Kaunas (Lithuania): Kauno Technologijos Universitetas. Vol. 29, Issue 3 (2023), p.11-18 [print]. ISSN 1392-1215: Access: <https://doi.org/10.5755/j02.eie.33865>.

National Journals

- [1] PETRO, Viktor - KYSLAN, Karol: **Bezsnímačové riadenie synchronného motora s permanentnými magnetmi pre nízke rýchlosti**. 2023. In: QuoVadis Research @ FEI. Košice (Slovakia): Technická univerzita v Košiciach, Vol. 6, Issue 2 (2023), p. 80-86 [print, online]. ISSN 2585-9587. Access: <http://quovadis.fei.tuke.sk/quovadis-v6-n2.pdf>.
- [2] ALEXOVIČ, Stanislav - LACKO, Milan - BAČÍK, Ján ml.: **3D Mapping with a Drone Equipped with a Depth Camera in Indoor Environment**. 2023. In: Acta Electrotechnica et Informatica. Košice (Slovakia): Fakulta elektrotechniky a informatiky. Vol. 23, Issue 1 (2023), p. 18-24 [print, online]. ISSN 1335-8243. Access: <https://sciendo.com/article/10.2478/aei-2023-0003>.
- [3] ALEXOVIČ, Stanislav - LACKO, Milan: **3D mapovanie dronom vybaveným hĺbkovou kamerou v prostredí bez prístupu GPS navigácie**. 2023. In: QuoVadis Research @ FEI. Košice (Slovakia): Technická univerzita v Košiciach, Vol. 6, Issue 1 (2023), p. 4-11 [print, online]. ISSN 2585-9587. Access: <http://quovadis.fei.tuke.sk/quovadis-v6-n1.pdf>.
- [4] PERDUKOVÁ, Daniela - FEDOR, Pavol - FEDOR, Marek: **Hydraulic Turbine Modelling Including a Fuzzy Model of Efficiency**. 2023. In: Acta Electrotechnica et Informatica. Košice (Slovakia): Fakulta elektrotechniky a informatiky, Vol. 23, Issue 1 (2023), p. 25-31 [print, online]. ISSN 1335-8243.

Patents and Utility Models

- [1] FEDOR, Pavol - PERDUKOVÁ, Daniela - BOBER, Peter: **Zapojenie obvodu identifikácie rotorového toku a momentu asynchronného stroja**. Patent No. 289110. - Banská Bystrica: ÚPV SR - 2023. 6 s. Spôsob prístupu: <https://wbr.indprop.gov.sk/WebRegistre/Patent/Detail/50044-2019?csrt=4640889482284414069>.

9.4. Other publications (papers in conference proceedings, etc.)

Publication Type	Confereces		Other
	Foreign	Home	
Number	0	26	-