



University of Pannonia

University Center for
Circular Economy Nagykanizsa

R+D competencies



RESEARCH AND DEVELOPMENT AT THE UNIVERSITY OF PANNONIA NAGYKANIZSA – UNIVERSITY CENTER FOR CIRCULAR ECONOMY

DEAR VISITOR!

Since its establishment, the University of Pannonia – University Center for Circular Economy has been committed to playing a key economic development role in the region. This mission is supported by strong industry partnerships, research activities commissioned by external partners, and industrial collaborations, as well as extensive experience in national and international projects. As a result, the Center is able to effectively support regional organizations in addressing today's challenges across a wide range of their activities.

The University Center boasts four academic and research and development units, whose staff possess broad scientific expertise and practical experience in the field of the circular economy and its implementation. The key areas of expertise include:

- applied informatics
- renewable energy
- water technology
- circular economy

The University Center warmly welcomes all inquiries and collaboration proposals from interested organizations and potential partners. Our researchers and units are open, experienced, and ready to contribute their expertise to new professional challenges and joint projects.

Contact

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CONTENTS

Institute of Applied Management Sciences.....	1
Department of Applied Information Technology	7
Soós Ernő Research and Development Center - Water Technology Research Group.....	11
Soós Ernő Research and Development Center - Renewable Energy Research Group	15



INSTITUTE OF APPLIED MANAGEMENT SCIENCES

The Institute of Applied Management Sciences at the University of Pannonia Nagykanizsa – University Center for Circular Economy is a practice-oriented unit addressing key economic and social challenges through innovation and sustainability. Its activities align with the University's strategic goals while responding to the needs of the economic environment. The Institute integrates interdisciplinary expertise to deliver real-world, applicable solutions in education and research.

We offer the following services to our partners:

- Circular economy and sustainability-oriented research and education,
- Practice-based teaching in tourism, trade, and marketing,
- Analysis of consumer behavior and market trends,
- Local and regional economic development and ecosystem analysis,
- Business and institutional circular operation models,
- Interdisciplinary approach combining management, marketing, tourism, and social sciences,
- Development of innovative solutions to complex economic and social challenges,
- Strengthening competitiveness through applied research and knowledge transfer.

Nikoletta Kaszás, PhD

Institute of Applied
Management Sciences -
Head of Institute
Associate professor



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Research areas:

Her primary area of research is the sustainability of tourism, with a particular focus on digitalization and the tools of the circular economy within the industry. In addition, his research topics include project management, with a focus on grant-funded projects and sustainable project management.

- Sustainable and Circular Tourism
- (Sustainable) Project Management
- Various Aspects of Digital Transformation in Tourism

Prof. Zoltán Birkner, PhD

University Foundation
Chair of the Board of Trustees,
Professor



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Research areas:

His main research area is the examination and development of innovation capability of companies. He has many decades of experience in the examination of regional cooperations, innovation, and relational and sustainability potentials. He has been the president of the Circular Economy Technological Platform since 2022 and he is the Vice President of the Hungarian Association for Innovation.

- Innovation
- R&D projects
- Management



Kornél Németh, PhD

Associate professor

nemeth.kornel@pen.uni-pannon.hu

Research areas:

His research interests are circular economy, renewable energy sources, complex analysis of the economic, environmental, social, technical and logistical conditions for renewable energy use, and eco-innovation.

- Circular economy
- Renewable energy sources
- Rural development
- Environmental sustainability
- Eco-innovations



Erzsébet Péter, PhD

Associate professor

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Research areas:

She is an active member of several professional organizations and academic committees, and serves as the chair of the MTA–VEAB Working Committee on Communication. Her career has been dedicated to advancing vocational training and higher education in economics. Her main research interests include commercial enterprises, management, and related educational and research activities. She also conducts research on the circular economy, consumer and corporate behavior, tourism, and the complex analysis of corporate operations. As a university professor, she considers it essential to involve young people in academic life and supports emerging scholars by supervising doctoral research.

- Business analysis
- Tourism
- Consumer and corporate behaviour

Ildikó Ernszt, PhD

Associate professor



ernszt.ildiko@pen.uni-pannon.hu

Research areas:

Her primary research areas include tourism safety and security, various aspects of sustainability, and certain legal aspects of tourism.

- Tourism and Law
- Sustainability
- Safety and Security

Zsuzsanna Marton, PhD

Assistant professor



marton.zsuzsanna@pen.uni-pannon.hu

Research areas:

Her primary research focuses on examining the intersections between tourism and security, as well as analyzing tourism areas from a sustainability perspective (e.g., visitor management).

- Introduction to Sustainable Tourism and Nature-Based Attractions
- Tourism and Safety Issues
- Tourism Marketing
- Sustainability in Marketing



Péter Balogh

Assistant research fellow

balogh.peter@pen.uni-pannon.hu

Research areas:

The main focus of his research area is industrial symbiosis, where enterprises cooperate in order to get economic and environmental benefits at the same time. He currently focuses on the levels of possible cooperation (such as eco- industrial parks, urban-industrial symbiosis, regional cooperation) and on the possible methods of initiation (such as bottom-up, top-down).

- Microeconomics and Macroeconomics
- Introduction to Economics
- International Economics
- Circular Economy
- Project Management



Nóra Mezőfi

Assistant research fellow

mezofi.nora@pen.uni-pannon.hu

Research areas:

Her main area of research is the circular economy, specifically practice-oriented research into the implementation of this paradigm shift at the corporate level.

- Industrial Economics
- Marketing
- Circular Economy
- Circular Management
- Sustainable Business Models
- Business Model Innovation

Bálint Jakab

Assistant research fellow



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Research areas:

His primary area of research is hotel management, with a particular focus on the operation and development of hotel rating systems and excellence models. In addition, his current research topics include tourism, sustainability, the circular economy, and marketing.

- Hotel Operations,
- Hotel Management,
- Tourism Geography of Hungary,
- Introduction to Marketing,
- Consumer Behavior

A background image showing a group of students in a computer lab. A male student in the foreground is looking at a laptop screen, while a female student behind him is also looking at a screen. Other students are visible in the background, some wearing headphones. The image is overlaid with a blue gradient and a white diagonal line on the left side.

DEPARTMENT OF APPLIED INFORMATION TECHNOLOGY

The Department of Applied Information Technology, located at the University Center, maintains close professional ties with the Faculty of Engineering and Computer Science at the parent institution in the areas of education, research, and grant applications.

The department's research focuses on IT challenges related to Industry 4.0, with a particular emphasis on industrial automation and the development of IT systems that support manufacturing. The continuously expanding laboratory provides opportunities for modeling and testing industrial processes. Processing the large amounts of data generated in modern industrial environments opens up new opportunities for increasing system efficiency and introducing intelligent automation solutions. Problems that are not exclusively IT-related are solved in collaboration with industrial partners.

In addition, the department has extensive experience in the development and integration of complex, web-based, and application-based software systems.

We offer the following services to our partners:

- Application development,
- Software system development,
- Web-based system development,
- Design and development of sensor networks,
- Big Data, data mining,
- Production planning,
- Optimization,
- Determination of automation levels,
- Development of potential IT/automation development strategies,
- Manufacturing/process analysis,
- Development/implementation of custom IT solutions,
- IT consulting, feasibility studies.



Szilárd Jaskó, PhD

Department of Applied
Information Technology -
Head of Department,
Associate professor

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Research areas:

His research interests include the sensor -, data collecting networks, adaptive intelligent systems and the industry 4.0, 5.0 are. His current research is in the area of the Human Digital Twins, Operator 4.0 and the water 4.0.

- Sensor -, data collecting networks
- Industry 4.0/5.0
- Operator 4.0
- Water 4.0



Tibor Holczinger, PhD

University Center for Circular Economy -
Deputy Director-General for Education,
Associate professor

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Research areas:

His research interests include the scheduling of production systems focusing on S-graph framework and the modeling of manufacturing systems in Industry 4.0. His current research is in the area of scheduling systems with uncertainty.

- Operation research
- Scheduling of industrial processes
- Industry 4.0

Krisztián Attila Bakon

Assistant lecturer



bakon.krisztian@pen.uni-pannon.hu

Research areas:

The focus of his research area is the scheduling of production systems, solving uncertainty scheduling problems with the S-graph framework. Application of maturity model in industrial and tourism areas.

- Scheduling
- Procedural problem resolution
- Software system development
- Management ICT
- Tourism 4.0

Tamás Schné, PhD

Assistant professor



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Research areas:

His research interests include control systems and adaptive intelligent systems. His current research is focused on the Water 4.0 field.

- Programming
- Control Systems
- Artificial Intelligence



Norbert Kiglics

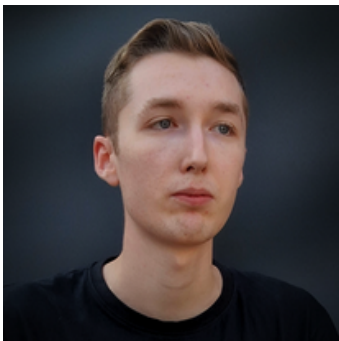
Software developer

kiglics.norbert@pen.uni-pannon.hu

Research areas:

His research focuses on modern, end-to-end web development and design. He is interested in modern manufacturing techniques, such as laser cutting and 3D printing.

- Full-stack web development and design
- Software development



Valentin Gergő Rajcsányi

Software developer

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Research areas:

His research focuses on the study of advanced web development and design methods, and he is also interested in the development of mobile applications based on the iOS operating system.

- Web Development and Design
- Software Development



SOÓS ERNŐ RESEARCH AND DEVELOPMENT CENTER - WATER TECHNOLOGY RESEARCH GROUP

As the water technology research center of the University of Pannonia in Nagykanizsa, we conduct R&D&I activities in the field of water treatment and purification, drawing on the city's decades-long tradition in water treatment and purification as well as the University's scientific expertise.

Drawing on our research experience, we assist in the implementation of international environmental monitoring programs and in solving specific industrial challenges. As part of our work, we develop technical and economic assessments to inform decision-making, as well as concrete recommendations for improvement. We accompany developments from the laboratory scale through the pilot phase to industrial implementation, thereby facilitating rapid deployment and enabling cost-effective, circular operations. Our mission is to build and operate a leading knowledge base in water technology at both the domestic and international levels.

We offer the following services to our partners:

- Water chemistry studies examining the environmental occurrence of organic micropollutants (e.g., pharmaceutical residues) and microplastics, as well as water treatment and purification technologies aimed at their removal,
- Review of water treatment systems and recommendations for the implementation of circular solutions (water recirculation, MLD/ZLD), preparation of a development roadmap, OPEX/CAPEX and SWOT-based decision support,
- Laboratory experiments to solve direct industrial problems: testing innovative membranes and membrane technology-engineering solutions in the field of membrane technology; optimization of process parameters, testing of adsorbents to support industrial decision-making,
- Pilot-scale experiments: design and implementation in R&D projects, with field validation,
- Process design and full-scale sizing, material and energy flows, development of PFDs and P&IDs.

Gábor Maász, PhD

Water Technology Research Group -
Head of Research Center,
Research fellow



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Research areas:

The primary focus of the research is the detection and quantification (using instrumental analytical methods) of organic pollutants found in small quantities in our natural waters (e.g., pharmaceutical residues, pesticides, etc.), as well as the investigation and application of water treatment and purification technologies aimed at their removal.

Since 2020, she has been conducting research in the field of sustainable pharmacy and the environmental aspects of safe drug use. She participates in international environmental monitoring programs (Watch Lists WL4, WL5; Joint Danube Survey JDS5) and provides analytical support for the development of remediation and purification technologies.

Ildikó Galambos, PhD

University Center for Circular Economy -
Deputy Director-General for
External Relations,
Associate professor



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Research areas:

She gained experience in the purification of surface and subsurface waters using various membrane filtration and membrane material transfer operations, both in laboratory, pilot and industrial scale. She paid particular attention to the removal of arsenic and humic acid, as well as the investigation of the effects of oxidizing agents. Other research area is the removal of organic microcontaminants and microplastic from different water bodies. She also dealt with the further treatment and reuse possibilities of industrial wastewater.

- Water treatment: membrane filtration and membrane material transfer operations.
- Application of membrane technology.
- Life cycle analysis.



Prof. Etelka Tombácz, PhD

Scientific advisor

tombacz.etelka@pen.uni-pannon.hu

Research areas:

She is a well-known colloid chemist researching aqueous interfacial equilibria, adsorption, pH and ionic strength dependent surface charging of polyelectrolytes, clay mineral and metal oxide particles, and the colloidal stability of composite systems. Recently, she focuses on the synthesis of magnetic nanoparticles, magnetic fluids and nanocomposites, as well as their environmentally relevant applications, such as magnetic adsorbents for the separation of micropollutants.

- Water treatment: adsorption and dispersion stabilization/destabilization.
- Magnetic nanoparticles, magnetic separation.
- Colloid chemistry.
- Environmental colloids, Interfacial equilibria and colloidal stability in aqueous media,
- Rheology



Renáta Gerencsér-Berta, PhD

University of Pannonia -
Vice Rector for Development,
Associate professor

berta.renata@pen.uni-pannon.hu

Research areas:

The main research area includes the qualitative and quantitative determination of micropollutants, the detection of various pharmaceutical preparations and chemical residues in water, the detection and knowledge of microplastic contamination, and the field of GMP document management.

- High performance liquid chromatography (HPLC) Elevated temperature
- liquid chromatography (HT-HPLC) High performance liquid
- chromatography mass spectrometry (HPLC-MS, UPLC-MS / MS)
- Classical analytical methods Non - destructive sample preparation
- procedures for liquid chromatographic studies.

Péter Kesserű, PhD

Research fellow

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Research areas:

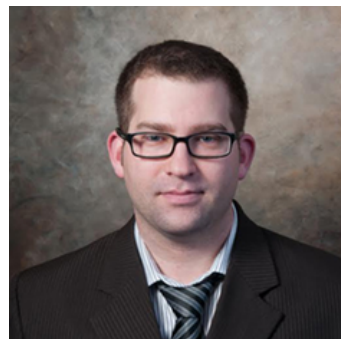
His main research is development of microbiologically supported technologies for industrial processes and for remediation of contaminated soils and water bodies. He also investigates complex biotic-nonbiotic reductive systems for elimination of hazardous inorganic and organic substrates.

- Biodegradation of pesticide residues
- Reductive microbiology
- Production and degradation of biopolymers and biofilms
- Functional microbiome assessment
- Lecture: Management and potential decomposition of biowaste, biogas, and compost production

Tamás Kucserka, PhD

Research fellow

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Research areas:

He investigated the water quality of Mura River as a drinking water base (delimitation of the most important pollution sources, environmental state review, sampling plan, examination of 46 types of components, online interactive database, final report). He also participated in the development, examination, and simulation of circular model-based water treatment procedures in relation to research on adsorption technologies as well as in the examination of exhausted oil- containing wastewater, designing and executing preliminary experiments for the application of high-efficiency oxidation procedures for the purpose of oxidative experimental testing.

- Water management, wastewater treatment
- Water treatment, Water and wastewater processing laboratory practices
- Treatment of the baths and thermal waters
- Fundamental of Limnology
- Hydrobiology and Limnoecology



Borbála Oláhné Horváth, PhD

Research fellow

horvath.borbala@pen.uni-pannon.hu

Research areas:

She studied the spread, current status, and decline of COVID-19 by analyzing various wastewater samples, and participated in a project that developed an early warning and notification system to detect the spread of gastrointestinal viruses using wastewater-based epidemiology.

- Biotechnology
- Food biotechnology
- Fermentation



Zita Zrinyi Maászné, PhD

Research fellow

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Research areas:

Her work focuses on the detection and quantification of organic micropollutants and microplastics in surface and groundwater, as well as data collection and monitoring of legal regulations pertaining to micropollutants. In addition, she is actively involved in research management: she writes and coordinates international research grants and builds and maintains international scientific collaborations. In her teaching activities, she instructs BSc and MSc students in both Hungarian and English, primarily in the areas of Water Chemistry and Assessment of the Aquatic Environment.

Áron Bóna, PhD

Research fellow

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Research areas:

His primary research area is membrane technology and related processes (adsorption, ion exchange, AOP). He specializes in the development, investigation, and application of polyelectrolyte multilayer (PEM-NF) membranes—developing solutions that start in the laboratory and are prepared for industrial implementation.

- Engineering consulting reports on membrane technology processes and water treatment systems (OPEX/CAPEX, risk assessment).
- Design and evaluation of membrane technology (RO, NF, UF) laboratory and pilot experiments:
- Removal of micropollutants from drinking water and in tertiary wastewater treatment.
- Treatment of water produced in the oil industry.
- Reuse of industrial wastewater—integration of complex, multi-stage processes.
- Development and implementation of innovative membrane technology and engineering solutions.
- Development and design of experimental equipment (laboratory and pilot) (e.g., membrane testers) (sizing, component specifications, P&ID).
- In-depth applied research on PEM-NF membranes—ion exchange, adsorption, chemical stability limits; precise measurement methods for salt retention.

SOÓS ERNŐ RESEARCH AND DEVELOPMENT CENTER - RENEWABLE ENERGY RESEARCH GROUP

The primary research focus of the Renewable Energy Sources Research Group is the application and system integration of renewable energy sources, as well as relevant aspects of energy storage. The group maintains extensive domestic and international industry ties and fosters strong relationships with major Hungarian companies in the electrical industry.

The research activities of the group's members focus on renewable energy sources, particularly photovoltaic technologies and related energy storage issues. In addition, they model the sustainability of power systems, conduct system control simulations, and analyze energy storage and grid development options. Their further research examines the economic, social, and infrastructural factors influencing the deployment of renewable technologies using statistical methods.

We offer the following services to our partners:

- Comprehensive design of systems utilizing renewable energy and/or energy storage,
- Modeling related to energy storage,
- Site assessment for the installation of solar power plants,
- Assessment of the condition of solar panel modules,
- Evaluation of application possibilities for renewable energy sources and selection of appropriate technology,
- Sizing and optimization of energy system installations, consulting,
- Economic calculations, OPEX/CAPEX calculations,
- Environmental economic analyses,
- Environmental awareness, monitoring of CO2 savings,
- Comparison of different technologies, preparation of complex case studies, SWOT analysis for situation assessment.



Nóra Hegedűsné Baranyai, PhD, habil.

Renewable Energy Research Group -
Head of Research Group,
University Center for Circular Economy
Director general,
Associate professor

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Research areas:

Her research focuses primarily on the analysis of social and economic processes, with a particular emphasis on renewable energy sources, energy storage, and energy systems. Other key areas of interest include tourism, economic time series analysis, regional development, and sustainable agriculture.

Together with his colleagues, he has been involved in the development of numerous patents related to photovoltaic (PV) technologies.

- Renewable energy (photovoltaic [PV] energy, etc.)
- Renewable energy systems
- Statistics and regional analysis



András Vincze, PhD

Research fellow

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Research areas:

His main areas of research include the application of renewable energy sources, current issues in renewable energy systems and energy storage, and the relationship between tourism and communication.

Together with his colleagues, he has been involved in the development of numerous patents related to photovoltaic (PV) technologies

- Renewable energy (solar energy, including photovoltaic [PV] energy, etc.)
- Policies and strategies related to renewable energy
- Social and economic implications of the widespread adoption of renewable energy sources
- Communication, international communication (business communication, policy communication, international tourism, etc.)

Henrik Zsiborács, PhD, habil.

Research fellow



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Research areas:

His professional interests focus on the technical and economic modeling of photovoltaic (PV) technology and energy storage solutions, fields in which he and his colleagues have been credited with numerous patents and prototypes. His other major research areas include forecasting photovoltaic power generation, energy strategy and policy, smart grids, and energy storage technologies.

- The use of renewable energy sources and the modeling of renewable energy systems
- The integration of renewable energy sources into power systems (scheduling, system control)
- Issues related to energy storage (battery storage, thermal energy storage, hydrogen, etc.)

Martin Bertók

Assistant research fellow



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Research areas:

His main areas of research include photovoltaic (PV) technologies and their integration into energy systems. He focuses particularly on the development of agrophotovoltaic (APV) systems and their integration into horticultural and agricultural crops, as well as on investigating their potential for off-grid applications. Through his work, he supports his colleagues by assisting with research processes and data processing. He also provides IT support in various research areas at both the software and hardware levels.

His research focuses primarily on the following areas:

- Modeling of renewable energy systems
- Possibilities for stand-alone implementation of renewable energy systems
- Investigation of implementation possibilities for agrophotovoltaic (APV) systems



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