



DEEP TECH 2M

# BOOK OF ABSTRACTS

## DEEP TECH OPEN SCIENCE DAY 2024

1ST DEEP TECH OPEN SCIENCE DAY CONFERENCE  
APRIL 5, 2024, KRAGUJEVAC, SERBIA



European Institute of  
Innovation & Technology



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**Editors:** Fatima Živić, Ana Kaplarević-Mališić,

Nenad Grujović, Boban Stojanović

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ISBN 978-86-6335-113-4

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**Publisher:** Faculty of Engineering, University of Kragujevac  
Sestre Janjić 6, 34000 Kragujevac, Serbia

**For the Publisher:** Slobodan Savić  
Faculty of Engineering, University of Kragujevac

**Technical editors:** Strahinja Milenković, Faculty of Engineering, University of Kragujevac  
Milica Kostić, Faculty of Engineering, University of Kragujevac

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The publication of this Book of Abstracts was funded through the EIT's HEI Initiative DEEPTECH-2M project, <http://deeptech2m.eu/> "Deep Tech Materials and Manufacturing Talent Development for an Improved EU Economy and Climate", supported by EIT Digital and coordinated by EIT RawMaterials, funded by the European Union.

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## Preface

FIRST DEEP TECH OPEN SCIENCE DAY CONFERENCE 2024 has been designed as the Science Fair - forum and exhibition of research results in all areas of science and innovation. Deep Tech brings together different fields of science that provoke major changes in the world today, such as:

- Advanced Materials and Manufacturing
- Aerospace
- Artificial Intelligence and Machine Learning
- Biotechnology
- Blockchain
- Web 3.0
- Electronics
- Photonics
- Quantum Computing
- Robotics
- Semiconductors (Microchips)
- Sustainable Green Energy and Clean Technologies

The conference presented an opportunity to gather young researchers and renowned scientists. The conference aimed to bring together young and senior researchers for networking, brainstorming, and promotion of science to scholars, students, prospective PhDs and young people and offers students the opportunity to experience the practices of science and engineering.

Deep Tech Open Science Day Conference 2024, in the form of the exhibition fair, was held on April 5, at Faculty of Engineering, University of Kragujevac. The Conference was opened by the vice-rector of University of Kragujevac, Vladimir Rankovic, dean of the Faculty of Engineering, Prof. Dr. Slobodan Savić, dean of the Faculty of Science, Prof. Dr. Marija Stanić, the State Secretary, Ministry of Science, Technological Development and Innovation, Prof. Dr. Miroslav Trajanović, CEO of MIND – Milanović Industries Group, Darko Djorić, the coordinator of the Innovation Incubator of University of Kragujevac, Nemanja Jovičić and Conference General Chair, Prof. Dr. Fatima Živić, Faculty of Engineering, University of Kragujevac.

Conference Organizing Committee, Prof. Dr. Fatima Živić and Prof. Dr. Nenad Grujović, from Faculty of Engineering, Prof. Dr. Boban Stojanović and Prof. Dr. Ana Kaplarević-Mališić, from Faculty of Science, University of Kragujevac, delivered the talks related to the Conference background:

- What is Deep Tech?
- Additive Technologies and Innovations
- Spinoff companies – the path from the research to market
- Why do we need market validation of research thesis?

Panel discussion "STARTUPS: yes or no?" was held with panelists: Dr. Vesna Rašković Depalov, EEN Serbia – BINS, Novi Sad, Dr. Nevena Mihailović, founder of HerbaLab cosmetics, research associate at the Institute of Chemistry, Faculty of Science, University of Kragujevac and Nemanja Jovičić, coordinator of the Innovation Incubator of the University of Kragujevac who discussed the Research commercialization, Intellectual property

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rights in multidisciplinary teams, Experiences of startup founders – what is the most challenging?, and How can the Innovation Incubator of the University of Kragujevac help in founding the startup.

More than 90 research groups presented their works as physical exhibits, posters and virtual presentations, including two high school student teams and several student teams, as well as more than ten companies that have joint research with University of Kragujevac. Different state-of-the-art scientific areas were presented. Conference had more than 500 visitors, including researchers, university students and PhDs, and high school students from three secondary schools, who have discussed scientific topics with researchers and made contacts for further collaborations.

Deep Tech Open Science Day Conference 2024 was jointly organized by the Faculty of Engineering and Faculty of Science, University of Kragujevac, as the first scientific Conference of such concept in Serbia, with scientific articles presented through exhibits, sample model, real systems and machine elements, virtual show and simulations, providing hands-on experience on science for young and prospective researchers. The objective of the Conference and training event was to promote and educate on Deep Tech and science to the HEI academics and non-academics, researchers, and young people, as well as to the companies and general public and to enable networking between the HEI innovation ecosystem stakeholders. Most participants were from the Faculty of Engineering and Faculty of Science, but there were also participants from the Faculty of Philology and Art, Faculty of Economics, Faculty of Medical Sciences, and Institute for Information Technologies from University of Kragujevac, as well as from companies that have joint research with University of Kragujevac, Serbia.

The Conference was very successful with participation of the large number of young people – young researchers and prospective researchers and PhD students. The Conference model of scientific research fair showed that such a new concept of scientific work presentation is very well accepted by the young people who actively participated during the whole time of the Conference. Special contribution to the Conference was participation of the “Lego musketeers” team of the high school students who won the 1<sup>st</sup> Prize at national championship, the 1<sup>st</sup> Prize in finals of the Lego league in Slovenia and won Engineering Excellence award 1<sup>st</sup> place at FLL Florida Sunshine Invitational world event on June 19 – 22, 2024 – First Lego League Florida Sunshine Invitational, USA.

Images from the Deep Tech Open Science Day Conference 2024 are given at  
<http://deeptech2m.eu/index.php/2023/12/25/prvi-deeptech-otvoreni-dan-nauke/>

Kragujevac, 2024

Conference Chair  
Prof. dr Fatima Živić

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# PLENARY TALKS

## What is Deep Tech?

*dr Fatima Živić, Faculty of Engineering, University of Kragujevac, Serbia*

## Additive Technologies and Innovations

*dr Nenad Grujović, Faculty of Engineering, University of Kragujevac, Serbia*

## Spinoff companies - The path from research to market

*dr Boban Stojanović, Faculty of Science, University of Kragujevac, Serbia*

## Why do we need market validation of the research thesis?

*dr Ana Kaplarević-Mališić, Faculty of Science, University of Kragujevac, Serbia*

## DeepTech vs ShallowTech

*Terence Bowden, Dermot Brabazon, Dublin City University, Dublin, Ireland*

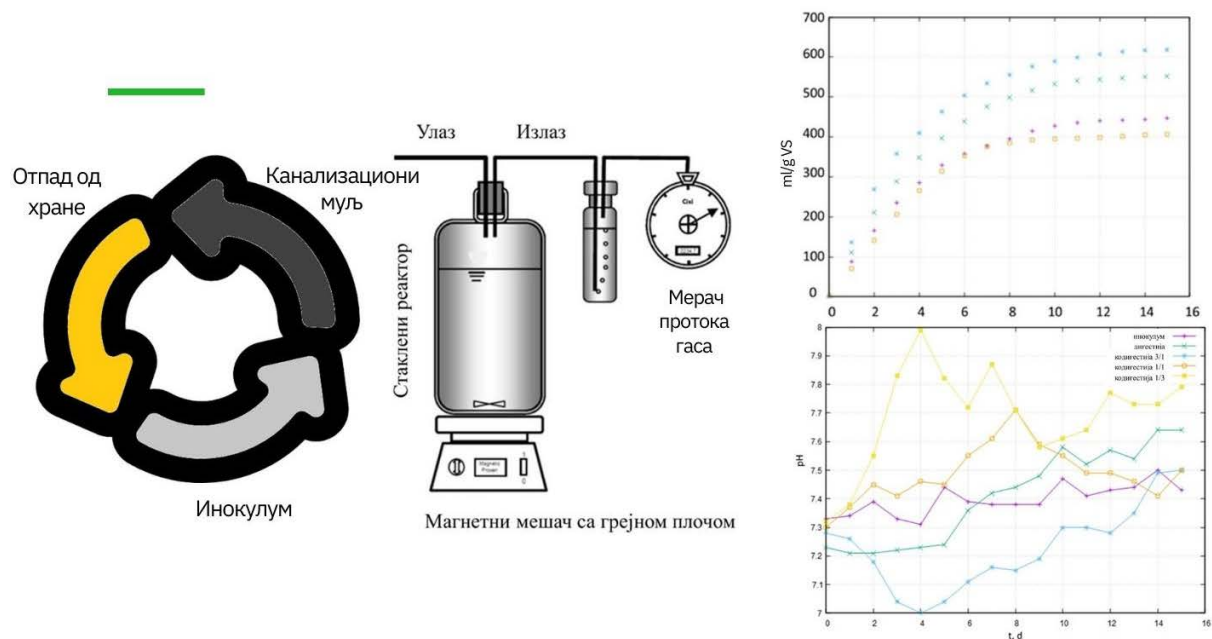
# Increasing Biogas Yield by Optimizing the Co-Digestion Process

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## Graphical abstract



## Abstract

The implementation of co-digestion in wastewater treatment plant would reduce the production of waste and would increase the yield of biogas. This research determined the increase in biogas yield and the synergistic effects of co-digestion were evaluated through batch tests and chemical oxygen demand balance of each co-/substrate in the feedstock. Anaerobic mono-digestion of primary sludge and co-digestions of primary sludge and food waste were performed in three volume basis ratios (3/1, 1/1, 1/3) with small inclusions of FW: 3.375%, 4.675% and 5.35%, respectively. The maximal performance was demonstrated by the mixing ratio of 1/3, which produced the most biogas (618.7 ml/g VS added) and had the highest organic reduction with COD elimination of 52.8%.

The practical application of the research is reflected in the supplementation of sewage sludge digester with food waste, which improves the yield of biogas and achieves a synergistic reaction of the process. In this way,

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co-digestion operations are made economically profitable and practical, while at the same time more stable operation can be ensured throughout the year. Also, the test results, if properly conducted and of good quality, can be used to obtain additional information about the studied substrate, such as hydrolysis rate and biomethane production potential.