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

Funded by the European Union

INNOVATION CAPCITY BUILDING FOR HIGHER EDUCATION
PART OF EIT HEI Initiative
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Editors: Fatima Živić, Ana Kaplarević-Mališić,

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ISBN 978-86-6335-113-4

Editors: Fatima Živić, Faculty of Engineering, University of Kragujevac
Ana Kaplarević-Mališić, Faculty of Science, University of Kragujevac
Nenad Grujović, Faculty of Engineering, University of Kragujevac
Boban Stojanović, Faculty of Science, University of Kragujevac

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

Printed by: Faculty of Engineering, University of Kragujevac
Sestre Janjic 6, 34000 Kragujevac, Serbia

Circulation: 100 copies (electronic publication on CDs) and online

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

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 1st Prize at national championship, the 1st Prize in finals of the Lego league in Slovenia and won Engineering Excellence award 1st 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
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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Virtual Laboratory Exercises Which Utilize Audio Signals to Enhance Understanding of Electronics Fundamentals

Isidora Grujić, Marijana Gavrilović Božović*, Vladimir M. Milovanović
Faculty of Engineering, University of Kragujevac, Serbia
email: marijana.gavrilovic@ kg.ac.rs

Abstract

Introductory analog electronics courses are traditionally considered among the most challenging in higher education curricula. Students usually encounter several key new concepts and paradigms, including incremental analysis of nonlinear electrical circuits and devices, as well as frequency domain analysis, time- and frequency-domain duality, filters, and signal filtering in general. Laboratory exercises serve as an indispensable tool to practically reinforce these concepts and diminish abstract barriers faced by first-time learners. However, they are often limited due to resource constraints. To address this challenge, a virtual laboratory exercise has been developed. This exercise demonstrates field-effect transistor amplifier quiescent point biasing, superimposed with a small audio signal and accompanying distortion. This implementation aims to bridge the gap between theory and practice, thereby enhancing students' insight into analog electronics.

Implemented virtual laboratory exercises showcase (i) a common-source field-effect transistor (FET) amplifier with purely resistive load, and (ii) an RC-based first-order low-pass filter. These exercises enable the injection of not only generic audio signals like sine or square waves, but also samples from different music genres at the circuit input. Sound reproduction is supported for both the input and output signals. Amplitude and frequency of an input, as well as the resistor, capacitor, supply voltage, and simple switch unified MOSFET model values, are manually adjusted with the idea of observing the influence of gain, distortion and filtering. This facilitates a smoother transition between theoretical concepts, which often remain vague, and the actual, usually time-restrictive, laboratory demonstrations, thus boosting students' understanding.

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