57th INTERNATIONAL SCIENTIFIC CONFERENCE ON INFORMATION, COMMUNICATION AND ENERGY SYSTEMS AND TECHNOLOGIES

16 - 18 June 2022, Ohrid, North Macedonia
www.icestconf.org

Organized by

Faculty of Technical Sciences, Bitola, North Macedonia

Faculty of Electronic Engineering, Niš, Serbia

Faculty of Communications and Communication Technologies, Sofia, Bulgaria

Under auspices of
Macedonian Ministry of Education and Science

In cooperation with:
Faculty of Tourism and Organizational Sciences – Ohrid
ICEST 2022 conference is supported by

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КОМORA НА ОВЛАСТЕНИ АРХИТЕКТИ И ОВЛАСТЕНИ ИНЖЕНЕРИ

ИВИГLOBAL Int

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Cythero VR
Dear Colleagues,

On behalf of the Technical Program Committee it is my pleasure to invite you to attend the 57th International Scientific Conference on Information, Communication and Energy Systems and Technology ICEST 2022, which will be held from 16 to 18 June at the Faculty of Tourism and Organizational Sciences - Ohrid, North Macedonia.

The ICEST Conference gained its acronym as a successor of EIST Conference in 2002, when the Faculty of Electronics from Niš, Serbia, joined the Faculty of Communication and Communication Technologies from Sofia, Bulgaria and the Faculty of Technical Sciences from Bitola, North Macedonia, in organizing the series of Conferences.

As to the previous ICEST Conferences, we have papers and authors from institutions all over the world. This year we have 230 authors (and coauthors) from 16 countries with 92 scientific and application oriented papers for oral and poster presentations.

In spite of the tight Conference schedule I hope that there will be enough time for social activities which will enable further strengthening of the professional and personal relations among the ICEST participants for the benefit of the institutions and the countries they are coming from.

At last, in the name of the Conference Technical and Program Committee I want to express my gratitude to the authors and reviewers who have contributed to maintain the high standards for ICEST, and to all others who were involved in organization of the Conference.

I am sure that the beautiful and picturesque Ohrid will give you all, an inspiration for fruitful work and pleasant time during the ICEST Conference.

I am looking forward for seeing you in Ohrid.

Prof. D-r Mitko Kostov
Conference Chairman
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TECHNICAL PROGRAM COMMITTEE

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Kalin Dimitrov, Technical University of Sofia, Bulgaria

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Ismail Altas, Karadeniz Technical University, Turkey
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Peter Planinšič, University of Maribor, Slovenia
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Stanimir Valtchev, New University of Lisbon, Portugal
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Zdenka Babić, University of Banja Luka, Bosnia and Herzegovina
Zoran Jovanović, University of Niš, Serbia
Zoran Stanković, University of Niš, Serbia
ORGANIZING COMMITTEE

University St. Kliment Ohridski, Bitola, North Macedonia:

University of Niš, Serbia:

Technical University of Sofia, Bulgaria:

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UPDATED INFORMATION

Updated information can be obtained from the official
Conference web site: http://www.icestconf.org
ICENSE HISTORY

The ICEST Conference appears to succeed a series of conferences started from 1963 under the name “Day of the Radio”. In 1977 the name of the Conference was changed into “Communication, Electronic and Computer Systems”. Since 2000 it has become an international conference under the name EIST (Energy and Information Systems and Technologies). The first two EIST Conferences were successfully organized by the Faculty of Communications and Communication Technologies Sofia and the Faculty of Technical Sciences Bitola.

In 2002, for the first time, the Faculty of Electronic Engineering Niš has accompanied the Conference organizers. Also, the Conference changed its name becoming ICEST (International Scientific Conference on Information, Communication and Energy Systems and Technologies). Since then, on a rotational principle, the conference has been organized by the Faculty of Telecommunications, Technical University of Sofia, Bulgaria, the Faculty of Electronic Engineering, University of Niš, Serbia, and the Faculty of Technical Sciences, St. Kliment Ohridski University, Bitola, N. Macedonia. This year host of the conference is the Faculty of Technical Sciences Bitola.

VENUE

ICEST 2022 will be held from June 16 through June 18, Faculty of Tourism and Organizational Sciences - Ohrid, North Macedonia.

Ohrid is a city in the Republic of N. Macedonia with continuity and around two and a half millenniums old marks of existence. Within the very heart of the present city of Ohrid, the antique city of Lichnid lies, significant and rich, as is its successor. The metamorphoses of the antique Lichnid into medieval Ohrid lasted for several centuries (VI-IX), thus being created one of the most significant medieval cities on the Balkan.

Through the pages of the Ohrid saga we will find the memories of the birth of the Slavic literacy and culture in the works of St. Clement and St. Naum, students of Thessaloniki brothers Sts. Cyril and Metodij. St. Clement is worshiped as a patron of the city, and his three-decade work in the city (886-916) initiated the foundation of the Clement Slavic University. The Ohrid saga cherries the memories of the Samuel Empire, too, as its capitol at the beginning of the XI century. It nourishes the testimonies of the Ohrid Archibishopry - a significant church organization, which pedestal was shared by influential philosophers, writers and theologians. Its worthy successor is the present Macedonian Orthodox Church. The Ohrid saga was composed by the stormy pages of the past, and the testimonies for some of them have reached the present days; the Monastery of St. Clement - St. Pantalejmon, the Monastery of St. Naum, the cathedral church of St. Sophia, the church of St. Clement, the church of St. John the Baptist, as many other pieces of art: frescoes, icons, manuscripts, all of them woven in the City of UNESCO - Ohrid.
CLIMATE

MICRO CLIMATE (local climate): MODIFIED MEDITERRANEAN (maritime) - TEMPERATE CONTINENTAL (because of the high mountains - 2000m and altitude - 695m there is also mountain climate)
distance from Adriatic Sea..............110 km
annual average air temp ....................11 °C
winter average temp...................... 2.7 °C
summer average temp...................... 19.6 °C
absolute maximum....................... 35.5 °C in July
insolation (sunny hours)..................2300 h per year

REGISTRATION AND INFORMATION DESKS

The Registration Desk, Information Desk, as well as Secretariat Office, will be open during the following hours:

<table>
<thead>
<tr>
<th>Day</th>
<th>April 16</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday</td>
<td>March 16</td>
<td>09:00 – 18:00</td>
</tr>
<tr>
<td>Friday</td>
<td>March 17</td>
<td>09:00 – 15:00</td>
</tr>
</tbody>
</table>

LANGUAGE

Official language of the Conference will be English.

CONFERENCE FEE

The registration fee includes publication of one paper in the Conference proceedings, conference kit and conference dinner.

Authors: 200 euro or 12.300 MKD denars

Additional ticket for conference dinner: 35 euro or 2.000 MKD denars.

Company presentations: 350 EUR or 20.000 MKD denars

IMPORTANT: Paper that is not covered by registration fee will not be published in the Conference Proceedings.
SOCIAL PROGRAM

Thursday, June 16, 2022, 12.00
After Conference opening and plenary session, a Welcome cocktail will be offered to all Conference participants.

Thursday, June 16, 2022, 20.00
Conference Dinner - Restaurant Millennium

CONFERENCE TOPICS

[1] Radio Communications, Microwaves, Antennas
[5] Computer Systems and Internet Technologies
[6] Informatics and Computer Science
[7] Electronics
[8] Energy Systems and Efficiency
[9] Control Systems
[10] Measurement Science and Technology
[12] Engineering Education
[13] Other
OPENING SESSION

Chairman: Prof. Mitko Kostov
University St. Kliment Ohridski Bitola, North Macedonia

Prof. Nebojša Dončov, University of Niš, Serbia

Prof. Kalin Dimitrov, Technical University of Sofia, Bulgaria

Prof. Igor Nedelkovski
Vice-Rector of University St. Kliment Ohridski-Bitola, North Macedonia

PLENARY SESSION

Chairman

Prof. Mitko Kostov

PL.1 – Aspects of Time and Space in Wireless Connectivity Beyond 5G and 6G

PETAR POPOVSKI

Department of Electronic Systems, Aalborg University Denmark

COCTAIL
Thursday, June 16

16:00 – 19:00

Room A

Chairman: Biljana Stošić & Kamelia Nikolova

Radio Communications, Microwaves, Antennas & Telecommunication Systems and Technology

1. **MLP Neural Model of Dual-Band Slotted Square Patch Antenna with Variable Slot Geometry**
   Ksenija Pesic, Zoran Stankovic and Nebojsa Doncov

2. **Outage Probability of Mixed Satellite RF / Terrestrial FSO Cooperative System**
   Goran Djordjevic, Nenad Milosevic, Jarosław Makal and Dejan Milic

3. **High-Gain Crossed Slot Antenna Array Fed by CPW Rat-Race Coupler**
   Marija Milijic and Branka Jokanovic

4. **Investigation of the Influence of the Distance and the Angle of Observation in Radiometric Measurements in the Infrared Spectrum**
   Hristo Hristov, Kalin Dimitrov

5. **Optical Method for Collecting and Examining the Dynamic Range of Signals by Displacement of MMF**
   Tsvetan Valkovski, Kalin Dimitrov

6. **The Role of Edge Artificial Intelligence in 6G Networks**
   Stojan Kitanov, Vladimir Nikolikj

7. **Yagi Antenna with Minimal Side-Lobe Levels for Satellite Communications**
   Miroslav Bozhkov and Peter Petkov

8. **Influence of Cut-off Level and α-κ-μ Distribution Parameters on Outage Probability and Amount of Fading**
   Dejan Milic, Marko Smilic, Zorica Nikolić, Srđan Milosavljević and Ana Tošković

9. **Load Balancing Implementation in Software Defined Networks**
   Nikolay Prodanov, Kamelia Nikolova and Dimitar Atamian
Thursday, June 16

16:00 – 19:00
Room B

Chairman: Mehmet Akif Şahman & Nikola Rendevski

Computer Systems and Internet Technologies & Informatics and Computer Science

1. Design and Implementation of a Configurable Software Architecture for Peer Learning
   Milen Petrov

2. On the Requirements for Successful Business Continuity in the Context of Disaster Recovery
   Saso Nikolovski and Pece Mitrevski

3. PC VR vs Standalone VR Fully-Immersive Applications: History, Technical Aspects and Performance
   Nikola Rendevski, Diana Trajcevska, Mario Dimovski, Konstantin Veljanovski, Aleksandar Popov, Naile Emini and Dimitar Veljanovski

4. Differential Search Algorithm by XOR gate in Binary Optimization Problems
   Mehmet Akif Şahman and Ahmet Cevahir Cinar

5. Visualization of Music - MIDI Content
   Ivana Milošević, Živanka Miladinović Bogavac, Dušan Regodić and Borivoje Milošević

6. Developing A Pre-Assessment System for Consumer Loan Applications Via the Simplification of Logical Functions Method
   Fatih Basciftci and Erkan Yeşil

7. Performance Comparison of Machine Learning Algorithms in Movie Recommender Systems
   Nora Pireci Sejdiu, Blagoj Ristevski and Ilija Jolevski

8. Review on E-management Approach, Methods and Implementation Platforms
   Galia Marinova and Krisel Tola
Thursday, June 16
16.00 – 19:00
Room C

Chairman: Mare Srbinovska & Ismail Saritas

Electronics, Control Systems & Measurement Science and Technology

1. Design and Implementation of Pulse Oximeter Synchronized with Respirators
   Serafetdin Baloglu, Ismail Saritas and Adem Golcuk

2. Design of Fuzzy Logic Controller for a Risley Prism Imaging System
   Mahmut Sami Güç and Ali Yaşar

3. Location Impact on Particulate Matter (PM) Concentration Reduction During COVID-19 Pandemic
   Mare Srbinovska, Aleksandra Krkoleva Mateska, Maja Celeska Krstevska and Vesna Andova

4. Comparative Measurements of Sound Insulation of Materials Placed in Small Size Acoustic Chamber
   Svetlana Djambova, Natalia Ivanova and Snezhana Pleshkova-Bekiarska

Thursday, June 16
20.00 – 24:00
RESTAURANT
HOTEL
MILENIUM

CONFERENCE SOCIAL DINNER
Chairman: Metodija Atanasovski & Bogdan Hnatiuc

Energy Systems and Efficiency

1. A Study on Optimum Tilt Angle of PV Panels for Konya, Turkey
   Mehmet Cunkas and Mustafa Arslan

2. Power Quality Improvement in Grid Connected Solar Energy For Harmonic Analysis
   Anjali Patel and Ranjana Singh

3. Impact of PV Type Dispersed Generation on Harmonic Distortion in Distribution Networks
   Martina Korlevska, Metodija Atanasovski, Mitko Kostov and Ljupco Trpezanovski

4. Red Deer Algorithm Based Harmonic Mitigation for Asymmetric Cascaded Multilevel Inverters
   Yasin Bektaş and Hulusi Karaca

5. System for Automatic Control on Technological Processes by Asynchronous Electrical Drive
   Vasil Dimitrov and Emiliya Dimitrova

6. Implementation of Neural Networks and Feature Selection for Short Term Load Forecast
   Goran Veljanovski, Pande Popovski, Metodija Atanasovski and Mitko Kostov

7. Optimizing Short Term Load Forecast: A study on Machine Learning Model Accuracy and Predictor Selection
   Pande Popovski, Goran Veljanovski, Mitko Kostov and Metodija Atanasovski

8. Real Study Case of Loss Allocation in Distribution Systems with RES
   Metodija Atanasovski, Tomce Mijoski, Mitko Kostov and Blagoja Arapinoski

9. Models for Integration of Flexibility Sources in Regional Electricity Markets
   Petar Krstevski, Aleksandra Krkoleva Mateska and Stefan Borozan

10. Detection of Parallel Electric Arc Faults by AFDD
    Bogdan Hnatiuc, Mihaela Hnatiuc, Sorin Sintea and Gabriel Vavilov
Signal Processing & Digital Image Processing

1. **Sound Based DC Motor Classification by a Convolution Neural Network**
   Dejan Ćirić, Marko Janković and Miljan Miletić

2. **Performances of CNN Architectures on Diabetic Retinopathy Detection Using Transfer Learning**
   Esra Kaya and Ismail Saritas

3. **Some of the Factors that Affect the Performance of Newly Designed CIC Filter Functions**
   Biljana Stošić

4. **Analysis of Neural Network Accuracy Degradation due to Uniform Weight Quantization of One or More Layers**
   Jelena Nikolić, Stefan Tomić, Zoran Perić and Danijela Aleksić

5. **Application of Artificial Intelligence for Traffic Data Analysis, Simulations and Adaptation**
   Daniela Koltovska Nechoska, Renata Petrevska Nechoska and Renata Duma

6. **Unified graph-based method for instance separation from foreground-background segmentation**
   Milica Spasic, Igor Mihajlovic, Nikola Spasic and Dragan Jankovic

7. **Model of Improved Floating Point 32-bits Quantizer**
   Nikola Vucic, Zoran Peric and Aleksandra Jovanovic

8. **Filtering of X-Ray Images using Nonlinear Isotropic Diffusion**
   Ivo Draganov and Rumen Mironov

9. **The Effect of Different Consequent Setting on the Effectiveness of Kóczy-Hirota Fuzzy Rule Interpolation in Colonoscopy Image Classification**
   Szilvia Nagy, Raneem Ismail, Brigita Sziová and Hussein Taha

10. **Impact Crater Rim Extraction Algorithm Based on Principal Curvature Directions**
    Hristo Hristov and Nicole Christoff
Chairman: Goran Nikolić & Boro Sitnikovski

1. From Single CPU to Multicore Systems
   Tatjana Nikolic, Goran Nikolic, Bojan Dimitrijevic and Mile Stojcev

2. Integrating a Virtual Machine on a system-on-a-chip
   Boro Sitnikovski and Biljana Stojcevska

3. A Comparison of Computing Spectral Transforms of Logic Functions using Python Frameworks on GPU
   Miloš Radmanović

4. Efficiency of the Method of Separation of Variables for Analyzing the Influence of External Body of Isotropic and Bi-isotropic Material on Homogeneous Electric Field Generated Using Two Toroidal Electrodes
   Žaklina Mančić and Zlata Cvetković

5. Teacher’s Assistant Application
   Aleksandar Janjikj, Ana Madevska Bogdanova and Vladimir Trajkovik

6. COVID-19 Prevention Systems within Hardware and Software Design Computer Science Courses
   Nenad Petrović

7. A Survey of Three Types of Processing Units: CPU, GPU and TPU
   Goran Nikolic, Bojan Dimitrijevic, Tatjana Nikolic and Mile Stojcev

8. Wiener Filter based Predictive Control of Wind Turbine
   Teofana Puleva, Ognyana Ognyanova and Elena Haralanova

9. Application of fleet management in intelligent transport systems
   Predrag Brlek, Ivan Cvitkovic, Nikola Kolarevic, Katarina Stojanovic and Zlatko Sovreski

9. Education for Resource Efficiency in Manufacturing Industries
   EREMI
   Georgi Georgiev, Tanya Titova, Rosen Kosturkov, Axel Sikora, Gordana Janevska, Mitko Kostov, Simona Halunga and Octavian Fratu
Poster 1 - Radio Communications, Microwaves, Antennas & Telecommunications Systems and Technology

   Hitesh Singh, Vivek Kumar, Kumud Saxena, Boncho Bonev, Ramjee Prasad and Vinod Kapse

2. ANN Model for DoA Estimation of the Signal Received by Crumpled Textile Wearable Antenna Array
   Zoran Stanković, Olivera Pronic Rancic and Nebojsa Doncov

3. Linearization of the 5G Power Amplifier Below 6 GHz by DPD Compensation Technique
   Aleksandar Atanasković, Nataša Maleš-Ilić and Djuradj Budimir

4. Linearly Polarized Phased Antenna Array with an Application for the Automatic Landing of Unmanned Flying Vehicle
   Ivaylo Nachev and Ilia Iliev

5. Propagation Loss Model for Mobile Wireless Communication Systems
   Ilia Iliev and Boncho Bonev

6. Secrecy Outage Probability and Intercept Probability Analysis over Alpha-F Fading Channels
   Jelena Anastasov, Aleksandra Panajotović, Nikola Sekulović, Dejan Milić and Daniela Milović

7. Adaptive Routing with Probability Response Function of the Service Time
   Tashko Nikolov, Denitsa Kireva – Mihova, Borislav Boyadjiev

8. Comparative Analysis of AODV, DSDV and DSR Routing Protocols in VANET
   Tsvetatan Marinov

   Ivaylo Vladimirov, Maria Nenova, Desislava Nikolova and Zornitsa Terneva
Poster 2 - Computer Systems and Internet Technologies & Informatics and Computer Science

1. ERP Systems in Corrugated Packaging Industry
   Radoslav Hrischev

2. Cyberattack Types - Methods and Technics for Protection of Communication Resources
   Zornitsa Terneva, Maria Nenova, Viktoria Terneva, Ivaylo Vladimirov and Desislava Nikolova

3. A Comparison of Machine Learning Classification Algorithms and Methods for English Author’s Works and their Translations into Bulgarian
   Neli Kalcheva and Milena Karova

4. Educational Model-based Evaluation of Buck DC/DC Converter Controllers
   Tsveti Hranov and Nikolay Hinov

5. Distress Study Through Machine-Learning Techniques
   Ginka Marinova and Neli Kalcheva

6. Modified Training Models Based on Medical Data Sets
   Ivan Ivanov, Borislava Toleva and Nikolay Netov

7. Time Series Prediction with Neural Networks: a Review
   Vasil Shterev, Nikolay Metchkarski and Kiril Koparanov

8. A review of machine learning methods for long-term time series prediction
   Milan Protic, Milos Stojanovic and Predrag Popovic

9. Concentration Testing and Data Collection System
   Gergana Spasova and Iliyan Boychev

    Daniel Denev and Tsvetoslav Tsankov
Chairman: Gordana Janevska & Tihomir Brusev

Poster 3 – Electronics, Control Systems & Measurement Science and Technology

1. Improving Piezo Effect of Egg Shell Composition by Rochelle Salt Nanocrystals
   Rostislav Rusev, George Angelov, Boriana Tzaneva and Mariya Aleksandrova

2. Power Losses in High Frequency Switching-Mode Regulator for Integrated Circuit Applications
   Tihomir Brusev

3. Landslide Monitoring Methods Based on RTK Navigation
   Rosen Miletiev and Emil Iontchev

4. FMEA as a Tool in Supply Chain - Automotive Industry, Case Study in Republic North Macedonia
   Aleksandar Stevanoski, Ivo Kuzmanov and Silvana Angelevska

5. A state-of-the-art review of ultra-wideband localization
   Rosen Vitanov and Dimitar Nikolov
Friday, June 17

16:00 – 18:00

Po. A

Chairman: Elena Kotevska & Valentina Rankovska

Poster 6 - Engineering Education & Other

1. Applying Free and Open-Source Tools in Microcontroller Laboratory Classes
   Valentina Rankovska and Goran Goranov

2. Teaching of Bayes formula
   Neli Kalcheva

3. Experimental Results of Breakdown Voltage and Electrical Breakdown Time Delay of Geiger-Muller Chamber
   Milić Pejović

4. Some Conditions on Total Boundness (3,2,ρ)-Symmetric Spaces
   Sonja Chalamani, Marzanna Seweryn-Kuzmanovska and Elena T. Kotevska

5. Classification of oncological medical institutions on the basis of patient survival and topographic code of the disease
   Maya Todorova, Neli Kalcheva and Ginka Marinova

6. Investigation of the Fiber-Forming Properties from Ternary Solutions Containing PVA and Nutraceuticals Additives on Electrospinning Process
   Margarita Neznakomova and Dilyana Gospodinnova

7. Identification of Characteristic Descriptors and Creation of a Model for Predicting the Stage of Cancer
   Maya Todorova and Neli Kalcheva
Friday, June 17

16:00 – 18:00

Po. B

Chairman: Blagoja Arapinoski & Gergana Vacheva

Poster 4 - Energy Systems and Efficiency

1. Modern Approach to Distribution Transformer Designing
   Trajche Stenkovski and Blagoja Arapinoski
2. Methods of Analysis of Dissolved Gasses in Transformer Oil
   Trajche Stenkovski, Natasha Mojsoska and Blagoja Arapinoski
3. Evaluation of the Life Cycle of a Hydropower Plant
   Gergana Vacheva, Plamen Stanchev and Nikolay Hinov
4. Methodology for Reliability Assessment of Power System with
   Decentralized Energy Resources Connected
   Evgeniya Vasileva
5. Modeling of Hybrid Autonomous Power System with PV, Fuel cell
   and Supercapacitor
   Gergana Vacheva, Plamen Stanchev and Nikolay Hinov
6. Wireless Power Transfer System with Four Degrees of Freedom
   Nikolay Madzharov and Desislav Iliev
6. Modeling and Simulation of DC-DC Push-Pull Converter
   Gergana Vacheva, Kiril Genev and Nikolay Hinov

Friday, June 17

16:00 – 18:00

Po. C

Chairman: Zoran Velickovic & Ivo Kuzmanov

Poster 5 - Signal Processing & Digital Image Processing

1. 3D Machine Vision System for Defect Inspection and Robot Guidance
   Danail Slavov and Vladimir Hristov
2. Artificial Humans: an Overview of Photorealistic Synthetic Datasets and Possible Applications
   Desislava Nikolova, Ivaylo Vladimirov and Zornitsa Terneva
3. Application of QR code as a watermark in multi-modal person’s identification
   Zoran Velickovic, Sladjana Velickovic and Marko Velickovic
4. Comparison of algorithms for elimination the outliers in the process of 3D modelling from video
   Svetlana Mijakovska, Filip Popovski, Roberto Pasic and Ivo Kuzmanov
Saturday, June 18

10:00 – 13:00
Room A

Chairman: Mitko Kostov

Editorial team meeting

Conclusions