

# 5<sup>th</sup> Annual International ENGINEERING Conference

**Dates: 26-27<sup>th</sup> OCTOBER 2023**

Hosted by the Faculty of Engineering under the theme “*Harnessing Research in Engineering for Resilience and Sustainability*”

**VENUE: University of Nairobi Towers (Main Campus) & Online**



**University of Nairobi**

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About UON:

Welcome notes:

Vice Chancellor:

Research Week Chair 2023/DVC RIE:

Dean: Faculty of Engineering

Associate Dean, Faculty of Engineering

EC2023 Committee

Several cross-cutting topics will be delivered by the authors of the papers where the sessions are tracked as “*Harnessing Research in Engineering for Resilience and Sustainability*”

- Innovations & Data in Engineering and Manufacturing
- Land Use/Land Cover and Ecosystems
- Agriculture and Food Security
- Water Resources and Hydroclimatic Disaster Management

Conference Organizing Committee:

Dr. John P. O. Obiero, Chairman, EC2023 Conference Committee Chair

Prof. John B. K. Kiema, Co-ordinator (Geospatial and Space Technology)

Prof. Siphila M. Mumanya, Co-ordinator (Civil and Construction Engineering)

Dr. Christian T. Omuto, Cordinator (Agricultural and Biosystems Engineering)

Dr. Richard M. Kivindu, Co-ordinator (Mechanical and Mechatronics Engineering)

Dr. Davis Segera, Co-ordinator (Electrical and Information Engineering)



Mr Michael Mangala, Co-ordinator (Nuclear Science)



# PROGRAMME


## ENGINEERING CONFERENCE 2023 (EC2023)

Thursday 26<sup>th</sup> October 2023

Time	Activities	Session Paper Author /Session Chair
8:30 – 9.00 am	<p><b>Opening Ceremony</b> <i>Vice Chancellor</i></p> <p><b>Opening Ceremony</b> <i>Committee Chair, Faculty of Engineering</i> <i>Associate Dean: Faculty of Engineering</i> <i>Dean: Faculty of Engineering</i></p>	<p><b>Opening Remarks – DVC RIE</b></p> <p><b>Opening Remarks – Host</b></p>
9.00 – 9.30 am	<i>Presentation by French Expert (Industry-Aademia Linkage), Engineering and Science Complex, (Prof. Marc Zolver)</i>	<b>Presentation</b>
9:30 – 11:00 am	<p><b>Innovations &amp; Data in Engineering and Manufacturing</b> <b>Session Chair:</b> Prof. Siphila M. Mumenya</p>	
9:30 – 9:45 am	<p>Techno-economic Analysis of PV-Battery Priority Grid Tie System with Diesel Genset Resilience</p> <hr/> <p><b>Authors:</b> Dessalegn Bitew, Aeggegna, George, Nyauma Nyakoe, Cyrus Wekesa</p>	
9:45 – 10:00 am	<p>A Comparative Study of Earthquake Performance and Material Cost of Braced Tube, Diagrid, Tube-in-tube, and Shear Wall-frame Structures</p> <hr/> <p><b>Authors:</b> Grant Oduor, Silvester Abuodha, Siphila Mumenya</p>	
10:00 – 10:15 am	<p>Assessment of excess lifetime cancer risk (ELCR) and risk of lung cancer due to radon exposure, and occupational exposure of mine workers in Tabaka Area, Kisii County, Kenya</p> <hr/> <p><b>Authors:</b> Linnet Kerubo Nyamweya, Geoffrey O. Okeng’o, Michael Mangala</p>	
10:15 – 10:30 am	<p>Application of artificial intelligence in civil engineering infrastructure</p> <hr/> <p><b>Authors:</b> Harun N Wagura, Siphila W Mumenya</p>	
10:30 – 10:45 am	<p>Recycled Plastic Waste in Production of Paving Blocks for Construction of Non-Motorized Transport Facilities.</p> <hr/> <p><b>Authors:</b> Jane Nailantei Mapelu, Siphila Mumenya, Damaris Oyaro</p>	
10:45 – 11:00 am	<p>Design for durability of reinforced concrete (rc) structures to ensure sustainable construction.</p> <hr/> <p><b>Authors:</b> Gladwell W. Nganga, Siphila W. Mumenya, Silvester O. Abuodha and Thomas O. Mbuya</p>	

11:00 – 11:30am	<b>HEALTH BREAK</b>	
<p><b>11:30 – 12:00 pm</b></p> <p><b>Northumbria University, Newcastle, United Kingdom</b></p>	<p><b>Guest Speaker:</b> Northumbria University, Newcastle, United Kingdom</p>	 <p><b>Fredrick Madaraka Mwema</b>  <b>Postdoctoral Research Fellow</b>  <b>Department of Mechanical &amp; Construction Engineering</b>  <b>Northumbria University, Newcastle United Kingdom</b>  <b>&amp;</b>  <b>Senior Lecturer</b>  <b>Department of Mechanical Engineering</b>  <b>Dedan Kimathi University of Technology, Nyeri Kenya</b></p>
	<b>Q&amp;A session</b>	
<p><b>12:00 – 12:20 pm</b></p> <p><b>University of Ghana, Legon, Accra, Ghana</b></p>	<p><b>Guest Speaker:</b> Department of Materials Science and Engineering  <b>University of Ghana, Legon, Accra, Ghana</b></p>	 <p><b>Benjamin Agyei-Tuffour</b>  <b>Assoc. Prof. Materials Science and Engineering</b>  <b>Department of Materials Science and Engineering</b>  <b>University of Ghana, Legon, Accra, Ghana</b></p>

<p><b>12.20 -12.40 pm</b></p> <p><b>University of the Witwatersrand, Johannesburg, South Africa.</b></p>	<p><b>Guest Speaker:</b> School of Chemical and Metallurgical Engineering, University of the Witwatersrand, Johannesburg, South Africa.</p>	 <p><b>Michael Bodunrin, Senior Lecturer, School of Chemical and Metallurgical Engineering, University of the Witwatersrand, Johannesburg, South Africa.</b></p>
<i>Q&amp;A SESSION</i>		
<p><b>12:40 – 1:00pm</b></p> <p><b>University of Massachusetts Amherst USA</b></p>	<p><b>Guest Speaker:</b> Department of Civil and Environmental Engineering University of Massachusetts Amherst USA</p>	 <p><b>Dr. Emily Kumpel Assistant Professor Department of Civil and Environmental Engineering University of Massachusetts Amherst USA</b></p>
<i>Q&amp;A SESSION</i>		
<p>1.00 – 2.00 pm</p>	<i>LUNCH BREAK</i>	

<p><b>2.00 – 2.30 pm</b></p> <p><b>University of Western Ontario (“Western”) in Canada</b></p>	<p><b>Guest Speaker:</b> Department of Chemical and Biochemical Engineering &amp; School of Biomedical Engineering at the University of Western Ontario (“Western”) in Canada</p>	 <p><b>Dr. Kibret Mequanint</b>  <b>Professor, Department of Chemical and Biochemical Engineering &amp; School of Biomedical Engineering at the University of Western Ontario (“Western”) in Canada</b></p>
<p><b>2:30 – 5.00 pm</b></p>	<p><b>Innovations &amp; Data in Engineering and Manufacturing - Contd</b>  <b>Session Chair:</b> Dr. Richard M. Kivindu</p>	
<p>2:30 – 2:45 pm</p>	<p>Assessing the Stability of Rooftop-Installed Continuously Operating Reference Stations.  <hr/> Nyabuti K. A., Matara S. M</p>	
<p>2:45 – 3:00 pm</p>	<p>Influence of redispersible polymer type and content on restrained shrinkage cracking in non-structural concrete patch repair mortars  <hr/> Philemon Arito</p>	
<p>3:00 – 3:15 pm</p>	<p>Effect of Laser Beam Cutting Parameters on Cut Quality of Ferrous and Non-Ferrous Metal Sheets  <hr/> Enoch Kimanzi</p>	
<p>3:15 – 3:30 pm</p>	<p>Experimental Study on the Performance of Prescribed Ratios with Different Cement Types in Kenya  <hr/> Muthomi Munyua</p>	
<p>3:30 – 3:45 pm</p>	<p>Influence of corn cob ash-silica fume blend on the mechanical and durability properties of concrete  <hr/> Otieno Linda Akoth, Sylvester Abuodha, Siphila Mumanya, Muthomi Munyua</p>	
<p>3:45 – 4:00 pm</p>	<p>Assessment of factors that influence construction timber waste management in a circular economy: case of affordable housing projects in Nairobi.  <hr/> Stephen Nyakondo Nyang’au</p>	
<p>4:00 – 4:15 pm</p>	<p>Effect of micro lime on the ambient cured sugarcane bagasse ash-based geopolymer concrete.  <hr/> Thuku Keithy Kamau, Benard Omondi, Janet Oyaro</p>	

4:15 – 4:30 pm	Assessment of radio-ecological hazardous and toxic heavy metal contamination associated with artisanal gold mining in West Pokot County Elijah Pkemoi, Elijah Mwangi, Michael J. Mangala
4.30 – 4.45pm	Comparison of Hot-rolled and Reworked Steel I-Sections on the Axial Capacity, Ductility and Lateral Deflection of Composite Slender Columns Subjected to Concentric Loading. Onditi Robert Ouko
4.45 – 5.00 pm	Excited grey wolf optimization for optimal power allocation in power domain non-orthogonal multiple access system. Wendy A.Ouko, Abraham Nyete, Davies Segera
	<b>END OF DAY ONE</b>

### Friday 27<sup>th</sup> October 2023



8:30 – 9:30 am	<b>Innovations &amp; Data in Engineering and Manufacturing - Contd</b> <b>Session Chair: Prof. John B. K. Kiema</b>
8:30 – 8:45 am	An Eigen decomposition-Based Estimation of the Direction of Arrival of Correlated Signals Using a Uniform Circular Array Njoroge Kennedy
8.45 – 9:00 am	Evaluation of radiological hazard indices, excess lifetime cancer risk, and occupational exposure due to Quarry mining at the Menengai Caldera, Nakuru, Kenya Ruth O. Achieng
9:00 – 9:15 am	Development of a Direct and Rapid Method for Screening Trace Heavy Metals in Water Using EDXRF and Deep Learning Njoki Benedict Kamoni, Ian Kaniu, Damaris Wachira-Mbui
9:15 – 9:30 am	Genetic Artificial Hummingbird Algorithm – Support Vector Machine for Timely Power Theft Detection Emmanuel Gbafore Rene Davies Segera and Cosmos Kiruki
9:30 – 10:45 am	<b>Water Resources and Hydroclimatic Disaster Management</b> <b>Session Chair: Dr. Davis Segera</b>
9:30 – 9:45 am	Material characterization of potential natural drinking water filtration materials in Kenya Caroline J. Ingati, John P.O. Obiero, Duncan O. Mbuge
9:45 – 10:00 am	Assessment of the impact of floods on availability of essential trace elements in soils, selected vegetables and water quality in Budalangi, Busia County. Anvar A lot

10.00 – 10.15 am	<p>Treatment of heavy metals contaminated water with organic materials within selected communities in Ibadan, Oyo state Nigeria</p> <hr/> <p>ADEPOJU, Adesola Oluwafunmilayo, ADESOGAN, Sunday Olufemi</p>	
10.15 – 10.30 am	<p>Treatment of Domestic Effluent Using Household Wastewater Treatment Plant.</p> <hr/> <p>Aladekomo, J., and Adesogan, S.O</p>	
10.30 – 10:45 am	<p>Optimizing Water Supply Infrastructure Management in Dryland Urban Setting to Enhance Water Security PhD study</p> <hr/> <p>Charles Odira Maxwell, Zablun Oonge, Patts M.Odira and Gilbert Ouma</p>	
10.45 – 12.30 am	<p><b>Land use/Land cover and Ecosystems</b></p> <p>Session Chair: Dr John P.O Obiero</p>	
10:45 – 11:00 am	<p>Effects of land use changes on soil erosion in Kaibon watershed, West Pokot County, Kenya.</p> <hr/> <p>Serah Lemurt, John Obiero, Elijah Biamah, Christian Omuto</p>	
11:00 – 11:20 am	<p><b>HEALTH BREAK</b></p> <hr/>	
<p><b>11.20 -11.40 am</b></p> <p><b>University of the Witwatersrand, Johannesburg, South Africa.</b></p>	<p><b>Guest Speaker:</b> School of Chemical and Metallurgical Engineering, University of the Witwatersrand, Johannesburg, South Africa.</p>	 <p><b>Prof. Lesley Cornish</b>  <b>Professor, the School of Chemical and Metallurgical Engineering, University of the Witwatersrand, Johannesburg, South Africa.</b></p>



<p><b>11:40 - 12:00pm</b></p> <p><b>University of Southampton, United Kingdom</b></p>	<p><b>Guest Speaker</b> Department of Mechanical Engineering University of Southampton, United Kingdom.</p>	 <p><b>Professor Philippa Reed, Professor of Structural Materials, Department of Mechanical Engineering, University of Southampton, United Kingdom</b></p>
<p><i>Q&amp;A SESSION</i></p>		
<p>12:00 - 12:15 pm</p> <p>12:15 – 12:30 pm</p>	<p><b>Land use/Land cover and Ecosystems</b> - cont</p> <p><i>Session Chair:</i> Dr John P.O. Obiero</p> <hr/> <p>Suitability analysis of solar photovoltaic farm locations using GIS: Case study of Nakuru County. Wisio, V.C and Kiema, J.B. K</p> <hr/> <p>Harnessing GIS and remote sensing technology to monitor urban sprawl: Case study Kajiado North subcounty. Opanga, Sara Beryl and Kiema, J.B.K</p>	
<p><b>12:30 – 1.00 pm</b></p> <p><b>University of the Witwatersrand South Africa</b></p>	<p><b>Guest Speaker:</b> School of Civil and Environmental Engineering University of the Witwatersrand South Africa</p>	 <p><b>Mike Otieno Associate Professor Head of School of Civil and Environmental Engineering University of the Witwatersrand South Africa</b></p>
<p><i>Q&amp;A SESSION</i></p>		
<p>1:00 – 2:00 pm</p>	<p><i>LUNCH BREAK</i></p>	



<p><b>2:00 – 2:20 pm</b></p> <p><b>International Centre for Clean Water, An initiative of IIT Madras</b></p>	<p><b>Guest Speaker:</b> International Centre for Clean Water, An initiative of IIT Madras, India</p>	 <p><b>E Nandakumar</b>  <b>Chief Executive Officer (CEO)</b>  <b>International Centre for Clean Water, An initiative of IIT Madras</b></p>
<p><b>2.20 – 2.40 pm</b></p> <p><b>Whitacre College of Engineering at Texas Tech University</b></p>	<p><b>Guest Speaker:</b> Dean for undergraduate studies Whitacre College of Engineering at Texas Tech University</p>	 <p><b>Professor Stephen Ekwaro-Osire</b>  <b>associate dean for undergraduate studies</b>  <b>Whitacre College of Engineering at Texas Tech University</b></p>
<p><i>Q&amp;A SESSION</i></p>		

2.40 – 3.55 pm	<p><b>Land use/Land cover and Ecosystems</b> – cont</p> <p><b>Session Chair:</b> Dr Christian T. Omuto</p> <hr/>
2.40 – 2.55 pm	<p>Harnessing GIS technology for suitability analysis for housing development: case study: Machakos Town Subcounty</p> <p>Kioko, B. M and Kiema, J.B.K</p>
2.55 – 3:10 pm	<p>Road Drainage Assessment and Management using GIS: Case Study of Magadi Road</p> <hr/> <p>Tonny Oginda and David N. Siriba</p>
3:10 – 3:25 pm	<p>Modelling Spatial Accessibility for Precision Targeting of School-based Interventions: A Case Study of Kilifi County</p> <hr/> <p>Anitah Cherono, David N Siriba, Robert W Snow, Peter M Macharia</p>
3:25 – 3.40 pm	<p>Application of GIS in road reserves mapping, case study: Kayole – Mananja – Masinga (C438) road in Machakos county</p> <hr/> <p>Mr. David M. Njoka, S. M. Musyoka</p>
3.40 – 3.55 pm	<p>Tracing sediment provenance in Kilindini harbour, Mombasa</p> <hr/> <p>Loise Mbae, Elijah Mwangi, Ian Kaniu, Jacques Bezuidenhout</p>
3.55 – 4.40 pm	<p><b>Agriculture and Food Security</b></p> <p><b>Session Chair:</b> Michael Mangala</p> <hr/>
3.55 – 4.10 pm	<p>Leveraging on GIS to increase efficiency of subsidized fertilizer distribution, a case study of Njoro sub-county</p> <hr/> <p>Ngugi, S.S.W and Kiema, J.B.K</p>
4:10 – 4.25pm	<p>Characterization of selected agricultural crop wastes for energy generation in Kenya</p> <hr/> <p>M. Konukoa, T. O. Mbuyaa , S. W. Mumenyab and I. B. Omosac</p>
4.25– 4.40 pm	<p>Atmospheric pressure and micro - environment principles application in sawdust combuster for the treatment of fish with hot and non densed smoke.</p> <hr/> <p>Adesanya A. S. and Olanrewaju, T.O.</p>
4:40 – 5:00 pm	<p><b>Closing Ceremony</b></p>