### UNIVERSITY OF NAIROBI

### FACULTY OF ENGINEERING

### 7TH ANNUAL INTERNATIONAL ENGINEERING CONFERENCE

### October 22-24, 2025

### PROGRAMME

# THEME: “ENGINEERING SOLUTIONS FOR A CHANGING WORLD”

## Sub-Themes:

* Engineering Climate Resilience, Sustainable Infrastructure and Transportation Systems
* Innovating Energy Systems for a Sustainable and Inclusive Future
* Engineering Innovations in Water, Food, Health, and Agricultural Systems
* Smart Systems and Digital Technologies for a Dynamic Global Landscape
* Advanced Manufacturing, Materials, and Industrial Transformation

**DAY 1: Wednesday, October 22, 2025**

**9-11AM OPENING CEREMONY**

**Presiding:** Conference committee

**Opening remarks**

* Associate dean, faculty of engineering
* Dean, faculty of engineering
* DVC AA
* DVC RIE
* VC

**Keynote speakers**

* Tilahun Seyoum Workneh, University of KwaZulu-Natal, South Africa
  + [34] Tilahun Seyoum Workneh, Jelili Babatunde Hussein. *Applications and Future Developments of Artificial Intelligence in Food Processing and Preservation.*
* Simon Meunier, Université Paris-Saclay, France
  + [46] Hafssa Elhaimer, Marie-Joelle Seka, Evelyne Lutton, Céline Hudelot, Simon Meunier. *Temporal irradiance clustering for photovoltaic systems: method and application to five African sites.*

**SESSION 1: 11-1PM**

**Session chair: Prof. John Kiema**

Climate Resilience & Environmental Monitoring;

Disaster Risk, Waste & Public Health

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 1 | John Ch. Dermentzoglou, N. Galiatsatos, D. Bandekas, N. Vordos, L. Magafas, M. Hanias | Development of Marine Propulsion Engines Mathematical Models for Real Time Simulation/Emulation |
| 2 | Linus Anari, David N. Siriba | Spatial-Temporal Analysis of Coral Cover Change and Its Engineering Applications: A Case Study of Kisite-Mpunguti Marine Protected Area, Kenya (2019–2024) |
| 3 | Caroline J. Bett, Galcano C. Mulaku | Analysis of Recent Locust Invasions on Northern Kenya’s Rangelands |
| 4 | Vincent Kipyegon, J.B.K. Kiema | Leveraging Geospatial Intelligence in Empowering Kenya’s Flood Resilience |
| 5 | Naomi Muthoni Karanja, Dr. David Siriba | Leveraging GIS for Refugee Camp Mapping: A Case of Dadaab Refugee Complex |
| 6 | David N. Siriba, Collins Mwange, Kevin Kariuki, Linus Anari | Mapping Nairobi’s Noise Hotspots: Citizen Science for Sustainable Urban Policy |
| 7 | Faith N. Karanja, Levis Kitonge | An AI-Mapping Driven Approach of Urban Heat Island Effect to Support a Climate-Resilient Urban Environment in Mvita Constituency, Mombasa County |
| 8 | Fay Annette Shitandi, Reuben Kivindu, David Siriba | Application of Shortest Route Method for Municipal Solid Waste Management: A Case Study of Nairobi Central Business District |
| 9 | Omondi P.C., Kiema J.B.K. | Flood Risk Assessment and Mitigation in Tana River County |

**SESSION 2: 2-4PM**

**Session chair: Dr. John Birir**

Disaster Risk, Waste & Public Health

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 10 | Amy Cheruto Siele | Design and Development of a Smart Waste Inventory and Clearance Monitoring System for Radiopharmaceutical Waste Using Python-Based Automation |
| 11 | Daniel Ributu Maina, Elijah Mangi, John Birir, Anselim Mwangi | Assessment of Occupational Radiation Exposure and Natural Background Radioactivity from Selected Quarries in Nyandarua County, Kenya |
| 12 | Margaret Ruguru Gitau, Elijah Mwangi, Michael Mangala | Exposure Levels to PM2.5 Associated with Toxic Heavy Metals to Pedestrians and Workers in Nairobi CBD Area |
| 13 | Ukhevi Cliff Wesonga | Assessment of Personal Occupational Exposure to PM2.5 Pollutants and Associated Health Risks Due to Long-Term Exposure among Boda-Boda Riders in Nairobi |
| 14 | George Nyamao, Thomas Mbuya, Stanley Shitote, James Mutua | Performance of Recycled Mixed Waste Glass as Partial Replacement for Fine Aggregate in Concrete |
| 15 | Camilla Aoko Okongo, Anne W. Muohi, Michael J. Mangala | Assessment of Carcinogenic Risk Due To Toxic Heavy Metal Exposure in Cosmetic Products Sold in Nairobi-Kenya |
| 16 | Mathenge P.,Kiema J.B.K | Flood Risk Assessment in Garissa County, Kenya |
| 17 | Graham Muma, Damaris Oyaro | Assessing Seasonal Variability of Leachate Pollution on Surface Waters Adjacent to the Noonkopir Dumpsite in Kitengela, Kenya |
| 18 | Mary Ann Wanjiru, Damaris Oyaro | Assessing Biogas-Based Energy Recovery Potential from Municipal Wastewater: A Case Study of the Kariobangi Treatment Plant in Nairobi, Kenya |

**DAY 2: Thursday, October 23, 2025**

**SESSION 3: 9-11AM**

**Session chair: Dr. Damaris Oyaro**

Disaster Risk, Waste & Public Health

Water, Food & Agriculture Systems

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 19 | Peter Ssekamanya | Assessing the Feasibility of Composting as a 3R Strategy in Solid Waste Management |
| 20 | Prosper Kpiebaya, Waweru N. Mugure, Okot Nelson, Tizazu Ayalew, Harsha Ratnaweera | Urban Floods in Sub-Saharan Africa: Status, Causes, and the Way Forward |
| 21 | Johnson Ngugi, George O. Rading, Thomas O. Mbuya | The Feasibility of Developing a Construction Material from Basaltic Quarry Waste and Recycled High-Density Polyethylene |
| 22 | Porchezhian Muthukumar | Understanding the economic failure of vertical farming technology and expansion of vertical farming utilization for successful venture in Kenya |
| 23 | Bruce Pius, Peter Odero Akuon, Kinyua Wachira | Global Agrilink: Empowering Smallholder Farmers through Blockchain, AI, and Smart Farming Technologies for a Resilient Global Food System |
| 24 | Magoye Sinclair Quinton, Mugo Betsy Makena | Water Quality Monitoring and Assessing the Impact of Land Use Land Cover Changes on Water Quality Using GIS and Remote Sensing. Case Study: Lake Baringo Basin |
| 25 | Emmanuel Nehemia, Elijah Mwangi, Michael J. Mangala, Kelvin Mtei | Assessment of Naturally Occurring Radioactive Materials (NORMs) Transfer Factors of Selected Vegetables Grown in the Uranium-Rich Semi-Arid Region of Manyoni District, Central Tanzania |
| 26 | Porchezhian Muthukumar | Re-designing solar farms for verticality to increase the density of solar panels |
| 27 | Mutugi Kiruki, Emmanuel Ndashimye, Evariste Twahirwa | Birds’ Repellent System for Large-Scale Rice Farming |

**SESSION 4: 11-1PM**

**Session chair: Dr. Reuben Kivindu**

Water, Food & Agriculture Systems

Energy Systems & Renewable Technologies

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 28 | Waweru N. Mugure, Prosper Kpiebaya, Okot Nelson, Tizazu Ayalew, Harsha Ratnaweera | A Review of Groundwater Use for Agriculture in Sub-Saharan Africa |
| 29 | Dennis Ndumbi, Damaris Oyaro | Low-Cost Slow and Rapid Sand Filtration for Treating Greywater–Stormwater Mixtures for Non-Potable Reuse in Kenya |
| 30 | Charles O Maxwell, Zablon Oonge, Patts A Odira, Gilbert O. Ouma, Marco Lompi, Tommaso Pacetti, Mario Di Bacco, Enrica Caporali | Water-Energy Nexus Based Optimization of Water Supply Infrastructure in Dryland Urban Setting |
| 31 | Wanangwe Davis Shatimba, Damaris Oyaro, David Nyangau Siriba | A GIS-Based Framework for Managing Non-Revenue Water: A Case Study of Westlands Service Area, Nairobi County |
| 32 | Waweru Nancy Mugure, Oonge N.I. Zablon, Oyaro K. Damaris | Comparative Study of Correlation of Consumptive Water Use and Emissions in Greenhouse and Open Field Irrigation from Vegetable Farms in Kenya |
| 33 | Njeri H. Njoroge, Kevin N. Guandaru | Biogas Energy for Rural Sustainability and Inclusion: A Case Study of Nyandarua County, Kenya |
| 35 | Caroline Ingati, Thomas O. Mbuya, Richard Kimilu | Strengthening Water Access and Quality in Selected African Cities |
| 36 | Mwene Job Omambia, Christopher Maina Muriithi, Irene Muisyo | Optimal Sizing and Techno-Economic Analysis of Battery Energy Storage Systems for Peak Shaving and Voltage Profile Improvement on a Rural Distribution Network |
| 37 | Liz Mubari | Optimizing Battery Energy Storage Integration with Utility-Scale Solar PV Plants for Grid Stability in Kenya |

**SESSION 5: 2-4PM**

**Session chair: Dr. Peter Kimani**

Energy Systems & Renewable Technologies

Smart Systems, AI & Digital Innovations

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 38 | Peter Waka, Victor Ouma, Alvin Wairagala | Smart Systems for Inclusive Talent Development: The Nawiri Model Bridging Kenya’s Engineering Education-to-Employment Gap |
| 39 | Idris Muhammad Chiromawa, Mikailu Abdullahi, Ibrahim Garba Shitu, Aminu Muhammad | Efficiency of Ab-Initio Total Energy Calculations for Metals and Semiconductors Using a Plane-Wave Basis Set |
| 40 | Rahma Mohamud Ibrahim | Engineering Low-Cost CO₂ Adsorbents from Local Biomass for a Changing World |
| 41 | Umang Sharma, Mohammad Arif Kamal | Analyzing the Potential of Aerogel Bricks for Energy Optimization in Buildings: An Approach towards Net-Zero Energy Solutions |
| 42 | Edwin Mayaka, Richard K. Kimilu, Julius M. Ogola | Assessment of the Energy Value Chain in Large Construction Projects: A Case Study of select ongoing projects within Kisii County |
| 43 | Peter M. Weramwanja, George O. Rading, Thomas O. Mbuya, John M. Kihiu, Joseph O. Borode | Enhancement of Local Kenyan Bentonite for Sustainable Drilling Fluid Applications |
| 44 | Ngugi S.S.W., Mwange C., Kiema J.B.K. | Spatial Analysis of Health Facilities in Nairobi Using GIS and Python |
| 45 | Otieno Linda Akoth, Sylvester Abuodha, Siphila Mumenya | Pozzolanic Cement Using Corn Cob Ash and Gum Arabic for Sustainable Construction |
| 47 | George Musumba Nyaory, Heywood A. Ouma, Abraham M. Nyete, Dominic O. Konditi | Smart Handshake Protocols and Dynamic Resource Allocation for Edge Servers in 5G/6G Networks |

**DAY 3: Friday, October 24, 2025**

**SESSION 6: 9-11AM**

**Session chair: Dr. Davies Segera**

Smart Systems, AI & Digital Innovations

Materials, Concrete & Industrial Transformation

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 48 | Kevin A. Misaro, Gustavo Tumialan | Glass Fiber Reinforced Polymer – Reinforcement Bars for a Changing World |
| 49 | Paul Sebastian Okoth, Silvester Abuodha, A. M. Nyete, Yashon Ouma, John Mwero | Semi-Supervised Anomaly Detection Framework for Vehicle Event Identification in Bridge Acceleration Data |
| 50 | Stephen Juma Wanjala, Richard Kyalo Kimilu, John Mmari Onyari | Influence of Alumina Catalyst on Chemical Characteristics of Polypropylene Plastics Oil |
| 51 | Stephen Juma Wanjala, Richard Kyalo Kimilu, John Mmari Onyari, Job Bosire Omwoyo | Effects of Alumina Catalyst on the Yield, Density, Viscosity, Calorific Value, and Cetane Index of Polypropylene Pyrolysis Oil |
| 52 | Dickens O. Agumba, Bemard O. Alunda, Weramwanja Peter, Johnson Ngugi | Technical Lignin Molecular Design towards Advanced Applications |
| 53 | Karuge Amos, Mumenya Siphila, Abuodha Silvester, Muthomi Munyua | Mechanical Properties of a High Volume Natural Pozzolan Roller Compacted Concrete for Dams – Laboratory and Field Trials |
| 54 | Dun Birekyeraho Tukwatse | Modelling the Effect of Aggregate Size on Compressive Strength of Structural Concrete |
| 55 | Muthomi Munyua | Acceptance Criteria for the Compressive Strength of Concrete in Kenya |
| 56 | Barrack Okoya OMONDI, Meshack Wafula IKHABI, Nicole Amondi OBONYO, Syslvester Ochieng ABUODHA, Siphila Wanjiku MUMENYA | Durability of Rice Husk Ash Concrete – An Investigative Report |

**SESSION 7: 11-1PM**

**Session chair: Dr. Collins Mwange**

Transportation, Infrastructure & Structural Engineering

Emerging & Cross-Cutting Engineering Solutions

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 57 | John Birir, Philip W. Loveday, Paul Fromme, Prabhu Rajagopal | Enabling Low-Cost Ultrasonic Guided Wave Inspection: Experimental and Theoretical Investigation of A0 Mode Interaction with Through-Holes in Aluminium Plates |
| 58 | Chepkirui J. Towett | Development and Validation of Finite Element Simulation Model for Rollover Crash Test of Class IV Typical Kenyan Made Bus |
| 59 | Nyabuto Webster Kabuka | Cooperative Vehicle-To-Vehicle Headlight Control for Automatic High-Beam Dimming |
| 60 | Newton M. Odari, Fredrick O. Bosire, John Njuguna Kiragu | Experimental Demonstration of the FieldsRider Optimized Spectrum Thruster (FROST): A Dual-Path Electromagnetic–MHD Non-Newtonian Propulsion System |
| 61 | Anthony Murigu Jane | Automated Real-Time Structural Analysis System |
| 62 | Chepkirui J. Towett, Njoroge D. Kenneth, Jama H. Hussein | Roof and Side Strength Analysis of a Typical Kenyan Made Bus for Rollover Crashworthiness |
| 63 | Akinjobi kolawole | Engineering Solutions for a Changing World |
| 64 | Otieno C.A., Koome M., Mulaku G.C. | A Review of Kenya’s Ardhisasa Land Information System: Institutional and Technical Issues |
| 65 | Gumay M.H., Astuti W.D | Development of a Portable Device for Moisture Content Estimation in Postharvest Chili Using Transfer Learning |

**SESSION 8: 2-4PM**

**Session chair: Dr. Moses Kabeyi**

Emerging & Cross-Cutting Engineering Solutions

|  |  |  |
| --- | --- | --- |
| **No** | **Names** | **Title** |
| 66 | Masai Franklin Netia, Kenneth D. Njoroge, Susan W. Karuga | Development of RFID-Based Corrosion Coupons |
| 67 | Musenero Hilda | Power Network Reliability in Mbale, Uganda |
| 68 | Brian Kipruto Kosgei | Machine Learning for Rapid Performance prediction of Flexible Graded-Z composites |
| 69 | Fridah Joy Namudu, Januarious Ondiek Agullo | Design of a Flue Gas Desulfurization System: A Case Study of Kipevu III Thermal Plant in Mombasa, Kenya |
| 70 | Dennis Kidake | BreatheLite: A Low-Cost Breath Analysis Tool for Early Detection of Respiratory Diseases in Resource-Limited Settings |
| 71 | Samson Kitsao Mramba | A Traveling Wave-based Protection Scheme for Power Systems with High Penetration of RES Using a Hybrid ICA-SVM Algorithm |

**4-5PM CLOSING CEREMONY**

**Presiding:** Conference committee

**Closing remarks**

* Associate dean, faculty of engineering
* Dean, faculty of engineering